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THE PUBLIC DOMAIN OF NEVADA AND FACTORS AFFECTING ITS USE.

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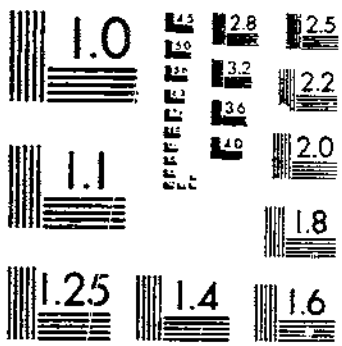

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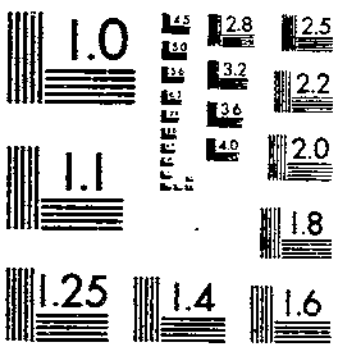

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NATIONAL BUREAU OF STANDARDS-1963-A

TECHNICAL BULLETIN NO. 301 APRIL, 1932

UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

THE PUBLIC DOMAIN OF NEVADA AND FACTORS AFFECTING ITS USE

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INTRODUCTION

From the time when cattle had spread well over the Great Plains, in the early and middle seventies of the last century, the need of land legislation adapted to that great region was felt by an ever-increasing number of people. By 1890, the range-grazing lands were so thoroughly occupied that organized efforts were being made to induce Congress to take some definite action.

At the annual meeting of the National Livestock Association held in 1898 William A. Richards, of Wyoming (*22*),[2] delivered a paper on the need for Federal legislation designed to give proper control of the public domain.[3] Among other things he said: "During the past 10 years at least a score of bills providing for the cession of the lands to the States have been introduced in Congress." Although the members of this meeting could not agree as to the method of bringing it about, they were all in favor of subdivision and individual control of the public grazing lands.

Year after year the American National Livestock Association has passed resolutions which they hoped would bring about such a result.

[1] The author wishes to express his gratitude to all who assisted in bringing together the information in this bulletin. The study was outlined and carried on under the direction of L. C. Gray, principal agricultural economist, division of land economics, Bureau of

State livestock associations of all the Western States and other local organizations of producers of cattle and sheep on range lands have repeatedly passed similar resolutions and recommendations.

Although many different arguments have been advanced as reasons for such action, the principal motive among these stockmen has been the producers' wish to improve their business and to increase output. They were using the range lands more or less, and they recognized that better management of the grazing, possible only under better control, would produce more livestock.

Technical investigators, members of the faculties of the universities and agricultural colleges of the western "public land" States, have analyzed the situation, each in his own State, and have published their conclusions as to conditions, have emphasized the necessity for Federal legislation, and mostly have recommended a particular type of action.[4]

In 1904 a Public Lands Commission, authorized by Congress and appointed by the President, made a study of existing conditions, their report being published as a Senate document (*23*). This report treats the subject exhaustively from many angles and summarizes the available data. A particularly illuminating part of this report is a large-scale map of the range country showing the manner in which both public and private lands were being used at that time. The report recommended legislation which is discussed later. At the meeting of the American National Livestock Association held in Denver in January, 1919, Clay Tallman, then Commissioner of the General Land Office of the United States Department of the Interior, recommended a certain plan of legislation to Congress (*27*). At that same meeting, David Houston, Secretary of Agriculture, recommended practically the same procedure (*14*). In the summer of 1919, at the call of the Arizona Livestock Association, representatives of livestock associations from all the western range States, assembled at Salt Lake City, discussed the subject at length and adopted resolutions recommending practically the same kind of

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Agricultural Economics. Director Cecil Creel, of the Nevada Agricultural Extension Service, and Director S. B. Doten and C. E. Fleming, of the agricultural experiment station at the University of Nevada, gave valuable assistance in determining various details of the plan. Two district agents of the Nevada Extension Service, C. R. Townsend, of Ely, and J. W. Wilson, of Elko, made it possible to ascertain, in the limited time available, the conditions existing on thousands of square miles of their State. The officials at the State capital, George W. Malone, State engineer, and George Watt, State commissioner of lands, and their office forces furnished every facility for an understanding of the water and land laws, the authorized procedure under them, and the consequences of their application. Vernon Metcalf, secretary of the Nevada Land and Livestock Association, explained the actions and wishes of the members of that organization and helped to clarify many uncertainties. John F. Deeds, of the agricultural division of the Geological Survey, Department of the Interior, furnished access to office records and maps showing distribution of forage plants and irrigated land in Nevada. The supervisors of the national forests furnished much information. Alexander McQueen, supervisor of the Humboldt Forest, supplied recorded data and guided the writer through the three divisions of the forest under his direction and discussed and demonstrated conditions and practices. B. A. McAllister, commissioner of the land department of the Southern Pacific Railway Co., gave access to the records of the railroad grant lands in Nevada and explained the methods of the company in handling them. The county assessors in each county and their office forces helped in many ways. Much information was drawn from their records and from their knowledge of conditions in their respective counties. Other county officials added valuable local data. B. O. Weitz and Alfred S. Dalton, former members of the division of land economics, assisted in collecting and assembling the data and in working out the legal status of land and water in Nevada.

[3] Italic numbers in parentheses refer to Bibliography, p. 50.

[4] Care should be taken to distinguish between the expressions "public lands" and "public domain." All lands over which Congress has jurisdiction are "public lands" except as Congress may have made other disposal. Only those lands which are unallotted, unreserved, and unappropriated constitute the "public domain."

[5] See Bibliography at the end of this bulletin.

legislation (*30*). Hardly a Congress for the last 30 years has been without one or more bills proposing legislation for the disposal or control of the public domain. A major difficulty has been the fact that conditions of land utilization in various parts of the public domain are so diverse that it is difficult to draft legislation equally suitable to all parts of it.

Believing that legislation properly applicable to conditions existing in a single State and satisfactory to the people of that State would readily pass Congress without opposition from representatives of other States,[5] it was decided to make a detailed study of all the factors affecting the present and potential uses of the land in some public-land State and to assemble the data in such a manner as to present a definite picture of existing conditions in that State.

Nevada was selected as representing in an extreme degree several of the factors of major importance in the problem. It is unique among all the public-land States in several ways:

There is a greater acreage of public land in Nevada than in any other State.

This acreage of public land constitutes a much greater proportion of the whole land area of Nevada than may be found in any other State.

The whole agricultural organization of Nevada is virtually determined by the only possible use that may be made of this public domain.

Methods of establishing partial control over public grazing lands, by controlling the stock water, that are in use elsewhere are rendered futile in most of Nevada by climatic conditions.

The necessity for legislation regulating the use of these lands has been most keenly felt in Nevada, and there have been many urgent requests for relief.

This study was begun in 1927, and the data presented relate mostly to conditions existing in 1926. Other data obtained later apply to 1929. No material changes have occurred in the major factors discussed, and the maps and tables present broad generalizations as to existing relationships.

THE PHYSICAL LIMITATIONS

SIZE

Nevada is a very large State, being sixth in order of size. Its surface area (70,285,440 acres of land surface and 556,166 acres of water surface) is about equal to twice the area of the New England States plus that of Maryland. Notwithstanding its huge proportions, when measured by agricultural production its rank is near the lowest, and it is lowest in population, as shown by figures from the 1925[6] census. (Table 1.)

[5] The Kincaid Act (passed in 1904), which was practically the same as the grazing homestead act (passed December, 1916), was made applicable to only that part of Nebraska which it fitted.

[6] Figures from the 1925 census (*29*) are used as being the most nearly comparable to the land-tenure and other data for 1926 that have been assembled and mapped.

TABLE 1.—*Comparative agricultural data for Nevada and for two States having comparable areas of crop land, 1925*

Item	Unit	Nevada	Delaware	New Hampshire
Land area of State	Acre	70,285,440	1,257,600	5,779,840
Farms, 1925	Number	[1] 3,883	10,257	21,065
Land in farms	Acre	[1] 4,090,580	899,641	2,262,094
Crop land	do	533,614	518,859	542,840
Crop land harvested	do	362,552	404,209	533,386
Pasture land in farms	do	[1] 2,973,821	101,633	1,087,385
Value of all farm property	Dollars	98,056,356	72,778,416	107,007,243
Value of all crops	do	8,445,833	11,848,440	10,195,895
Value of all products of farms	do	[1] 40,500,764	25,368,656	36,040,638
Value of land and buildings, per acre	do	16.62	66.86	48.30
Population, 1930	Number	91,058	238,380	465,293
Farm population, 1925	do	17,034	54,062	77,450

[1] Includes all farms and stock ranches in Nevada.

SURFACE RELIEF

The State consists of a series of long, narrow basins (bolsons) locally called valleys, separated by many narrow ranges of parallel and apparently naked mountains that run in a nearly north and south direction, with occasional low cross divides between the basins. All surface drainage in each valley runs toward the bottom of the basin, where there usually may be found a playa—the flat bottom of an ancient lake that has dried up.

These valleys are usually several times longer than they are wide and occasionally they have been connected by drainage channels cut through the low divides. The bottoms of these valleys are mostly at rather high elevations above sea level—2,000 feet or more—and the mountains rise from 3,000 to 5,000 feet above them. The high plains in the northeastern part of the State, which divide the glacial Lake Bonneville drainage area in Utah from that of Lake Lahontan in Nevada, are over 6,000 feet above sea level.

The mountain ranges rise to levels of 8,000 to 10,000 feet or more, and the higher peaks within the State exceed 12,000 feet. A good idea of the general relief features and their distribution may be obtained from the relief map. (Fig. 1.)

CLIMATE

These relief features and the geographic position of the State in the continent determine the amount and character of the average annual precipitation and its distribution in time and place, as well as the temperature variations to which the State is subjected. All parts of the State are dry when compared with common standards, and some parts are very dry.

> The average annual precipitation [of the State] is about 9.62 inches, of which more than half falls in the four months from December to March, and over three-fourths in the seven months from November to May. The winter precipitation * * * occurs mostly in the form of snow. * * * The month of least precipitation is July, and the greatest monthly amounts usually fall in January (2, p. 2).

A diagrammatic map shows the areas having the same average annual precipitation. (Fig. 2.)

Extreme range characterizes the temperatures of nearly all parts of the State. Summer temperatures are relatively high and winter

temperatures low for the latitudes, except in the southernmost part of the State, where winter temperatures are rather high. Daily vari-

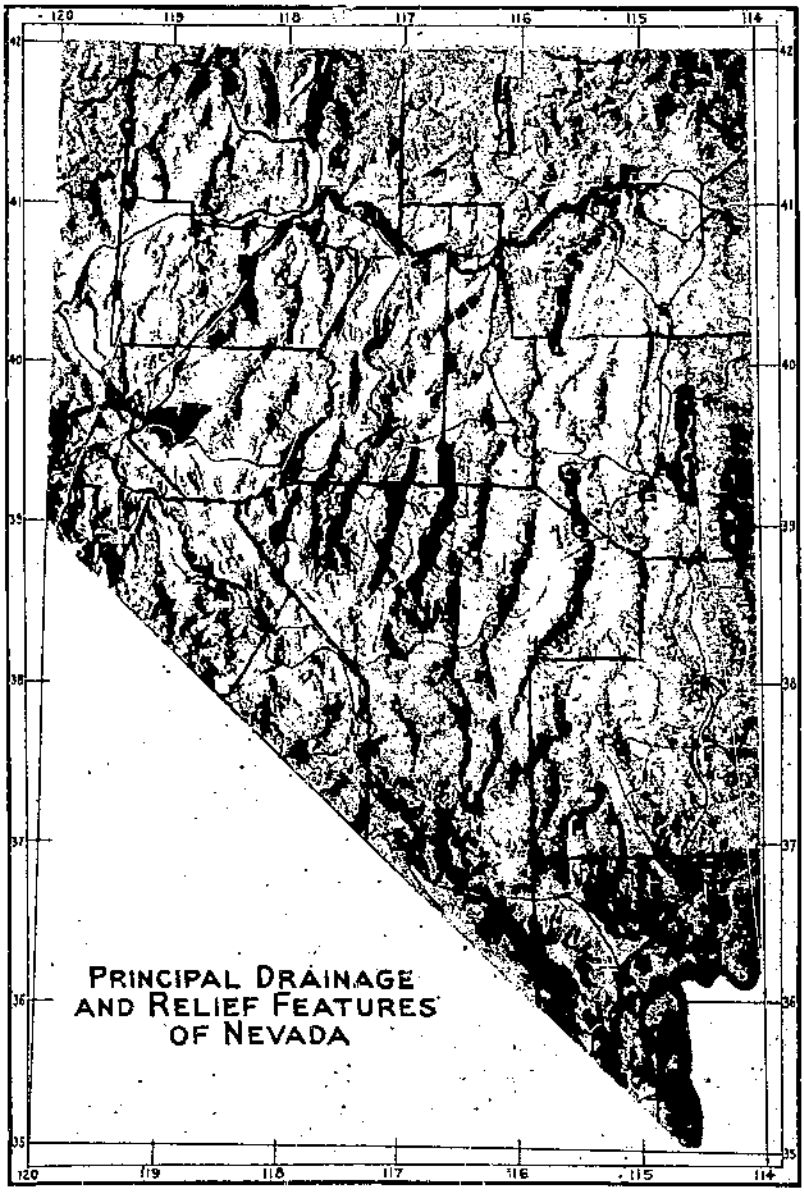

FIGURE 1.—This map was prepared several years ago, from the available data, by William Simpkins. The original, a cast about 5 by 7 feet, is displayed at the State Capitol of Nevada

ations of temperature are large, as is common in most dry regions of moderate-to-high elevations. Strong light and many bright sunshiny days are characteristic of the region.

EROSION

Under natural conditions erosion occurs on all land surfaces where deposition is not taking place. Within certain limits erosion can

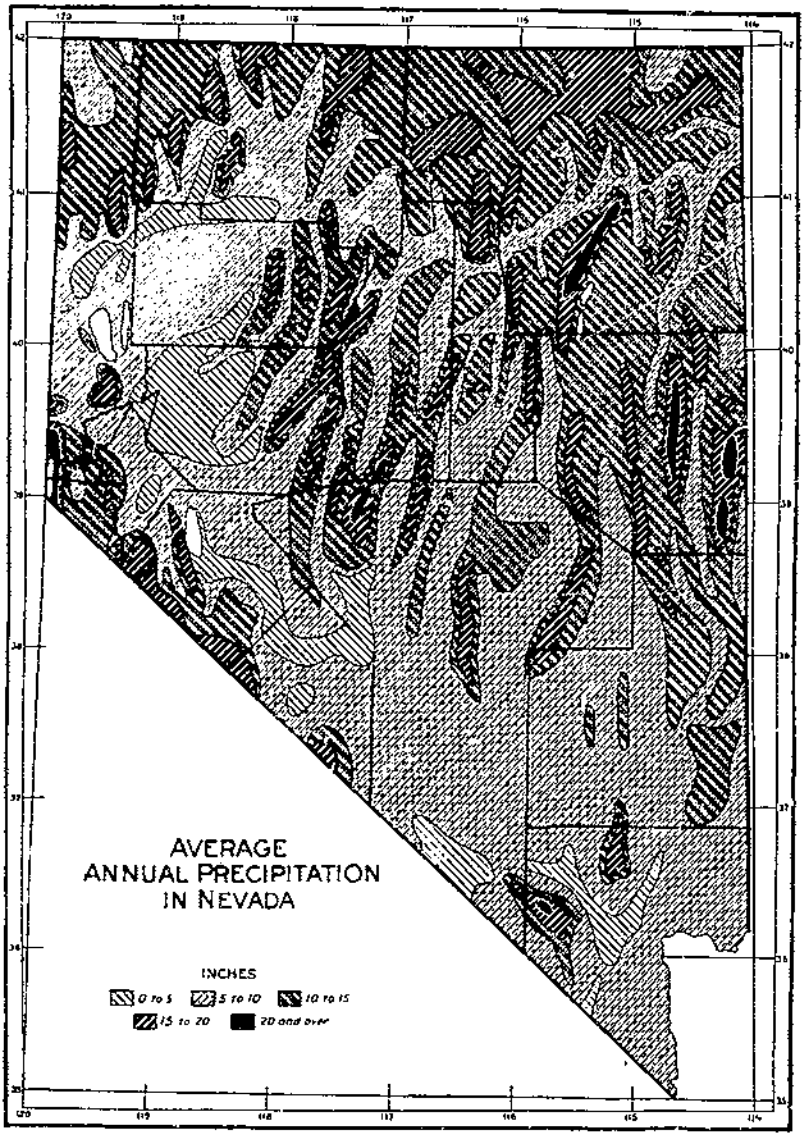

FIGURE 2.—The average annual precipitation at a given station is the average of total recorded readings for a period of 10 years or more. A shorter period is not used because it does not give reliable averages for the station. (After a map published by Aldous and Deeds, as revised by the U. S. Weather Bureau)

be retarded or minimized by human activities, but frequently such activities, although physically possible, are not economically warranted, especially from the standpoint of private enterprises. In Nevada there is and always will be some erosion. There is perhaps

less of it in that State than in any State having similar surface gradients, loose sandy soils, scanty plant cover, and an equivalent total precipitation; for in Nevada most of the precipitation occurs as snow, and the superficial run-off is comparatively small. It is doubtful if any important unprotected area exists in Nevada, for virtually all areas significant for watershed control have already been included in the national forests. If other such areas do exist they should be withdrawn before any steps are taken toward allocating range claims on the public domain.

PLANT COVER

These climatic conditions and the relief features determine the types of plant cover that naturally occupy the land surface of the State. They also determine the place and the amount of crop farming that may be carried on and the kinds of crops that can be grown.

A scanty supply of moisture, coming mostly as snow in the winter with almost none falling during the growing season, has resulted in a natural plant cover consisting of low to medium-sized, long-lived, drought-resistant shrubs on the floors and gently-sloping sides of the valleys. Scattered among these shrubs certain long-lived, drought-resistant bunch grasses grew in some profusion before the coming of the white man's cattle and sheep.

Limited rainfall and the basin structure have resulted in the accumulation of alkaline salts in the soils of the valley floors, particularly along the drainage channels and around the playas. The plants that grow on these alkaline areas must be able to endure alkaline soil conditions, as well as the temperature and moisture limits of the region.

On the mountain ranges, growing conditions for plants are not quite so trying. Soil conditions are better, moisture is somewhat more abundant, and although winter temperatures are low, summer temperatures are more favorable. With such an environment, the plant cover is more abundant and varied. At no place in the State are large areas of heavy forest to be found. Formerly there was a limited growth of yellow pine (*Pinus ponderosa* Dougl.) on spurs of the Sierras that project into Nevada on the western side near Reno, but these trees have mostly been cut. Small forested areas are found in most of the national forests at high levels on the cooler slopes of the mountains.

Woodland areas covered with junipers (*Juniperus* spp.) and piñons (*Pinus monophylla* Torr. & Frém.) occupy large areas of mountain slopes. Much of the mountain land is covered with bushes of several kinds, and aspens are common on the cooler and better watered slopes and along the watercourses in the mountains. In proportion as the soil-moisture conditions improve, the numbers of species and abundance of individuals of grasses and herbaceous flowering plants increase. The water resources are discussed later. A careful and exhaustive general treatment of these physical characteristics may be found in Aldous and Deeds' report [7] and need not

[7] UNITED STATES DEPARTMENT OF THE INTERIOR. AGRICULTURAL UTILITY OF UNRESERVED PUBLIC DOMAIN IN NEVADA. [U. S. Geol. Survey, Agr. Div.] Memorandum for the Press. 26 p., illus. 1928. [Mimeographed.]

be repeated here. Enough has been said, with the help of the maps, to set forth the general physical background of the problem.

It should be kept clearly in mind that the physical conditions set limits that are practically impassable upon the possible uses which may be made of the land. The very small production of any usable "crop" of which the land is capable not only sets a low limit on its sale and rental value, but a still lower limit on the amount of expenditure the user is warranted in making to improve its productivity. One can not spend much money to improve land that rents for a few cents per acre per year unless by so doing he increases the total output of the improved area enormously.

THE FORAGE RESOURCES

Data sufficient for the accurate and complete presentation of the forage resources of Nevada have never been obtained. If an attempt be made to assemble the available information, the data that must be used are found in several sorts of publications and reports. Botanists (*9*, *11*, *12*, *28*), zoologists,[8] and ecologists (*24*, *25*, *26*, *35*) have published maps which show plant and animal distribution, life zones, or ecological subdivisions. Altitude, precipitation, and temperature maps help in determining boundaries, since all of these factors are closely interrelated.

Geological papers frequently tell something about the more conspicuous or characteristic plants of the regions geologically described, and recent topographic maps issued by the United States Geological Survey show certain types of plant cover (*4*). Water-supply papers use certain plants as indicators of the depth of underground water, and they map the distribution of these indicators in considerable detail (*6*, *8*, *13*, *19*, *20*, *31*, *32*).

Certain range forage-plant studies have been carried out by experiment station workers and published in bulletins (*15*, *16*) or in technical magazines. Such studies usually consider nothing but the relative importance of certain named species adapted to particular uses. They occasionally name associated plants but tell comparatively little about their distribution and density.

Careful surveys of the forage resources have been made in most of the national forests, and the maps and reports, though not published, may be consulted.[9] Much valuable information as to plant cover in Nevada has been collected by the conservation branch, agricultural division, of the United States Geological Survey, which has been published in a preliminary report.[10] All such information is reliable and important, but none of the areas so treated has been selected with the idea of its being a representative sample. Results of the study of such detailed areas may be used as guides for the interpretation of less accurate and more generalized data.

Particular attention is called to the maps contained in the report of the Public Land Commission (*23*) and in the report made by Aldous and Deeds.[10] They show certain similarities and differences to each other and to the map that follows. (Fig. 3.) Neither of

[8] BAILEY, V. LIFE ZONE MAP OF NEVADA. [Unpublished office copy.]

[9] UNITED STATES DEPARTMENT OF AGRICULTURE, FOREST SERVICE. RANGE CLASSIFICATION REPORTS OF THE NATIONAL FORESTS OF NEVADA. [Unpublished office reports on file in Forest Service.] 1922.

[10] See footnote 7, p. 7.

the earlier maps attempts to show anything but the way the range lands were being used at the time the data were collected. They have the effect of unintentionally implying that the use depicted is the only possible use, or the best use. The fact that they disagree noticeably shows that such an interpretation was not intended and is unwarranted, since the use has changed considerably in the twenty-odd years between the two reports.

FORAGE-PLANT ASSOCIATIONS AND THEIR DISTRIBUTION

Forage-plant associations must be based upon their forage-plant content. Such an association is, of necessity, an assemblage of a limited number of species of plants having a fairly well-defined common distribution area, similar possible uses, and nearly uniform grazing capacity. It must be easily distinguishable by some well-known species or set of species after which it is usually named. The area covered by such an association can be mapped and generalizations can be drawn from the map.

Notwithstanding the importance of such data in a study of this kind, no attempt will be made here to present anything but a generalization, some approximate measurements, and a map of the distribution of the principal forage-plant associations. (Fig. 3.) This map is on a small scale, much generalized, and diagrammatic, showing merely the major forage-plant associations found in the State. It is a summary of the available data. Some of the information was on a large scale and gave details that are not necessary here and that could not be shown on a map of this scale. For other parts of the map the available data were much less adequate. For this reason, important special areas are not shown on the map but are reported in Table 2 under some group of which they are assumed to be a part.

The principal kinds of forage plants found in these plant associations have been discussed in detail in the publications listed and will not be repeated here. Some generalizations concerning the associations are given here, and details are given in Table 2.

Five major range plant associations are listed in Table 2 with the principal important facts related to them. Two of these, the forest association and the creosote bush association, are of comparatively little importance, from a grazing standpoint, notwithstanding the large area covered by the latter.

The forest association is productive, has a large variety of valuable feed, is well watered, and has a high grazing capacity for the short period in which it may be grazed, but on account of its very limited area (a little over 500,000 acres) its relative importance for grazing is small.

The creosote bush area,[12] though containing over 4,000,000 acres, is relatively unimportant from the standpoint of production. Practically no sheep and probably less than 5,000 head of cattle are run on the area. The principal drawback is the lack of permanent stock water, though the feed is scanty and mostly poor. Both of these conditions arise from the very small amount of precipitation, which

[12] The exact equivalent of the "Southern desert scrub" of Shantz and the "Lower Sonoran Zone" of the U. S. Biological Survey writers as applied to Nevada (25).[13]
[13] BAILEY, V. Op. cit. See footnote 8.

averages less than 5 inches per year. The soils of the level basin floors within this area, where not too alkaline, are very fertile, and temperature conditions are extra favorable for crops. Hence, where

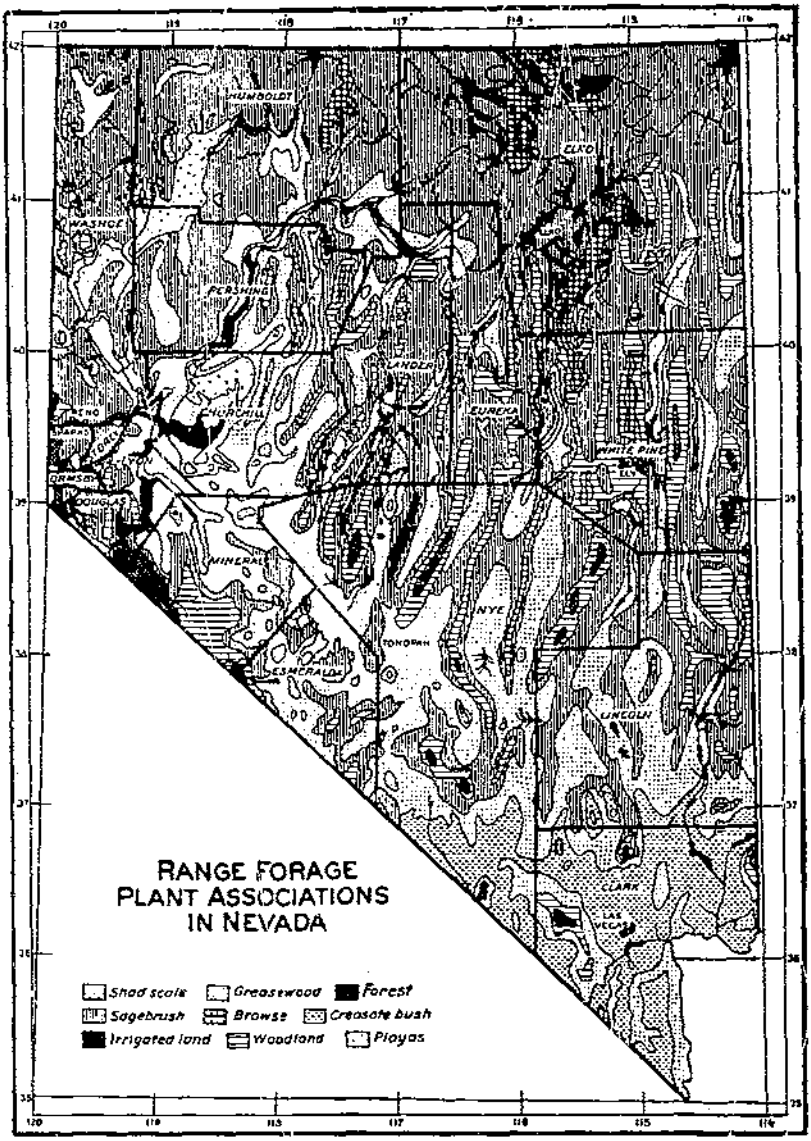

FIGURE 3.—This diagram is designed to show the approximate extent and geographic distribution of the areas covered by the major associations of forage plants upon which range livestock graze in Nevada. The playas have no plant cover of any kind, and the irrigated land is in crops. In estimating the area of each type the greasewood area was added to the shadscale and the browse to the woodland area, as explained in the text

sufficient irrigation water is available, conditions for crop farming are very good. A few small areas having a limited supply of artesian water are known within the area covered by this association. The

TABLE 2.—*Summary of the available data concerning the principal range forage-plant associations in Nevada*

[The playas shown on the map (fig. 3) have no plant cover of any kind and the irrigated land is in crops. In estimating the area of each type the greasewood area was added to the shadscale and the browse to the woodland area]

Item	Creosote bush association	Shadscale association	Sagebrush association	Woodland association	Forest association
Other published names (and authority).	Southern desert shrub (Shantz) (*25, 26*) and Covillea belt (Tidestrom) (*28*).	Lower part of northern desert shrub (Shantz) (*25, 26*) and sagebrush belt (Tidestrom) (*28*).	Upper part of northern desert shrub (Shantz) (*25, 26*) and sagebrush belt (Tidestrom) (*28*).	Piñon-juniper woodland (Zon) (*35*) and piñon belt (Tidestrom) (*28*).	Yellow pine forest or belt (Zon) (*35*), (Sampson) (*24*), (Tidestrom) (*28*), and timbered belts of higher levels.
Identifying plants	Creosote bush (Covillea tridentata).	Shadscale (Atriplex confertifolia).	Big sagebrush (Artemisia tridentata).	Junipers (Juniperus spp.) or piñon (Pinus monophylla).	Pines (Pinus spp.), firs (Abies spp.), and mountain-mahogany (Cercocarpus spp.).
Other conspicuous plants that may range more widely.	Big rabbit brush (Chrysothamnus graveolens); Joshua tree (Clistoyucca brevifolia); horse brush (Tetradymia spp.); arrowweed (Pluchea sericea); cacti (Opuntia spp. and others); jointfir, Mormon-tea (Ephedra spp.); mesquite (Prosopis glandulosa).	Big rabbit brush; Joshua tree; horse brush; snakeweed or matchweed (Gutierrezia sarothrae); Bailey greasewood (Sarcobatus baileyi).	Hop-sage (Grayia spinosa); horse brush; small sagebrush (little sage) (Artemisia nova?); wild-rye (Elymus condensatus); blue-bunch wheatgrass (bunch grass) (Agropyron spicatum).	Buckbrush or snowberry (Symphoricarpus spp.); sagebrush in scattered areas; junipers, three species.	Aspen (Populus aurea); chokecherry (Prunus spp); wild plum (Prunus spp.); snowberry (buckbrush); willows (Salix spp.); alder (Alnus tenuifolia); many grasses and herbs.
Forage plants of importance in the association.	Fanscale saltbush or desert sage (Atriplex polycarpa); bur-sage (Franseria acanthicarpa) black brush (Coleogyne ramosissima); fourwing saltbush, often known as chamiza (Atriplex canescens); numerous spring annuals like California poppy (Eschscholtzia spp.); Indian wheat (Plantago spp.); Eriogonum spp.; annual grasses.	Little sage (Artemisia nova?); winter fat or white sage (Eurotia lanata); black brush; hop-sage (Grayia spinosa); wild-rye; fourwing saltbush; blue-bunch wheat grass; saltgrass (Distichlis spicata); alkali sacaton (Sporobolus airoides); spring annuals.	Little sage; winter fat; hop-sage; bud sagebrush (Artemisia spinescens); little rabbit brush (Chrysothamnus puberulus) wild-rye; rice grass (sand grass) (Oryzopsis hymenoides); blue-bunch wheat grass; galleta grass (Hilaria jamesii); wheatgrasses Agropyron spp.); many annual and perennial herbs.	Aspen; bitterbrush (Purshia tridentata); blue-bunch wheat grass; other perennial grasses; many herbs; scrub oaks (Quercus spp.).	Mountain-mahogany (Cercocarpus spp.); aspens; snowberry (buckbrush); service berry or shadblow (Amelanchier spp.); elder (Sambucus spp.); bush (shrubby) cinquefoil (Dasiphora fruticosa); wild-rye; many species of grasses and herbs.
Approximate area covered.	4,100,000 acres	20,800,000 acres	32,500,000 acres	8,500,000 acres	550,000 acres.
Total area of the State covered.	5.8 per cent	29.6 per cent	46.3 per cent	12 per cent	0.8 per cent.
Area of the association in national forests.	None	1.5 per cent	4.8 per cent	29.4 per cent	69.6 per cent.
Extreme altitude range above sea level.	2,000 to 3,500 feet	3,000 to 5,000 feet	4,500 to 6,500 feet	6,000 to 7,000 feet	Over 7,000 feet.

TABLE 2.—*Summary of the available data concerning the principal range forage-plant associations in Nevada*—Continued

Item	Creosote bush association	Shadscale association	Sagebrush association	Woodland association	Forest association
Approximate limits of average annual precipitation.	Under 5 inches	Under 10 inches	10 to 18 inches	15 to 20 inches	Over 20 inches.
Season in which forage may be used.	Yearlong, where stock water is available.	Yearlong for cattle, winter for sheep.	Yearlong in places for cattle; mostly spring and fall; spring, fall, and winter for sheep.	Yearlong in south-central part of State for cattle; elsewhere spring and fall. Mostly spring and fall for sheep; some summer feed.	Summer feed for both cattle and sheep.
Present utilization	Only a few cattle	Cattle and sheep, at different places.	Much competition between cattle and sheep in utilization of this feed, especially in south-central part of the State.	Some competition in utilization, both cattle and sheep.	Both cattle and sheep use it under control of Forest Service.
Sources of stock water	Wells and springs, few and widely scattered.	Wells, springs, streams, and snow; much development possible.	Wells, springs, streams, and snow; considerable not yet developed.	Springs and streams, scanty in more southerly parts; poorly distributed over much of the area.	Springs and streams mostly plenty and well distributed. Considerable water that originates in this area is piped out to towns.
Temperature; extreme range recorded.	7° to 117° F	−38° to 108° F	−41° to 106° F	−25° to 105° F	−16° to 105° F.

rough mountain ridges scattered through the area usually have better feed of the higher (in vertical distribution) associations, but on account of lack of stock water these areas are rarely grazed.

In the Atlas of American Agriculture, Raphael Zon (*35*, p. *8*) says:

> Over thousands of square miles piñon-juniper and sagebrush alternate, the former occupying the rough, broken country and the shallow stony soil, while sagebrush occurs on the more level ground, which has a deep, uniform soil. The area of land occupied by piñon-juniper, especially in the Great Basin, is very great. * * * The piñon-juniper belt is characterized by hot dry summers, the annual rainfall being less than 20 inches.

The piñon-juniper area that Zon mentions exactly corresponds with the woodland association named here.[14] It covers about 8,500,000 acres in Nevada (12 per cent of the land area), but its carrying capacity, is hardly as great as might be expected from an area receiving as much precipitation as it does. The shallow soils and the open porous nature of the underlying rock are probably responsible for this condition. Though most of this association is on the mountain slopes and often covers the tops of the lower ridges, the feed is scattered and never very heavy, and the area is poorly watered. Even within the Toiyabe National Forest, the supervisor reports considerable tracts of woodland as practically useless because of insufficient stock water, and this condition exists in other mountain ranges in the same region. Farther north in the State the conditions in the woodland association are not so trying, and it furnishes its quota of the summer feed.

Two other forage classes used by the forest officials [15] are "aspen" and "browse." Aspen-covered areas range all the way from the cooler and higher parts of the sagebrush belt to the upper timber-covered slopes of the higher mountains. "Browse" is a convenient term for bush-covered ranges. It may occur anywhere above the sagebrush belt in the mountains. Over many of the mountain ranges in the State not in national forests these two types undoubtedly occur, but the details of their distribution are not known. Such areas have been classified on the maps as "woodland"; hence these two classes have been added to the woodland association. Together these two types, here treated as subtypes, cover a little over 1 per cent of the total land area.

The remaining two associations taken together constitute what Shantz calls the "northern desert scrub" (*25*). Thirty-two and one-half million acres, or nearly half the land area of the State (46.3 per cent), is in the sagebrush association. The area is characterized by level to gently rolling surface with deep fertile soil. Generally speaking, it is poorly watered for range use. This area furnishes most of the spring and fall grazing for both sheep and cattle, considerable of the winter grazing for sheep, and nearly all of the yearlong grazing for cattle in the south-central part of the State, where yearlong grazing of cattle is possible. Such cattle usually get considerable protection and some grazing in the lower edges of the woodland belt during the winter. The association formerly had

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[14] It is called the "pinyon belt" by Tidestrom (*28*), the "pinyon juniper woodland" by Shantz (*26*), and the "pinyon-juniper belt" by Sampson (*24*).

[15] See footnote 9, p. 8.

a rather high carrying capacity for this general region, before it had been overstocked for years and badly eaten out. Many of its shrubs furnish good feed, and it had a rather thick cover of several long-lived, perennial bunch grasses that were excellent feed and well adjusted to the environment. They were the best forage plants of the region. Much damage has been done to all these best forage plants by long-continued overgrazing. Persistent, long-continued care and considerable expense will be required to bring this association back to its former productivity, but such a result is possible and may ultimately be obtained.

Scattered over the sagebrush area, especially in the northern part of the State and near the upper edge of that belt, comparatively large patches of wild rye occur. Formerly these were much more extensive. Many of them are used as hay meadows now, most of which are irrigated or subirrigated. Considerable areas within the Humboldt National Forest partly of this character and partly with a cover composed of other grasses are classed as "grasslands." The same name was used for the grasslands outside the forests. These areas are very important on account of the feed they produce, but the patches are too small to show on the map. The areas inside the forests classed as "meadows" and "open weed range" are even smaller. They have all been included in the sagebrush association on the map and in the summary table. This arrangement is not entirely satisfactory, but it seemed necessary. Taken all together, these grasslands cover a little over 1 per cent of the total area of the State.

Lying at levels just below the sagebrush and occupying the floors and lower slopes of all the basins, on soils that are usually heavier, drier, and more alkaline than those of the sagebrush area, is the shadscale association. The total area covered is about 20,800,000 acres, which is 29.6 per cent of the land area of the State. This assocation furnishes a small quantity of the spring and fall feed for livestock, usually taken as they travel over it, and much of the winter feed for sheep. For the most part the feed is not particularly good, except on the areas covered by winter fat and little sage, which overlap the upper part of this association and the lower part of the sagebrush association. Areas covered by Coleogyne, which overlap the lower edge of this association and extend into the creosote-bush area, also furnish moderately good feed. The shadscale[10] itself furnishes much of the feed.

The greasewood area shown on the map is included in the table with the shadscale association, which is merely a way of choosing the lesser of two evils. This greasewood area is covered by a composite group of scattered alkali-enduring, water-requiring shrubs and certain grasses that have about the same requirements, like saltgrass, alkali-sacaton, reed grass, etc. In very wet places tules and rushes come in, and in others, where the alkali is not so strong, bunches of wild rye may occur. The shrubs are not very important sources of feed, though they are used to some extent, but the grasses furnish

[10] Griffiths (*11*) calls this plant spiny saltbush; it is one of the saltbushes—*Atriplex confertifolia*. The name shadscale probably originated in Utah, though in some of the older bulletins it was applied to *A. canescens*, a mistake the present writer once followed. That plant is now usually called by the Spanish name, chamiza.

considerable feed. These greasewood areas are mostly associated with shadscale, but they may be found below it in the creosote-bush association or above it in the sagebrush area. The group is relatively too unimportant to be ranked with other major associations, and since it is mostly used with the shadscale association it is here combined with that area.

Besides the range areas just discussed, three other major land classes are shown on the map and in the tables, which must be treated briefly for completeness. These are the irrigable lands, the playas, and the barren or waste lands of the high mountain peaks and cliffs. Little or none of the land can be successfully dry farmed.

It has been tried in nearly all parts of the State, but usually by settlers with little knowledge of the proper cultural methods, whose efforts were doomed to failure from the outset. Even with proper cultural methods there are relatively few areas in which the quantity of precipitation, the length of the growing season, and the soil conditions are so combined as to permit the practice of dry farming with reasonable success."

All the lands reported as irrigated or irrigable were included in this class. The resulting area is about 1,600,000 acres, or approximately 2.3 per cent of the land area of the State. This figure is almost three times the area assessed as irrigated or subirrigated by State and county officials (592,371 acres). The crop-land area reported in the 1925 census is about the same (533,614 acres) as the assessed irrigated area, which is a fairly good check on the accuracy of the assessors' figures, since all the crops grown in the State are produced on irrigated or subirrigated land. It is therefore safe to say that the irrigated area shown on the map (fig. 4) is considerably exaggerated, though some such treatment is necessary to make its presence apparent in the large areas of grazing land that dominate the picture.

The irrigated lands are nearly all used in direct connection with the range-livestock industry. Of the 362,552 acres of harvested crops reported in the 1925 census, 332,682 acres (nearly 92 per cent) produced some sort of hay and 9,174 acres produced other forage, most of which was used as winter feed for range livestock that must be fed for a short time when range feed is not available. Although some of the forage produced may have been sold or used for farm stock, it is safe to say that enough of the crops other than forage, grown on the irrigated lands of stock ranches, were used by the families and farm stock on such ranches to more than balance all the hay sold and that used by farmers without range-stock interests. So at least 85 per cent of the crops produced in the State were used in the range-livestock industry. Two-thirds of the area classed as irrigable was not irrigated, but was used as additional pasture lands, sometimes of high-carrying capacity, along with the range lands.

Scattered over the State, in the bottoms of the bolsons, or valleys without exterior drainage, are many absolutely bare areas of varying size, the bottoms of old lakes that have dried up, called playas. These playas are common in all regions of inclosed drainage such as the Great Basin, and the area of such land is relatively large in Nevada (1,400,000 acres, or 2 per cent of the land area), where they are sometimes referred to as "slick deserts."

[17] See footnote 7, p. 7.

These areas produce no feed. Studies made by the United States Geological Survey indicate that they are areas from which underground water that rises to the surface is continually evaporating. This process has resulted in such large accumulations of alkali in the soils that no known plant will live on them.

These playas are level for long distances. On some the surface when dry is hard and full of cracks; on others the dry surface is finely powdered and not so hard. When wet they are impassable to vehicles of any kind and deserve their local name. Except for very limited deposits of certain minerals, they have no use and are often much in the way, since one must go across or often around them at great expense of time and effort. Digging near the margins has demonstrated that water is to be had near the surface, but it is usually very alkaline.

On the tops of most of the mountains and often along the sides of canyons are rocky cliffs and peaks that produce little or no forage, and what little they do produce is inaccessible. In the Sierras there is a small area in Nevada covered so densely with certain coniferous trees that no forage plants are produced. The total area of such barren land is a little over 750,000 acres, or 1.1 per cent of the total land area of the State.

GRAZING CAPACITY

The numbers and kinds of stock grazed and the length of the grazing season are accurately known for each administrative subdivision of each of the national forests. These data are on record for a long series of years, so that a long-time average of the number of days feed per animal unit produced on known acreages of standardized types of forage may be calculated for each of the forests in which the forage types have been mapped and measured. In the few forests in which this mapping has not yet been completed, somewhat less exact but reasonably accurate estimates could be made.

The area of land in harvested crops in 1924 and the kinds and yields of these crops are reported for each county of the State in the agricultural census. From the total crop yields of forage plants the number of days of feed per animal unit produced by the irrigated lands can be calculated.

Mountain lands, presumably having forage similar to that in corresponding localities in the national forests, have not had their forage types mapped and measured. Consequently averages obtained from the forests can not be applied to these areas. Nor are the numbers and kinds of animals grazed on these lands definitely known.

The forage types covering by far the largest part of the land area of Nevada—that outside the forests—are not found inside the forests, and the grazing capacity of each has never been measured.

It is, therefore, evident that any attempt to estimate grazing capacity for each forage-plant association can not now be successful, and that the total grazing capacity of the State can not be obtained in this way.

A circular of the United States Extension Service entitled "An Estimate of the Forage Produced in the Eleven Western States" [18] contains among others an estimate for Nevada as a whole. It offers a method for "evaluating the feed resources of the various agricultural areas within the States" that can be used by county agricultural agents and others interested. This method can be applied to small as well as large areas and may be described as follows: The total quantity of feed used in an area is derived from five sources—harvested crops, plowable pasture, controlled range, national forests, and uncontrolled range. The quantity of feeds derived from each of these sources except the uncontrolled range is either accurately known or can be closely estimated from available records. If the numbers and kinds of animals produced in the area are known, the number of days' feed required to sustain them for a year may be calculated and allocated to the five different producing areas, if the acreage of each area is known. As has been stated, all the details are known for the irrigated crop land and for the national forests. The areas of the controlled pasture and range may be ascertained from the census, and the uncontrolled range is the remainder. The feed produced on the controlled pasture lands can be closely estimated, and what is not otherwise accounted for is furnished by the uncontrolled range.

For Nevada the following results were obtained by this method: Fifteen per cent of the feed used was produced by the (irrigated) harvested crop land (about 400,000 acres), 4 per cent from plowable pasture land and 8 per cent from the controlled range (the two together estimated at about 5,000,000 acres), 11 per cent from the national forests (4,750,000 grazable acres), and the remainder, or 62 per cent, from the uncontrolled range (about 56,500,000 acres). This allows 3,600,000 acres for barren and unproductive lands, which is a reasonable estimate.[19]

THE WATER SUPPLY AND ITS USE

The business of producing livestock in Nevada—one of the major permanent industries of the State—is absolutely dependent upon the proper utilization of the State's water resources. Over at least half of the area of the State, and that half the one which produces the most and the best feed, feeding of range livestock for a longer or shorter period in the winter is a necessity determined by climatic conditions. This fact is basic to the industry and has been taken for granted almost since the business started. The present type of organization of the livestock industry is a direct outgrowth of this fact. It has been the practice for many years to assume that if the operator had irrigated land enough to produce the hay required to carry 100 head of cattle through the winter-feeding period he could run 100 head on that range, because the outside range was believed to be ample to carry the stock through the remainder of the year.

[18] MERRITT, E. FEED RESOURCES OF 11 WESTERN STATES, 1925. U. S. Ext. Serv. Circ. 20, 1926. [Mimeographed.]

[19] In the opinion of the writer the area shown as controlled pasture and range is several times too large. It is doubtful if the fenced pasture lands in Nevada aggregate over 1,000,000 acres (not including irrigated crop lands). They can hardly be credited with producing 12 per cent of the total feed. If this judgment is correct the percentage of feed produced by uncontrolled range would be greater, the area of such land greater, and the animal-unit-days feed per acre from this source a little greater.

Need of winter feed has made the production of hay in sufficient quantity to supply this need the principal function of the irrigated lands, for two reasons: (1) The range lands can be used best when supplemented with a reserve supply of feed which may be most conveniently produced on irrigated lands, and (2) the demand for winter feed furnishes a market for the hay that is one of the most easily produced crops of these lands. Virtually all the irrigated lands are used in connection with the livestock industry, usually as part of the stock ranches themselves. Only a very small part of the total irrigated area of the State is being used for ordinary crop farms. Census figures do not show this relationship, because they list all ranches as "farms" and include all owned range land in "land in farms."

Permanent watering places are necessary on stock ranges. Perhaps the most striking feature of the ranges of Nevada to an observer who is well acquainted with other arid and semiarid range lands is the long distances which separate the watering places. This is to be expected in areas of scanty rainfall like that covered by the creosote bush association (fig. 3); but in other States semiarid range lands having grazing capacity comparable with that of most of Nevada have many more developed watering places than are to be found in Nevada, and they are much closer together.

The suggestion can hardly be seriously made that Nevada stockmen do not know of the water resources of the State or appreciate the importance of proper water distribution over their ranges or that they are unwilling to pay for the development of such a vital necessity. There is abundant evidence, including that in several Government publications, to prove that considerable underground water is available which might be but is not used.

Nor can it be argued that the ranges are as yet understocked and that the water is not needed. Evidences of long-continued overstocking abound on the ranges, and the literature treats of the subject in many places.

In the opinion of the writer the reason for the lack of development of stock water, which is conspicuous all over the State, is the fact that control of stock water in most cases does not control the range surrounding it. When the ranges were occupied by cattle alone, such privately owned watering places did exert a measure of control over the surrounding public range lands, just as it did and still does in other regions of the arid Southwest. This control disappeared when it was learned that sheep could be run over such ranges in the winter wherever sufficient snow could be found to supply them with water.

Control of the stock water is without doubt an important factor in many parts of the State, but the writer surmises that it is the control of the irrigation water and the irrigable land upon which the hay for the winter feeding is produced that to a much greater degree dominates the situation, at least in the upper Humboldt Valley, and brings about certain undesirable conditions.[20]

Ever since it was learned that sheep could use the snow for water during the winter, nomadic sheep have been the bane of Nevada

[20] This situation was discussed some years ago by Adams (1), though he seems to have overemphasized the importance of the control of stock water.

cattlemen. Probably more thought has been given to this condition than to any other phase of the livestock business, and more different kinds of abortive attempts have been made to control nomadic sheep in Nevada than in any other range State.

It follows that if any better adjustment of the business to the environment is to be brought about, the method of approach to such a change must be by way of legislation affecting the grazing use of the land, since there is little probability of a change in the climatic conditions involved.

To present the extent and distribution of the water resources of the State and their utilization, a diagrammatic map is given (fig. 4) which shows the irrigated land and the allotted stock-watering places. The sources from which the data were obtained and the degree of accuracy of the map are explained below.

With the other dry-land States, Nevada was granted control of its natural waters by the law of 1866 (p. 32), and for many years its citizens appropriated irrigation and stock waters (along with those used for mining and smelting) without any very definite regulations.

In 1905 the State legislature passed a law establishing a method of obtaining the right to put waters to beneficial use. Water appropriations that were already established at the time of the passage of this act were recognized as vested rights, for both irrigation and stock water. Future appropriations, under this law, are to be made through the State engineer, who keeps a record of all official allotments.

Since much of the irrigation water is held under these vested rights some of which are not yet on record in the engineer's office because the rights have not yet been definitely delimited,[21] a copy of his records would show only a part of the land actually irrigated under legally appropriated water. This is true in lesser degree of the stock waters held under vested rights.

The best map of the irrigated lands of Nevada is that published in the report on irrigation in the 1920 agricultural census. Upon this map as a base, the positions of the stock watering places in the State allotted up to 1927 have been entered, and a reduced copy of that map constitutes the impressionistic picture given here. (Fig. 4.) A perfectly accurate map of this kind would show a few additions to and slight changes in the irrigated areas here depicted (which were rather liberal estimates) and more dots showing stock watering places, but the general picture of distribution would be essentially the same as this. A comparison of this map with the land-tenure map (pocket map No. 1) will show to what extent the irrigated lands are used for livestock production and how much is used by farmers (see p. 28).

THE CONTROL OF THE LAND AND ITS UTILIZATION

Nevada was part of the area ceded to the United States by Mexico in 1848. Settlement of the area that now constitutes the State began shortly after the discovery of gold in California, almost wholly in consequence of that discovery, and in two ways.

[21] The condition of uncertainty as to area irrigated and water allotted arises from the fact that the law establishing vested water rights did not require that each be determined and recorded with the State engineer within a specified time. A similar condition exists in parts of Colorado, with consequent uncertainty as to the limits of certain vested rights.

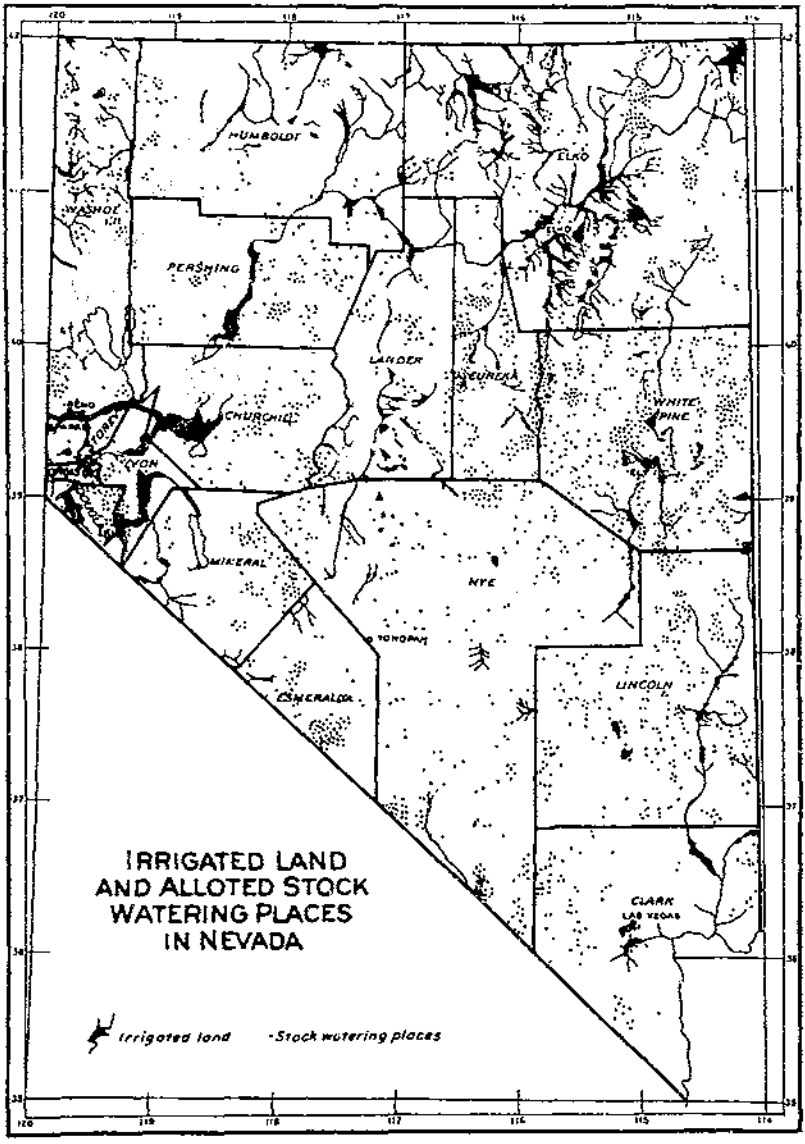

FIGURE 4.—The base map used is the diagrammatic presentation of the irrigated lands as published in the irrigation report of the 1920 census. It is known to be slightly exaggerated. Some changes have occurred in the last 10 years, but it is believed that this is still the most accurate information available for a map of this size. Upon this base has been entered the approximate distribution of allotted stock-watering places as recorded in the State engineer's office to 1927. Other allotments have been made since, and there are some stock watering places used under vested rights that have not been recorded

The principal land route to the gold fields followed down and up two of the most important stream valleys of Nevada, the Humboldt and the Truckee, hence what has since proved to be some of the best land was known to all who passed, because it lay beside the main traveled road. Stations along this road were an immediate necessity, and settlement began at convenient points in the Humboldt Valley and in other valleys near the base of the Sierras.

Soon after prospecting for gold began in what is now California, valuable mineral deposits were found on the east slopes of the Sierras, and mining settlements were made beside the prospect holes that produced valuable ore. Thus, mining and transcontinental transportation were established and were then, as now, two of Nevada's principal industries.

Stock feed was abundant in the Humboldt Valley and in many of the basins. Pasture grasses were plentiful on subirrigated lands, and many "rye patches" were ready to be cut for a winter supply of hay. The transcontinental traffic of the time brought with it, more or less as a by-product, the first of the animals that started the third great industry of the State—range-cattle production. Although the range livestock industry started slowly, it grew steadily, and is now the second largest source of taxes in the State.

From the original cession until to-day—a period of about 80 years—the lands of Nevada have been easily obtainable under one or more of the Federal land laws. But in all that time only a little over 4,000,000 acres—less than 6 per cent of the 70,000,000 acres of land in the State—have passed into private ownership, if the lands granted to the Central Pacific Railway Co. as a subsidy are excepted. Over half of the land in private ownership was acquired by the indirect method of purchasing school lands, as explained elsewhere. (See p. 33.)

For many years range stockmen claimed that the lands of the Great Plains—an enormous area lying west of a generally north-and-south line from central North Dakota to San Antonio, Tex., and stretching to the Rocky Mountains—was good for nothing but range grazing. It was generally believed that the rainfall was insufficient for crop farming and would always be so. Arguing from this assumption and the fact that these lands were then in use as range grazing lands, they urged that the lands be transferred to them in large bodies, and they went to great lengths to attain this end. That they could never agree on how the transfer should be made probably constituted one of the principal reasons why no Federal legislation designed to fit the conditions was ever passed. Later experience has demonstrated that their assumptions and contentions were incorrect, since much of the region is now in crop farms and most of it is capable of being used as dry-land crop or crop and livestock farms.

That such a condition does not exist in the case of Nevada is believed to be demonstrated by the analysis of the existing and potential utilization of its lands that is here presented. Recognizing that a more intensive use of the land might arise, great care has been exercised, in classifying the land holdings into utilization types, that crop farming should be given the advantage of any doubt over range-grazing uses.

METHODS USED IN THIS STUDY

Data concerning the area of land owned and the use made of it the previous year by all the landowners in the State (outside the towns) were obtained from the county assessors. The area and distribution of the lands leased from the railway company and the names of the lessees were copied from the records of the company.[22] The records of all the stock permitted to graze in the national forests and their distribution in the forests were obtained, as well as the range classification and operative subdivisions of the forests. A considerable part of the State was visited. State records of the disposal made of the school lands and of the administration of the water laws were studied and used. State and Federal officials in direct touch with the use of the lands were consulted, as were numerous stockmen who are using these lands. The literature was assembled and studied, and the developmental and legal phases were considered.

The land data thus obtained have been assembled and the ownerships classified on the basis of the use made of the land in the year to which the records apply—1926. The summary of this work is presented on the land-tenure map (pocket map No. 1) found in the pocket at the back of the bulletin. Further explanations of methods used and generalizations as to major deductions follow in the text, and some of the details are shown in the tables.

The major subdivisions of the State were on the Land Office maps. The position and extent of the national forests and Indian reservations were known, as well as the approximate limits of the railroad land-grant belt. The assembled data gave the location and amount of the privately owned land; there are no longer any State lands, and there is only one small national monument. The remainder is all considered to be public domain, though a small part of it is held as uncompleted homestead entries.

The first step was to devise a classification that would fit the data and give an instructive picture of the situation when these data were assembled. The principal categories of such a classification had been suggested by the data themselves. The land users are stockmen or crop farmers. At times it was difficult to tell to which class a particular individual belonged. Some of the land is not used by its owners; such land is a part of the open range, and is grazed by range stock if it is used at all. A negligible part of the owned land is used for mining. These data indicated the two major classes of users—(1) range stockmen, (2) farmers—and a third group of owners which, for lack of any better name, was called miscellaneous.

The range stockmen automatically fall into three classes—producers of (1) cattle, (2) sheep, or (3) both cattle and sheep. It was necessary, for tabulating purposes, to set somewhat arbitrary limits to determine what should be called a cattleman, or a sheepman, or a farmer having range stock. A man who had as many as 50 head of range cattle was classed as a cattleman. The possession of more than 300 head of sheep caused a man to be classed as sheepman unless the list of the sheepmen (in the State brand book) showed that his sheep constituted a "farm flock." The fact that a man had a registered brand or was on the list of the active cattlemen of the State

[22] No means of learning about other kinds of leases were available (p. 29).

and had a permit to graze more than 50 head of cattle in the forest confirmed his classification as a cattleman.

To avoid classifying a "farmer with range stock" as a "range stockman," whenever a doubt in the matter arose, the man was placed in the farmer class. The resulting summaries give evidence that some of those listed here as farmers really consider themselves stockmen, and although they farm their lands, their most important source of income is livestock produced partly on the open range. It is thus shown to be almost certainly true that, by various incorrect but unavoidable interpretations of the available data, the total number of men and the area of the holdings of such men as consider themselves stockmen rather than farmers have been minimized. This reduction is believed to be small, but it is enough to insure against exaggeration of stockmen's numbers and holdings, a mistake the author was anxious to avoid.

Difficulties were also experienced with the "miscellaneous" class. The data were sometimes insufficient or conflicting. Assessors did not know, or what they said disagreed with what others thought was correct or what was shown by their own published annual reports. In all cases of doubt or uncertainity, the landowner and his land were classified in the miscellaneous group. Although the evidence sometimes suggested that considerable areas of privately owned land were probably leased to stockmen and used as range lands, so long as the data were insufficient to determine the use with certainty, such lands and their owners were classified as belonging to the miscellaneous group. In a number of instances it happened that the land shown on the assessor's plats (which were copied for study) was shown in his report under another name for which the equivalent was not known. Such acreages also went into the miscellaneous group.[23]

There is hardly any doubt that a considerable number of sheepmen, who neither own nor lease land in the State and who do not have permits in the forests, graze their animals on Nevada ranges. These methods and data omit all such users of the public domain. No method was readily applicable that would give reliable quantitative data concerning such operators.

Considerable talk about migratory or nomadic sheep was heard. The owners of such sheep were nearly always said to live in an adjacent State. There is no doubt that some sheep from outside the State do come in, and it is certain that some Nevada sheep go out of the State for feed. It is generally believed that such interstate movement of stock (mostly sheep) is a necessary condition of the best use of the available forage, though there is reason for believing that its importance has been considerably overemphasized. The undesirable consequences of such unregulated nomadism are well known. It is recognized that many of these sheep belong to operators who have established possessory and other rights in Nevada, but they do not confine their stock to the areas associated with such rights, and since the range is open and free to all comers, there is

[23] In some of the counties containing national forests the assessor's plats did not show the location of privately owned (alienated) land within the forest. This was learned long after it was too late to copy these data from the forest records. This gave a number of names of permittees for whom no owned land could be found. Some of these were people living in town, some were Indians whose allotted land is not taxed, and some probably held rented land (p. 30).

no means of regulating their actions. But it makes little difference to the permanently located cattleman, who has investments in ranch property, whether the nomadic sheep that appropriate the feed on lands surrounding his watering places which is needed by his cattle belong to a wandering "tramp" sheepman or to a Nevada stockman with possessory rights. Without the feed he is powerless to carry on his business, and his investment is valueless. If the sheepman ultimately buys his ranch it is at once changed from a home occupied by a family into a temporary sheep camp.

From this explanation it follows that the actual number of range stockmen of all kinds in Nevada may be and probably is somewhat greater than the 923 shown in Table 4. The figures showing numbers of forest permittees and lessees of railroad-grant land are correct, as are the numbers of permitted stock and the acreages of land leased from the railroad company. Some duplication in permittee numbers was unavoidable, because in one class many of the men held permits for both sheep and cattle which were issued and enumerated as separate permits, although held by the same person.

On the map which gives a picture of the use made of the controlled land (pocket map No. 1) the areas in black (showing the controlled lands of farmers with and without range stock) and in red (miscellaneous—all kinds) are both exaggerated. A considerable part of the red and some of the black should be green or blue or yellow. The colors black and red were chosen in order to accentuate further these really insignificant areas when compared with the other colored areas and the large area of white—the public domain.

In only one way can injustice be said to have been done by this method. Although areas of "miscellaneous" and "farm" lands are small, the numbers of people listed under these terms are larger than they should be, and comparisons of such numbers should take this into consideration when generalizations are being attempted. (See explanation following Table 4, p. 30.)

In spite of the minor but unavoidable inaccuracies, the relationships shown by the ratios and percentages obtained by the study are believed to be entirely reliable, and the following generalizations concerning the relative importance of the various types of land control and use are warranted.

THE RANGE STOCKMEN

At least 16 per cent of all the landowners[24] in Nevada are stockmen whose principal business is raising cattle, sheep, or both. The number is somewhat dependent upon definition, but is safely between 750 and 1,000 individuals or companies. The number so classified here, using the method previously explained, is 923, of whom 572 raise cattle, 210 raise sheep, and 141 raise both cattle and sheep.

These men own about 68 per cent of all the privately owned land in the State.[24] Of the 923 owners, 103 (11.4 per cent) lease more railroad land than the whole group owns, and what they rent is over 98 per cent of all the railroad land rented.

It is of interest that the average holding of the cattlemen (approximately 2,250 acres) is about the same as that of the sheepmen

[24] Not including town property nor railroad land.

(approximately 2,400 acres) and that the operators who are handling both kinds of stock have average holdings nearly four times as large (8,500 acres). The sheepmen lease much more railroad land per man (34,700 acres) than the cattlemen do (13,900 acres), but not as much as the men who raise both sheep and cattle (61,150 acres).

These figures clearly demonstrate that the men who are raising both kinds of stock are much the larger operators. The class includes most of the large incorporated companies. Most of the smaller operators are those who produce cattle only, though a considerable number of the sheepmen have only one band.

These range stockmen (including all kinds) control about 81 per cent of all the controlled land in the State. Of this group, nearly half (47 per cent) hold permits to graze livestock in the national forests during the summer. These permittees own 94.1 per cent of all cattle and 98.7 per cent of all the sheep permitted in the forest, and they control (own or lease) nearly half (47 per cent) of all the controlled land of the State. In this group of permittees the men who handle both kinds of stock again constitute the dominating factor. The average forest permit of the cattlemen is about 175 head; the sheepman's average number is 3,500 head, while the corresponding numbers for the operators who raise both kinds of stock are 325 and 4,100 respectively.

The figures obtained do not show how many acres of the irrigated land are in stock ranches instead of farms. But a careful comparison of the water-resources map (fig. 4) with the land-tenure map (pocket map No. 1) will give a good idea of the relative proportions. It is safe to say that over half of the irrigated land of the State is in stock ranches; and the census report shows that much the greater part of the crop land—the irrigated land—produces hay, practically none of which leaves the State.

The tables demonstrate that much the greater part of the land area of Nevada—irrigated valley land, railroad-grant land, national forests, and open public domain—is used for the range production of livestock. They also show that a few large operators—less than 150 in number—each of whom raises both cattle and sheep, control over one-third of all the controlled land of the State and use at least that proportion of the open grazing lands.[25]

These figures disprove one generalization which has often been made and which is accepted as true by many of the stockmen. It is often stated that the only proper organization of a stock ranch in Nevada is one that will furnish (1) winter feed and some fall and spring grazing on the owned land of the ranch, (2) summer grazing under permit in the national forests, and (3) the remainder (possibly five or six months' feed) on the public domain.

There can be no doubt that an organization of this kind is a convenient one and one which, under favorable economic adjustments and on a large scale, may be profitable to the operator. But the

[25] Attention is again called to the comparisons presented in Table 1 (p. 4) as to the relative productivity of these arid range grazing lands. Acreages controlled by some of the larger operators seem very large to men accustomed to think of highly productive crop land, but the actual size of business of such men is not out of the common when compared with large ranches elsewhere. Two of the largest operators in the State, each of whom owns more than 90,000 acres, rents 450,000 acres of railroad land, and uses approximately 2,000,000 acres of public domain, run less than the equivalent of 12,000 head of cattle each. There are ranches in other States that run considerably more stock.

tables show that only a few of the ranches are completely so organized, since less than 10 per cent of the cattle and not over 75 per cent of the sheep go to the national forests. These percentages are both too large, since they show what percentage permitted cattle and sheep are of the total assessed number of range cattle and sheep for the State, and it is well known that numbers of assessed stock are rarely, if ever, the full numbers, and that a considerable number of "tramp" sheep are not taxed.

Not only is this general type of range-stock raising not the only possible one, but it is doubtful whether it is the most desirable one from the standpoint of anyone but the man who profits by it. The writer agrees with Adams (*1*) in thinking that, as it is at present exemplified, it is undesirable sociologically; and he is also reasonably certain that it makes for a relatively inefficient use of a large part of one of the State's major natural resources—the irrigable land and the associated irrigation water.

In support of the conclusion that such a condition exists in the northeastern corner of the State [28] and constitutes a separate and very different problem in land utilization, Table 3 has been compiled from the United States Agricultural Census of 1925 (*29*), supplemented by more recent detailed figures. It has been so arranged as to show the efficiency with which the crop land is now being used by the operators in these four counties as compared with the uses of such land in the other counties of the State.

TABLE 3.—*Data for a comparison of the relative efficiency of utilization of their crop land and water resources as made by the 4 northeastern counties of Nevada and by the other 13 counties*

COMPARATIVE ACREAGES, YIELDS, AND VALUES

Item	Unit	The 4 northeastern counties	The 13 other counties
Land area	Acre	23, 514, 240	46, 771, 200
Land in farms	do	2, 430, 459	1, 660, 127
Crop land	do	295, 632	237, 982
Land in hay (all kinds)	do	167, 178	165, 504
Area in alfalfa	do	28, 804	111, 851
Estimated yield of alfalfa hay [a]	Ton	48, 670	268, 442
Area in wild grass	Acre	106, 612	21, 446
Estimated yield, wild grass hay [a]	Ton	90, 620	19, 516
Area of all other hay	Acre	31, 762	32, 207
Estimated yield of all other hay [a]	Ton	34, 305	43, 802
Estimated yield of all hay [a]	do	173, 202	331, 760
Total yield of all hay	do	153, 740	312, 146
Crop land in other crops	Acre	3, 047	25, 541
Remainder of crop land (idle, fallow, etc.)	do	125, 407	46, 937
Value of all crops	Dollar	2, 354, 799	6, 101, 034
Value of all livestock	do	11, 439, 577	14, 933, 951
Value of all livestock products	do	1, 490, 900	4, 180, 503

[a] Estimated from weighted average acre yields for the counties included, using data obtained in 1929 for the 1930 census. Such detailed figures were not published in the 1925 census. The average yields per acre change very little from year to year.

[28] This expression is used (p. 48) to refer to the upper Humboldt Valley and its branches; the conditions are best exemplified in Elko County. In compiling the table, the four counties, Elko, Eureka, Humboldt, and Lander, were treated as constituting the region concerned. Of course, this is only a rough approximation for which census figures could be assembled.

TABLE 3.—*Data for a comparison of the relative efficiency of utilization of their crop land and water resources, etc.*—Continued

PERCENTAGE COMPARISONS

Item	Unit	The 4 northeastern counties	The 13 other counties
Crop land in hay	Per cent	56.55	69.54
Crop land in alfalfa	do	9.74	47.00
Crop land in wild grass	do	36.06	9.01
Crop land in other hay	do	10.75	13.53
Crop land in other crops	do	1.03	10.73
Remainder of crop land (idle, fallow, etc.)	do	42.42	19.72
Value of all crops	do	27.85	72.15
Value of all livestock	do	43.38	56.62
Value of all livestock products	do	26.29	73.71

AVERAGE YIELDS PER ACRE

Alfalfa hay in 1929	Ton	1.69	2.40
Wild grass hay in 1929	do	.85	.91
All other hay in 1929	do	1.03	1.36
All hay in 1929	do	1.04	2.00
All hay in 1924	do	.92	1.89

It should be remembered that the most valuable natural resources of Nevada are its irrigable land and its irrigation waters. Since only irrigable land can be cropped in that State, the census figures for crop land and its utilization give data for comparisons. Since by far the greater part of the crop land produces hay, a careful study of the area and production of each kind of hay and the average yield per acre are criteria as to the efficiency of use of both land and water. Unfortunately, the yields of the different kinds of hay were not obtained for the 1925 census, but the details for 1929 are now available and have been applied to the 1924 areas on the assumption that average county yields per acre do not vary materially from year to year. Since the principal agricultural industry of all the counties is the same and the products of this industry are closely comparable, the total values of the different agricultural products—crops, livestock, and livestock products—also indicate relative efficiency of the use of the land and water for agriculture.

Attention is called to some of the striking contrasts shown in Table 3. Though the four counties contain only about one-third of the land area of the State, they have about three-fifths of the land in farms and 55 per cent of the crop land, which also includes the irrigation water. Notwithstanding these advantages, the 4 counties have only 1,674 acres more land in hay than the 13 other counties and less than one-eighth as much land in other crops. Over 40 per cent of the crop land of the 4 counties was, for one reason or another, unproductive, whereas the corresponding figure for the 13 counties was less than 20 per cent.

Yet the 13 counties had nearly four times the acreage of alfalfa that the 4 counties had and produced five and one-half times as much alfalfa hay and about the same acreage of all other tame hay, with over one-fourth larger total yield. The acreage of wild-grass hay in the 4 counties is nearly five times that of the other 13, but the average yield per acre is somewhat less. Average yields and feeding

value of wild-grass hay are usually much less than those of alfalfa and somewhat less than those of other tame hays. The average yield per acre of all kinds of hay in the 4 counties was less than half that in the other 13, and although the hay acreage was greater the total tonnage produced in the 4 counties was only slightly over half that grown in the other counties. The better utilization of these natural resources is certainly desirable, and these 4 counties constitute one part of the State that might profit by a better organization and use of its irrigable land and irrigation water.

The writer also believes that the earlier method of estimating rate of stocking cattle ranches (p. 17) no longer holds good, as much of the spring and fall pasture land has been turned into hay land by a better use of the water supply, and the grazing capacity of the open range land has been depleted considerably by continued overgrazing. In consequence, the spring and fall grazing periods on pastures and ranges have been shortened without lengenthing the feeding period, and the number of cattle has been increased because of increased hay production. This results in an attempt to lengthen the summer grazing period to a degree that the area of this sort of feed will not carry.[27]

THE FARMERS

Twenty-seven per cent of all the landowners (1,550 operators) are crop farmers, though some of them (429 operators) run a few head of stock on the open range. They own about 355,000 acres of land, which constitutes only 8.1 per cent of all the owned land in the State. The average size of their farms is about 230 acres. Since most of them do not use outside range land and since land that is not irrigated can not be farmed, the greater part of the land in these farms is consequently irrigated or irrigable. Only a few of them have leased any railroad land in addition, and the amount leased raises the average size of the farm less than 10 acres. Forty-six of those farmers having range stock hold permits in the national forests, which supply summer feed for 1,067 head of cattle and 795 sheep. The cattle permitted constitute less than 2 per cent of all permitted cattle on the forests, and the sheep are 0.2 per cent of all permitted sheep.

From these figures it is safe to say that there have been few or no mistakes in the classification of these landowners as farmers. They use the range lands and national forests hardly at all. Their numbers and the percentage of the owned land that belongs to them show how unimportant farming (as most people understand the word) is in Nevada.

As will be noted by an examination of the land-tenure map, on which farm land is shown in black, appreciable areas of farm land are to be found in only a few places in the State. These black areas occur along the bases of the Ruby Mountains, around Lovelocks, around Fallon, near Reno and Carson City, at Minden and Gardner-

[27] Incidentally, it should be noted that this change in the adjustments of seasonally produced feeds has also resulted in considerable unjustifiable complaint against the administration of the national forests. The areas within forest boundaries furnish only a certain quantity of feed. There is no doubt that under the management of forest officials the grazing capacity of these areas has increased. It is no fault of the official if more feed is desired than can be furnished by that area. His duty requires him to prevent any misuse of the area under his control.

ville, and near Wellington, Yerrington, and Wabuska. Small farming areas are found in the Virgin and Moapa Valleys, in Clark County, about Bunkerville, Mesquite, Overton, and St. Thomas, and in Lincoln County, a few around Panaca.

It is strikingly noticeable that real farms are not found in the Humboldt Valley, except around Lovelocks, though the Humboldt River is the major source of irrigation water supply in the State, as shown by the map of the water resources. This map indicates plainly that there is more irrigable land north of the railroad, between Winnemucca and Wells and north to the State boundary, than in all the remainder of the State. Almost none of it, however, is used by crop farmers: it is included in stock ranches.

THE MISCELLANEOUS CLASS

So far as numbers go, even if proper allowance be made for the exaggeration in this category, at least half the landowners in Nevada (not including owners of town property) are in the miscellaneous class.

The area held is comparatively large (three times that classified as in crop farms), and the average area owned by one man (over half a section) is misleading. Familiarity with the actual records warrants the statement that probably three-fourths of the owners listed here owned 160 acres or less.

The facts that 14 of them leased additional railroad land (average amount over 3,000 acres) and that 8 of them held permits to graze cattle and sheep in the forests indicate that some range stockmen were classified in this group because of insufficient or inaccurate data. Several large holdings that were probably leased to stockmen, but for which complete data were not obtained, were intentionally included.

The members of this miscellaneous group consist largely of such holders as the following: (1) Homesteaders who got title to their lands but abandoned them; (2) men or banks that have loaned money on small pieces of land, which they were compelled to take over; (3) all patented mining property, mill sites, etc.; (4) all land held by nonresident owners who still pay taxes but do not lease the land; (5) all those whose lands were shown on the assessors' plats but were listed under other names in their reports; and (6) any one for whom no definite data were obtained. Those not in the assessors' reports were rather numerous. The list probably arises from the fact that changes on the rolls due to transfer of ownership were not kept up to date on the plats. The error involved is of relatively little importance and would not change percentages above the tenths place.

Table 4 summarizes relationships that have already been presented. The figures demonstrate that about one-sixth of the landowners of the State use for the production of range livestock (1) probably three-fourths of the owned land, including over half of the irrigated land, (2) practically all of the railroad-grant land, (3) over 95 per cent of all the forest ranges, and (4) at least three-fourths of the usable area of the public domain, along with (5) a large part of the million acres of the land owned by the members of the miscellaneous group. The overwhelming dominance of this

industry over all others using the land surface of the State is shown statistically in the table and is graphically pictured on the land-tenure map. It is believed that this represents about the only feasible use for by far the greater part of the land area of the State, but that marked improvements in its organization are possible.

TABLE 4.—*Summary of data concerning land tenure and utilization in Nevada, 1926*

[For geographic distribution of holdings and nature of use see pocket map No. 1]

Type of use	Nature of the control exercised							
	Landowners		Land lessees		Holders of permits in national forests for—			
					Cattle		Sheep	
	Owners[1]	Area owned[2]	Lessees[3]	Area leased[2]	Permittees[4]	Animals permitted	Permittees[4]	Animals permitted
	Number	*Acres*	*Number*	*Acres*	*Number*	*Number*	*Number*	*Number*
Producers of—								
Cattle	572	1,259,963	48	668,170	237	46,950	2	720
Sheep	210	507,581	31	1,075,430	7	140	86	300,986
Cattle and sheep	141	1,197,860	24	1,467,780	42	13,598	49	201,760
All stock ranches	923	2,965,407	103	3,211,380	286	60,688	137	503,465
Per cent of grand total	16.0	67.8	74.1	98.3	69.3	94.5	94.5	98.7
FARMERS—ALL KINDS								
Farmers with range stock	429	141,662	14	8,440	42	1,067	4	750
Farmers only	1,121	214,237	8	3,580			1	15
All farms	1,550	355,899	22	12,020	42	1,067	5	795
Per cent of grand total	27.0	8.1	15.8	0.4	10.2	1.7	3.4	0.2
MISCELLANEOUS								
Miscellaneous of all kinds	3,273	1,065,537	14	42,260	8	1,239	1	1,512
Per cent of grand total	57.0	24.1	10.1	1.3	1.9	1.9	0.7	0.3
Permittees with incomplete land data[5]					77	1,230	2	4,306
Grand total	5,748	4,416,839	139	3,265,660	[6] 413	[6] 64,224	[6] 145	[6] 510,078

[1] Number of individuals or firms owning land, as shown on assessors' plats.
[2] Estimated acreage of owned or leased land determined by assuming that each surveyed section contains 640 acres.
[3] Number of same individuals or firms who leased railroad lands.
[4] Number of same individuals or firms who held grazing permits in the national forests.
[5] See explanation on following pages.

Besides the landowners shown in Table 4 there were 79 other permittees for whom no record of owned land could be found on any of the available records. (See footnote on p. 23.) Of these permittees 19 were Indians. Many of the Indians of Nevada have had land allotted to them, but since the patent has not been issued the land is not assessed for taxation and is, therefore, not on the assessors' records. These 19 Indians held permits for 158 cattle and horses; probably most of the animals were horses. Four of them together held permits for 124 of the 158 animals. The numbers permitted to each of these owners were such that they would fall in the "farmers

with range stock" class if the records had shown that they owned any land. The others average less than three head per permit.

Of the 79 permittees, 37 probably live in town, as they are taxed for town property and do not own land outside of town. Of these, 2 hold permits for 33 and 19 head of cattle or horses, respectively, and the other 35 average exactly 5 head per permit. The two mentioned probably rented some farm land and should fall in the class of "farmers with range stock."

There were 23 other permittees in this group, all but 6 of whom held some taxable property as shown by the tax reports. The assessors' reports show the nature and value of the property but do not show the acreage nor location of real estate. The forest records show the numbers of animals permitted. Judging from such data alone, there are 5 permittees of the "cattleman" class, having permits for 456 head, and 16 permittees that would be classed with the "farmers with range stock," having permits for 389 head, an average of 24 head each. One has a farm flock of 28 sheep also. There are two other permittees having permits for sheep. One of these is a bank having an annual permit for 3,028 head. These sheep were either some taken on a mortgage, or the bank got the permit for some borrower who controlled land. The other is a town resident with a permit for 1,250 head that are probably run on rented land when outside the forest.

The table as it stands shows all the owned land except allotted Indian lands. The classification is explained and its limitation recognized. The permits just noted indicate some possible corrections. If it be assumed that the estimates made above show a correct classification and that the land is already included in the black or red area on the map, both of which are known to be exaggerated, the indicated changes of the table should be an increase in the number of permittees and permitted stock, as follows:

To the producers of cattle class add 5 permittees and 456 cattle; to the producers of sheep add 2 permittees and 4,278 sheep; to the farmers with range stock add 4 Indians, 2 townspeople, and 16 others, and 565 head of cattle or horses and 28 sheep; and add 50 permittees and 209 cattle or horses to the miscellaneous group.

These changes if warranted (1) would not change the land area at all; (2) would increase the total number of cattlemen to 577, sheepmen to 212, and total stockmen to 930; would increase the number of farmers with range stock to 451 and farmers of all kinds to 1,572; would raise the number of miscellaneous owners to 3,325 and the grand total of all operators or owners to 5,827; and (3) increase the numbers of permitted stock by 1,230 cattle or horses and 4,306 sheep.

IMPORTANT STEPS IN THE DEVELOPMENT OF THE LIVESTOCK INDUSTRY

Certain outstanding conditions in the range-livestock industry in Nevada are so directly traceable to previous events that a clear understanding of these conditions is best obtained by reference to what led up to them. A mere chronological synopsis of principal events will be given, with emphasis on those that are more important.

The first steps in the occupation and development of what is now Nevada have already been described and the relationships of other developments to mining have been pointed out (p. 19). The peculiar environment and the new kind of industry resulted in a type of organization that was not thought out in advance. Everyone was directly interested in mining even if he might be for the moment cooking in a "hotel" or driving a "bull team." Consequently everything was thought of as subservient to mining, and all customs—there were no laws—as to land ownership, use of timber and water, mineral discovery and development, were made to fit the principal business and the region. The commanding officer of the American forces (Mason) at the close of the Mexican War is quoted as saying to the miners:

> The Mexican law is abrogated. This is public land and the gold is the property of the United States; all of you are trespassers.[28] But the Government is benefited by your getting out the gold. I do not intend to interfere.

Later, when some kind of official government was considered necessary, they placidly adopted the laws of certain eastern States and the common law principles and went on following their customs. The law passed by Congress in 1866 [29] merely made legal the local customs and laws of the country, without defining any of them. During much of this time the existing laws were being unwittingly and thoughtlessly violated.

Meanwhile the enormous wealth of the Comstock lode had been discovered (1859) and was being exploited; Virginia City had become the center of population of the region, and the Territory of Nevada had been organized (1862). The Civil War had been fought, and Nevada had become a State.

The mining law of 1866 established the principle of the right to put water to beneficial use outside its natural channels without returning it undiminished in quantity, as required by riparian law. It also established the priority-of-use right, which is so important for irrigation. This law was primarily written to settle the mining troubles and to give properties worth millions of dollars a legal status. Much of the California mining was placer mining and required water to wash out the gold. So the customs and their change to laws took care of mining water rights and included the use of water for agriculture as well. Waters used for mining and agricultural purposes were recognized as under the jurisdiction of the State. Later expansions of the meaning of the phraseology have included stock water along with waters used for mining and agriculture. It is now possible under the existing State water laws for an applicant to have allotted to his use by the State engineer the water—wells, spring, or seeps—found on public lands, without the need of owning the land upon which it arises. It is also desirable for the owner of land having such wells or springs upon it to have the water officially allotted; and it must be kept in beneficial use in order for him to retain the allotment. This law is made the basis of a later law which is discussed elsewhere (p. 35).

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[28] Referring to the United States law of 1807 claiming all mineral found in the earth for the Federal Government.

[29] Sec. 2339 R. S.

In 1880 another legal step was taken that is probably more directly responsible for the existing organization and status of the livestock business of this State than any other one thing which has happened. When admitted to the Union, Nevada received a grant of land for its public school system. Like other western States, it was given sections 16 and 36 of each township or lieu selections for all such land as was already taken in these two sections. In 1880 its Representatives went to Congress with the plea that the State had been unable to dispose of more than a few thousand acres of these lands (229,000 acres to 1880) and was unable to get any income for the schools out of the lands then held. It was proposed that Congress take back the lands remaining unsold (over 3,000,000 acres) and give the State 2,000,000 acres, which State officials were to be allowed to select. Congress agreed, and the exchange was made. In 1885 the State remodeled the State land laws and provided for the selection and sale of these lands.

It was this exchange that made possible the purchase of large holdings that cover all the hay land, irrigation water, and most of the stock water found in the region, and thus dominate the use of much larger areas of contiguous and associated public range lands. The State land laws were so drawn as seemingly to prevent such a concentration of control, but the interpretation made of them allowed it, and the lands were sold.

This condition has always been more characteristic of the northeastern corner of the State than of any other part, probably for physiographic reasons. It prevails to some extent elsewhere but is now showing signs of disappearing in places, even in Elko County, where it is probably best exemplified. It still dominates the industry and delays the development of the State, as it has done for probably 25 years.

Easy money obtained from mining ventures may have caused some of these large businesses to develop, but it is more likely that they simply grew under the direction of capable, hard-working, and ambitious organizers. Most of them are the creations of individuals who later organized and incorporated into stock companies for business advantages. The land laws permitted an applicant for State lands to pay 20 per cent of the purchase price ($1.25 per acre)[30] or 25 cents per acre down, and the remainder in a period of years,[31] with interest at 6 per cent. Under this arrangement the applicant could get the use of the land for a down payment of 25 cents per acre and 6 cents per acre per year (plus taxes) thereafter.

The rate at which the lands were taken is an indication of the generalization in the preceding paragraph. Table 5 shows, for some of the larger purchasers, the amounts of land applied for, the period over which the applications were made, and the dates at which the patents were issued.

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[30] Within the limits of the railroad land grant the price was $2.50 per acre.

[31] The period first established was 10 years. It has been lengthened at various times and now stands at 50 years. The contract of purchase therefore amounts to a 50-year lease at 6½ cents per acre per year, or double that amount on the $2.50 land. In some instances fees that were required raised the price considerably. These prices would be low rentals for irrigated or subirrigated lands, but they are very high for the lands not supplied with water. The railroad-grant lands (over 3,000,000 acres) are to-day rented at an average price of 2½ cents per acre per year; they return only about half their annual cost (taxes) to the railroad.

TABLE 5.—*Data showing the periods during which some of the larger landowners were purchasing their State land holdings*

Applicants	Year of earliest application	Year of latest application	Year in which patents were issued	Separate holdings purchased	Total area bought
Number				*Number*	*Acres*
1	1867	1910	1917–1921	53	12,303
1	1872	1900	1916	63	25,330
1	1872	1904	1909–1913	220	128,050
1	1873	1921	1922	204	30,300
1	1882	1897	1917	123	67,820
1	1886	1926	1919	67	23,980
6	----	----	----	730	297,728

Fifteen or twenty years ago the practice of incorporating these larger properties was begun. This made necessary the completion of the purchases of State lands, in order that they might be used, along with improvements, water rights, livestock, etc., as the contribution of the owners to the capital stock of the companies to be incorporated. Securities of such companies were sold on the market for a number of these companies, and the ownership of many of them now largely rests in investors entirely out of contact with the business itself or the interests of the State as a social unit. The securities represent investments that are good or bad only as they pay or do not pay dividends.

The owners of the securities of a number of these incorporated companies are the heirs of undivided estates who have taken this means of dividing ownership without dividing the property. Often these heirs do not wish to be directly associated with running a stock ranch. Few of them live on the property, many live in near-by towns, some of them have gone to California. They have no interest in the property except as a means of earning incomes—a function several of the ranches have failed to perform for some time past.

The burden of taxation in Nevada falls heaviest upon the agricultural lands. The largest taxpayers are the railroads, which furnish, roughly, about 40 per cent of the taxes. Second in importance among taxpayers is the livestock industry, though the gross income from mining is probably two to two and one-half times that from the livestock business; and the land, which carries the heaviest burden, belongs mostly to the large livestock operators. Naturally they are now anxious to be relieved of such burdens, and the properties of many of these companies are for sale.[32]

These owners wish to sell all their property as a unit, not subdivide and sell in pieces. Many of the pieces that are important parts of the whole would have little value if offered separately; but possible buyers of such large properties are not numerous, and the outstanding securities which are liens upon the lands in many cases prevent

[32] The report of the Nevada State Equalization Board (p. 23) shows that the livestock interests of the State paid about 18 per cent of all taxes paid in 1926. Of this total, about 11 per cent was assessed upon their lands and 7 per cent upon their livestock and other personal property, not including automobiles. A little over 4 per cent of the total taxes assessed were paid by the railroads upon their grant lands. The rentals for such of these lands as stockmen leased amounted to half of the taxes paid. Hence stockmen actually contributed approximately 20 per cent of all taxes paid that year. About the same proportion has been paid for several years past.

sales that might otherwise be made. It was this condition that led Dan Casement,[33] who was appointed by the Secretary of Agriculture to review grazing fees in national forests, to say: "Contact with stockmen in Nevada leaves one with the impression that ranch and range lands in the State are regarded as very burdensome, if not actually undesirable, possessions."

Efforts to maintain the domination of large businesses and to keep up the morale of those who are weakening give rise to the generalizations heard there: That Nevada does not need or want more people and ranches; that what it needs is fewer and bigger ranches; that certain parts of the State (which have been cattle ranches for half a century) could be much more profitably and effectively used as winter ranges for sheep.

Yet the one outstanding irritation that has beset the cattlemen for years has arisen from nomadic sheep, and the laws that have been passed in attempts to control the sheep number more than all other range laws together. It has already been shown that winter snow and existing lack of law controlling grazing on the public domain, when taken together, give the sheepmen advantages that have so far not been met by cattlemen.

Laws to prevent sheep from other States coming into Nevada were repealed because some Nevada sheep go into other States for summer feed. A law that required all stockmen using Nevada ranges to own Nevada land was declared unconstitutional, though it lasted long enough for one speculator to lose $18,000 to $20,000 of first payments on all the available State lands. He expected to sell such lands at much higher prices to Utah and other extra-Nevada sheepmen who wished to graze Nevada lands in the winter. The land ultimately reverted to the State and was resold.

The national forests of Nevada were established at the request of resident stockmen, who keenly felt the need for a means of keeping nomadic sheep off summer ranges. Some of the stockmen who now can not qualify for permits in national forests are ..ging changes in the administration of those areas for any reason that seems plausible, in the hope that under a new arrangement they might get something better than what they have now.

The latest legislative attempt to control the nomadic sheepman is what is known as the 3-mile limit law, which restricts the use of allotted water and associated forage as a regulatory act under the police power of the State government (p. 40).

In the evolution of the range industry of Nevada certain fixed opinions have developed among stockmen that have become the accepted, almost authoritative, rules governing the operator. When men began to use the grazing lands in the Humboldt River Valley they raised cattle. In that region it is necessary to feed cattle one or two months in the winter. The only feed available was native-grass hay, but there were many thousands of acres of flooded valley lands covered with giant ryegrass ready to be made into hay. Control of the winter feed meant control of the range, and for years cattlemen have determined the number of stock their ranges would carry by the number of tons of hay they could cut for winter feed.

[33] CASEMENT, D. [THE RACHFORD REPORT.] Letter from Dan Casement to W. M Jardine, Secretary of Agriculture. 21 p. 1926. [Mimeographed.]

It was this set of conditions and the reasoning that grew out of it that brought about the exchange of school lands and the concentrated ownership of hay lands.

The subirrigated lands produced excellent spring pastures, originally in native grasses, but later, to some extent, seeded with the common cultivated pasture grasses. Such pastures, associated with hay and outside range, made possible the grass finishing of 3 and 4 year old steers that found a profitable market in California, where such beef animals could undersell a better but more expensive product originating east of the Rocky Mountains.

Operators who were fortunate enough to be fully equipped for this type of beef-cattle raising were prosperous, and their methods were assumed to be those that should be applied by all cattle raisers in the State. This type of beef production still is profitable for the man with the properly organized ranch business, but other systems of cattle raising are probably better suited to present conditions on many ranches. Yet many cattlemen are strongly convinced of the superiority of the established system.

Raising sheep began very shortly after cattle production began. The sheep have always been handled in bands and have always competed more or less with the cattle for range forage. Under such competitive conditions on an open, free range, sheep have some advantages over cattle, and this is especially true where snow is associated with browse feed in the winter. The desert ranges, as they were called, were an invitation to sheep from other States, and they encroached more and more upon the cattle range. The first important effects of extra-Nevada sheep were felt in the summer ranges of the mountains, and accordingly the national forests were established. Since then their crowding on the winter ranges has been increasingly serious.

The coming of the national forests and the development of a more complete utilization of the available irrigation water, which was accomplished by small operators who do most of their own work and live on and farm their irrigated lands, changed the relationship of the different sources of feed in a large part of the State. These small operators developed water and were given permits in the adjacent forests. The hay they raised, mainly alfalfa, gave larger yields than the grass hay, and their use of their irrigation waters was more economical and effective.

Nowadays the industry finds its expansion limited not by winter feed but by summer feed. The steady reduction in range feed on the public domain is also becoming important, though many of the stockmen will not acknowledge it. Many thousands of acres that were formerly grass patches in the sagebrush area are now covered with sagebrush itself and with more or less useless annuals, and the winter-fat and little-sage areas are badly grazed down. Most of the scattered bunch grasses are grazed so closely that they are not producing seeds. Several valuable native species of Poa, relatives of Kentucky bluegrass, and some of the best feed grasses formerly reported from these ranges were absent in 1927, when the writer was looking for them. But all the earlier publications dealing with Nevada range forage plants tell about them and name the species.

In summarizing these tendencies it may be said that the development of the water-utilization laws was beneficial; that the exchange

of the school lands and their sale in large bodies made for the rapid development of a thinly populated area up to the limit of that system of organization; that the control of the national forests came in time to save most of the best summer feed and has since brought about its recovery, at least to a degree; that the opportunities and encouragement afforded small stockmen have brought about the development and better use of much of the natural water; and that, along with other factors, this development has exerted some pressure tending to bring about the subdivision of the larger ranches.

The crowding and overgrazing of ranges by nomadic sheep have done no one except the nomad any good and have done the ranges outside of protected areas enormous harm. These nomadic sheep are in a fair way to displace some of the year-long cattle ranchers who are and wish to continue to be permanent residents.

Nevada needs two things: (1) Better use of some of its irrigated lands in smaller parcels and by a larger number of people and (2) fenced stock ranches used by individuals or small groups who will develop the stock waters and protect and improve the range forage. Such improvements can be made and would benefit the State as a whole.

THE LEGAL STATUS OF THE PUBLIC DOMAIN

All of the data presented have demonstrated the limitations placed upon the economic advancement of Nevada by the lack of legislation to make possible the better utilization of the public domain.

All of Nevada, along with much more of the land area of the Union, was originally the property of the Nation, to be disposed of by Congress as it saw fit. The various States carved out of this Federal property and admitted to the Union by Congress agree, in their constitutions, that the lands of the State should be brought under the complete jurisdiction of the State government only after they had ceased to be the property of the Federal Government.

The enabling act of Nevada contained the following agreements, which are written into the State constitution. The people of Nevada agreed that—

> (1) They will forever disclaim all right and title to the unappropriated public lands lying within said territory;
> (2) That the same shall be and remain at the sole and entire disposal of the United States; and that
> (3) No taxes shall be imposed by said State on lands or property therein, belonging to, or which may hereafter be purchased by the United States.

From this it appears that political jurisdiction and exclusive power over these lands was not retained by the United States. What was retained were ordinary property rights, with power of disposal, and freedom from taxation. In respect to these lands, the Federal Government is in the status of a private owner, with special privilege as to taxation, until Congress so acts as to establish some other status.

The admission of the State of Nevada into the Union made it amenable to the Federal Constitution; hence, powers granted by that document to the Federal Government automatically applied to Nevada. Under the Federal Constitution, Congress is authorized to dispose of the public lands.

This limited jurisdiction of the Federal Government over public lands automatically leaves to the State all other powers, except as it is limited by the State and Federal Constitutions and the acts of Congress.

Congress has all along had the authority to act in the disposal of public lands. It has acted with respect to (1) national forests, (2) national parks and monuments, (3) mineral deposits of certain kinds and the disposal of them, (4) Indian lands, and (5) various other lands. But it has never acted in respect to use of the public domain except indirectly.[34] Certain rulings of the Secretary of the Interior have been supported, and in 1885 Congress passed a law prohibiting the inclosure of lands of the public domain with a fence. Grazing of livestock upon the public domain has always been allowed and declared by the courts not to be trespass.[35]

Thus arises the existing condition of the public domain. It is an open "commons" upon which the livestock of any citizen may graze without charge. No one has legal authority to appropriate a part of it exclusively to individual use, to inclose any part of it with a fence, or directly to prevent anyone from using it.

Since many of the plants growing naturally upon most of this public domain have some forage value, and such forage is free for the taking to him who can get it, there has been more or less competition for it since white men have occupied the region.[36] This "first come, first served" principle, when applied to free feed, usually results in friction or something worse, and then the police power of the State is invoked to maintain the peace. The State has always been sustained by the United States Supreme Court in the exercise of this power so long as there is no violation of the Federal Constitution. An act once passed by either State or Federal Government becomes the law until repealed; and any property rights obtained under it, while it is in force, will be defended by the courts, whatever action may be taken later.

Early in the development of the new country the constant dissension between stockmen and other settlers or between owners of one kind of livestock and owners of another kind resulted in what passed for legislative action. In California in 1857 a law was passed making the herding of sheep on "land or the possessory claim" of another than the owner a trespass and finable in two counties. This was later extended to more counties and finally to the State. Idaho passed a "2-mile limit" law[37] which was sustained by the State courts[38] and finally by the United States Supreme Court in 1906.[39] This law prohibits any person owning or having charge of sheep to herd the same, or permit them to be herded, on the land or possessory claims of other persons or to herd the same or permit them

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[34] This statement refers to the management of these lands while still the property of the Federal Government. Very definite laws regulating the transfer of title to these lands have been on the statute books since the Nation was established.

[35] Buford v. Houtz, 133 U. S. 320.

[36] The writer once asked the chief of one of the Pueblo tribes of New Mexico why the grazing lands of their reservation did not show overstocking. His reply was that they had known for many years about what the range would carry and the tribe had maintained that limit. Most white men who have control do the same thing. Without control of prescribed areas, such regulatory measures can not be applied. The recognition of the necessity by the Indians had probably resulted in a tribal custom that is now obeyed without question.

[37] Sec. 1210, 1211 R. S.

[38] Walker et al. v. Bacon, 81 Pac. 155.

[39] Bacon v. Walker, 204 U. S. 311.

to graze within 2 miles of the dwelling house of the owner or owners of such possessory claim.

In 1925, Nevada passed its "3-mile limit" law, which has already been mentioned; some of the consequences are considered at some length in the next section (p. 40). The law has been declared constitutional by the State Supreme Court, but has never been before the United States Supreme Court.[40]

As will be seen, the effect of these laws is to restrain certain individuals from the use of the public domain in specified areas—a power delegated to Congress only, but allowed by the courts because Congress has not acted and the peace must be maintained even at the expense of "even-handed justice" or "ideal fairness."

One further step in this process of getting individual control of the public domain for grazing purposes was taken in 1929 by the State of Colorado. The State legislature passed a law which assumes that the custom of grazing livestock on the public domain is an established custom carrying with it possessory rights that have the status of private property, and that these possessory rights are therefore subject to the laws and court decisions of Colorado that relate to them. Then, acting under its police power and to prevent conflicts between individuals, the legislature declared that—

> the question as to the kind of livestock, whether cattle or sheep, that shall have the preferred or better right to graze upon any particular portion of the public domain within this State shall, from and after the passage of this act, be determined according to the use made thereof during the last grazing season prior to the passage of this act, whether such use was as a cattle or sheep range and whether the same was used as a spring, summer, fall, winter, or other kind of range.[41]

This law places the responsibility of determining the nature of the range use for any area upon the district court when a case is brought before it and sets forth certain methods of procedure and principles of action for the guidance of the court. It also commits the State government to a policy of conservation of the forage resources of the public domain and the prevention of overstocking and erosion. It authorizes the court to determine the number of animals that a range may carry. This law has been declared to be constitutional by the State supreme court.

Two other acts of Congress bear on this subject. At the request of the people living in a few contiguous townships in Montana, the Secretary of the Interior was given authority to lease the public domain within those townships. Congress has authorized the withdrawal of many thousands of acres of public domain from entry, in the Owens Lake region of California, to protect the water supply of Los Angeles. But grazing is permitted upon these lands under rules and regulations of the Secretary of the Interior.

Thus, various indirect legal methods have been used to get individual control of the range lands of the public domain. The fencing law passed in 1885 was intended primarily to prevent stockmen from establishing possessory rights to large areas of public domain under State laws that recognize such rights as may arise from

[40] Until the U. S. Supreme Court is called upon to decide the constitutionality of this law or unless Congress shall take adverse action, the State law will continue in force. Previous action of the U. S. Supreme Court has established precedents which appear favorable to a confirmation of the constitutionality of this law.

[41] Colo. Sess. Laws, 1929, p. 443.

undisturbed possession and use of property for a period of years. Before that law was passed hundreds of thousands of acres of the public domain in the Great Plains had been fenced and homesteaders had been driven off.

While these events were taking place the desired end was being approached from an entirely different angle—that is, through the control of the very limited supply of water. It has been shown how Nevada stockmen used the control of irrigable land and irrigation water to control winter feed, which was the key to the control of the large acres of the arid grazing land that constitute the public domain in that State. The way this method was worked out and applied has been discussed (p. 33), and the limits of its effectiveness in Nevada have been stated. The net result has been to build up the water laws of the State as they exist to-day.

The feature of these laws that needs discussion here is the extension of the idea of the ownership of the waters of the State to the stock water, and the law authorizing the State engineer to allot all such water whether on private lands or public domain. Acting under the provisions of this law, the engineer has allotted many such sources of stock-water supply over the State. (Fig. 4.)

In April, 1925, the State legislature passed a law which prohibits any person from watering

> on two or more separate days, during any season, more than 50 head of livestock at the watering place at which another shall have a subsisting right to water more than 50 head of livestock, or within 3 miles of such place, with intent to graze the livestock so watered on the portion of the public range readily accessible to livestock watering at the watering place of such other person.[42]

This law also forbids the issuance of water allotments to waters from the same or different sources, the use of which will impair the use of the surrounding public range if that is already fully occupied by livestock watering at places already allotted. This law has been declared constitutional by the State supreme court,[43] but has not yet been before the United States Supreme Court.

Just what effects this law will have is not yet evident. It patently attempts to restrict the use of the public grazing lands to the stock belonging to men having "a subsisting water right," which will cover either vested rights or allotments more recently made. It will give incentive to present owners of watering places to develop more and thus bring about the long-delayed development of the underground sources of water in the State. It remains to be seen whether or not, in the meaning of this law (1) snow lying on the ground is to be considered a "watering place" or (2) allowing sheep to eat snow is a method of "watering" them. If a court of competent jurisdiction decides these questions in the negative, nomadic sheep that use snow only may graze anywhere on the public domain that snow and feed are found together.

THE RECORDED RANGE CLAIMS

These two limitations upon the use of range forage and stock waters have produced another result that was not anticipated. This

[42] Nev. Stat. 1925, p. 348.
[43] In re Calvo, 253 Pac. 671.

is in consequence of the action of the State engineer, whose business it is to make water allotments. The new law places considerable responsibility upon him, since it prohibits the allotment of stock waters on ranges where operators having subsisting water rights run live stock on the surrounding range " in sufficient numbers to utilize substantially all that portion of the public range readily available to livestock watering at that place "—that is, the allotted waters. This makes it necessary for the State engineer to have accurate knowledge of the ranges used by the men having the water rights. He has a record of all water allotments made and of some of the vested water rights, but at the time the law was passed he did not know the limits of the ranges as claimed by stockmen.

The engineer made this clear to the stockmen and told them that if they would furnish him with maps showing the extent of their range claims he would keep the information on maps filed in his office. He promised the stockmen that whenever an application was made for an allotment of water he would notify the man whose business might be affected by such an allotment, so that such an operator might enter a protest against the granting of the application. The action taken would then rest on the evidence as to whether the range was already " substantially utilized."

The result was the preparation of maps which are on file in the engineer's office at the State capitol. Through his courtesy and the assistance of one of the district extension agents [44] of the State agricultural extension service, a large-scale copy of a State map on which these individual range claims had been assembled was made available to the writer.

On this map as a base the owned and leased lands controlled by the claimants were entered and the claims numbered so that they could be identified. This " range-claims " map is in the pocket at the back of the bulletin. (Pocket map No. 2.) It presents a picture of the actual conditions that result from lack of some system of control in an open-range country.[45]

No sufficient description of the resulting situation can be put into words, though several facts may be noted. The first impression made by the map is the amazing jumble of overlapping claims of all sizes and shapes. When it is remembered that this map records the claims from not over 20 per cent of the stockmen in the State, the complexity of the situation is appreciated.

The claims vary in size from the small claim of a half to a whole township with an associated area of compact, consistently located, legally controlled land, inside the claim, to the enormous claims of certain companies that have nothing but some stock-water allotments, and an occasional 40-acre piece of land. Some of the claims registered have no associated owned land but merely certain "possessory-rights," as stated by the county assessor.

There is a principle of action that arises out of our method of making laws under the common-law principle—namely, that so long as there is no law prohibiting it, one may do anything that is to his own advantage. If some practice or method of action not formally

[44] C. R. Townsend.
[45] To include the areas used by these claimants in national forests was found impracticable because of the extreme complexity of the map.

controlled by law but resulting in good to those using it becomes an established custom and rights are developed thereby, these rights have the status of possessory rights, and the courts will defend them. So long as the individuals who might be competitors in the field get along together without dissension and do not arouse the public, the practices may continue. Once the matter is aired and laws are made, the practice must follow the law, but the possessory rights usually get some legal recognition.

This general principle of action has long been well understood by the stockmen in Nevada and has been in practice for many years (*1*). These stockmen have become so thoroughly habituated to using indefinitely defined large areas of pasture land to which they have and can get no statutory rights that they are watching for opportunities to establish possessory rights, especially if they cost nothing, in the expectation that when statutory rights are established, equities in the form of possessory rights, adherence to custom, priority of utilization, etc., will receive due consideration in the new adjustment.

Their position is well taken, since it gives present advantage and profit, and the habit of the courts is officially to recognize all such property rights in so far as they can. This is particularly true when the law-making power that has authority to consider the subject and establish statutory principles does not exercise its function.

That men of business acumen and common sense have taken advantage of such a situation is plainly evident from the map. Some of the claims are conservative and clearly represent an effort to put on the map no more than the area that the operator can prove he has "substantially utilized" for years. Others are as patently an effort to develop a claim to as large an area as possible. Ranges recorded a second time by the same parties and considerably enlarged illustrate this expansive tendency.

The following are some brief generalizations concerning these claims that have been worked out from the data available. They point out the high lights of the picture.

The law was passed in 1925. The State supreme court declared it constitutional in February, 1927. By October of 1929, 199 claims had been recorded.

Counting out duplications and claimants having no owned or leased land that could be found, 164 claimants are represented.

Of these, 149 are the same parties enumerated as "range stockmen" in the tables showing tenure and use of lands. (P. 24 and Table 4.)

The gross area (estimated) of all the separate claims is about 65,056,000 acres.

The area of duplications and overlaps is approximately 20,338,000 acres.

The net area covered by all reported claims, eliminating duplications, is approximately 44,718,000 acres, or 63 per cent of the total area of the State.

The area owned or leased by these claimants is approximately 2,791,000 acres, or about 6 per cent of the net area claimed.

Of the 149 range stockmen mentioned, 91 raise cattle only, 28 raise sheep, and 30 produce both cattle and sheep.

Of these 91 cattle raisers, 40 had permits to run 15,013 cattle and a few sheep on the forests in 1926.[46]

Of the 28 sheep raisers, 8 had permits to run 72,297 sheep in the forests in 1926.[46]

Of the 30 producers of both cattle and sheep, 13 held permits to run 10,725 head of cattle and 12 held permits to run 111,602 sheep in the national forests in 1926.[47]

Table 6 gives the details of these relationships and should be compared with Table 4 which shows land tenure and use for the whole State (p. 30).

The landholdings and permits of the few claimants found in any of the use classes other than range stockmen are shown in Table 6. These probably also show some of the inaccuracies in the data which were not eliminated by the methods used.

TABLE 6.—*Summary of data concerning recorded range claims, Nevada, 1929*

[For geographic distribution of claims see pocket map No. 2]

STOCK RANCHERS—ALL KINDS

Type of use	Nature of control upon which claims rest									
	Land owners			Land lessees			Holders of permits in national forests for—			
							Cattle		Sheep	
	Claimants [a]	Claims	Area owned [b]	Lessees [c]	Separate leases	Area leased [b]	Permittees [d]	Animals permitted	Permittees [d]	Animals permitted
Producers of—	*Number*	*Number*	*Acres*	*Number*	*Number*	*Acres*	*Number*	*Number*	*Number*	*Number*
Cattle	91	102	375,568	11	20	181,410	40	15,013	2	720
Sheep	28	31	157,470	5	14	482,610			8	72,297
Sheep and cattle	30	34	672,960	5	38	1,014,120	13	10,725	12	111,602
Total	149	167	1,205,998	21	70	1,578,140	53	25,738	22	184,619
Percentage of grand total	90.8		99.4	100		100	96.4	99.6	100	100

FARMERS—ALL KINDS

Farms with range stock	9	9	4,397				2	100		
Percentage of grand total	5.5		0.4				3.6	0.4		

MISCELLANEOUS—ALL KINDS

All kinds	6	7	2,160							
Percentage of grand total	3.7		0.2							
Grand total	164	183	1,212,555	21	70	1,578,140	55	25,838	22	184,619

[a] Number of individuals or firms owning land, as shown in Table 4, who have recorded range claims.
[b] Estimated acreage of owned or leased land, calculated on the assumption that each surveyed section contains 640 acres. Such figures are usually about 1 per cent over assessed acreage.
[c] Number of same individuals or firms who leased railroad lands.
[d] Number of same individuals or firms who held grazing permits in the national forests.

[46] There are usually only a few changes in the forests each year.
[47] Some of the men holding permits for cattle also obtained sheep permits.

SUMMARY AND CONCLUSIONS

This study was undertaken to ascertain the conditions peculiar to different parts of Nevada and to the State as a whole that would have to be taken into account in any attempted solution of the range problem. Nevada was chosen because it has more public domain and a greater proportion of its area in public domain than any other State and because it is more dependent economically on the public domain than is any other State.

At various times a number of methods of disposing of the public domain have been proposed. Four of these that have received serious consideration are listed here without reviewing their advantages and disadvantages. They are (1) selling the land at a reasonable price, (2) giving the land to the State in which it is located and allowing the State government to dispose of it, (3) leasing the land at a reasonable price, and (4) establishing a system of Federal control over these lands modeled upon the plan of the permit system now in use in the national forests. These proposals have always contained limitations and various safeguards. Sometimes the limitations are stated definitely, and at other times the duty of proper administration is assigned to a responsible authority. Each proposal has been made to cover the whole of the public domain.

One general conclusion is reasonably certain. In the regions where competitive grazing on public lands prevails with little restraint, any one of the various methods that have been proposed for the disposal of the public domain would be more satisfactory than our present habit of letting things drift. Each plan would have advantages in certain regions and disadvantages in others.

Studies made in several of the States indicate that there is no single simple policy that can be applied satisfactorily to the remaining public domain, since under any set of assumptions as to the ultimately desirable, that action which will be acceptable in one State may not be acceptable (and usually is not) in others. Each State has developed a set of laws and customs that differ more or less from those of other States. Stockmen have acquired various degrees of control over the use of the public domain, and this use is correlated in numerous ways not only with that of their own and other private lands, but with State lands, Indian lands, and national forests. Each geographic region imposes different physical limitations upon the business of range stock raising.

Nevada is a rather striking example of these varied regional conditions. Northeastern Nevada has one set of conditions and an established organization now in operation, characterized mainly by large holdings of irrigable land and the ownership of the associated irrigation water rights. Many of these operators are incorporated firms with securities in the hands of scattered nonresident owners who have no close personal interest in the region and its development. The use of the resources held by these stockmen is so important to the State as a whole that the question of how best to utilize the region becomes a separate problem for solution. In east and south-central Nevada another set of conditions is found. Here the amount of irrigable land and irrigation water is so limited that its proper utilization does not constitute a separate problem. In the northwestern part of the State the use is more nearly like that in the

east and south-central parts, but this condition has developed recently, and further adjustments are to be expected. In the southwestern part of the State the use of the land is so dependent upon the feed and the scanty supply of water that permanent occupation by stock of anything but small, scattered areas is not to be expected. The extreme southern part of the State, below 37° latitude, has very little permanent stock water and almost no snow, with very scanty feed, and only a few stock. Sheep rarely go there, and cattle can stay the year through in only a few places.

The study of the physical conditions, the tenure and use of the land and water, the historical and legal factors, and the claims made by stockmen indicate certain generalizations that are considered basic to any conclusions that may be reached. They are:

Most of the tillable land of the State and the associated irrigation waters belong to stockmen and are employed mainly in the production of hay that is requisite for the best utilization of the associated grazing lands.

The public domain in Nevada is all arid grazing land, except the absolute desert, which has no known agricultural use.

All the usable part is now fully occupied and employed as open range by tacit permission of the Federal Government.

Free, open-range grazing leads to (1) nomadism, (2) overstocking, (3) cumulative range deterioration, (4) soil erosion, and (5) final complete destruction of the grazing resources, to say nothing of continual friction among the users. Nomadism tends to disorganize the business of permanent settlers, and eventually to drive them away.

These arid grazing lands are capable of greater or less improvement under better managerial practices than can be applied on open, uncontrolled ranges.

Operation of these lands in separate units under proper restrictions, by individuals, or small groups is the best method known.

Operators can not afford to apply the known practices that bring about improvement unless they can be guaranteed the resulting rewards of their efforts.

The right of any State to exercise police control over citizens on the public domain within the State is recognized by the Supreme Court of the United States.

The right to graze on the public domain has been recognized by the courts and is considered a property right.

This study has shown that active livestock producers in Nevada are warranted, on some or all of the following grounds, in believing that their interests should be carefully considered in any adjustments that may be made: They own the lands and control the irrigation waters that are the keys to the use of practically all the grazing lands, they hold nearly all the grazing preferences in the national forests of their State, they have most of the possessory rights on the public domain, they hold most of the stock-water allotments made under the laws of the State, and they lease nearly all of the usable railroad grant lands. This domination of the grazing resources of the State is the result of years of development and the gradual acquisition of the various rights and privileges mentioned. The existing stockmen have built up and now operate the second largest business in the State, and they pay more taxes than any other industry in the State except the railroads.

An obvious desideratum in carrying out any plan is the sympathetic cooperation of the people concerned. In order that the next step in advance may be taken, the present status of development of the business must be clearly understood and should not be suddenly and drastically modified. So far as possible such modi-

fications as may appear desirable in the public interest should be worked out gradually.

Nevada stockmen are confirmed in the belief that the range lands of by far the greatest part of their State can never be used as anything but *open* ranges. They may be correct; nothing else has ever been tried. But if experience in other States having large areas of arid grazing lands is to be trusted, the best use of such lands is to be had only when they are fenced. Even a system of regulated grazing on unfenced ranges does not give the control necessary for the best practices in handling cattle. This proved true in Texas, where fencing was compelled by State authorities. It has proved true in other range States on all lands that operators could get fenced. Many stockmen so thoroughly believe in the advantages of the practice that in order to be able to fence the lands they use they are ready to lease, buy, or submit to Federal regulations.

Perhaps no body of men are more confirmed in the idea of the desirability of open ranges than the sheepmen of the range States. Yet the chief of the department of animal husbandry, Texas Agricultural College, says that 95 per cent of the 5,500,000 sheep and 2,965,000 Angora goats produced in that State "are grazed 'loose' in wolf-proof pastures in the great permanent ranching area of southwestern Texas." (*5*) By this he means that these animals are in fenced pastures without herders and not handled in bands, as is the common practice. The pastures are usually large, often several square miles in extent, and the fences are wolf proof.

Nobody can now say definitely, and no one will know until it is tried, whether Nevada stockmen would avail themselves of the privilege of fencing if the opportunity were offered.

The stages in development of private range control in the United States have been somewhat as follows: (1) Open, free range; (2) open range limited to operators who control water; (3) open range region subdivided into large areas by drift fences, natural barriers, railroad rights of way, etc.; (4) drift and railroad fences and natural barriers so used as to produce a few large inclosed individual ranches; (5) State, railroad, and other grant lands, in large bodies, fenced; (6) consolidation into private fenced, subdivided holdings, by any method applicable in the region. These steps have been taken slowly or rapidly by stockmen, individually and collectively, and regionally as they have believed they might profit by the change. It is not improbable that such tendencies would emerge in Nevada if and when a greater degree of control of the open range results in range improvement.

If one is to believe the opinions expressed by some of these men to the Stanfield committee and to the present investigators, as reiterated in the official organ of the State Stockgrowers Association and as implied in Dan Casement's report to the Secretary of Agriculture, the attitude of these same men is unsympathetic toward any of the proposals mentioned above (p. 44).

Apparently most Nevada stockmen are not in favor of leasing the public domain, even at the low rates of rental that prevail for railroad grant lands. They say they can not afford even this small charge, since the production of feed on the lands will not warrant it. Hence a leasing system would get little support. A few would

probably purchase some of the public domain if it could be acquired at a reasonable price and on convenient terms of payment, but many claim that the use value of the public domain has already been fully capitalized in the value of associated privately owned land. If the land should be offered to them as an unconditional gift, many would hesitate to accept it on account of the taxes. Most of them, at least those who express themselves most freely, would prefer not to be subjected to any regulatory authority that might impose restrictions for reasons other than those determined by what the operators consider the best interests of their business.

A reasonably definite statement of what they believe to be desirable is rather hard to make. Expressed in general terms, many of them think that legislation is needed which will give them legal right to the privilege they now exercise, and this change from a poorly defined privilege to a legally defensible right would have to come without any large additional cost or they would prefer to have conditions remain as they are.

The Legislature of Nevada has tried several times to pass laws that would stop some of the worst abuses, particularly the encroachments of "tramp" sheep. The courts have done what they could in support of the laws. The latest effort, the 3-mile law, held some promise but has not helped much yet. The law passed by Colorado in 1929 which attempts to restrict the use of certain areas of the public domain of that State to cattle or sheep or for seasonal grazing has not yet been tried sufficiently to warrant passing it in Nevada. The law passed by Montana authorizing leasing in a limited area would not appeal to Nevada stockmen. At best, all such attempts are indirect and only partially effective and are subject to change by any act Congress may pass.

It is reasonably evident that any plan that would attempt to divide the public domain into units having productive capacity equivalent to the original 160-acre homestead and offer to give such units to applicants as homesteads have been given in the past would completely disrupt the business as now organized. These proposed units, composed entirely of public domain, would lack stock water and hay land. The privately owned lands and water rights, although capable of some independent use in most instances, would automatically lose in output because of the loss of the feed now obtained on the associated public domain. The proposed units cut out of public domain would not be economic units. The plan would induce inexperienced men to try the impossible, and at the same time would set up the machinery whereby capable stockmen would be either forced out of business at great loss, or compelled to overcapitalize in order to retain a hold on the economic units they now use.

In any case it seems clear that any plan for leasing or sale that might be developed should be carefully devised so as to give due recognition to existing possessory rights in so far as this is compatible with the public interest, and particularly to protect the numerous small operators who have limited capital and only a few stock but whose possessory rights rest on the same foundation as those of their financially more powerful neighbors. Without such safeguards the business is bound to be more or less disrupted if any major change of policy is made, and some men will profit

at other men's expense. The present organization in any locality represents a delicately balanced condition of the factors of physical productivity, available capital, business judgment, and perseverance that can not be disturbed without very undesirable consequences, both for individuals and society.

The repeal of the homestead laws has been suggested as a desirable policy. Specific recommendation of the repeal of the stock-raising homestead law has been made for several years by the Commissioner of the General Land Office in his annual reports. It is recognized by students of land policies that the general effect of the homestead policy has always been more or less unsatisfactory in several ways, even in those areas to which it was best adapted. That it was never adjusted to conditions in Nevada is shown by the large proportion of the State that is still public domain after nearly 60 years' operation of laws that were designed to transfer the land to private owners. Less than 4,500,000 of the 70,000,000 acres that constitute the land area of the State are owned by private individuals, and of that area about 2,700,000 acres are lands that were given to the State for its school fund. Only about 2½ per cent of the total land area has been transferred to private individuals in that long period through the operation of the homestead laws, though many of the large stockmen would at one time probably have been glad to obtain complete possession of the land they used if it could have been done at a reasonable expense.

In the area loosely referred to as the northeast corner of the State there is a separate problem needing careful attention. Some of the lands of that area and their associated irrigation waters could probably be so used as to produce all the required hay and much besides. Such irrigable lands and their waters, now used more or less inefficiently (Table 3), constitute one of the principal natural resources of the State, and the best interests of the people of the State will be served only when these resources are used at their highest efficiency. This condition is found in only a small part of Nevada and is most evident in the upper Humboldt Valley. This opinion is in agreement with that of Romanzo Adams, who pointed out nearly 14 years ago (*1*) that the inefficient utilization of the best irrigable land and the limited supply of water had led to social conditions less desirable than would exist under a system of more numerous occupiers operating on a smaller scale.

Some of the leading men of the State now recognize that any plan of reorganization, to be of advantage to Nevada as a whole, should anticipate an increase of total production from the area involved without an undue enhancement of costs and should result in a denser population made up of resident operators. This problem of reorganization is a complex and very difficult one that would need to be worked out gradually. To bring about the more efficient utilization of the irrigation water and the irrigable lands would probably involve impounding the water and building better distributing and drainage systems, as well as the subdivision of the land into smaller units, at least part of which would be used to raise other crops than hay and stock feed.

Such a reorganization, if properly financed and managed, would make possible the breaking up of some of the larger properties the

present owners of which are not interested in ranching, and at the same time allow the land and water to be more intensively used. Some of the larger properties are no longer profitable. Others have been subdivided but the subdivision as made has not resulted in the type of reorganization that leads to a more intensive use of the available irrigable land.

In any proposed change in the economic organization of such an area provision should be made for employing as much of the irrigated area as may be required to produce the winter feed complementary to the surrounding range forage, the remainder being made available for other uses.

Such a program should ultimately result in better utilization and conservation of the irrigation water and irrigable land, as well as of the range lands; it should increase the total quantity of crops and livestock and permit the maintenance of a larger resident population of self-supporting owners.

In certain parts of the United States broad national interests have led to the establishment of national forests. The two principal objects of this national policy are (1) timber production and (2) water conservation.[48] Range grazing, recreation, and wild-life preservation in national forests, although desirable, are by-products of the major purposes for which the areas were set aside, and must always be treated as such. It follows that range grazing on national forests is always to be considered as a privilege to the grazer, to be limited or curtailed at any time for reasons arising from the other proper uses of the particular forest. If there be other timbered areas on the public domain not now within the boundaries of the national forests of Nevada, or if there be water-catchment areas the control of which is of national rather than local importance, such areas should be set aside for these national purposes before any disposal is made of the public domain of which they are now a part.

The proper policy for other parts of the public domain can be determined only by an intensive study of existing conditions in each. There are some parts of the public domain that should be retained in public ownership because they are adapted to growing timber, and other areas are of public significance because they are suitable for national parks and monuments or the serving of other public interests. There is also a large, though vaguely defined, area in which the conservation of water and the protection of watersheds are matters of national concern.

As in Nevada, there are parts of the public domain in other States where existing possessory rights, in their complex interrelation with private lands, water rights, State lands, and various national reservations, should be considered carefully in any adjustment provided. It may be learned, after careful study, that the best adjustment is a regional one that does not conform even to State boundaries.

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[48] By water conservation is meant the regulation of the whole train of phenomena which commences with the fall of the water, as rain or snow, upon a catchment area, its proper protection and storage, its properly regulated flow to lower levels with the maximum development of power and the minimum of damage as an erosive agent, and its final use for irrigation and municipal water supplies.

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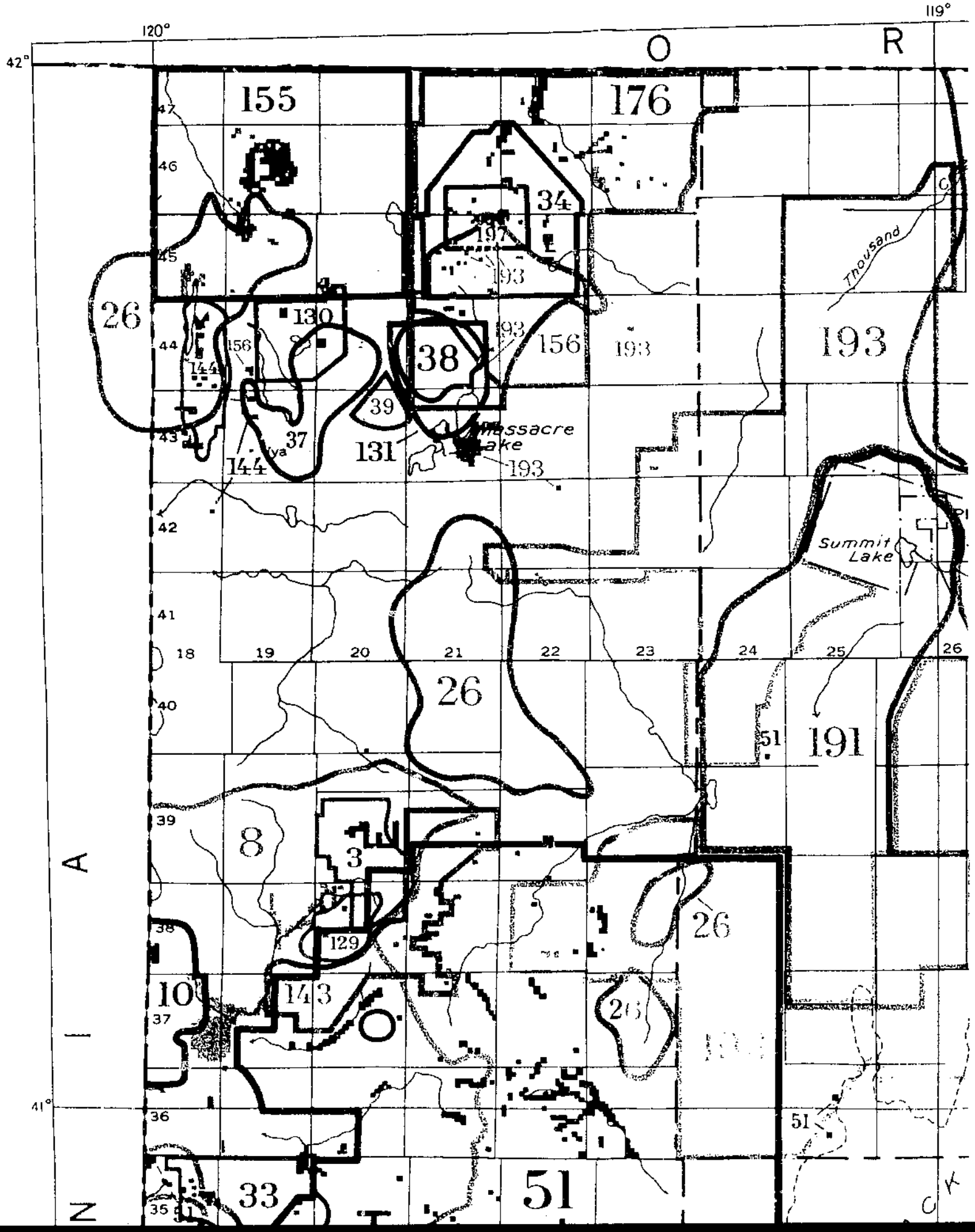
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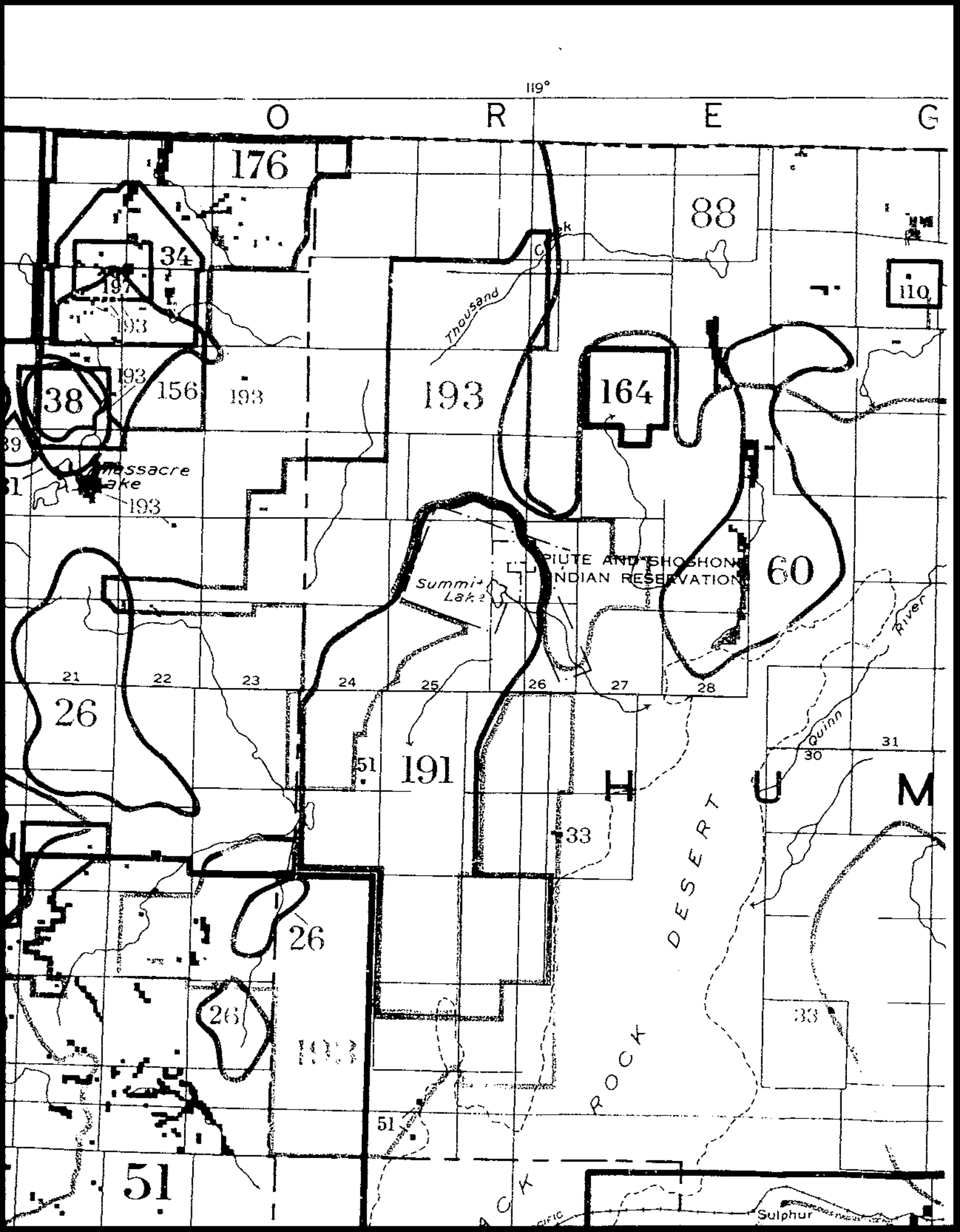
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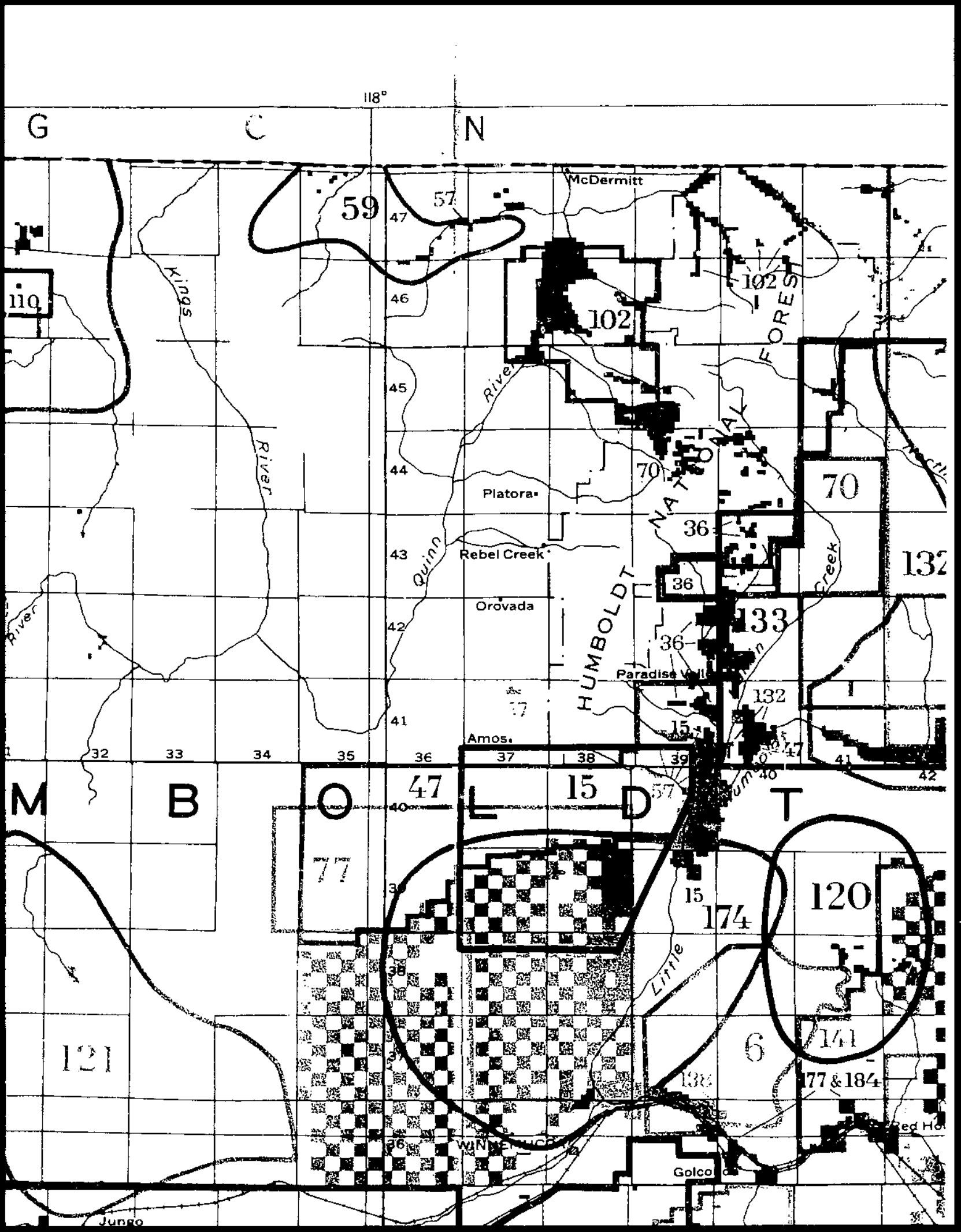
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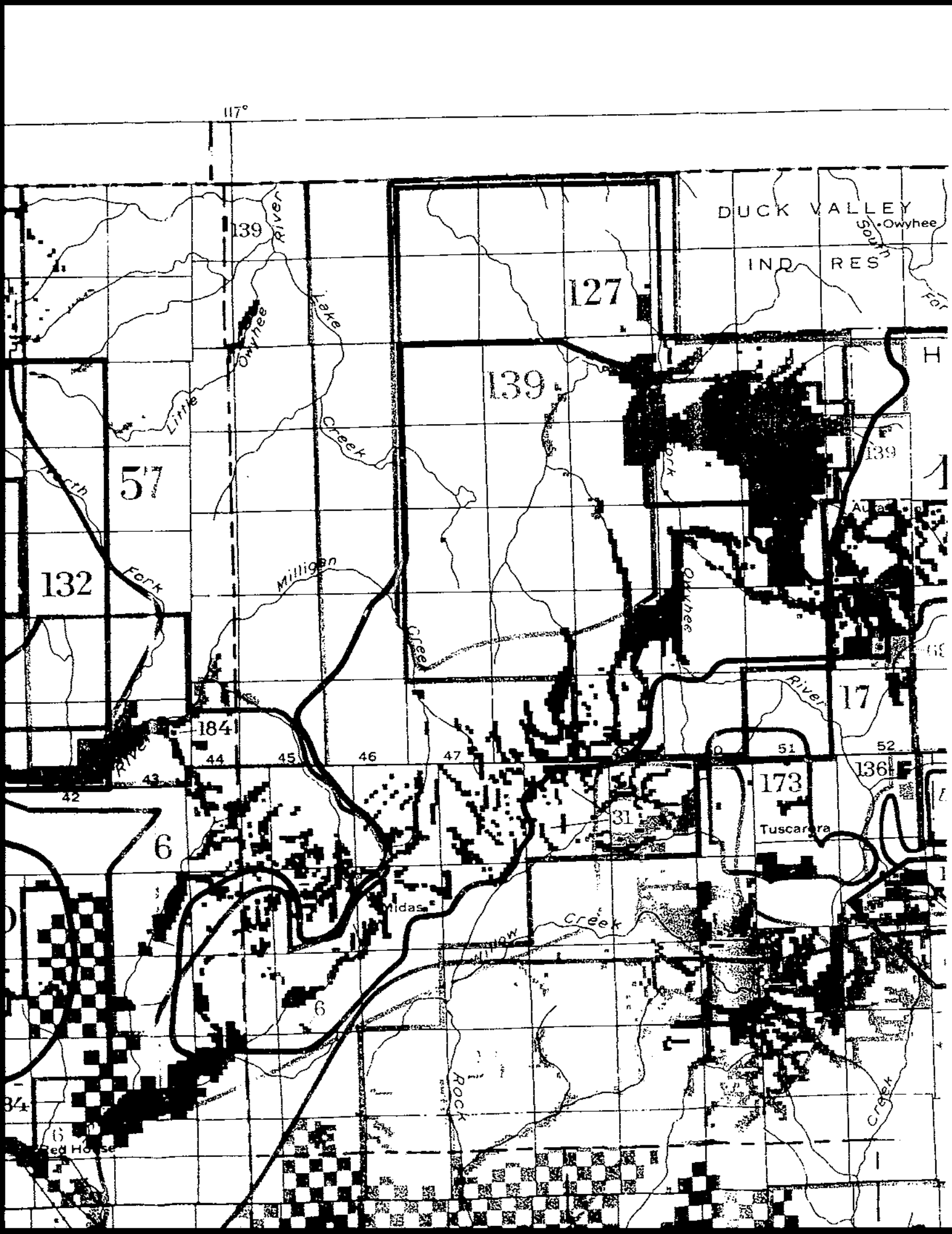
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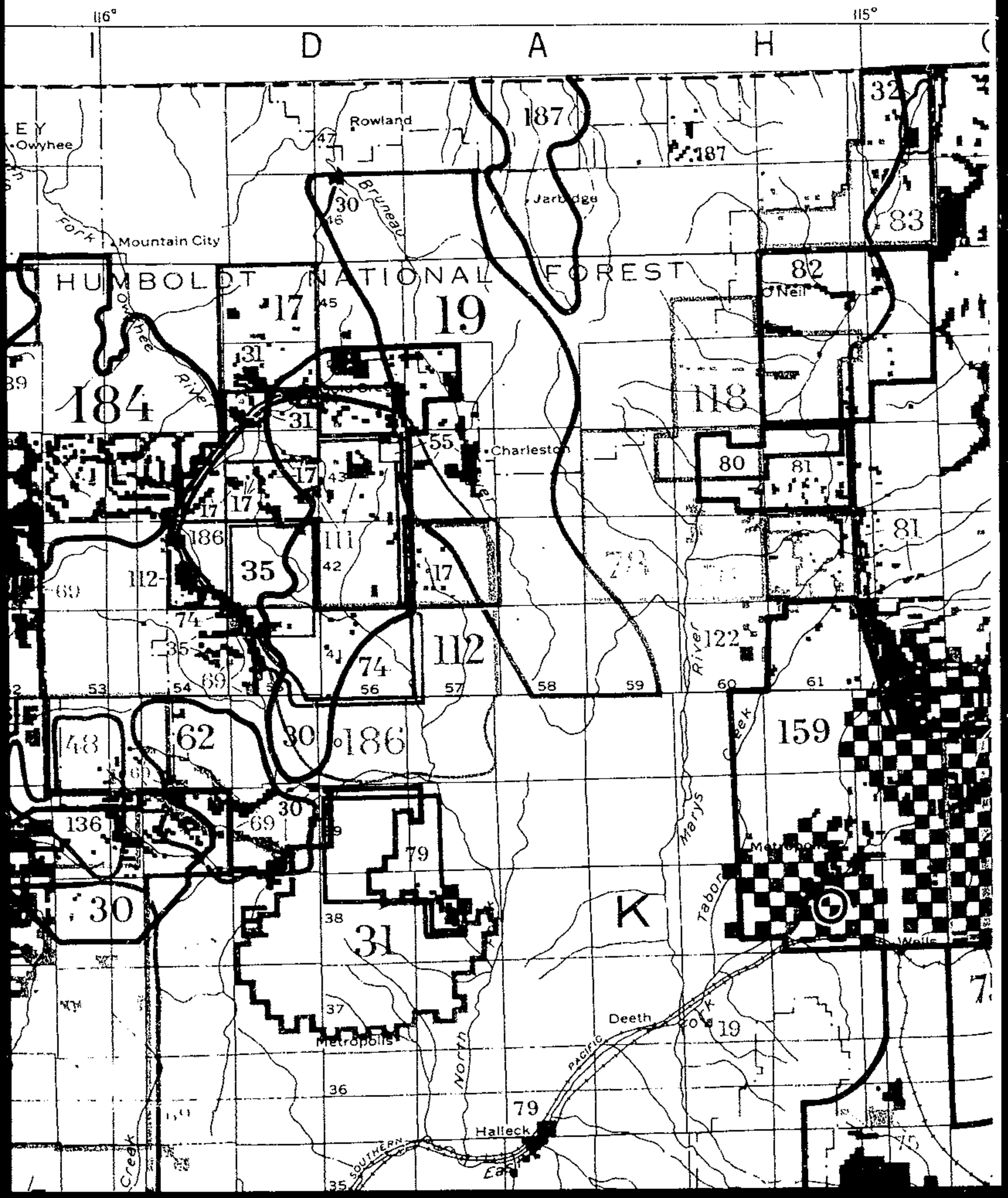
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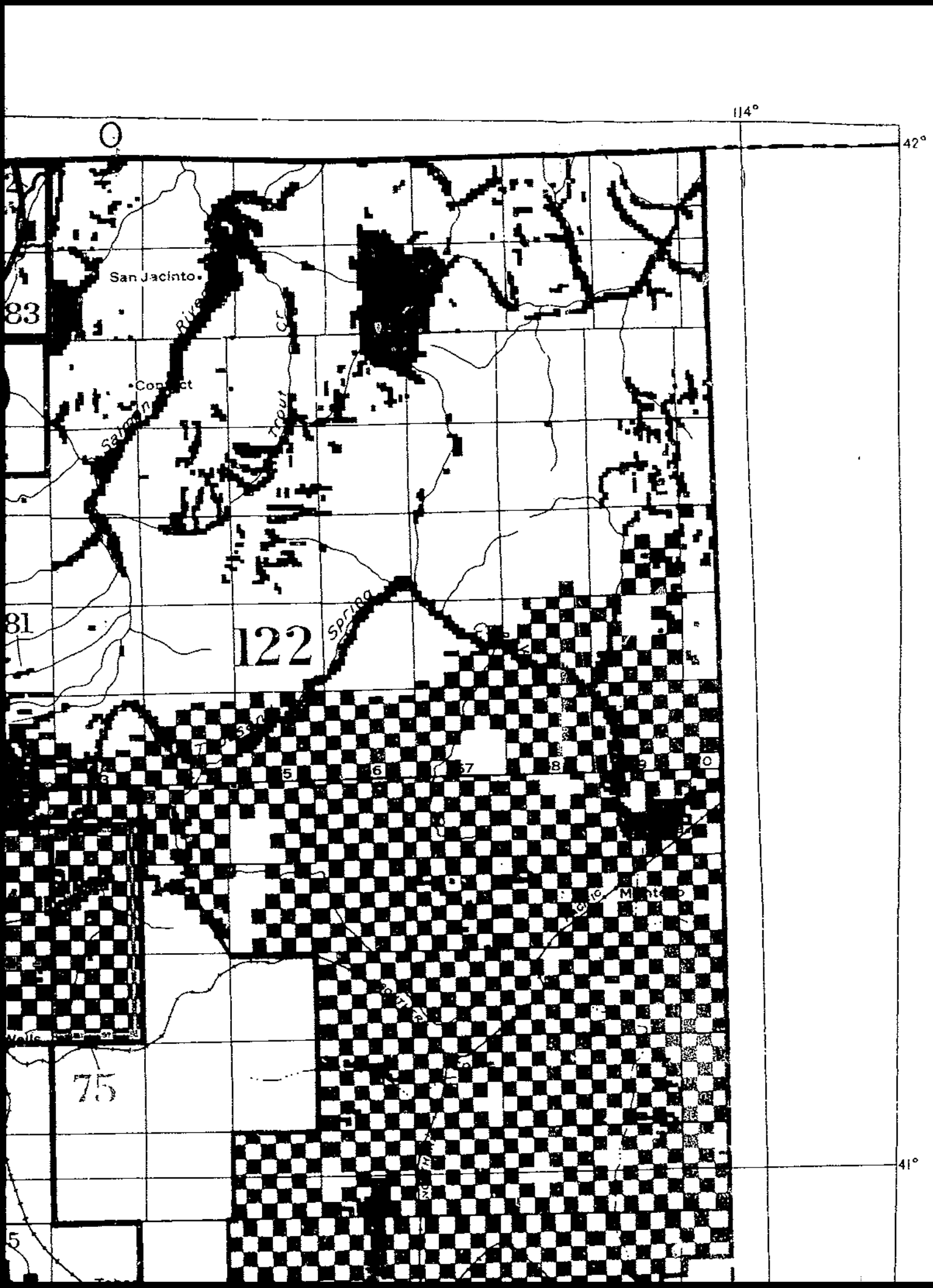
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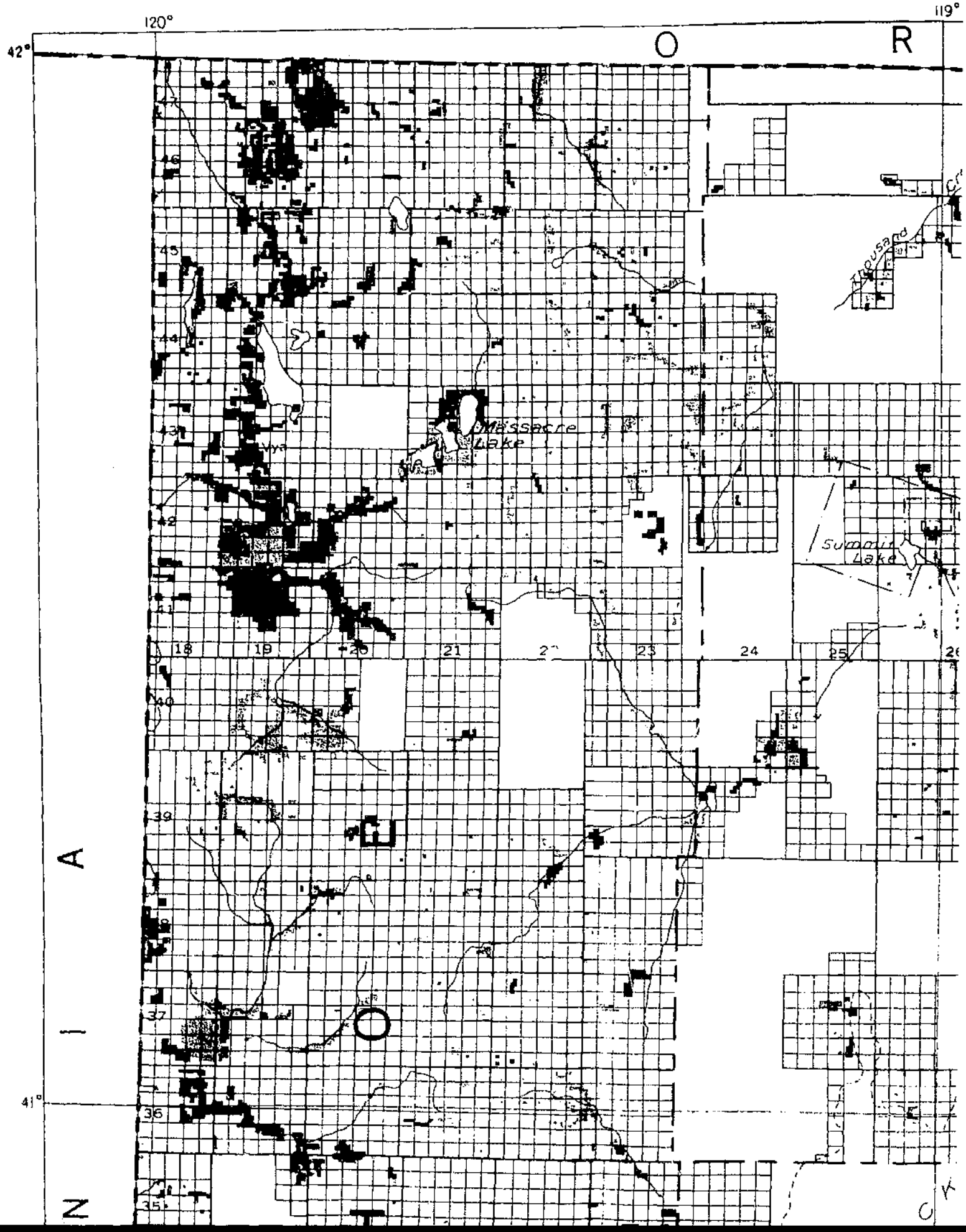
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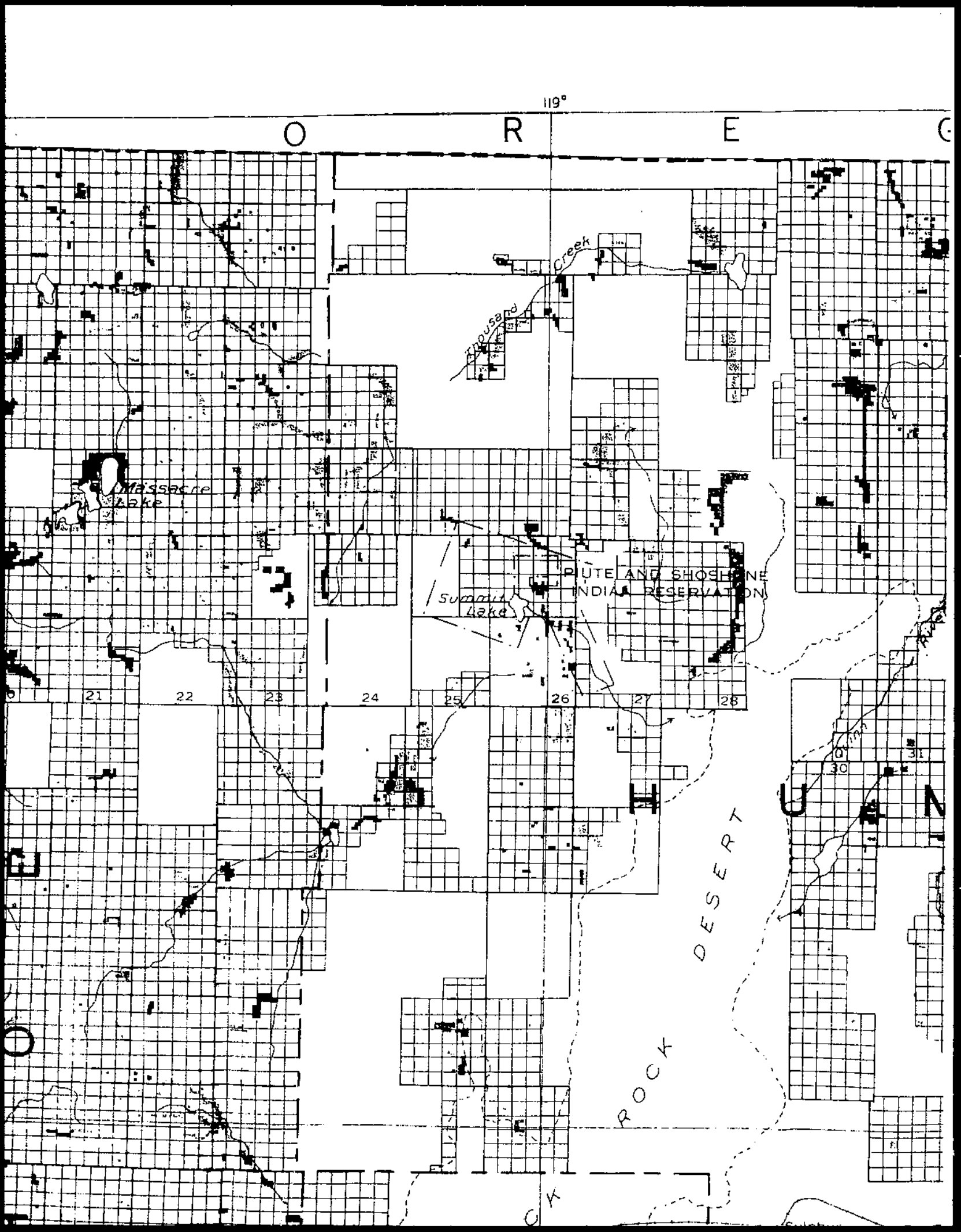
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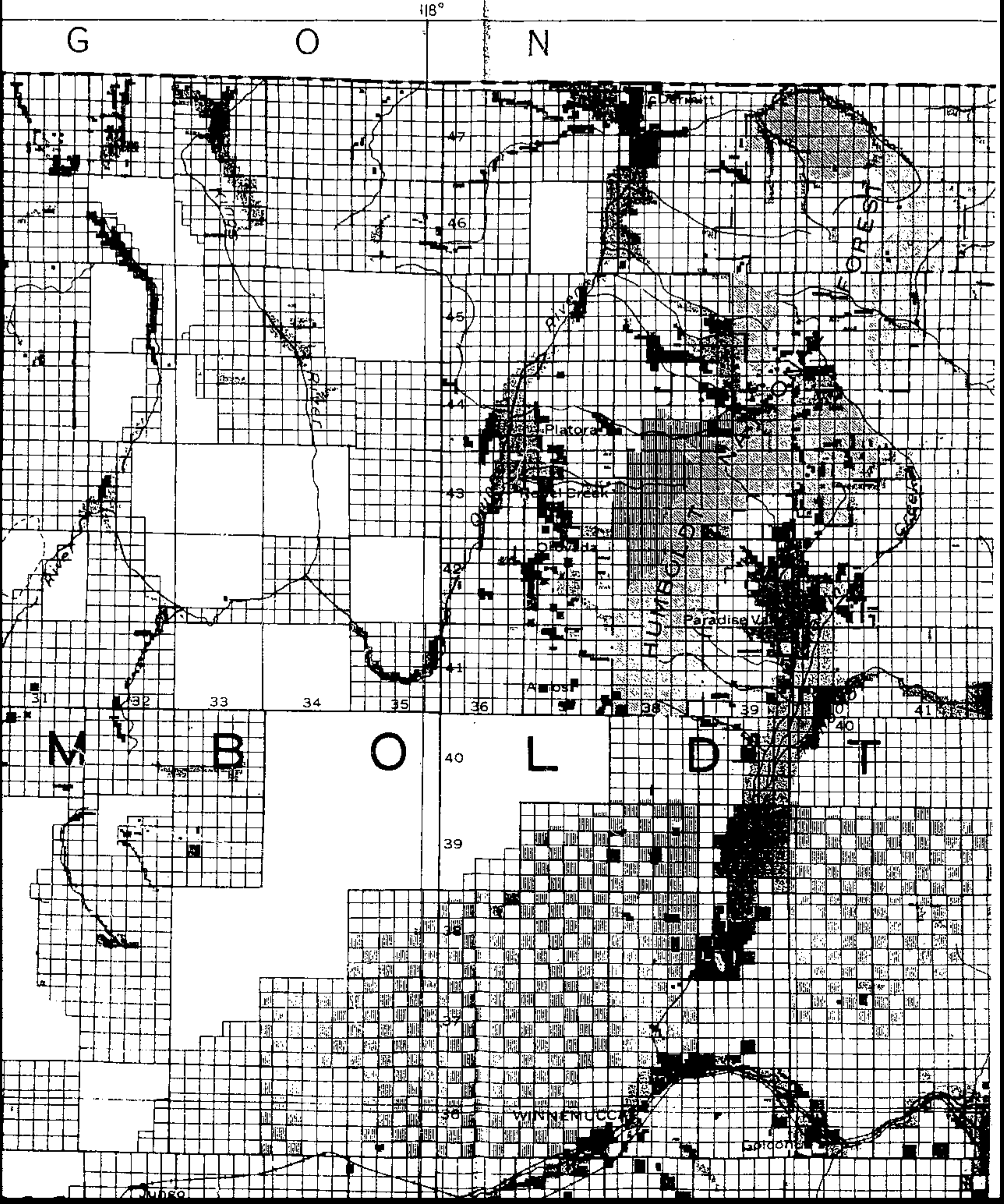

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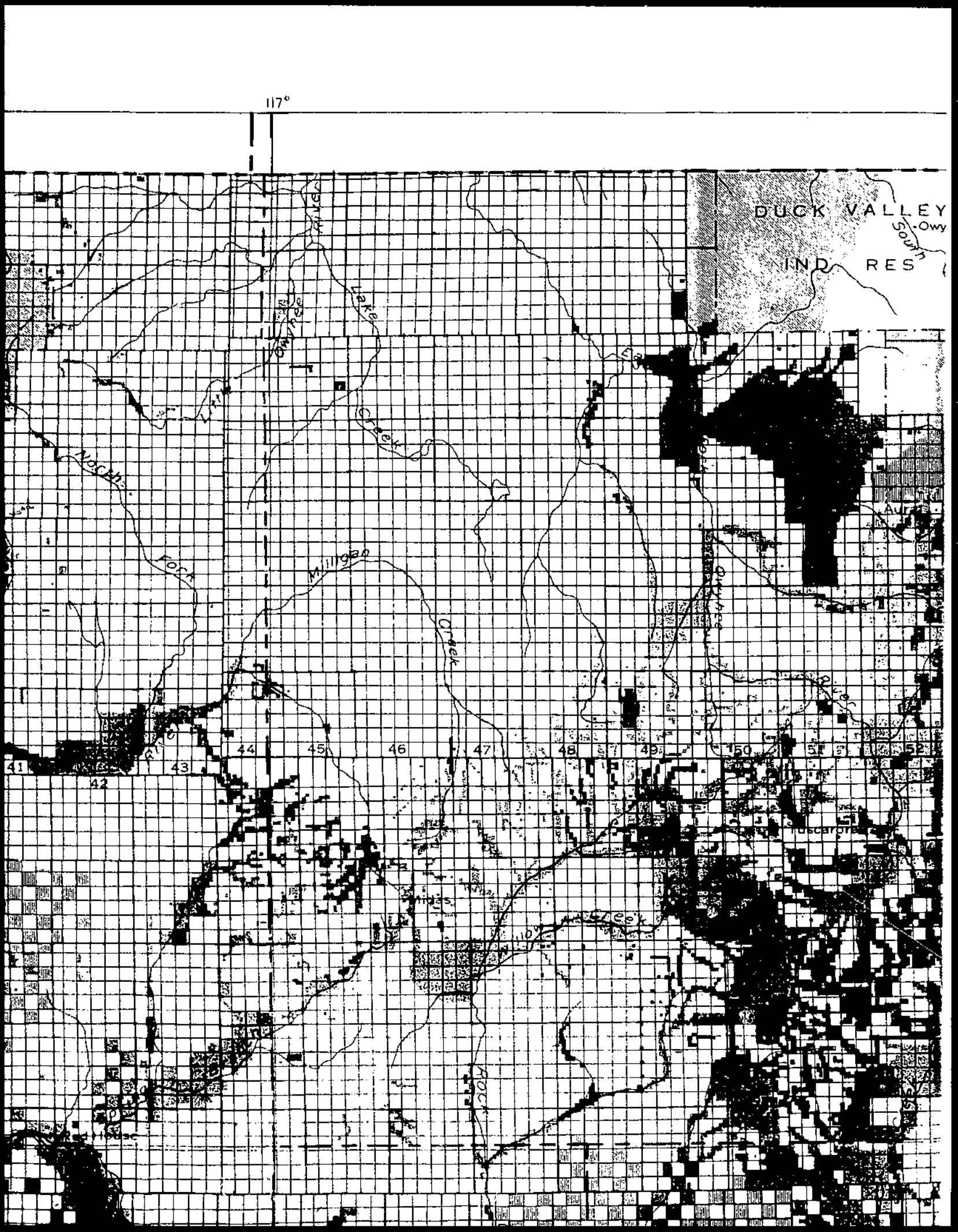
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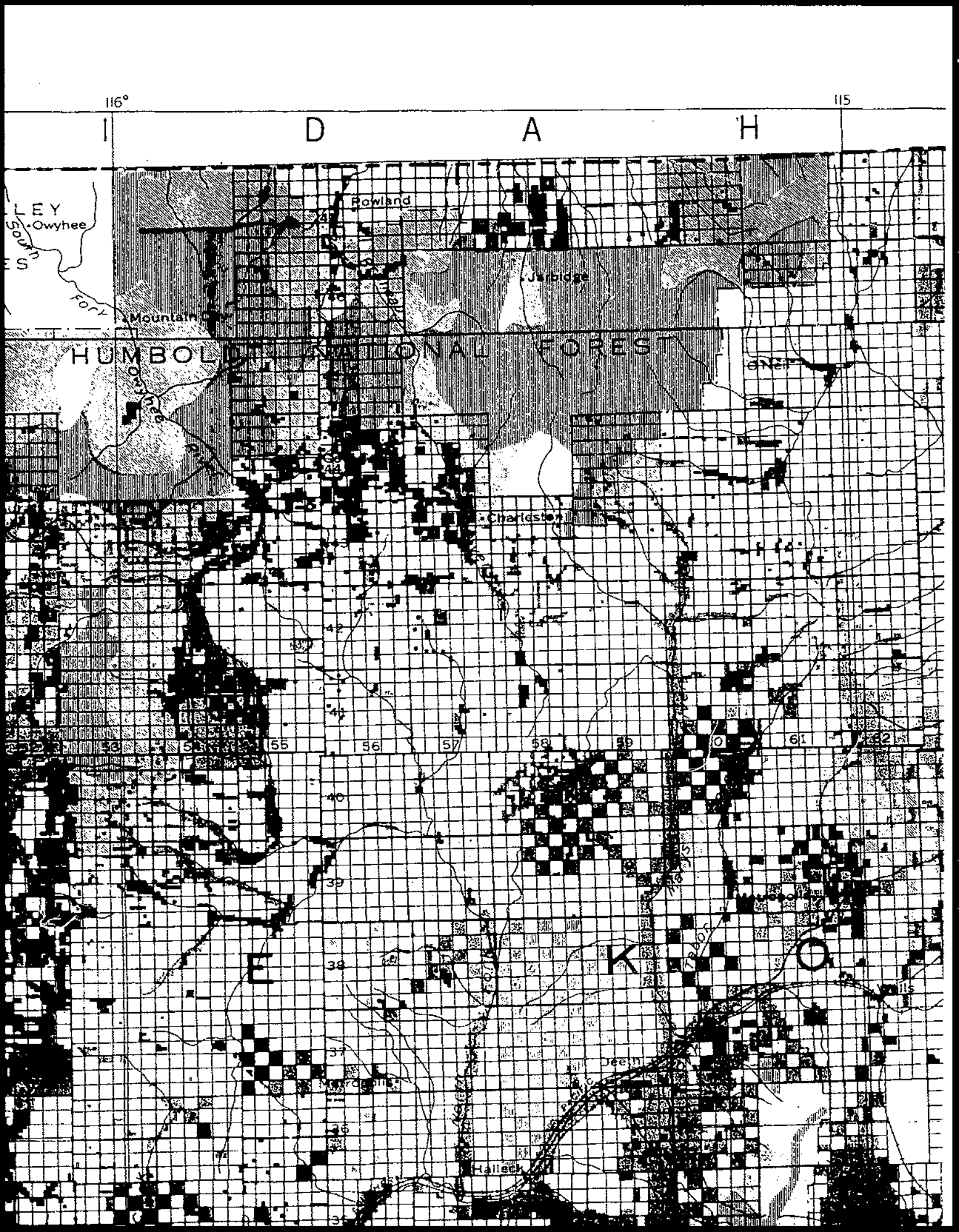
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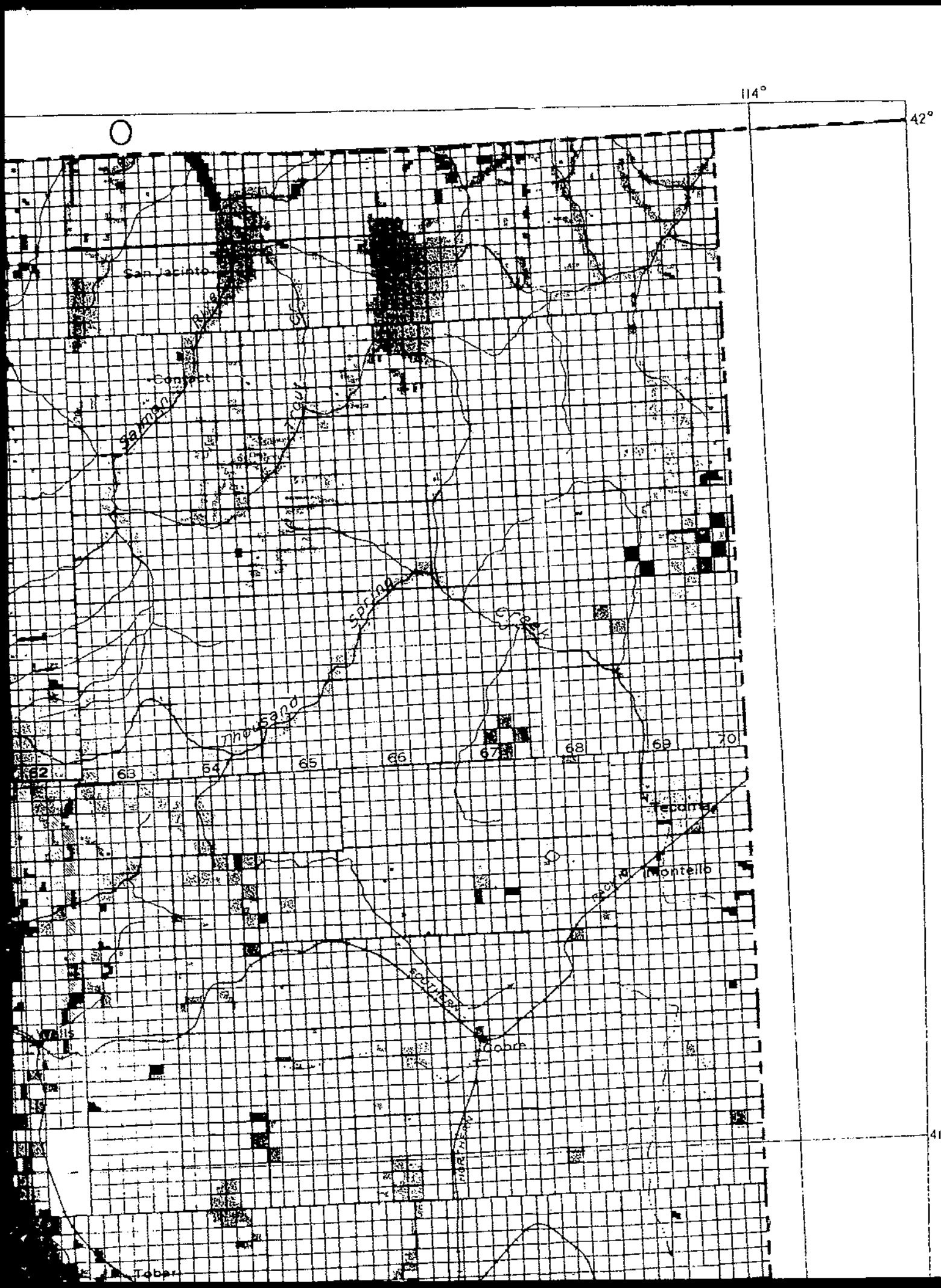
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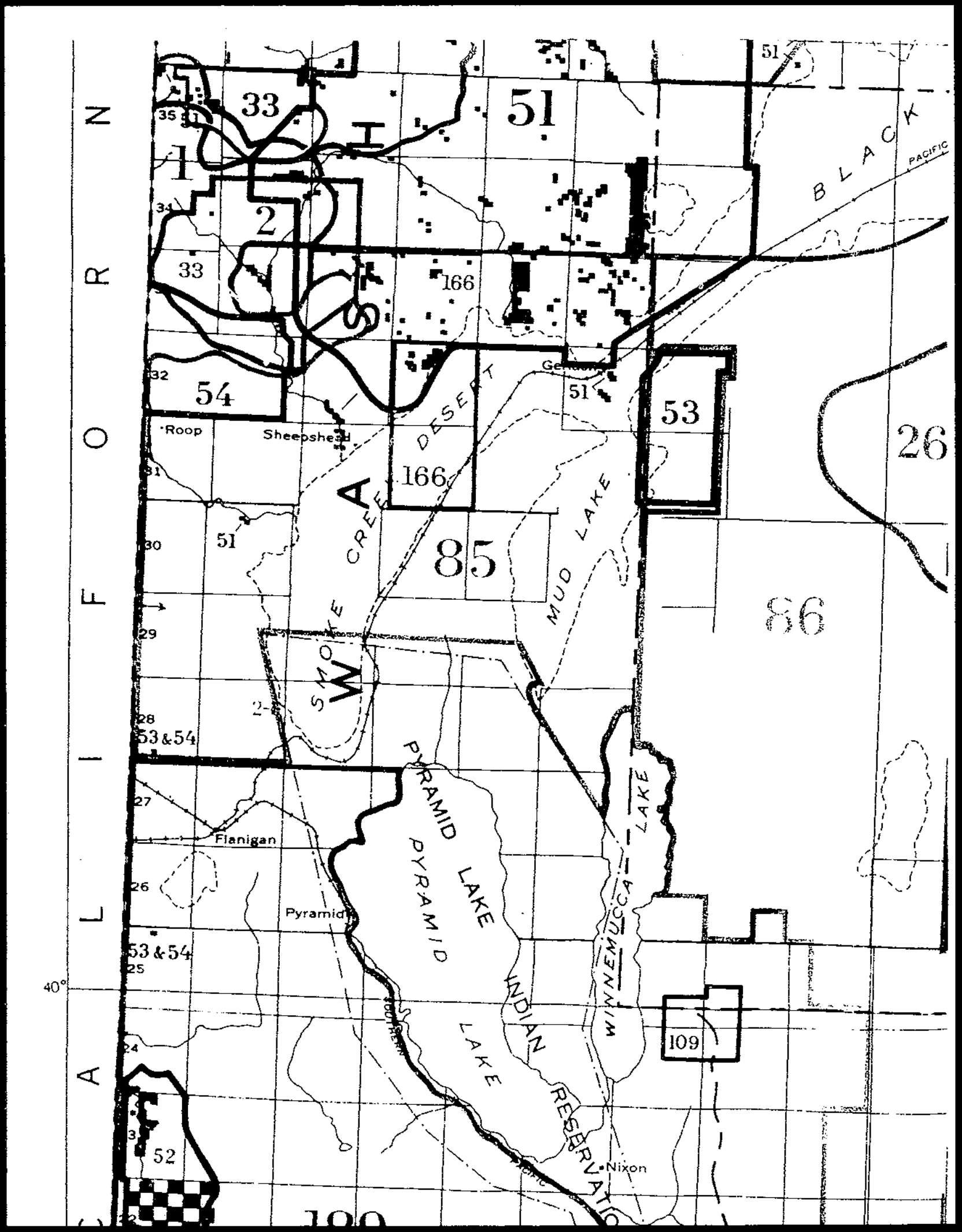
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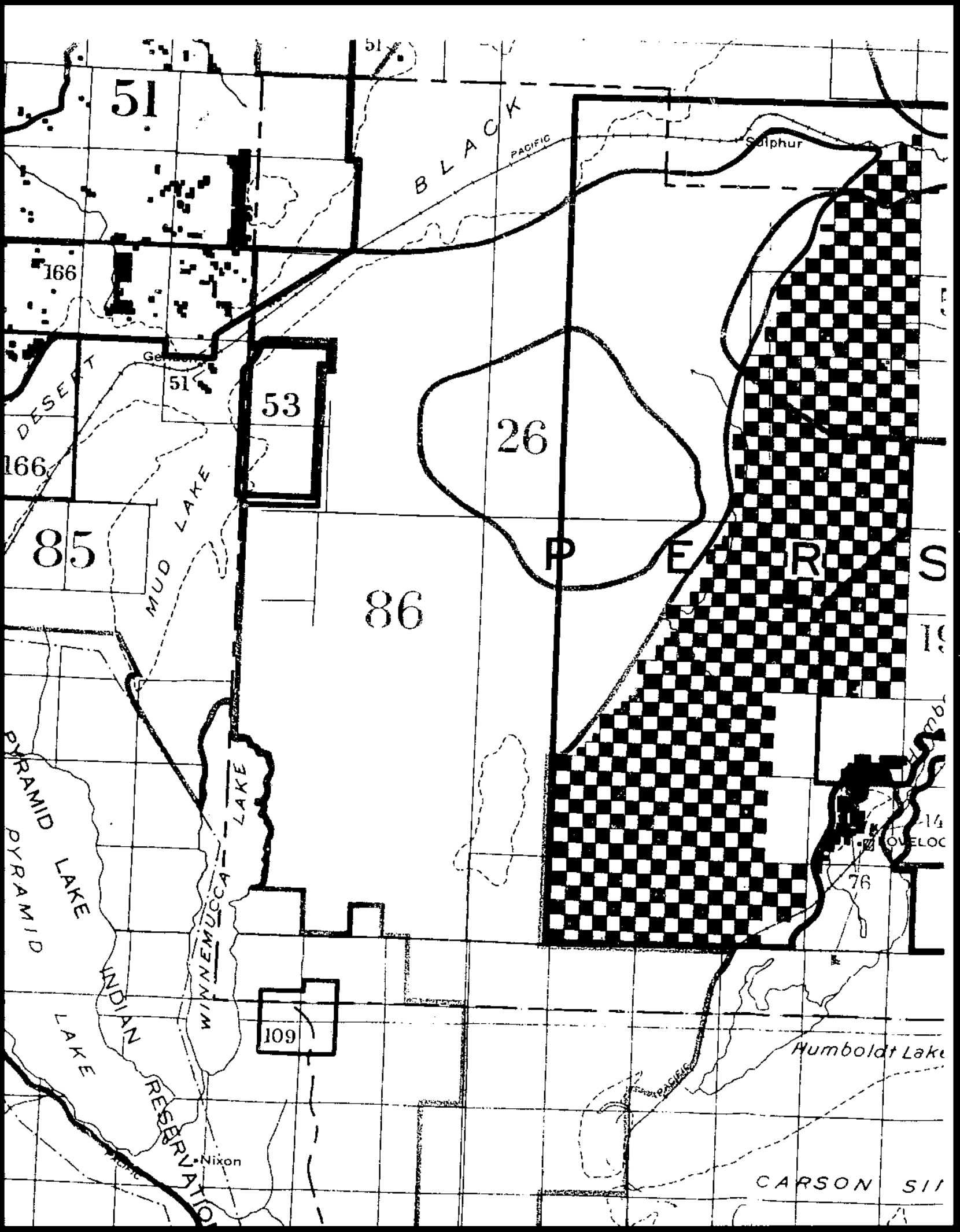
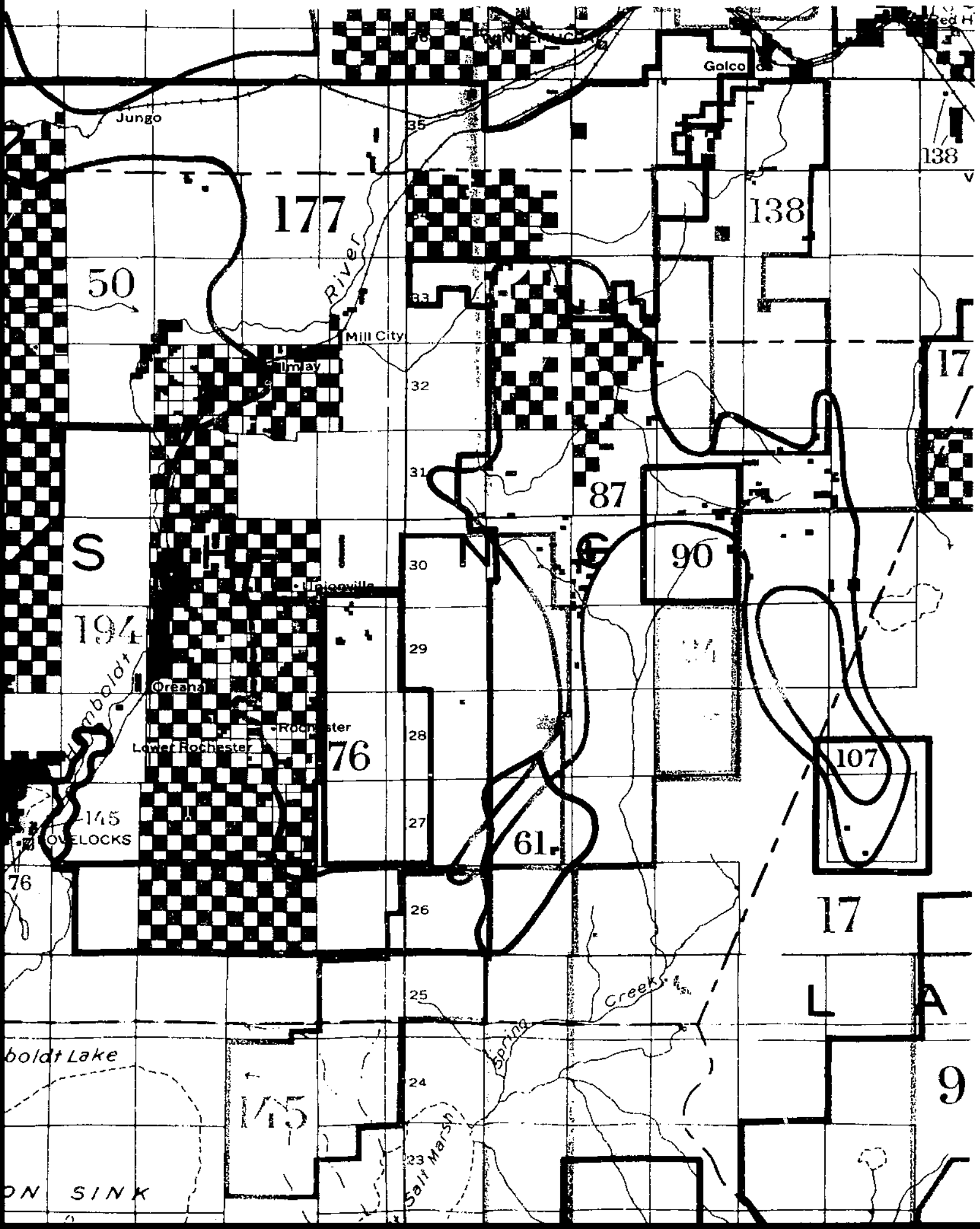
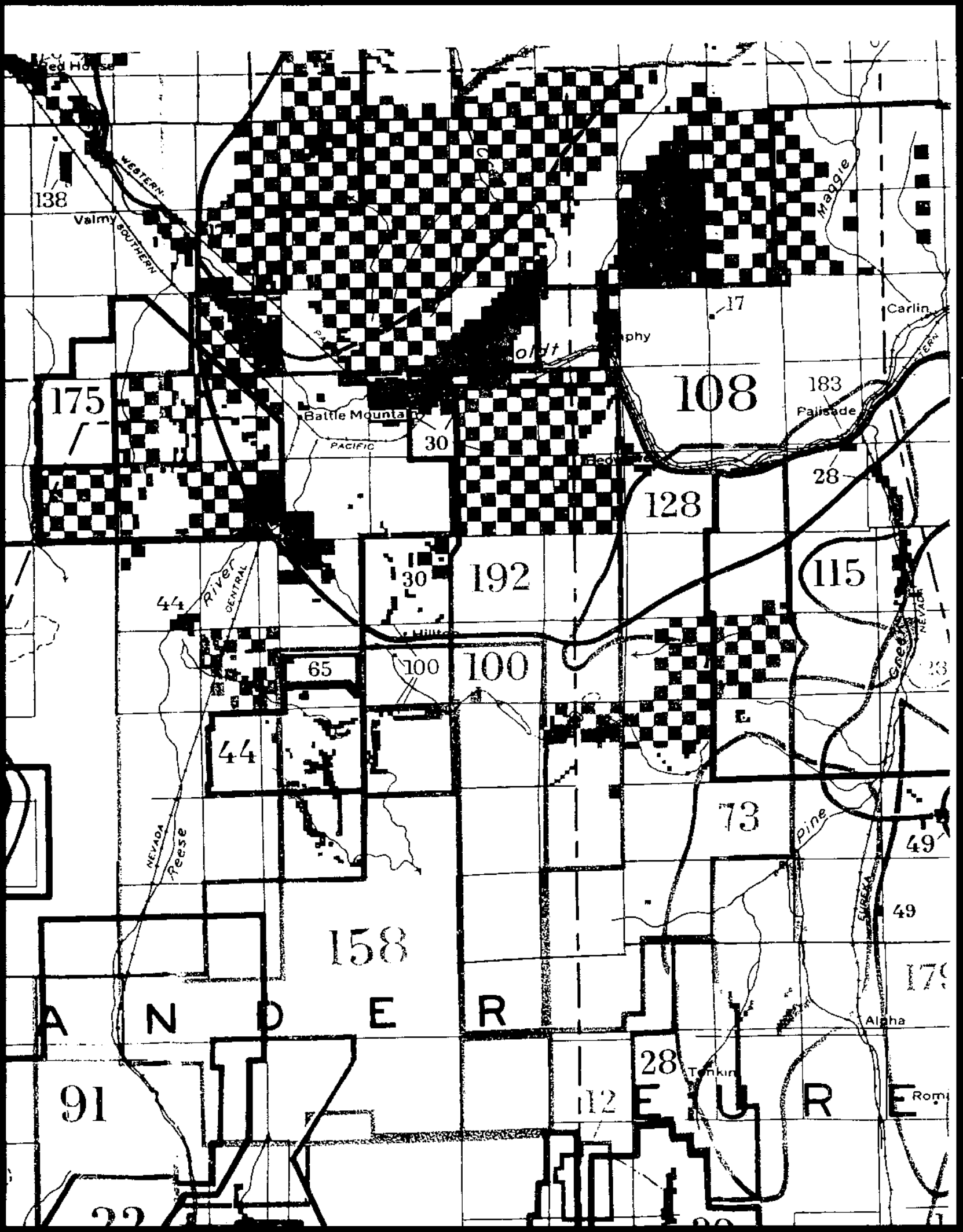
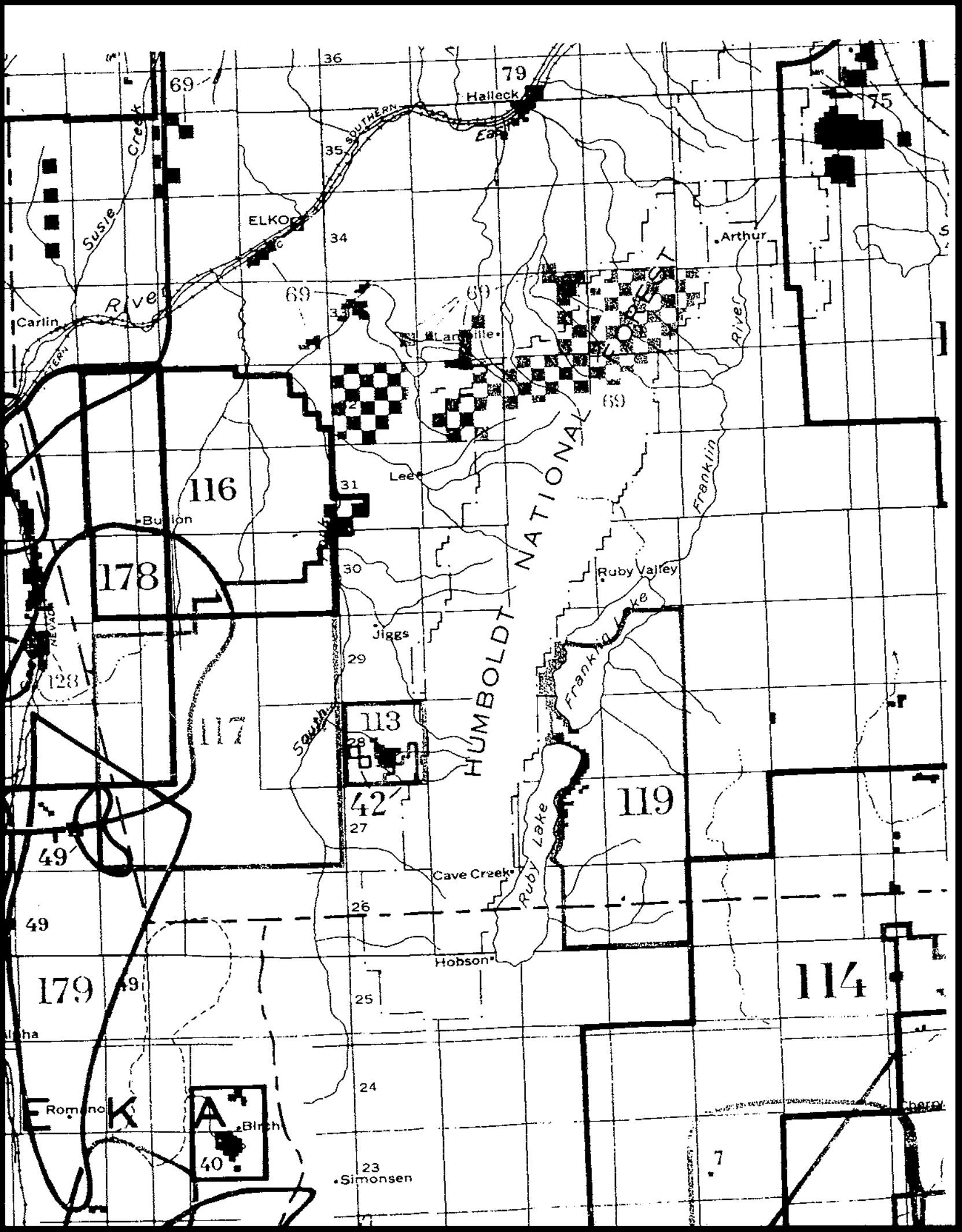

51
BLACK
PACIFIC
Sulphur
166
DESERT
51
53
26
166
85
MUD LAKE
P E R
86
PYRAMID LAKE
PYRAMID
LAKE
WINNEMUCCA
LAKE
INDIAN
RESERVATION
109
Nixon
Humboldt Lake
PACIFIC
CARSON
76


Golco
Jungo
35
138
177
138
50
River
Mill City
Imlay
32
17
31
87
S
I
N
C
90
30
Unionville
194
29
Humboldt
Orean
Rochester
Lower Rochester
28
76
107
145
LOVELOCKS
27
61
76
26
17
25
Creek
Spring
L
A
boldt Lake
24
145
9
23
Salt Marsh
ON SINK


Red House
138
Valmy
WESTERN
SOUTHERN
PACIFIC
Battle Mounta
30
175
108
Maggie
17
Carlin
183
Palisade
28
128
192
115
30
44
River
CENTRAL
65
100
100
44
NEVADA
Reese
73
Pine
49
49
158
A N D E R
Alpha
28
91
12
E U R E
Rom
22


Halleck
ELKO
Susie Creek
Carlin
Lamoille
Arthur
Bullion
Lee
Jiggs
Ruby Valley
Cave Creek
Hobson
Simonsen
Birch
Romano
HUMBOLDT NATIONAL FOREST
Franklin River
Ruby Lake
South Fork
Franklin Lake
116
178
117
113
42
119
49
179
114
128
40
69
79
75
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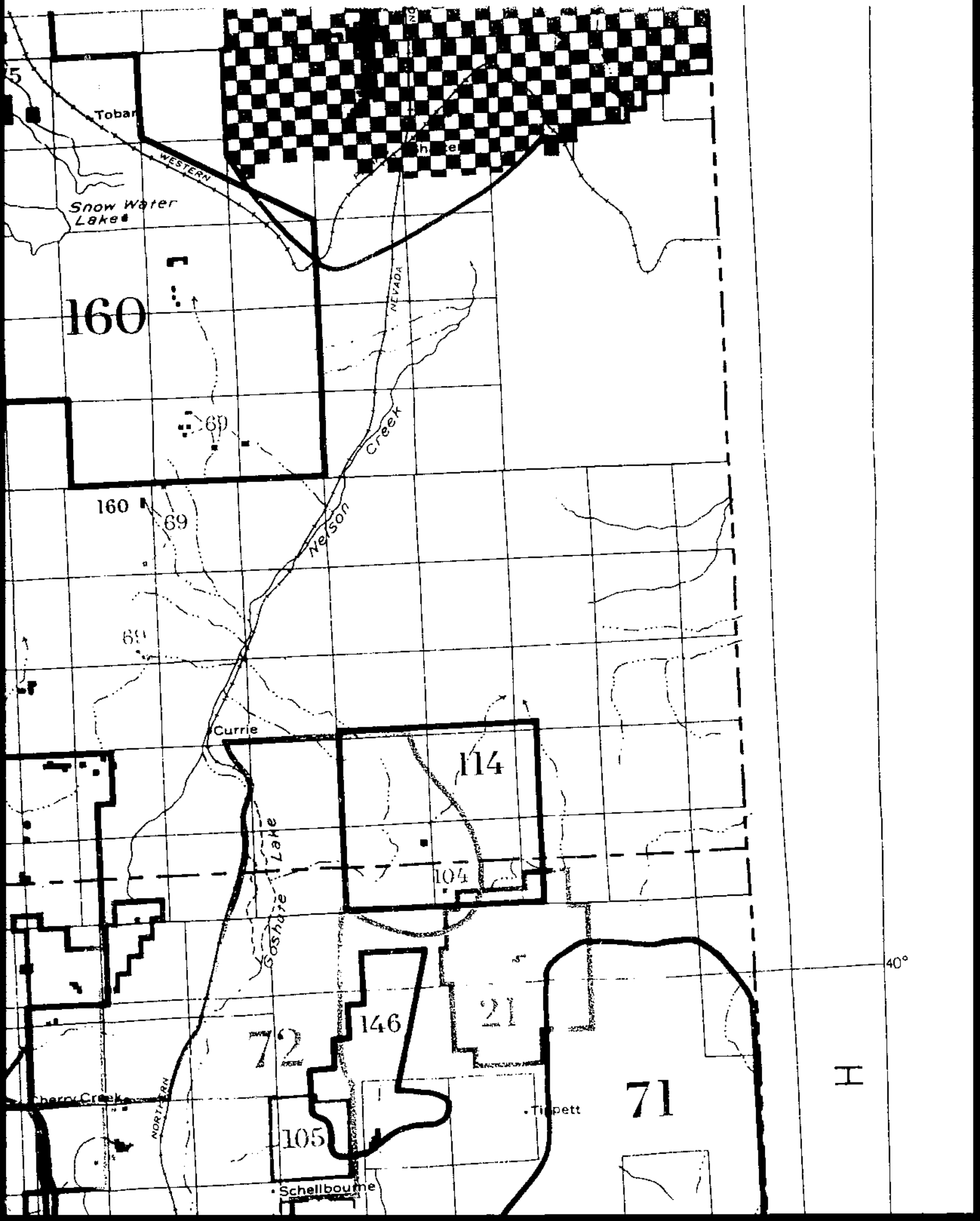
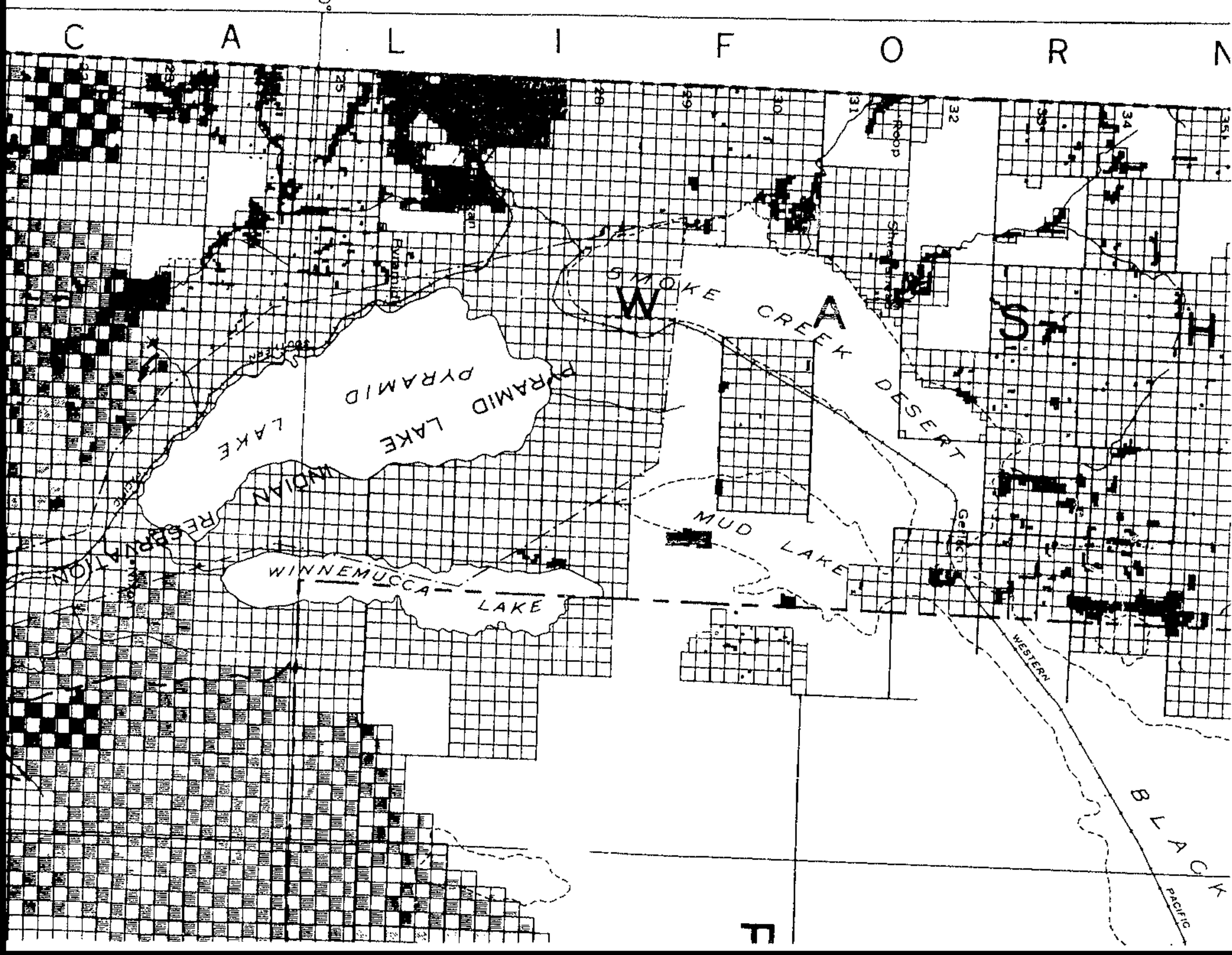
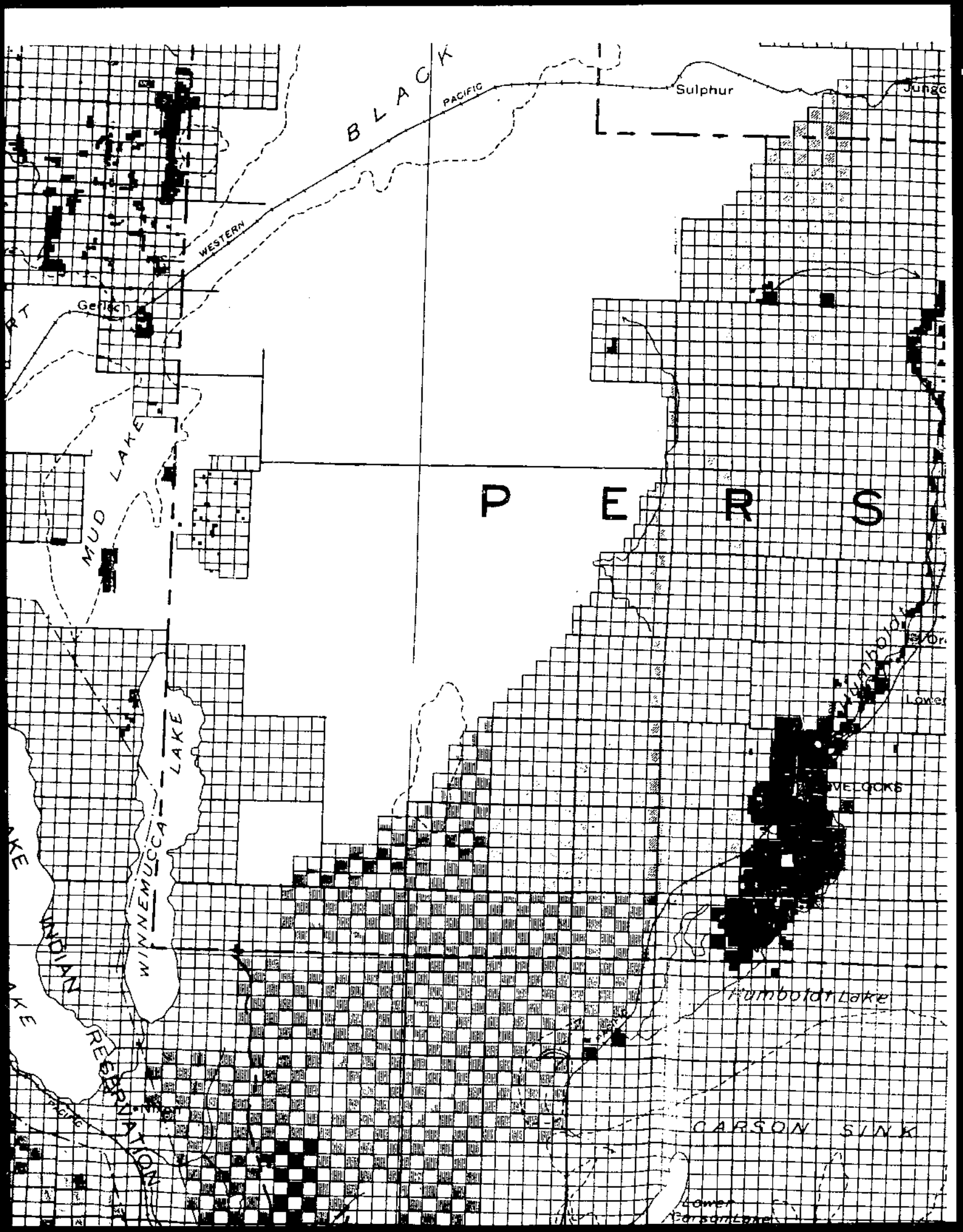
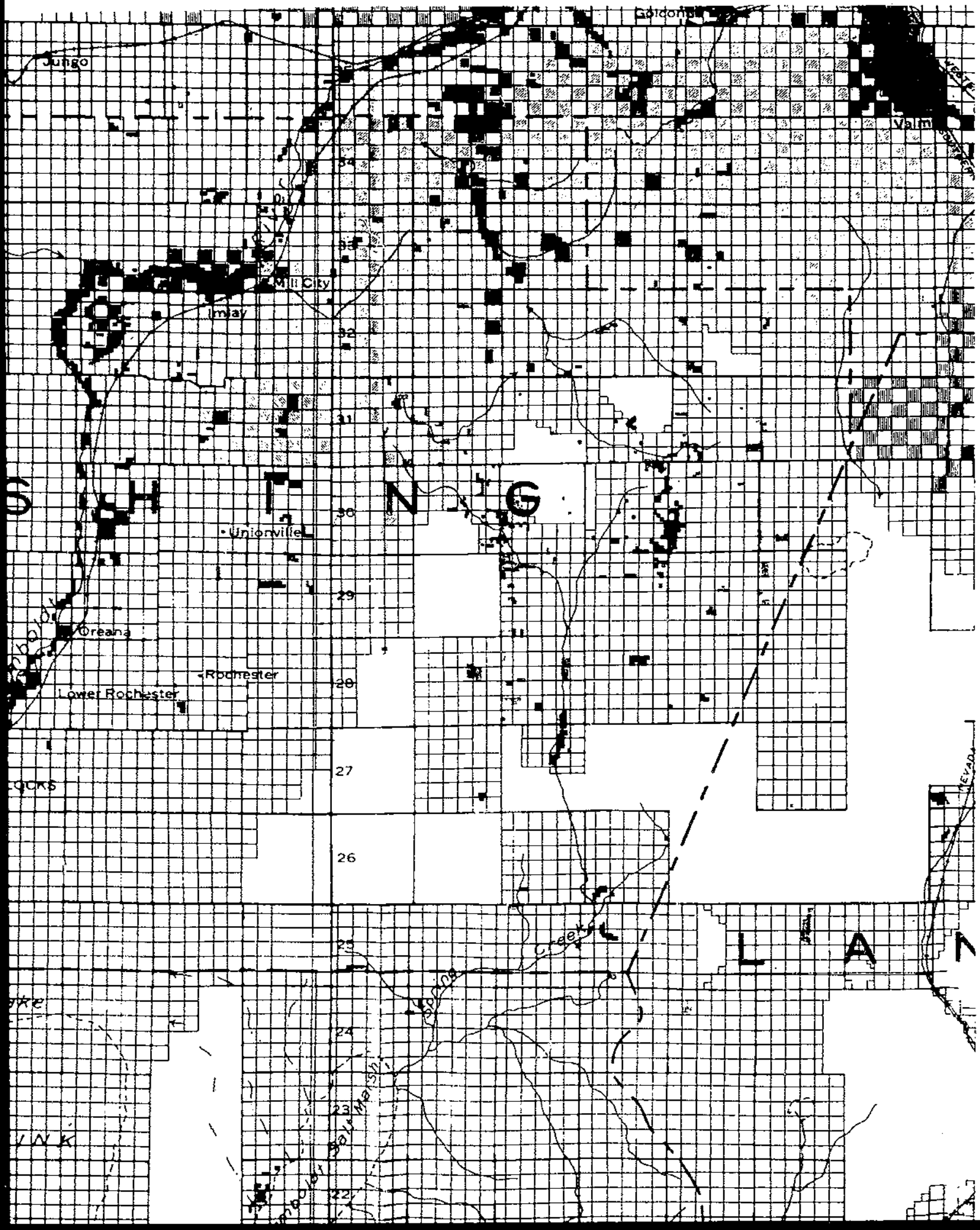

Tobar
WESTERN
Snow Water Lake
160
69
160
69
69
NEVADA
Nelson Creek
Currie
114
104
Goshawk Lake
146
72
21
71
Tippett
105
Schellbourne
Cherry Creek
NORTHERN
40°


CALIFORN
40°
WASH
SMOKE CREEK DESERT
PYRAMID LAKE
PYRAMID LAKE
INDIAN RESERVATION
WINNEMUCCA LAKE
MUD LAKE
Roop
Gerlach
Pyramid
WESTERN
PACIFIC
BLACK


BLACK
PACIFIC
Sulphur
WESTERN
Gerlach
MUD LAKE
P E R S
LAKE
WINNEMUCCA
INDIAN RESERVATION
Humboldt Lake
CARSON SINK
Lower Carson Lake


Jungo
Mill City
Imlay
Unionville
Oreana
Rochester
Lower Rochester
Goldonna
Valmy
32
31
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29
28
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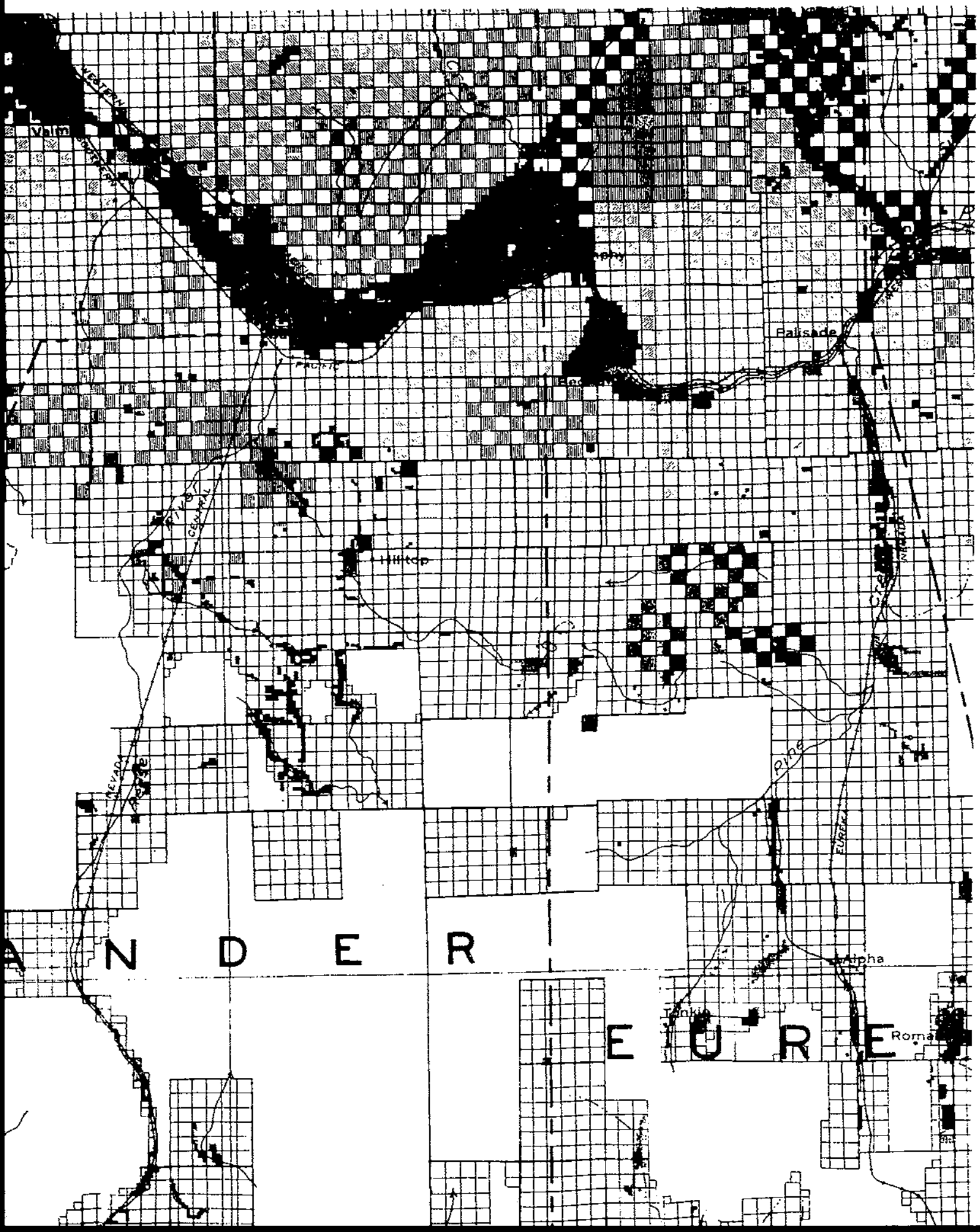
26
25
24
23
22


Palisade
Hilltop
Alpha
Tonkin
Roma
N D E R
E U R E


TEMBOLDT NATIONAL FOREST
Franklin Lake
Ruby Lake
Cave Creek
Hobson
Birch
Simonsen
Cherry Cree
Roma
31
32
33
34
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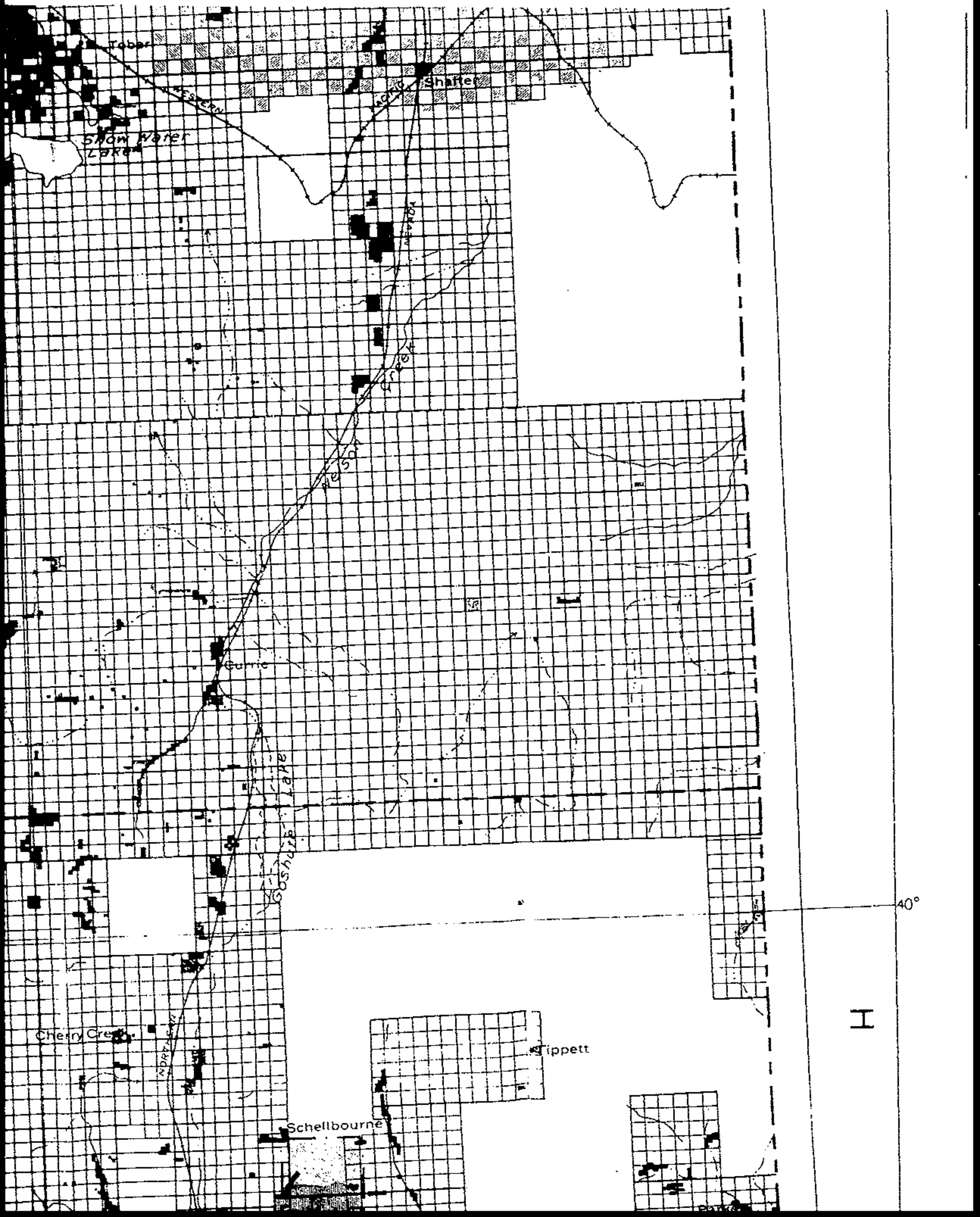
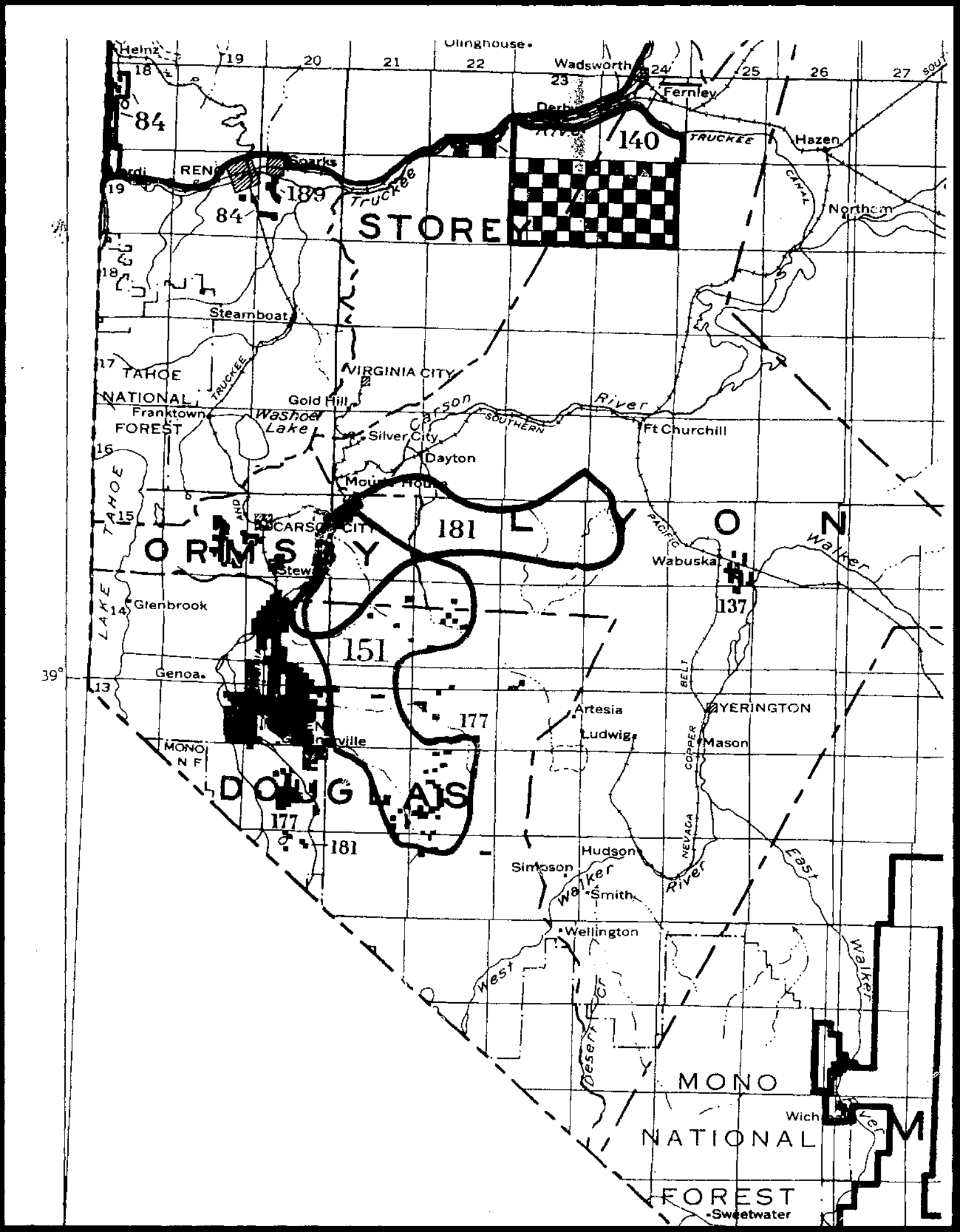
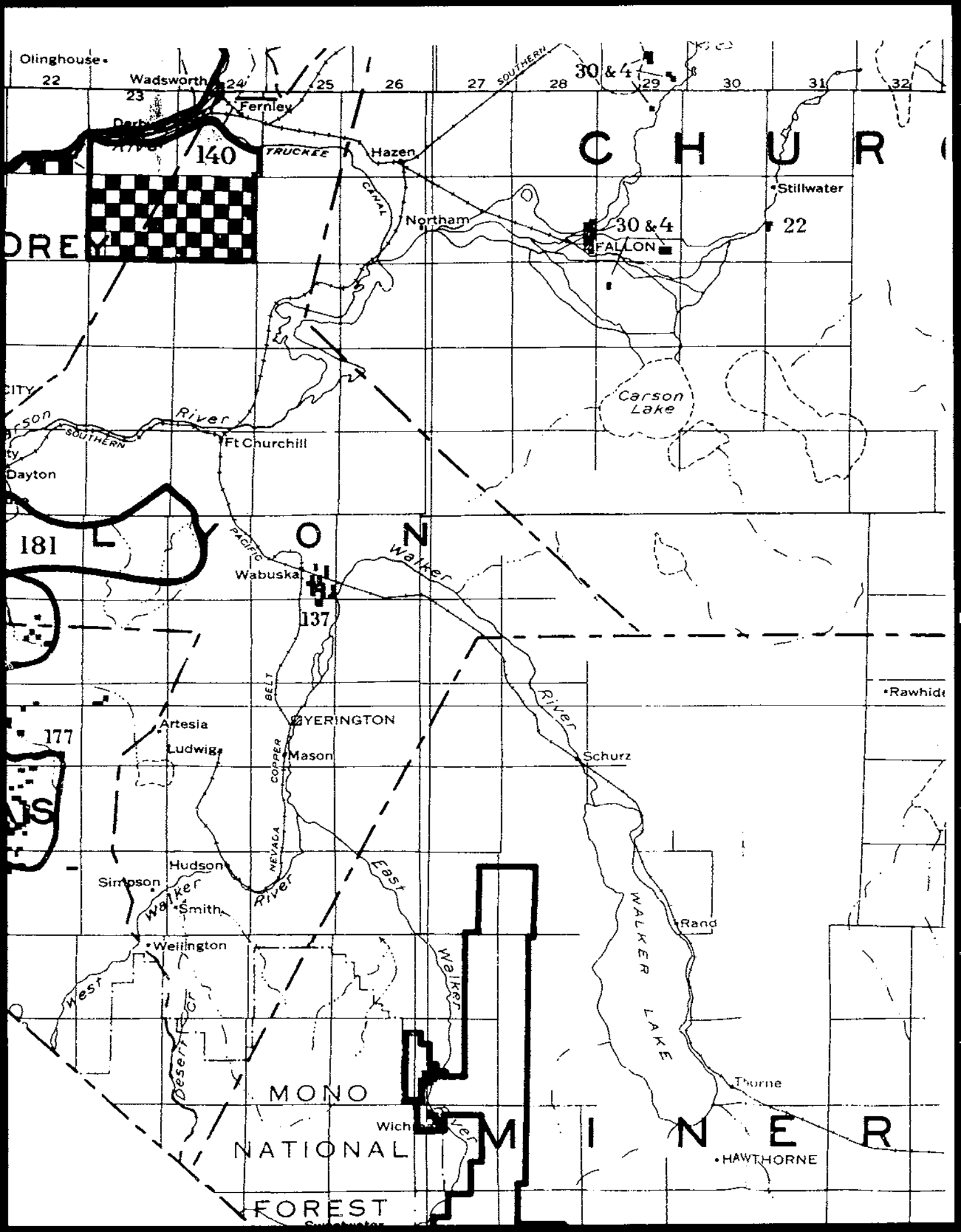
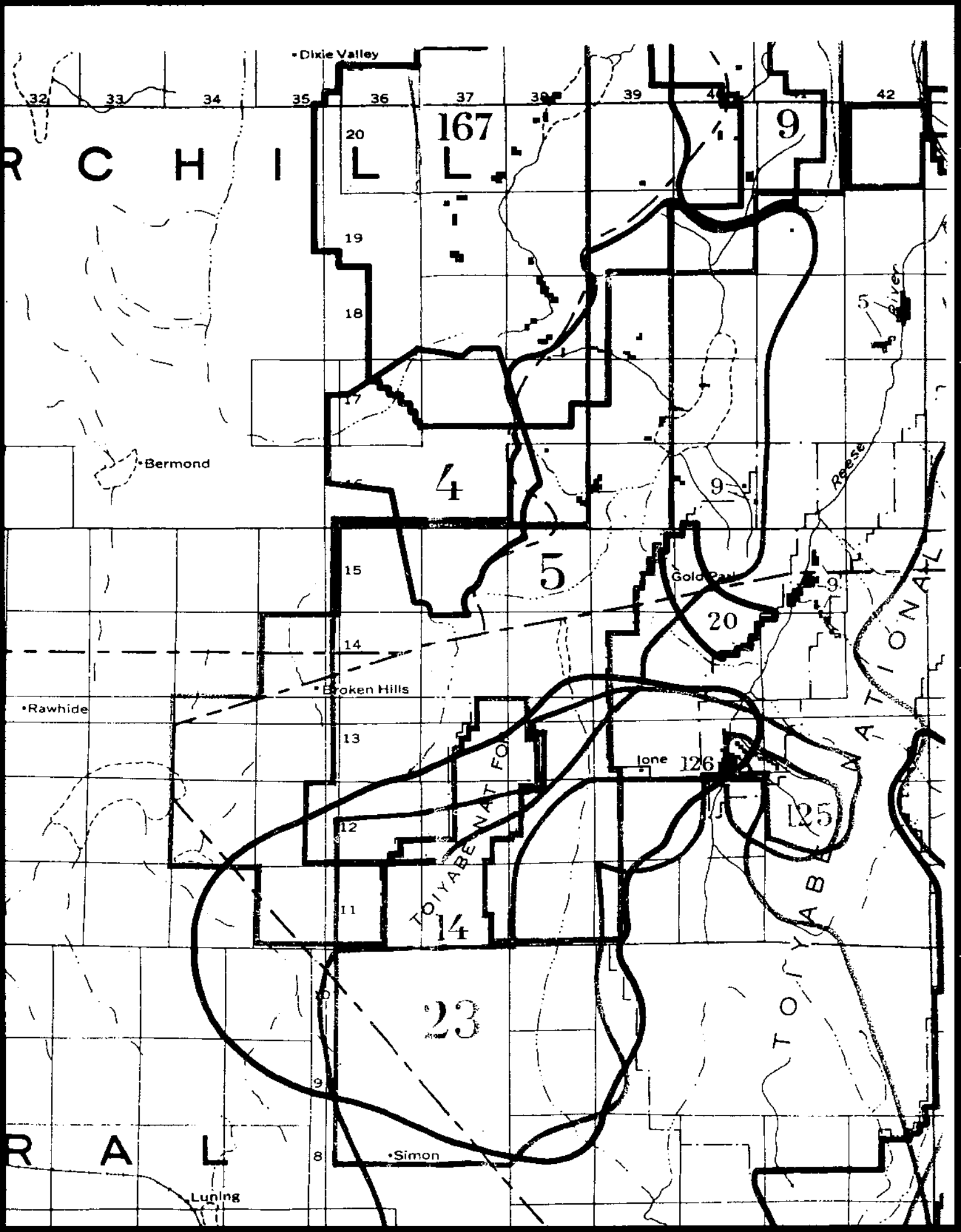
29
28
27
26
25
24
23
22

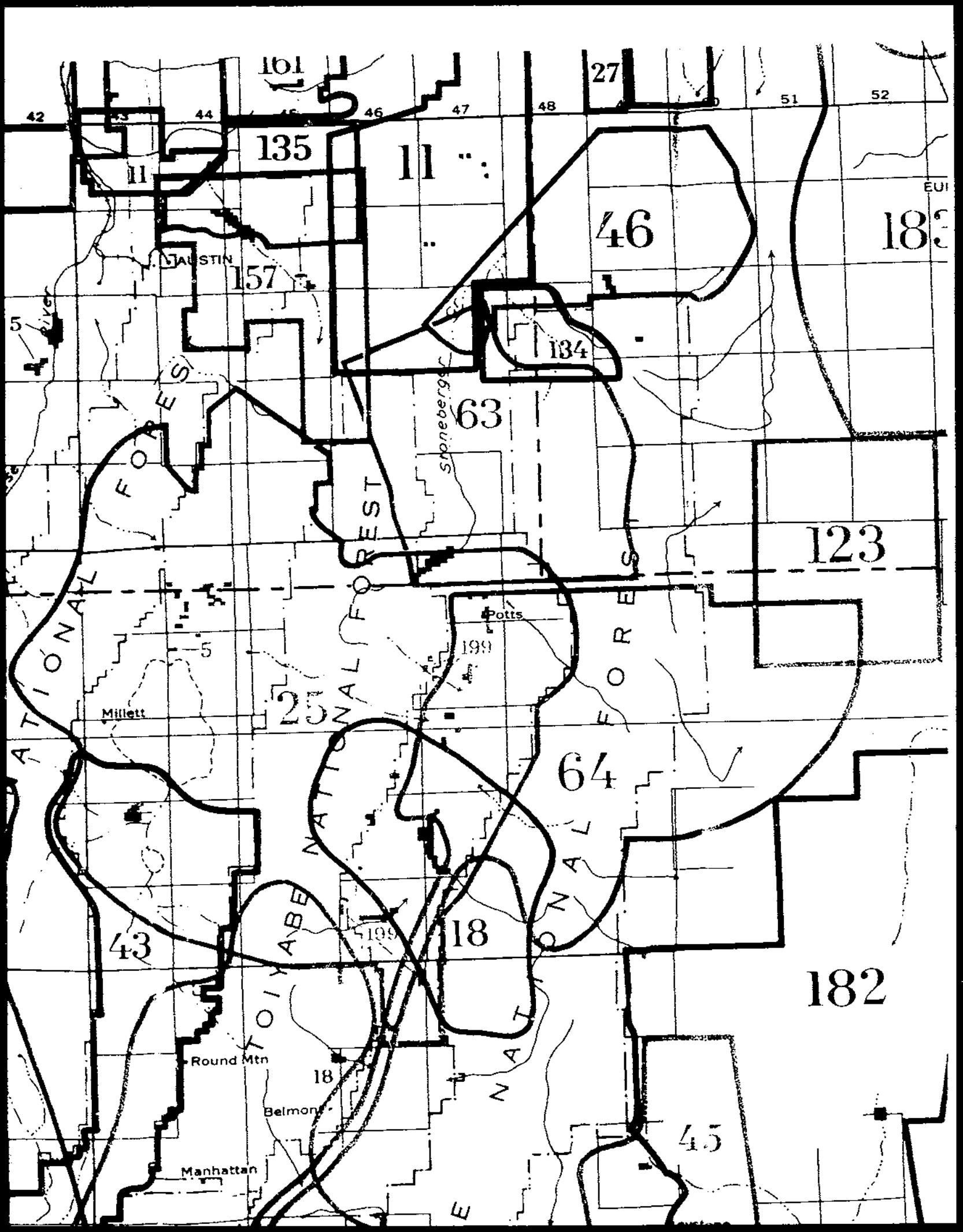


Tobar
Shafter
Snow Water Lake
Nelson Creek
Currie
Goshute Lake
40°
Cherry Creek
Tippett
Schellbourne
I


Helmz
Olinghouse
Wadsworth
Fernley
Derby
Hazen
Sparks
RENO
Truckee
Truckee Canal
Northern
STOREY
Steamboat
TAHOE NATIONAL FOREST
Franktown
Washoe Lake
VIRGINIA CITY
Gold Hill
Carson River
Southern Pacific
Silver City
Dayton
Ft Churchill
Mound House
CARSON CITY
LYON
ORMSBY
Stewart
Wabuska
Walker Lake
Glenbrook
Genoa
Artesia
Ludwig
YERINGTON
Mason
Copper Belt
MONO N F
DOUGLAS
Hudson
Simpson
Smith
Wellington
Nevada
East Walker River
West Walker River
Desert Cr
MONO
NATIONAL FOREST
Sweetwater
84
140
189
181
151
177
137
39°


Olinghouse
22
Wadsworth
23
24
25
26
27
28
29
30
31
32
SOUTHERN
30 & 4
Fernley
140
TRUCKEE
CANAL
Hazen
Northam
Stillwater
22
30 & 4
FALLON
Carson Lake
River
SOUTHERN
Ft Churchill
Dayton
181
PACIFIC
Wabuskal
Walker
137
BELT
YERINGTON
Artesia
Ludwig
Mason
COPPER
Schurz
177
Rawhide
River
NEVADA
Hudson
Simpson
Walker
River
East
Smith
Wellington
West
Walker
River
WALKER LAKE
Rand
Thorne
MONO
NATIONAL
FOREST
HAWTHORNE


Dixie Valley
167
9
4
5
Bermond
Reese River
Gold Park
20
Broken Hills
Rawhide
Ione
126
125
TOIYABE NAT FO
TOIYABE NATIONAL
14
23
Simon
Luning
RCHILL
RAL


101
27
42
43
44
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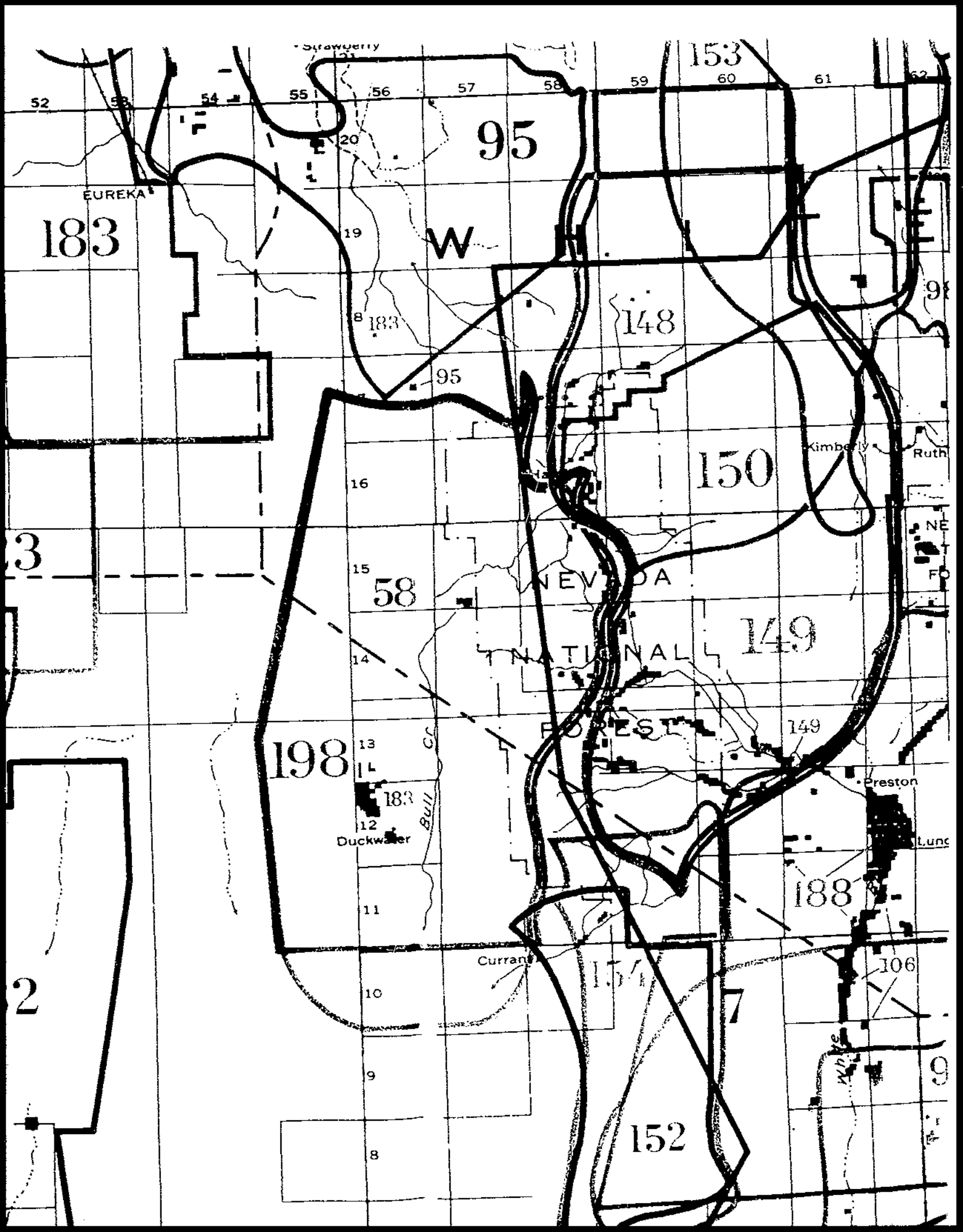
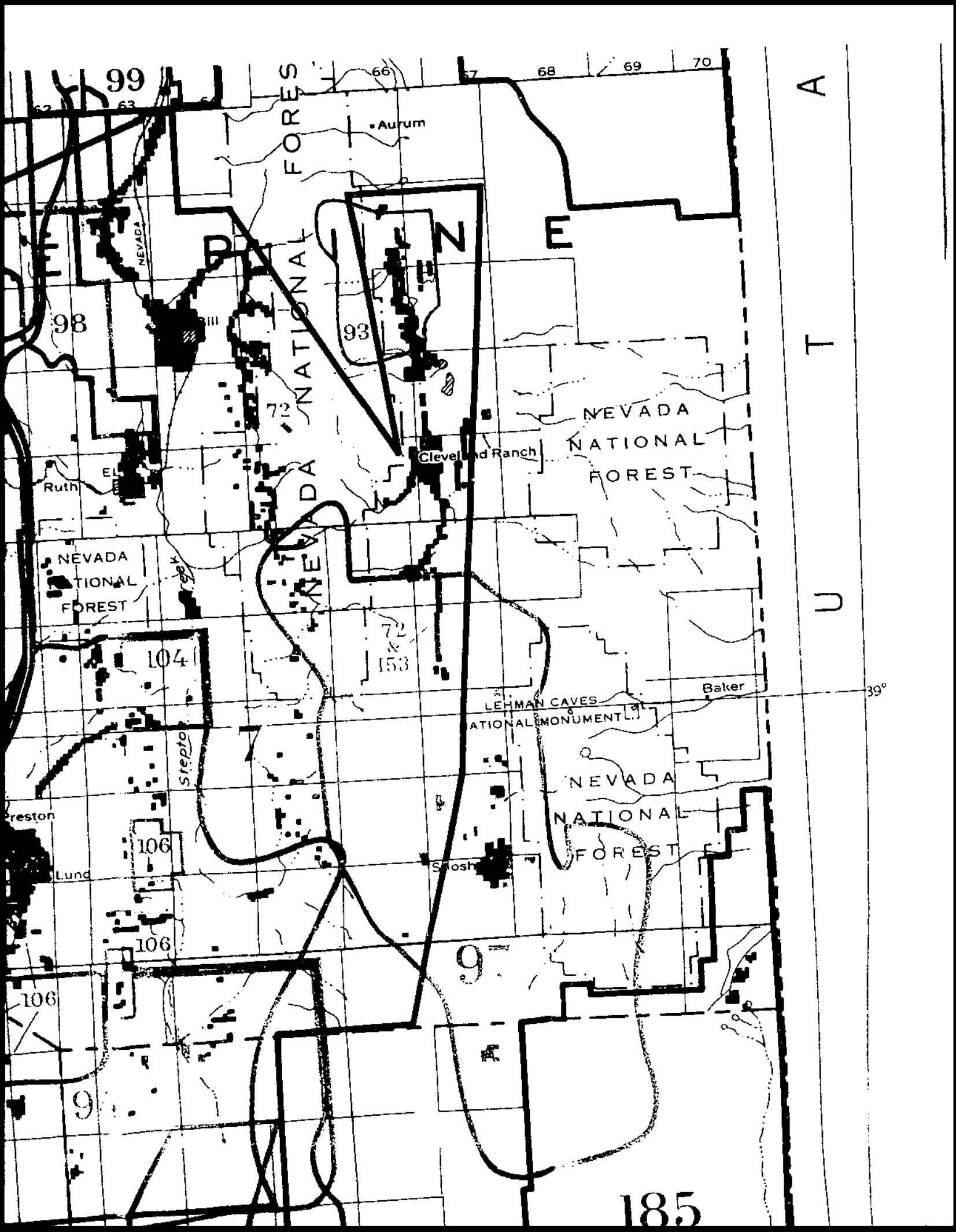
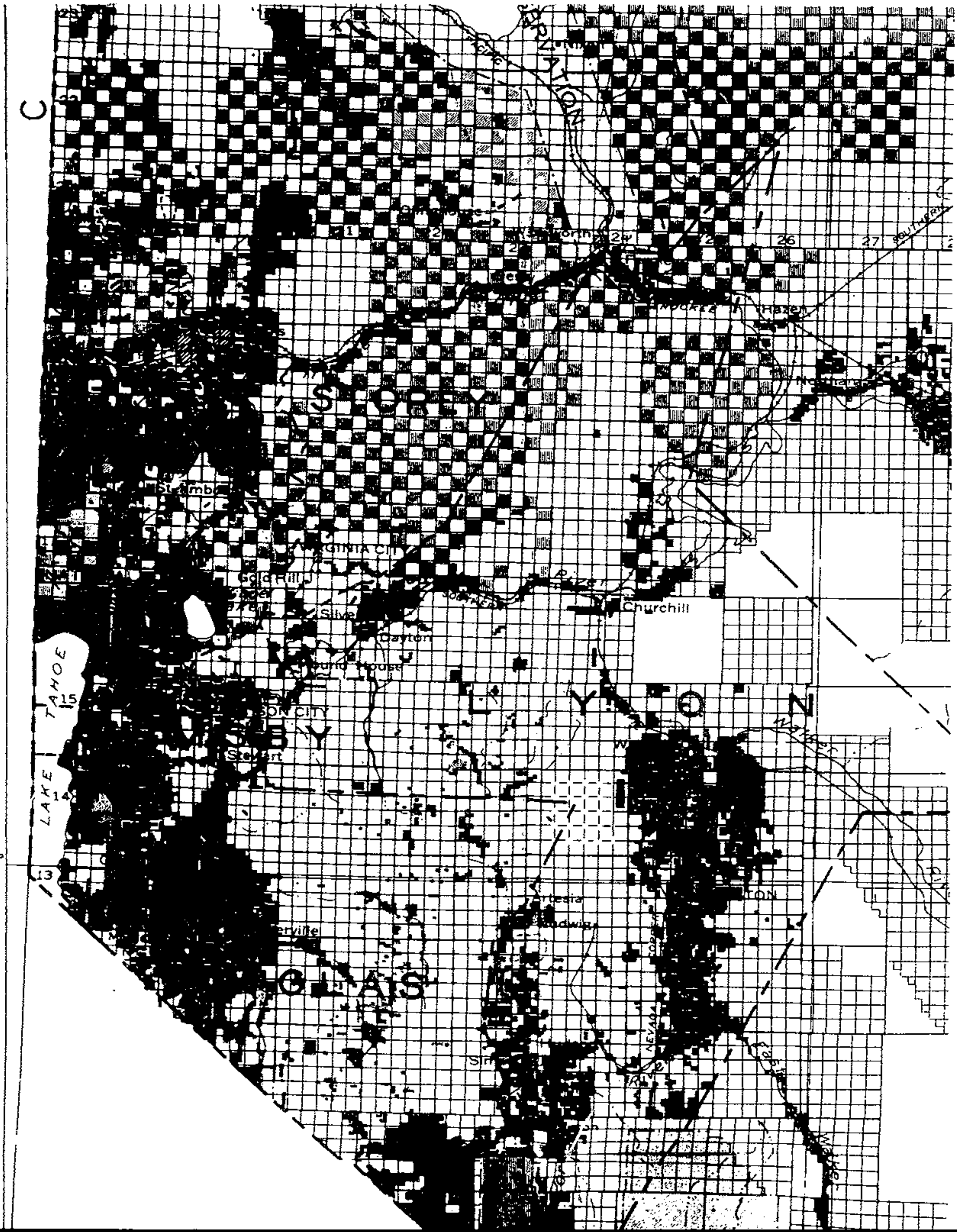
47
48
51
52
135
11
46
157
134
63
123
Potts
199
Millett
25
64
43
18
182
Round Mtn
Belmont
Manhattan
45
TOIYABE NATIONAL FOREST
Shoneberger

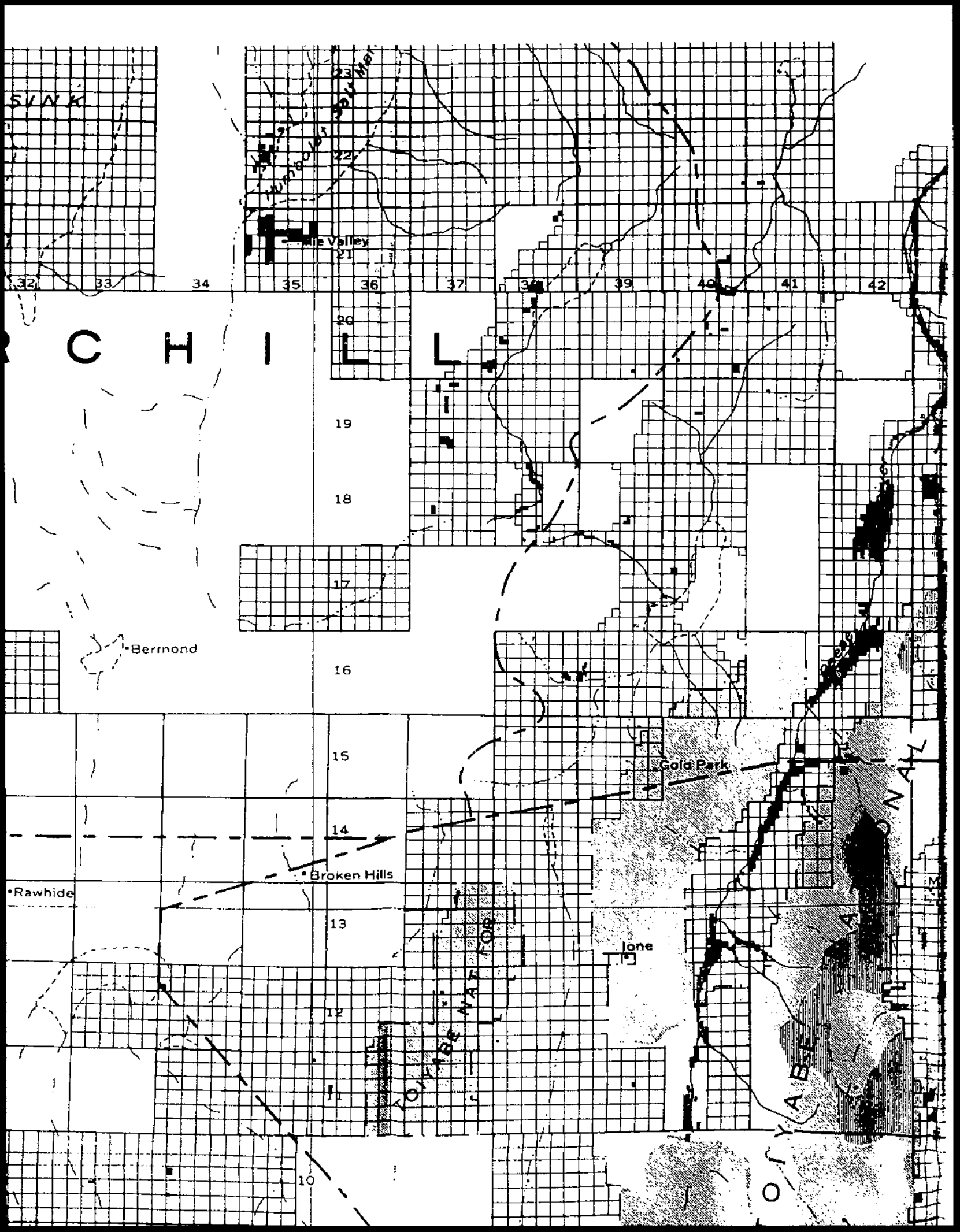

153
95
EUREKA
183
W
148
150
Kimberly
Ruth
58
NEVADA
NATIONAL
149
FOREST
198
Duckwater
Preston
188
106
152
7


99
63
66
67
68
69
70
Aurum
NEVADA
98
93
72
NATIONAL FOREST
Cleveland Ranch
Ruth
NEVADA
NATIONAL
FOREST
104
153
LEHMAN CAVES
NATIONAL MONUMENT
Baker
39°
Strepto
NEVADA
NATIONAL
FOREST
106
Lund
Sunnyside
9
185
UTAH



Wadsworth
26
27
Hazen
Gold Hill
Churchill
Dayton
LAKE TAHOE
15
14
13
39°
Artesia


CARSON SINK
Lower Carson Lake
Hazen
Churchill
Carson Lake
Rawhide
Schurz
Ardesia
Hadwiga
WALKER LA


SUNK
C H I L L
Bermond
Broken Hills
Rawhide
Gold Park
Ione
FOUR ABE NAT FOR
FOUR ABE NAT FOR
32
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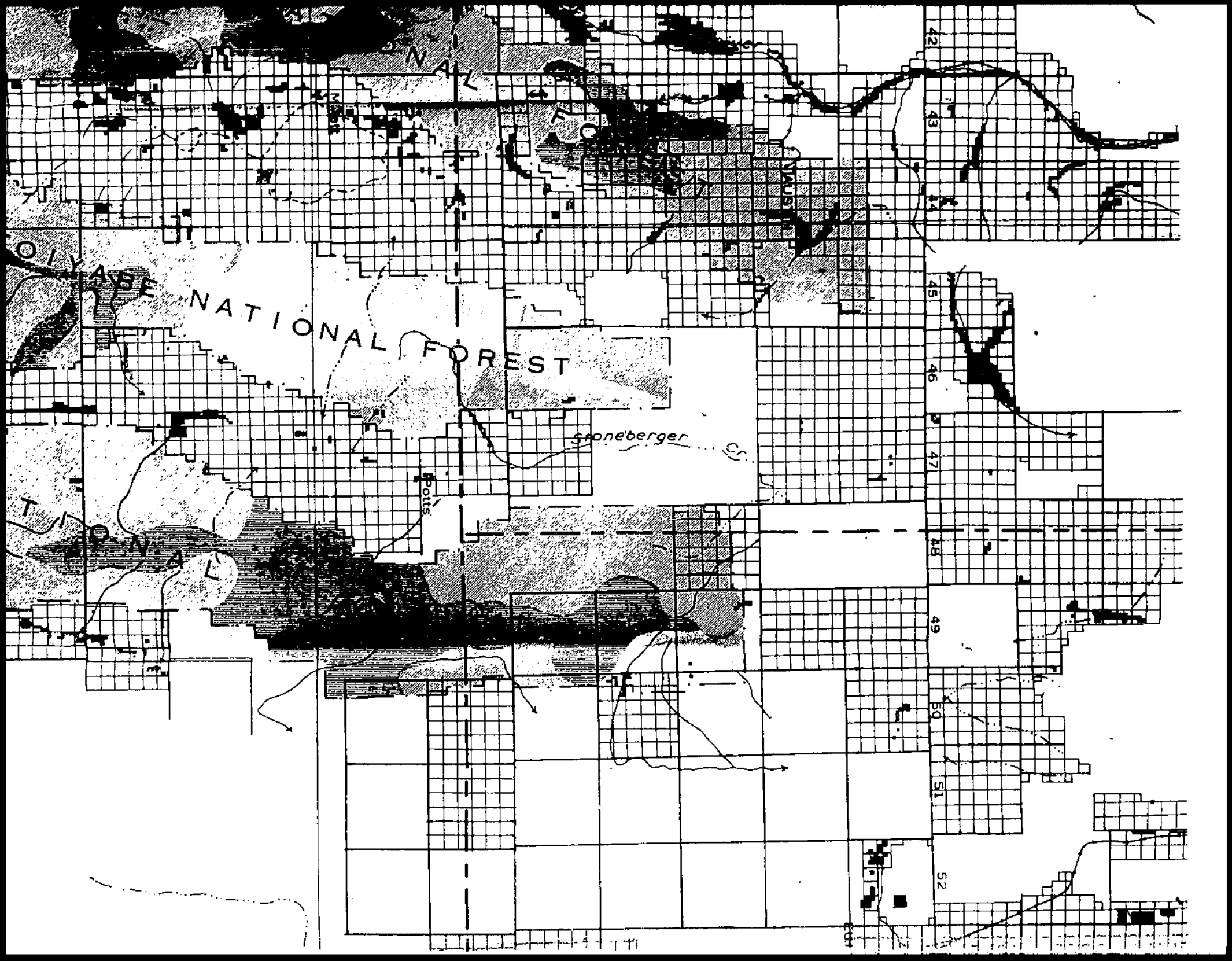
NATIONAL FOREST
NATIONAL FOREST
NATIONAL FOREST
Stoneberger
Potts
42
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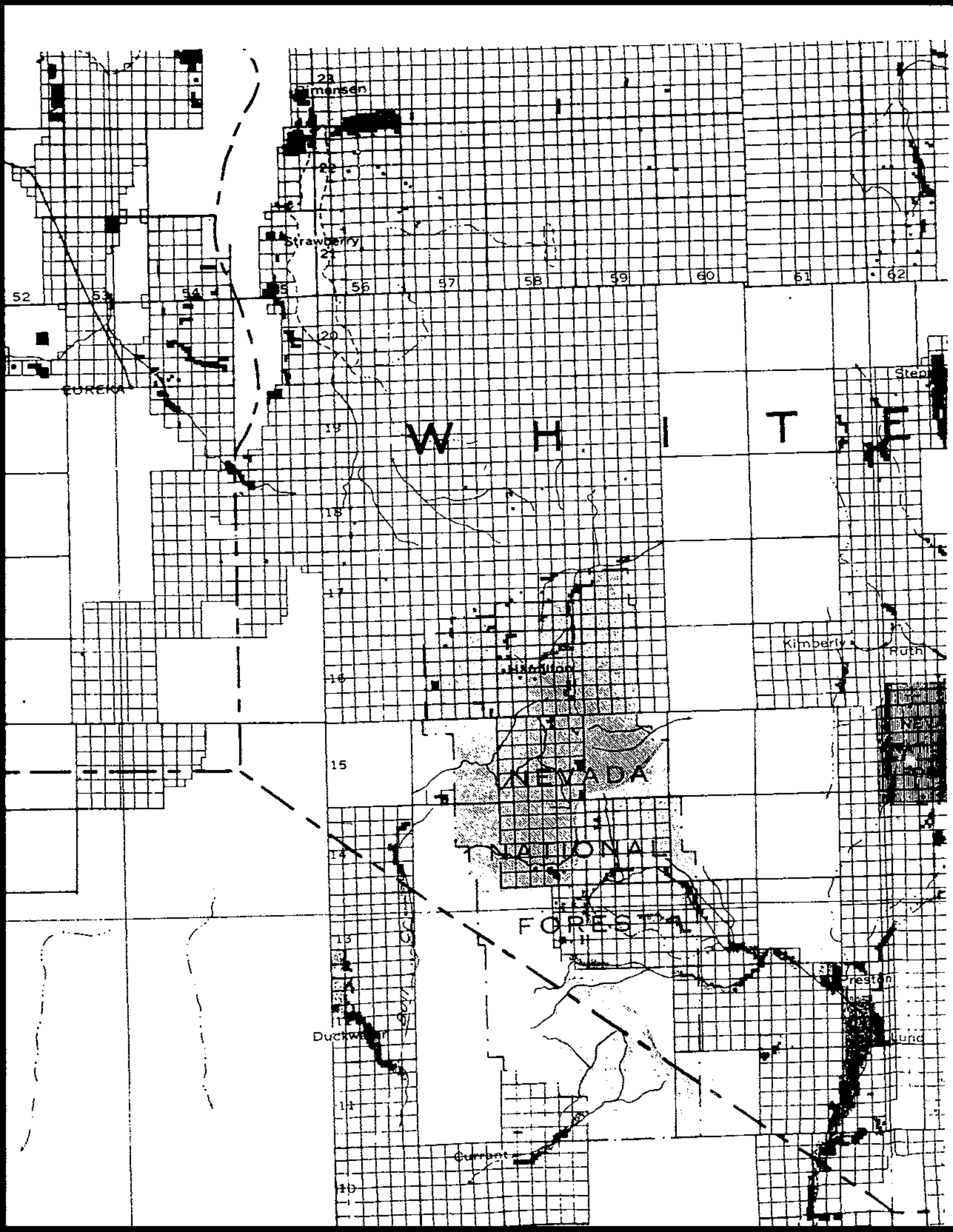
51
52


Zimmerman
Strawberry
52
53
54
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60
61
62
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19
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16
15
14
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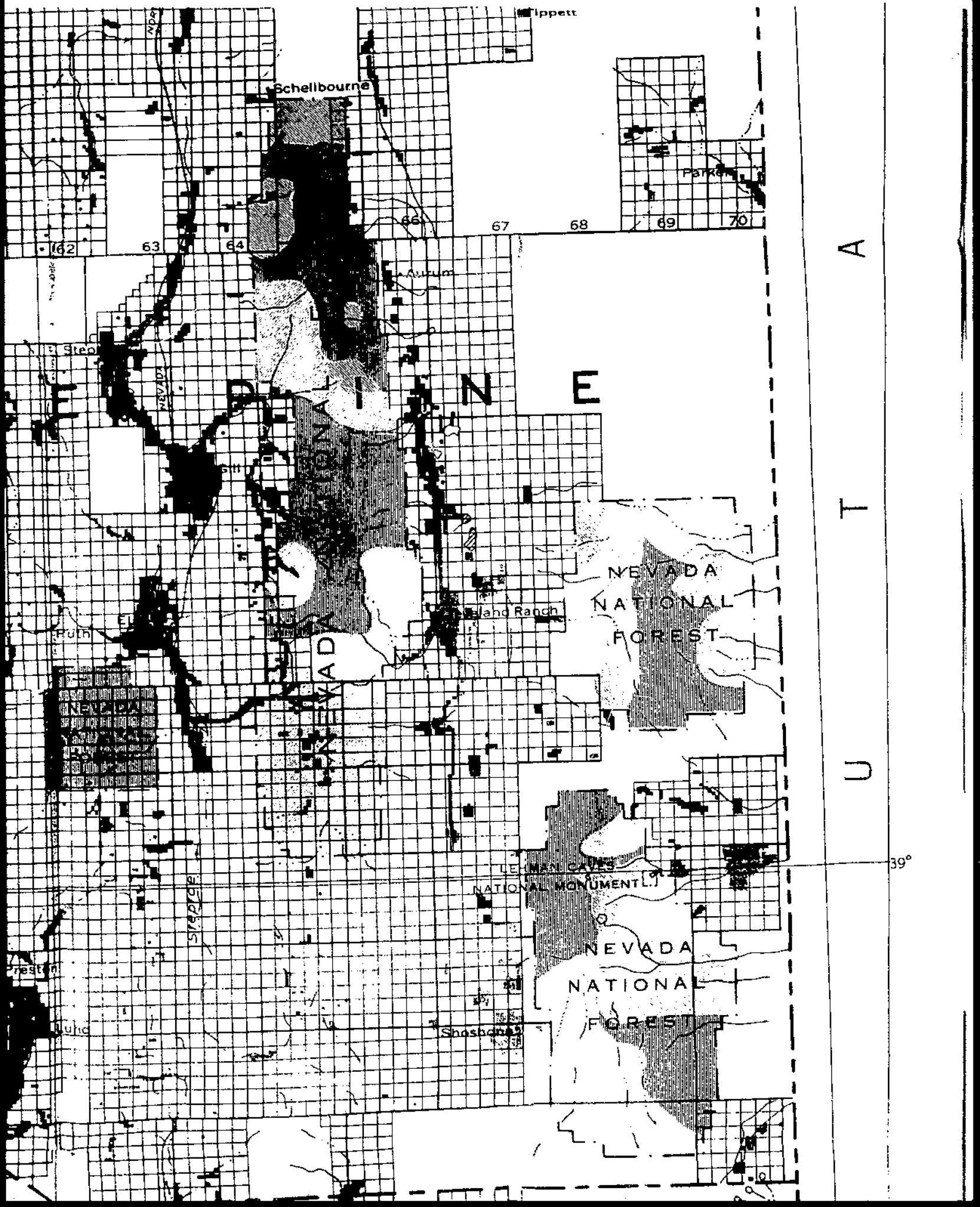
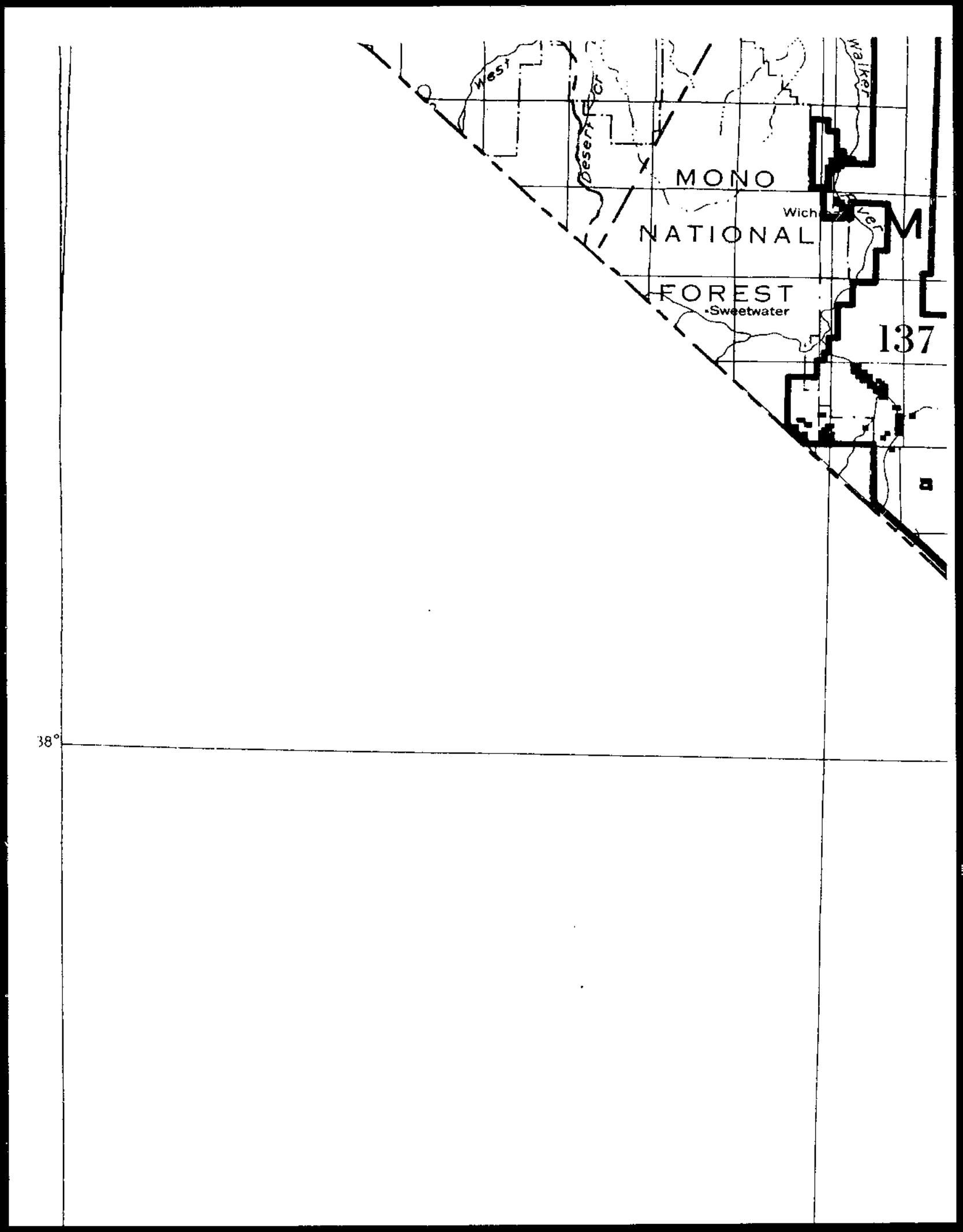
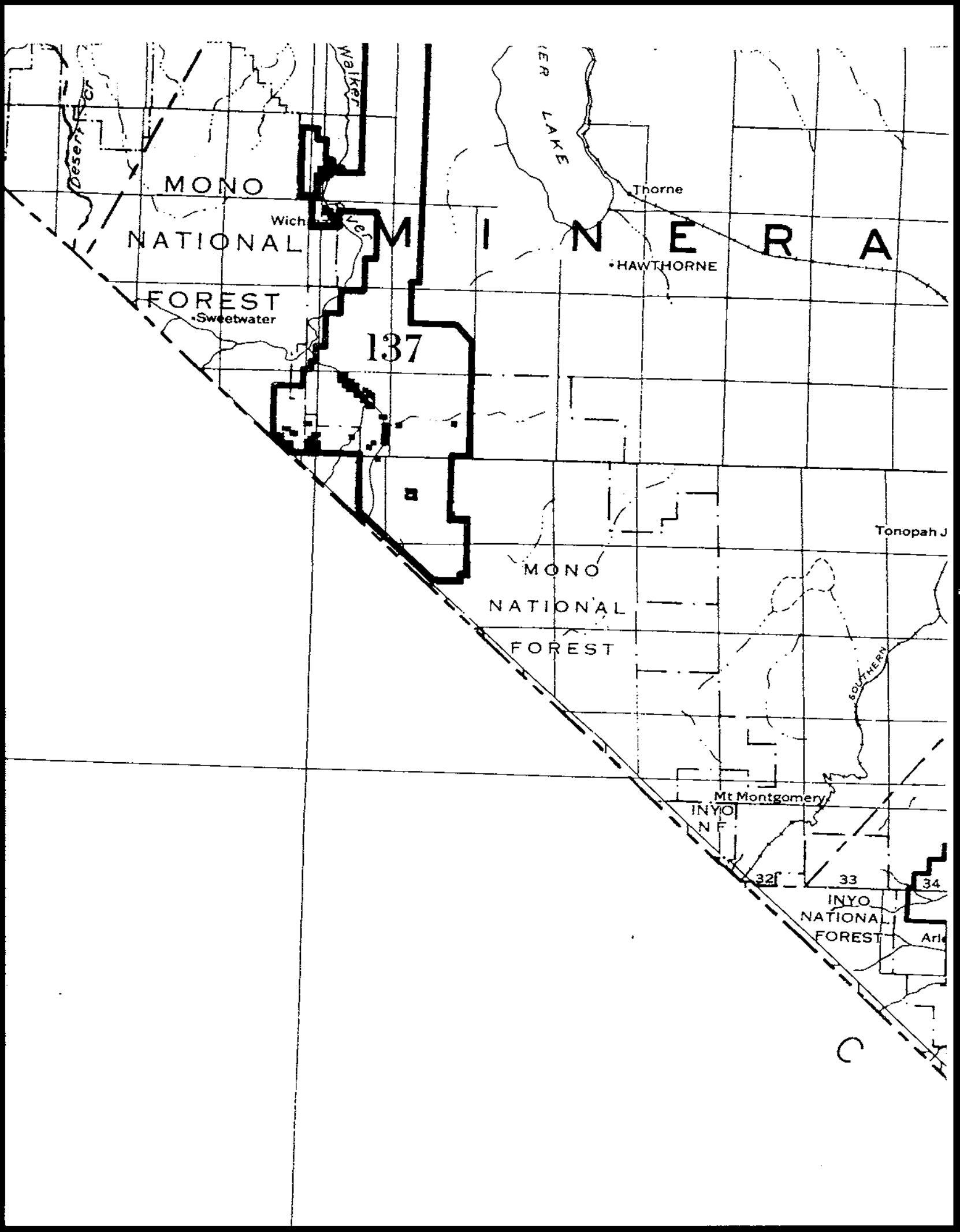
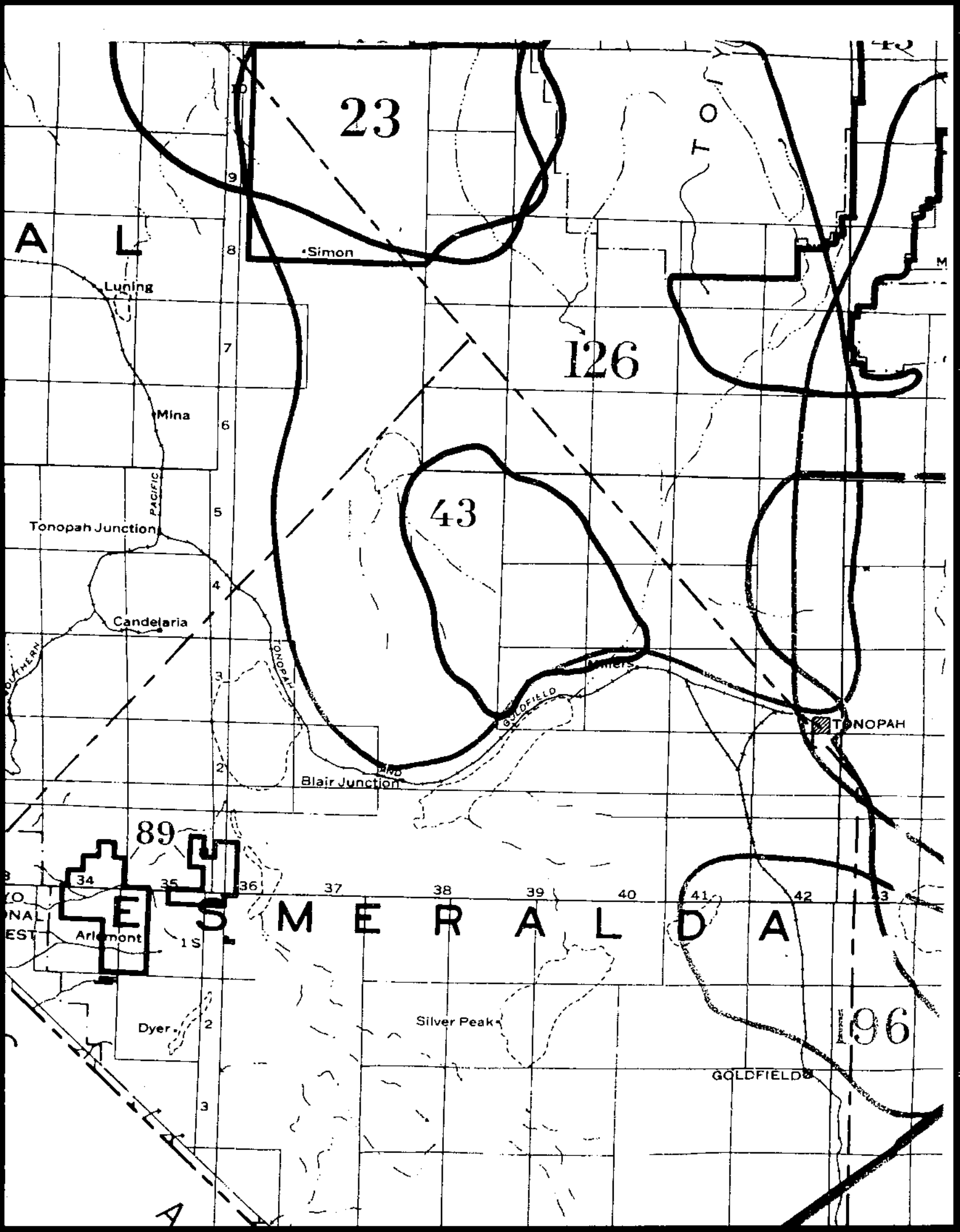
11
10
EUREKA
WHITE
Kimberly
Ruth
Hamilton
NEVADA
NATIONAL
FOREST
Duckwater
Current
Creek
Preston


Tippett
Schellbourne
Parker
66
67
68
69
70
62
63
64
Aurum
Step
NEVADA
NATIONAL
FOREST
Ruth
Ely
Leland Ranch
NEVADA
NATIONAL
FOREST
39°
Shoshone
UTAH


West
Desert Cr
Walker
MONO
NATIONAL
FOREST
Sweetwater
137
38°


Walker
Desert
MONO
NATIONAL
FOREST
Sweetwater
Wich
ver
137
LAKE
Thorne
HAWTHORNE
M I N E R A
Tonopah J
MONO
NATIONAL
FOREST
SOUTHERN
Mt Montgomery
INYO
N F
32
33
34
INYO
NATIONAL
FOREST
Arl
C


23
126
43
89
196
Simon
Luning
Mina
Tonopah Junction
Candelaria
Blair Junction
Silver Peak
Dyer
Arlemont
TONOPAH
GOLDFIELD
EMERALDA
PACIFIC
SOUTHERN
TONOPAH
GOLDFIELD
T O
34
35
36
37
38
39
40
41
42
1 S
1
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5
6
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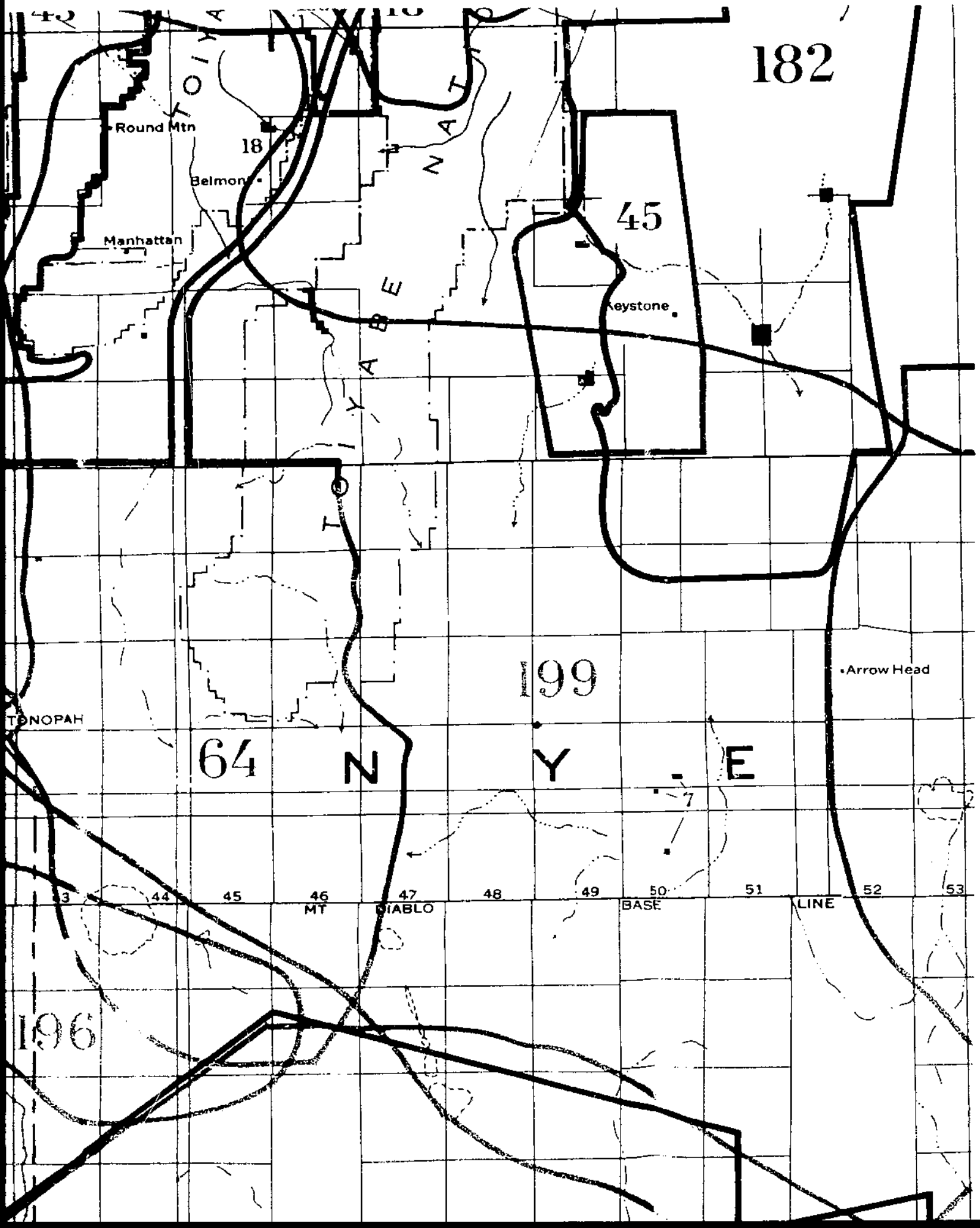
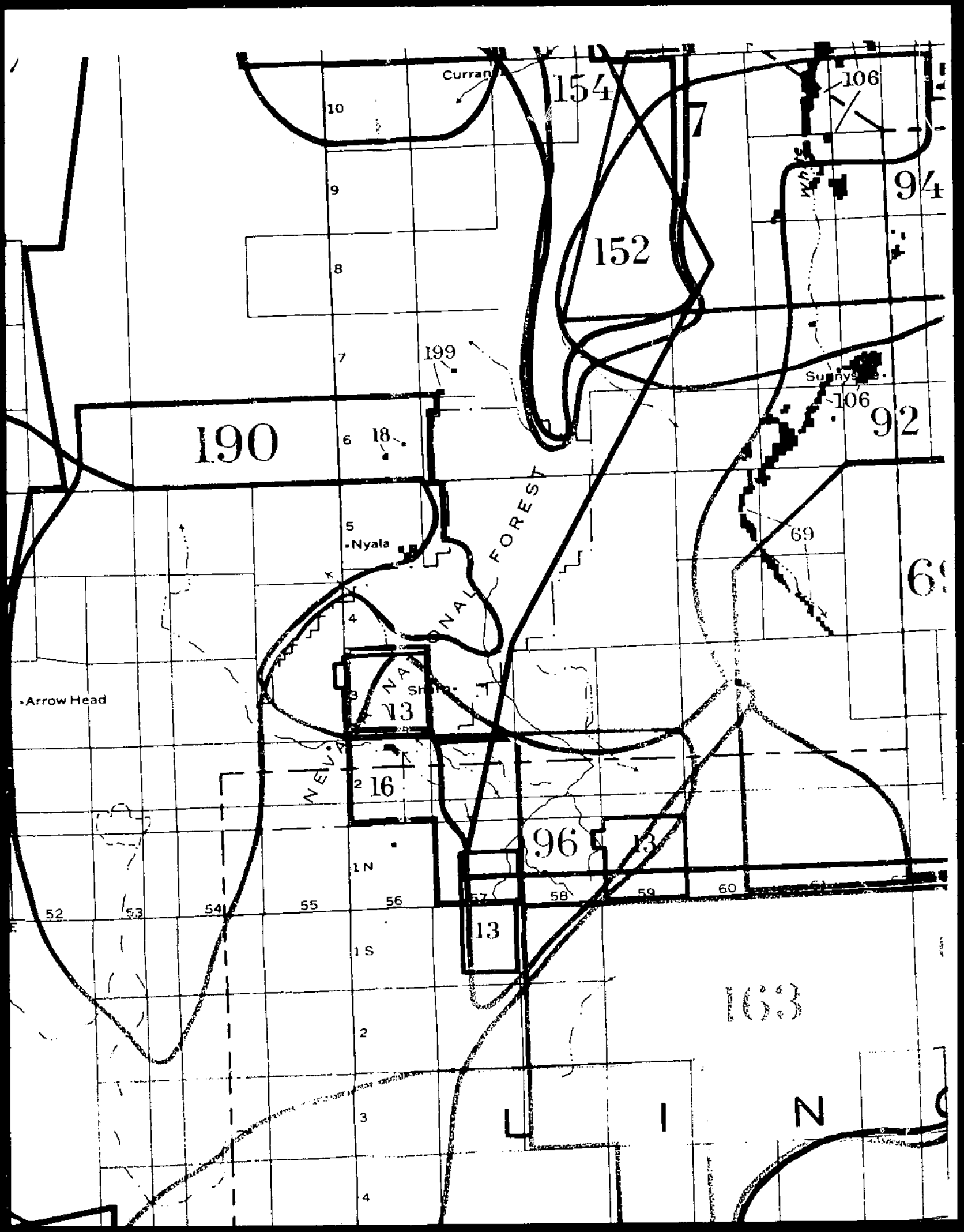
8
9


182
Round Mtn
18
Belmont
Manhattan
45
Keystone
TONOPAH
99
Arrow Head
64
N
Y
E
7
43
44
45
46
MT
47
DIABLO
48
49
50
BASE
51
LINE
52
53
196


Curran
154
106
10
9
94
152
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7
199
Sunnyside
106
92
190
6
18
5
Nyala
69
4
Arrow Head
13
16
2
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57
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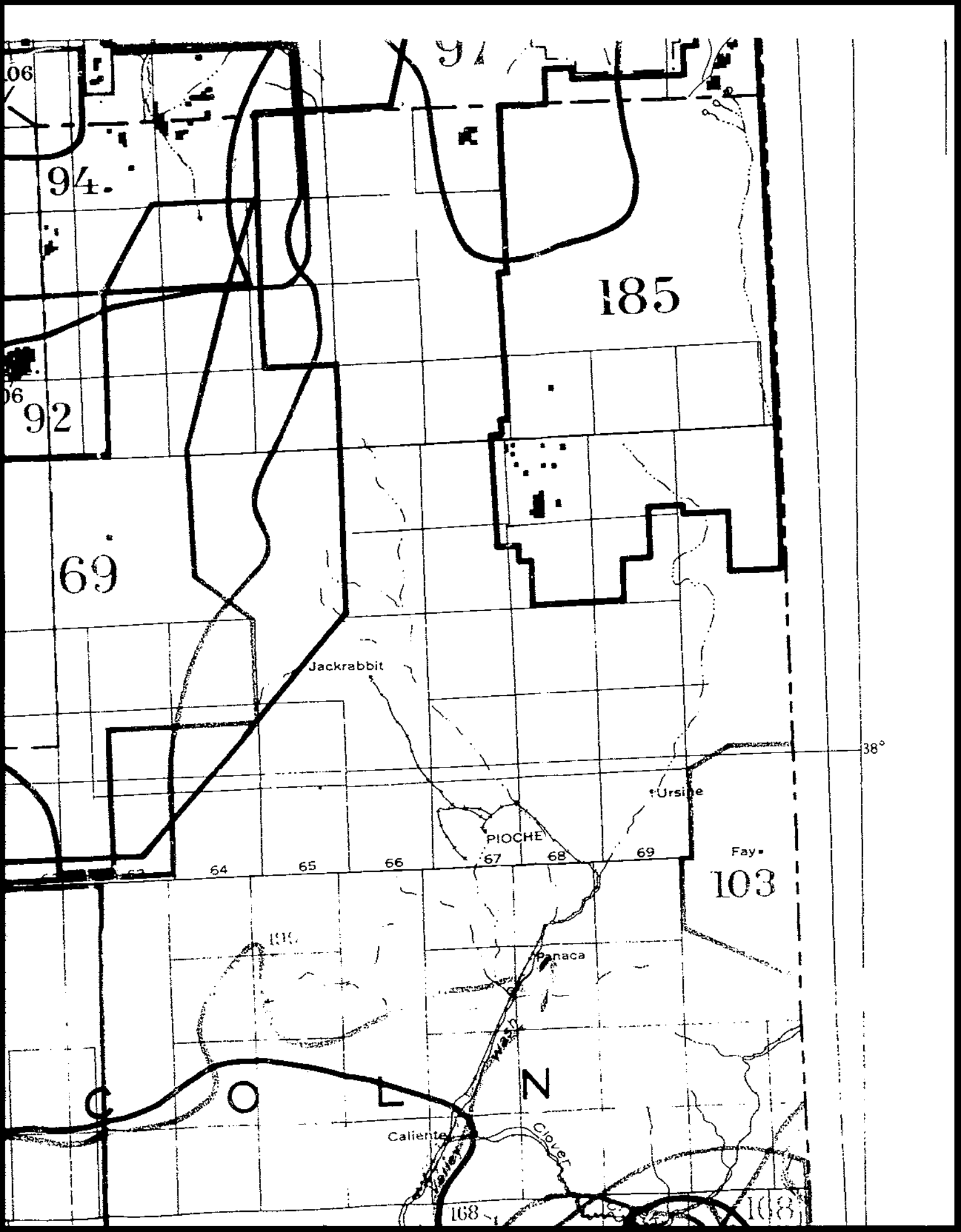
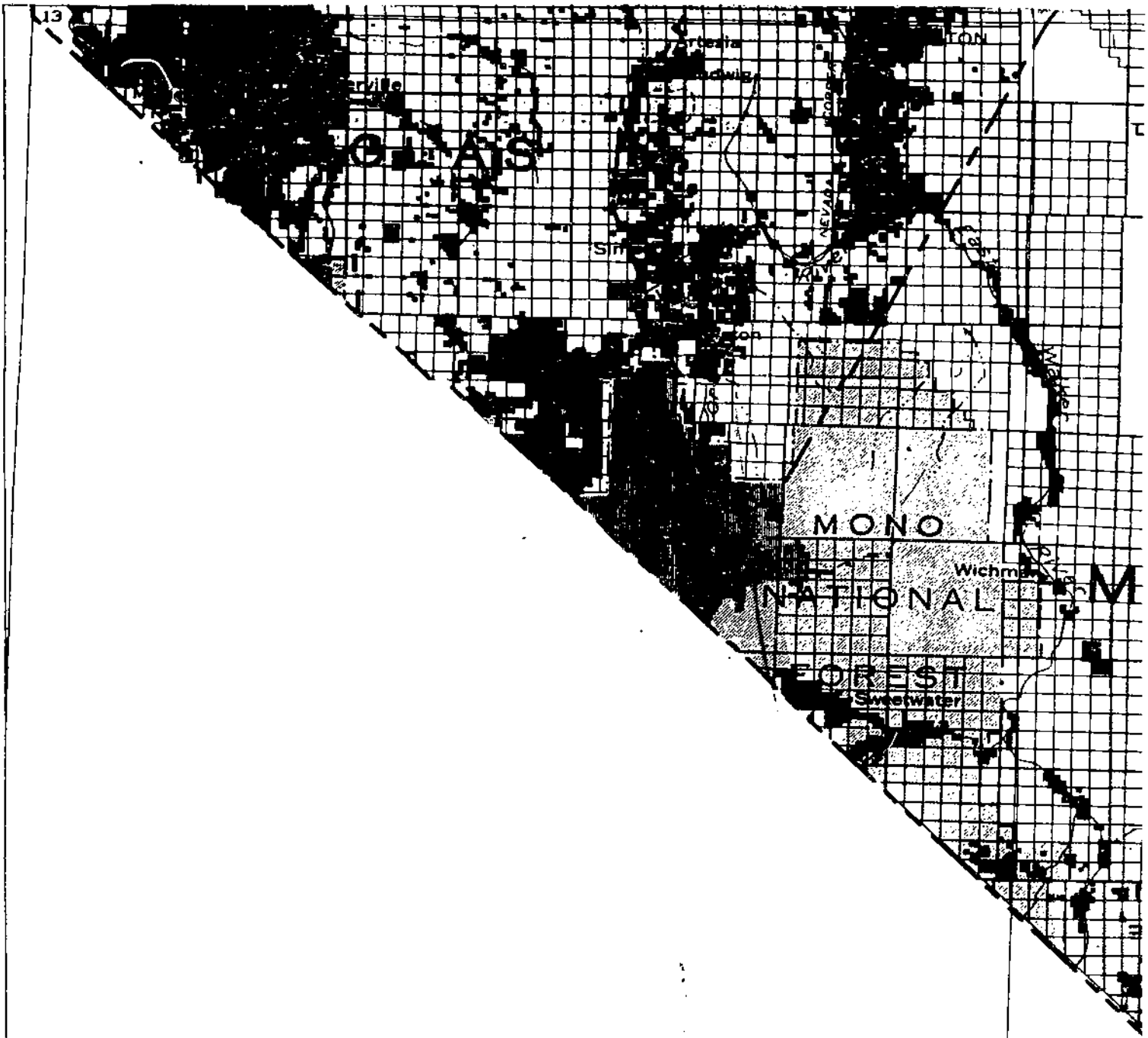
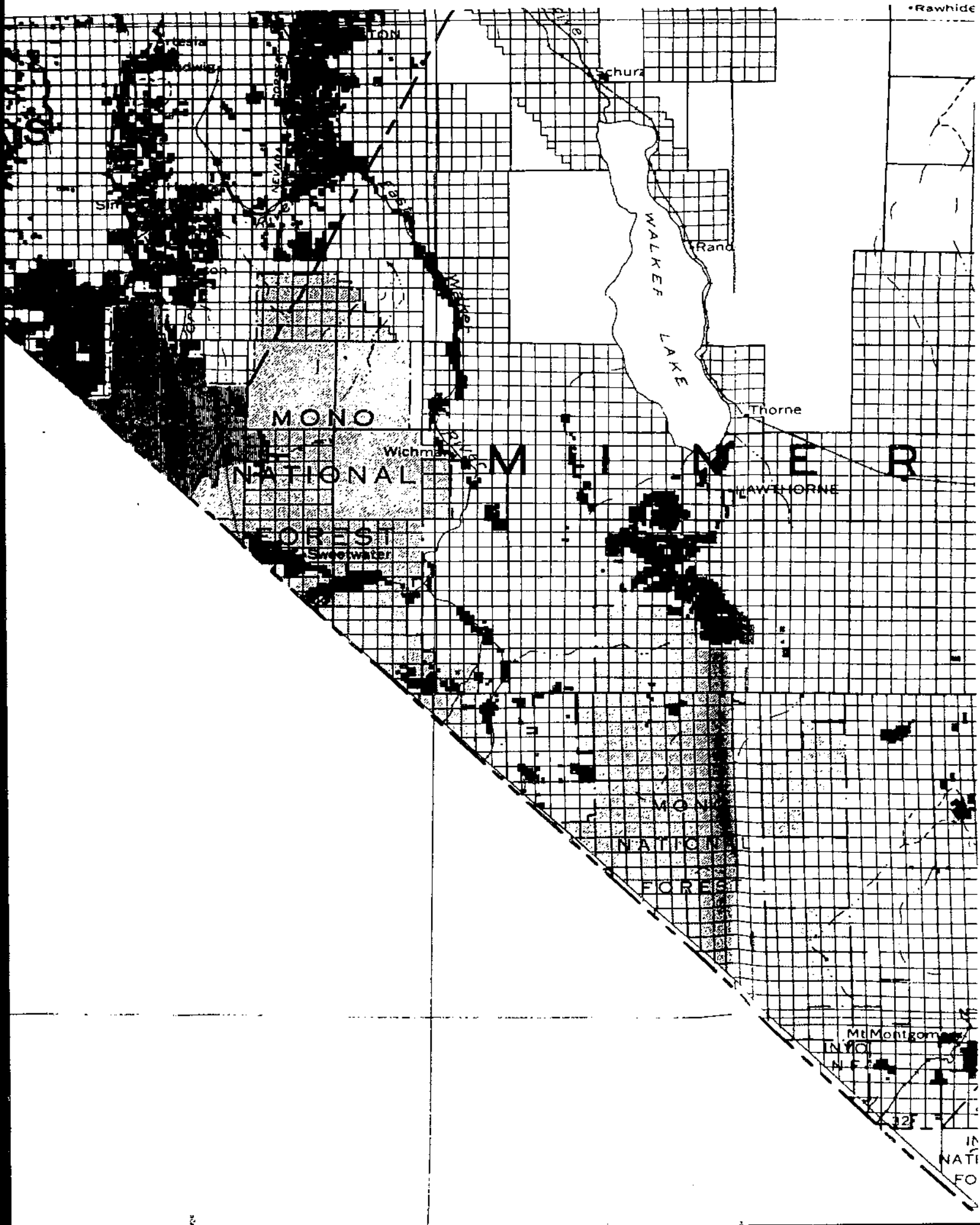
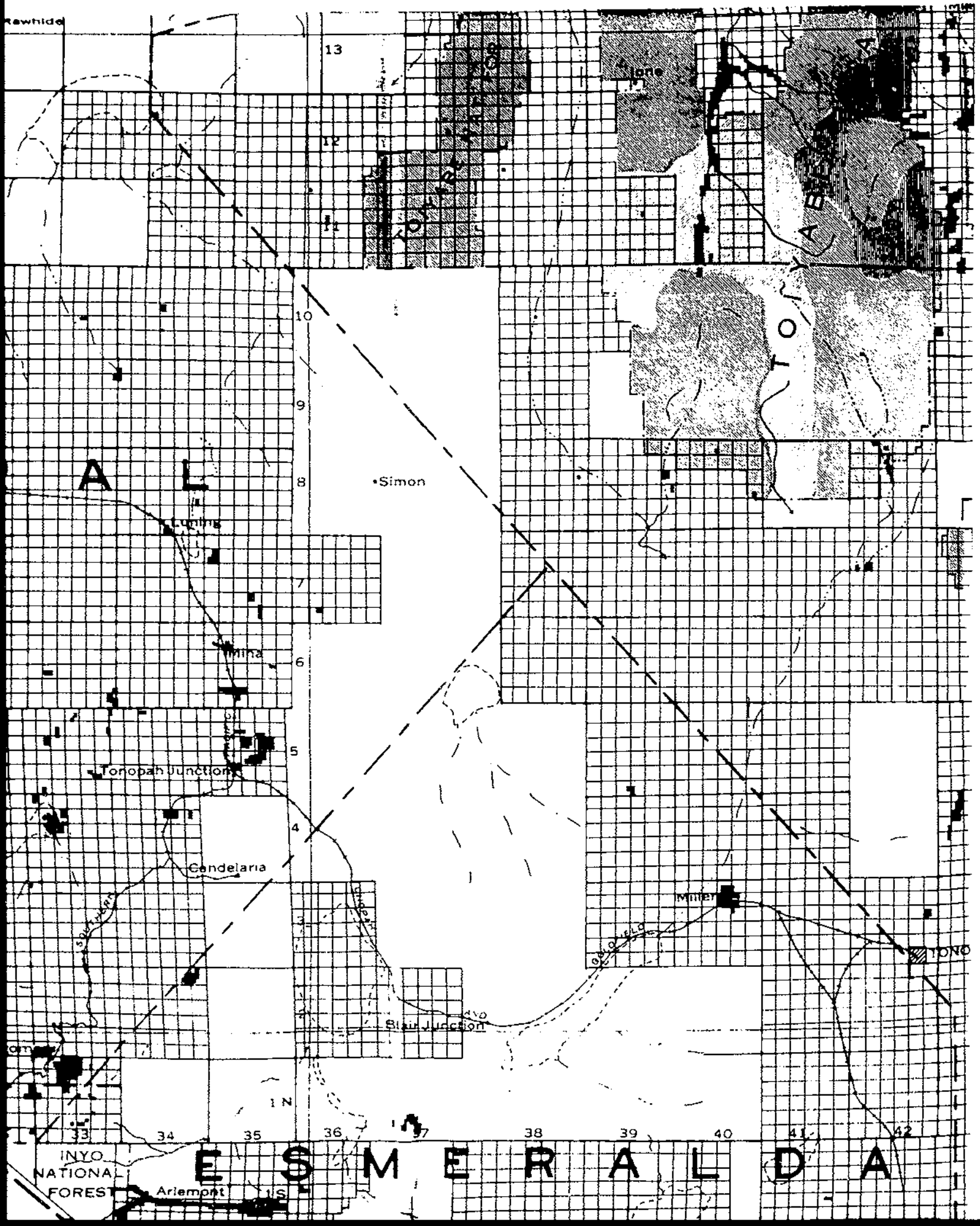
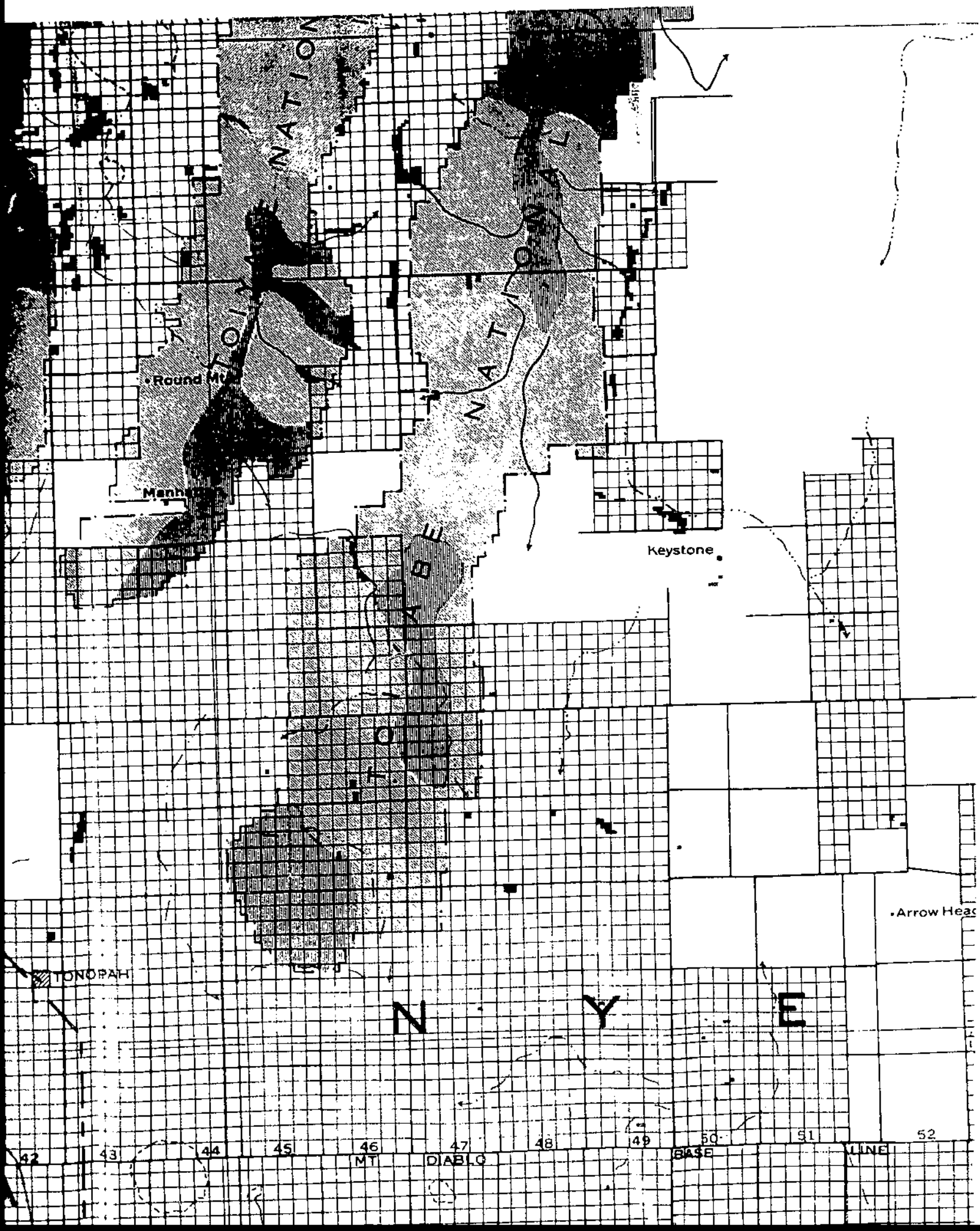
1 S
2
3
4
L I N


94
185
92
69
Jackrabbit
38°
Ursine
PIOCHE
64
65
66
67
68
69
Fay
103
Panaca
Caliente
Clover
168

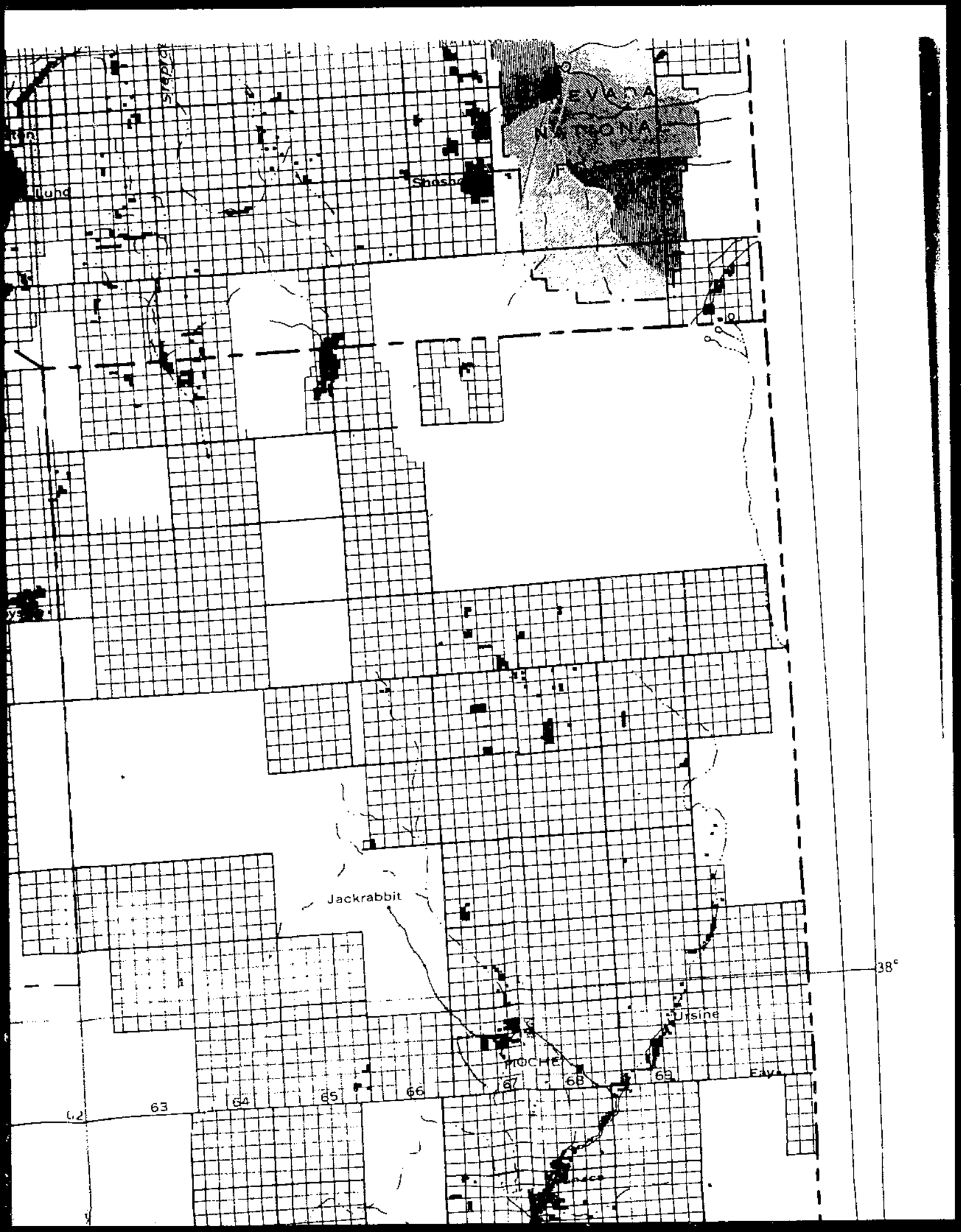

13
MONO
NATIONAL
FOREST
Sweetwater
38°

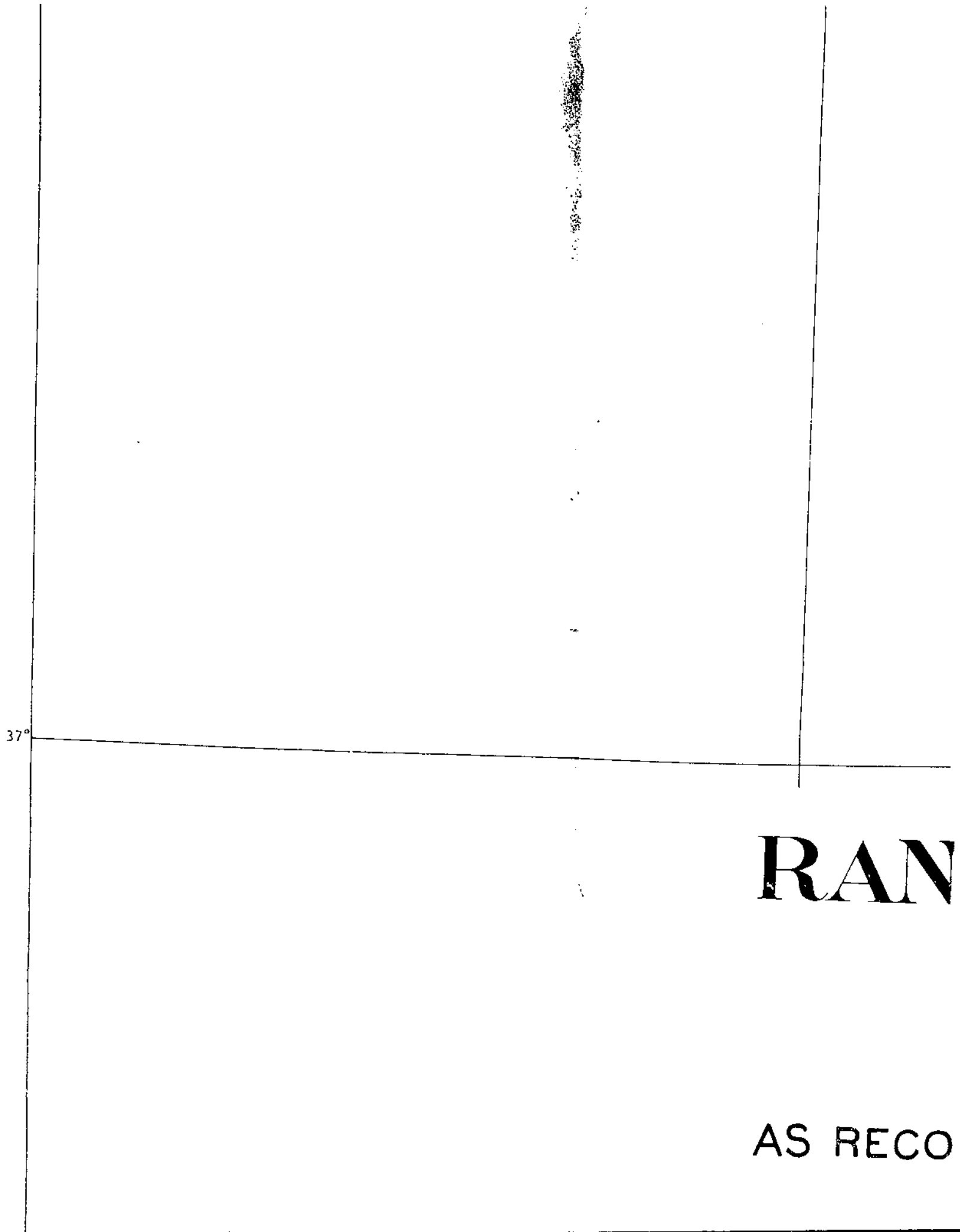

Rawhide
Schurz
WALKER LAKE
Rand
Thorne
MONO
NATIONAL
FOREST
Wichman
MINERAL
LAWTHORNE
Sweetwater
MONO
NATIONAL
FOREST
Mt Montgomery
INYO
N F
32


Rawhide
13
12
11
10
9
8
7
6
5
4
3
2
1
Ione
TOIYABE
A L
Simon
Luning
Mina
Tonopah Junction
Candelaria
Miller
TONO
Blair Junction
33
34
35
36
37
38
39
40
41
42
INYO
NATIONAL
FOREST
Arlemont
E S M E R A L D A


NATION
NATIONAL
Round M
Manh
Keystone
Arrow Hea
TONOPAH
NYE
42
43
44
45
46
MT DIABLO
47
48
49
50
BASE
51
LINE
52


FOREST
Duckwall
Current
Nyala
Arrow Head
Sharp
NATIONAL FORES
52
53
54
55
56
57
58
59
60
61
62
1N
1S

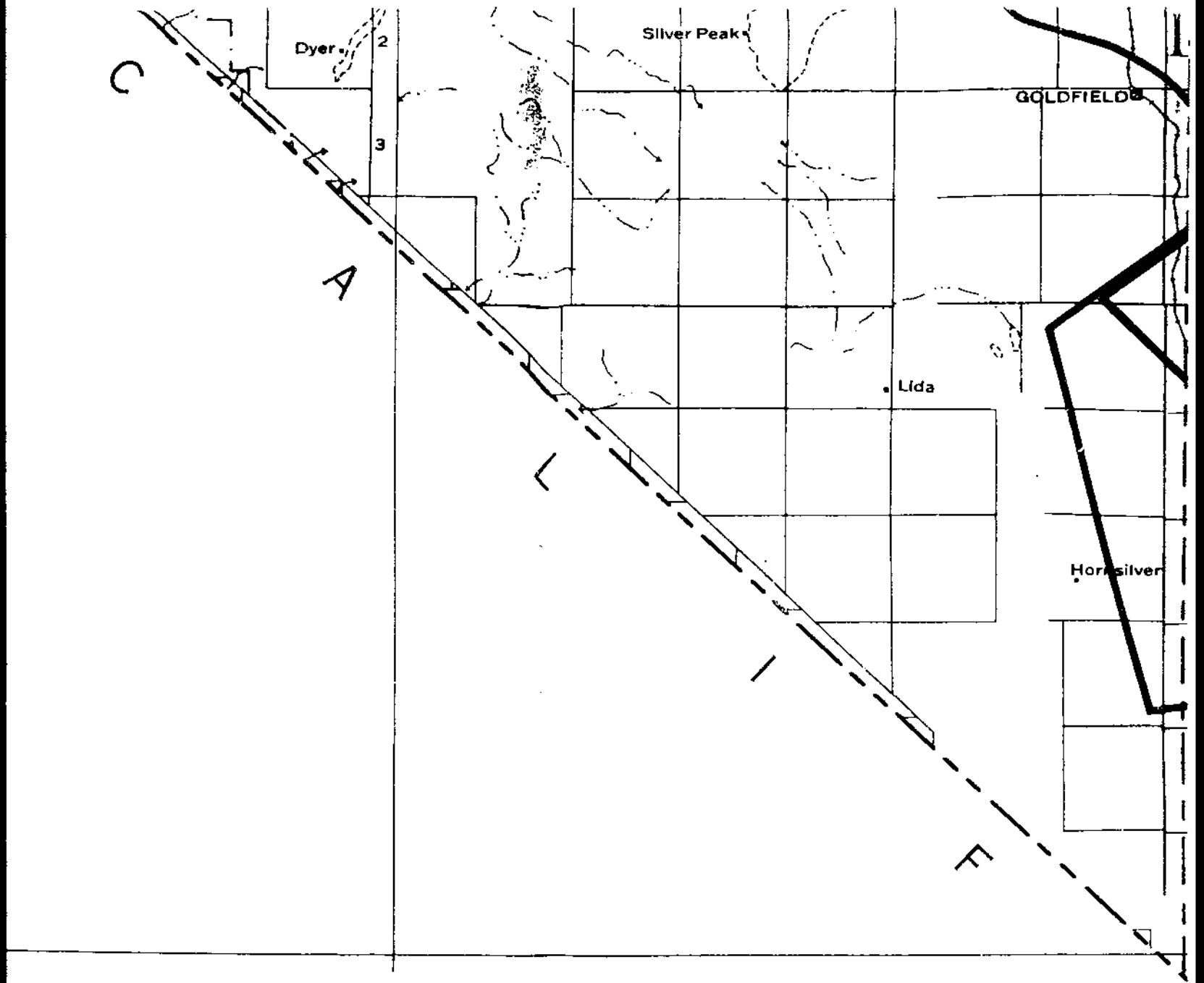

Jackrabbit
Ursine
62
63
64
65
66
67
68
69
38°


37°
RAN
AS RECO

C

RANGE CLAI
NEVADA

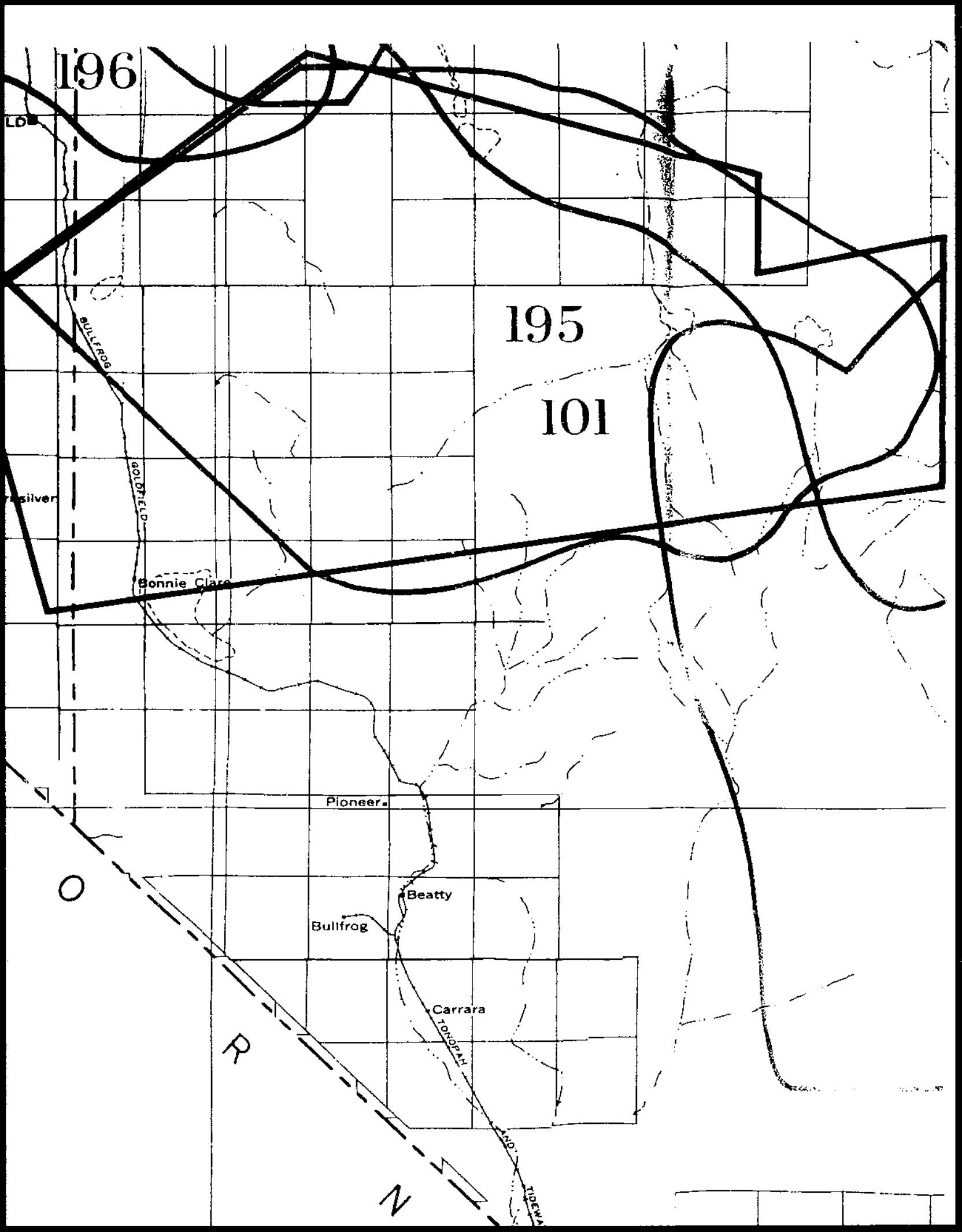
AS RECORDED IN THE STATE
OFFICE TO JULY, 19

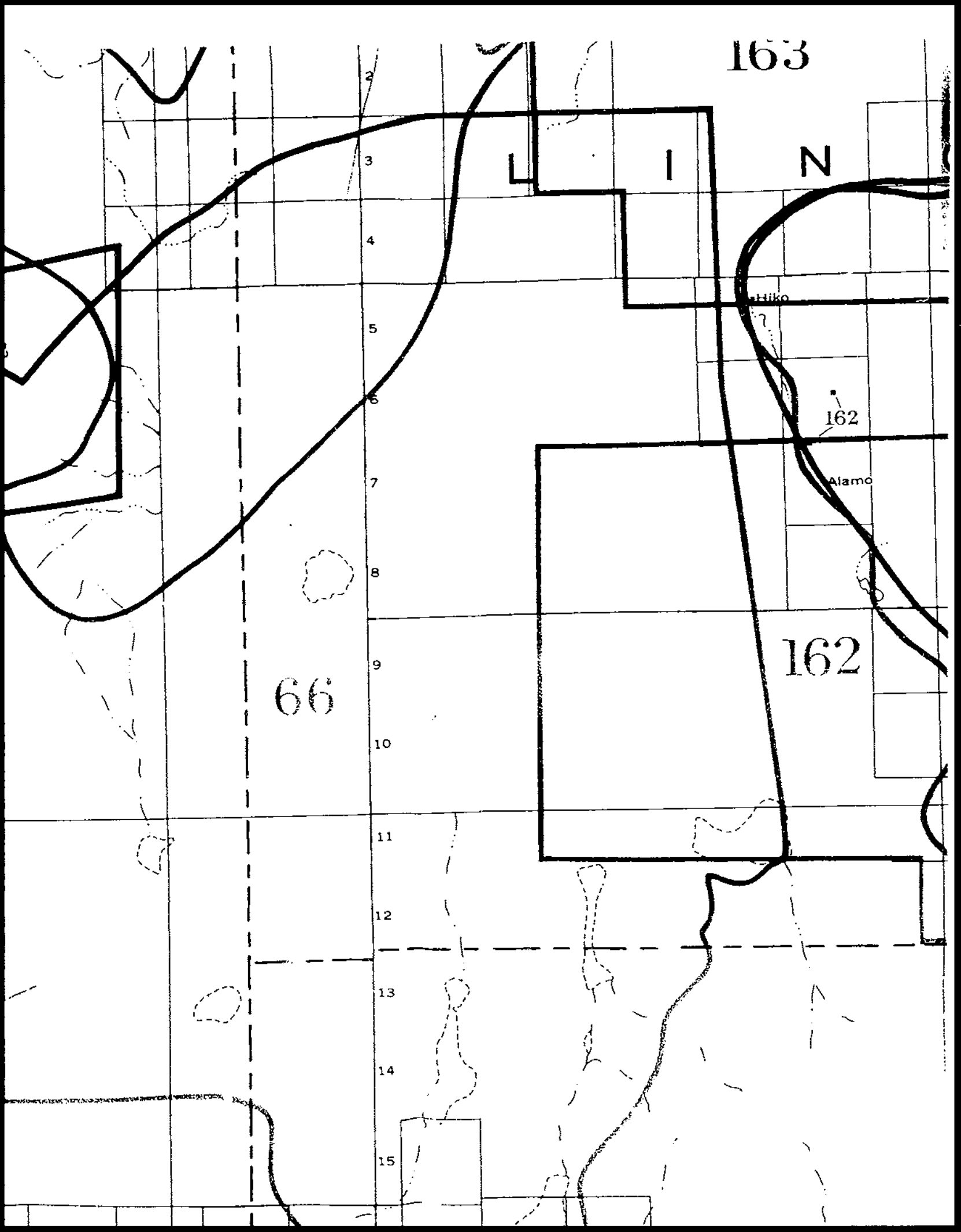


LAIMS IN
ADA

STATE ENGINEERS

ULY, 1929


196
195
101
BULLFROG
GOLDFIELD
Bonnie Clare
Pioneer
Beatty
Bullfrog
Carrara
TONOPAH
O
R
N


163
L I N
Hiko
162
Alamo
162
66
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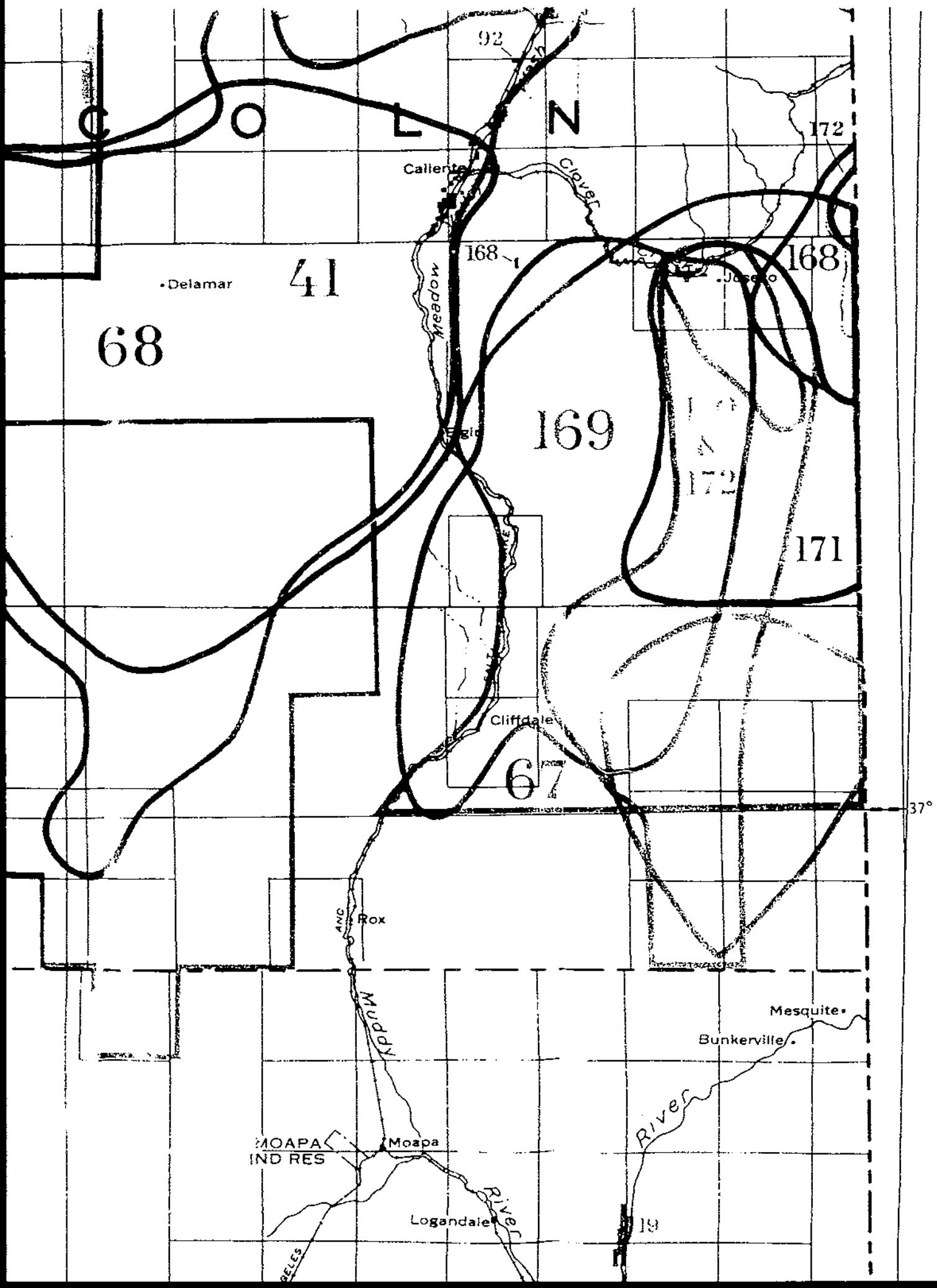
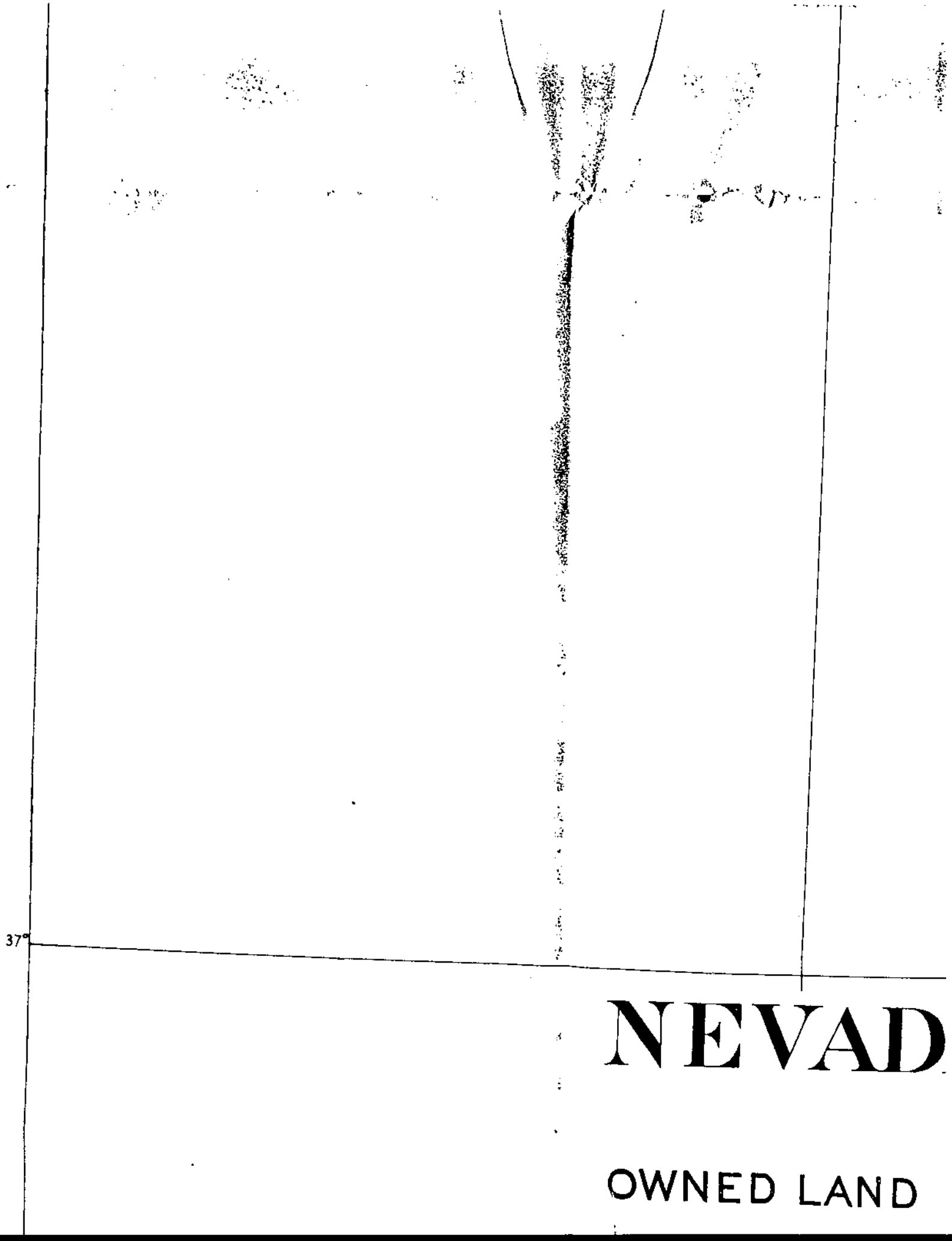
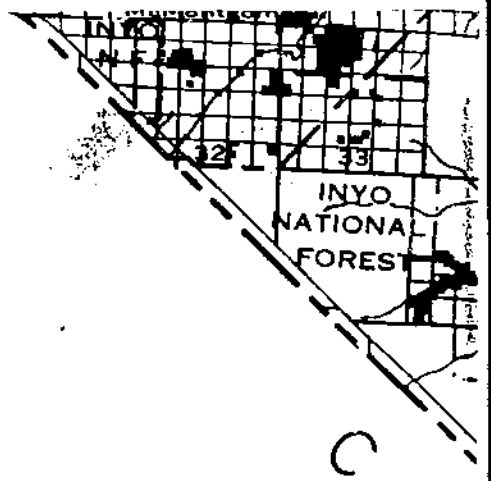

92
172
Callente
Clover
168
Meadow
Delamar
41
68
168
169
172
171
Cliffdale
67
37°
ANC
Rox
Muddy
Mesquite
Bunkerville
River
MOAPA
IND RES
Moapa
Logandale
19


37°
NEVAD
OWNED LAND



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NEVADA LAND T

OWNED LAND LEASED LAND

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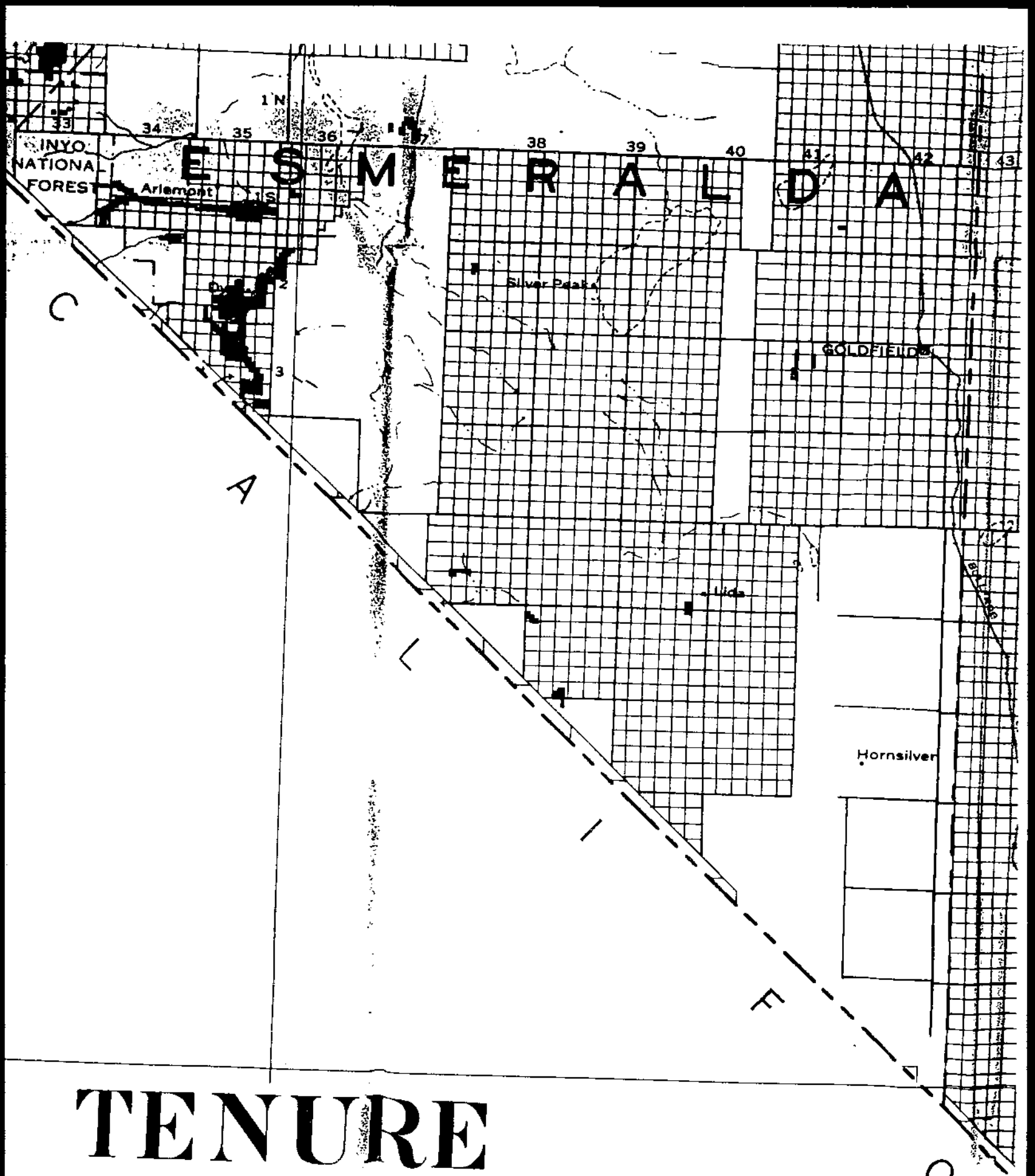
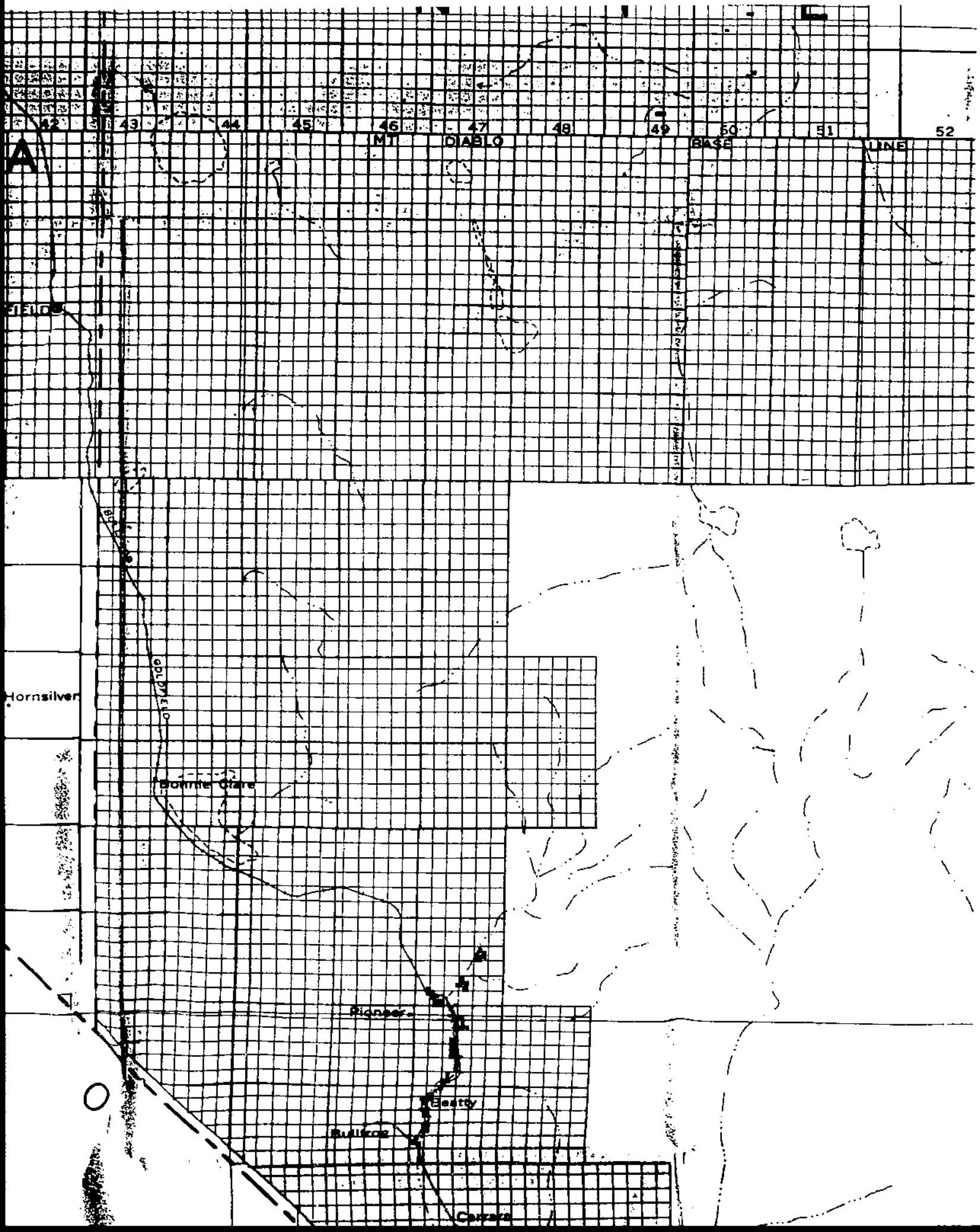


TENURE

LAND USE


42
43
44
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48
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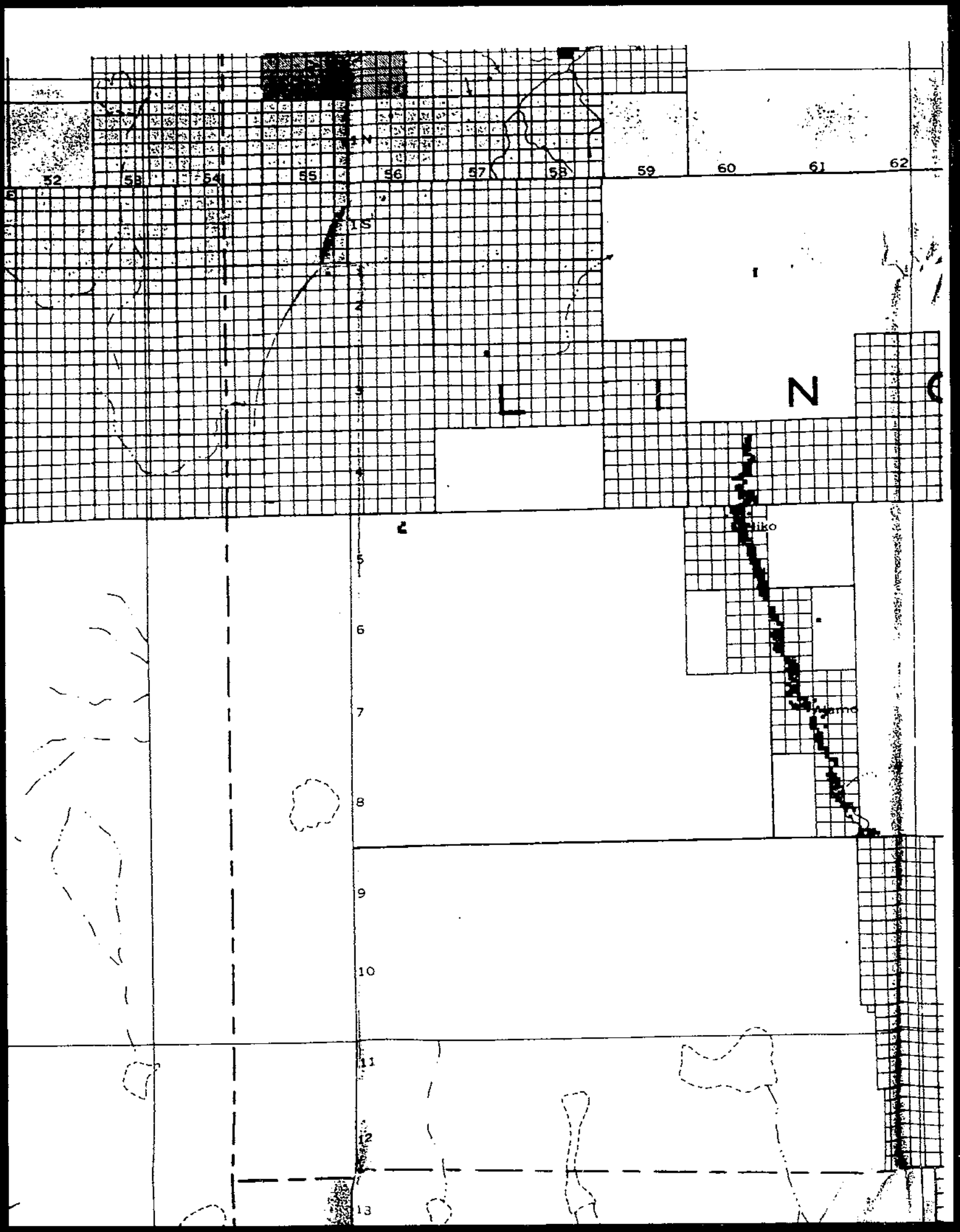
52
MT
DIABLO
BASE
LINE
A
FIELD
Hornsilver
Bonnie Clare
Pioneer
Beatty
Bullfrog
Carrara


52
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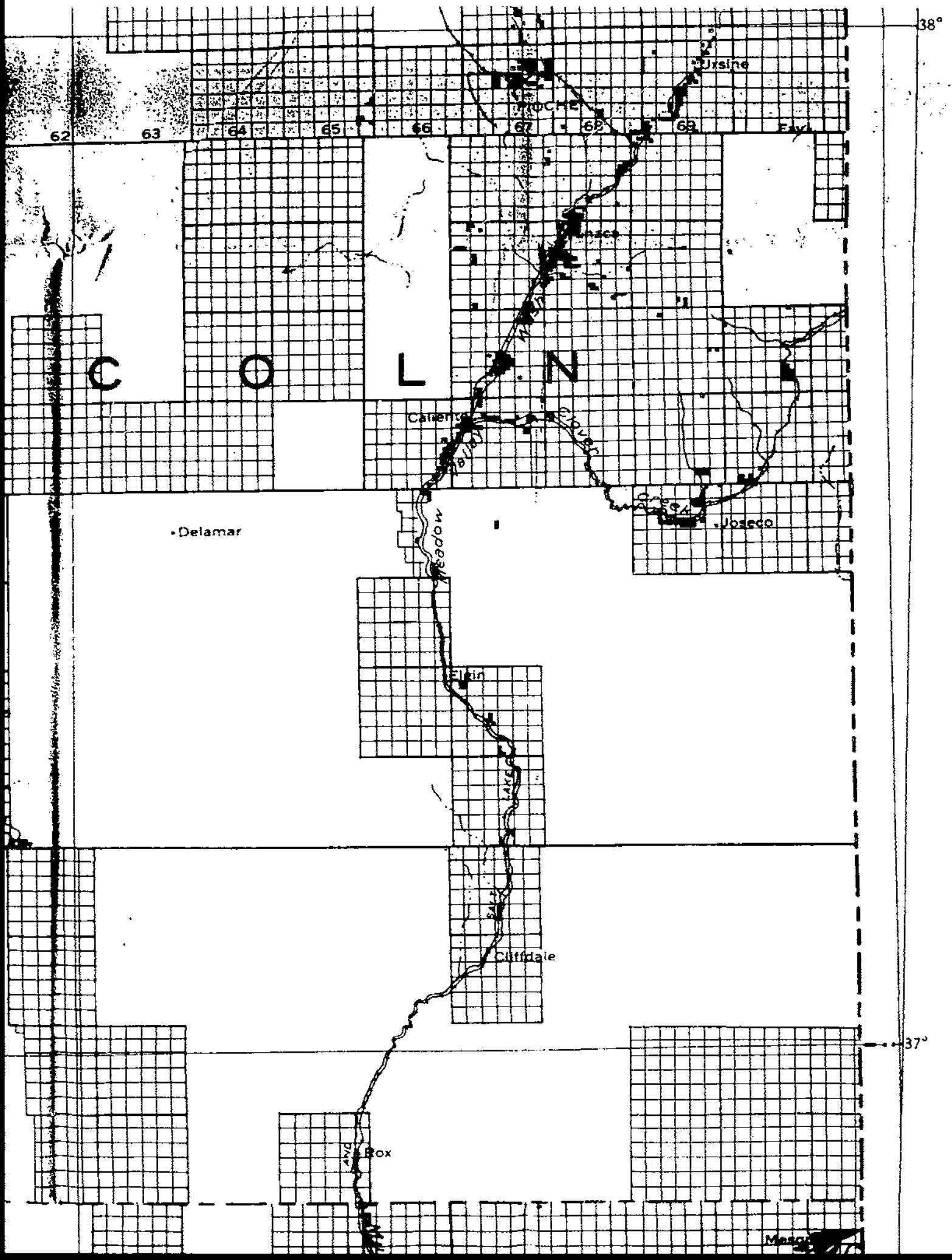
Ajamo


38°
Ursine
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63
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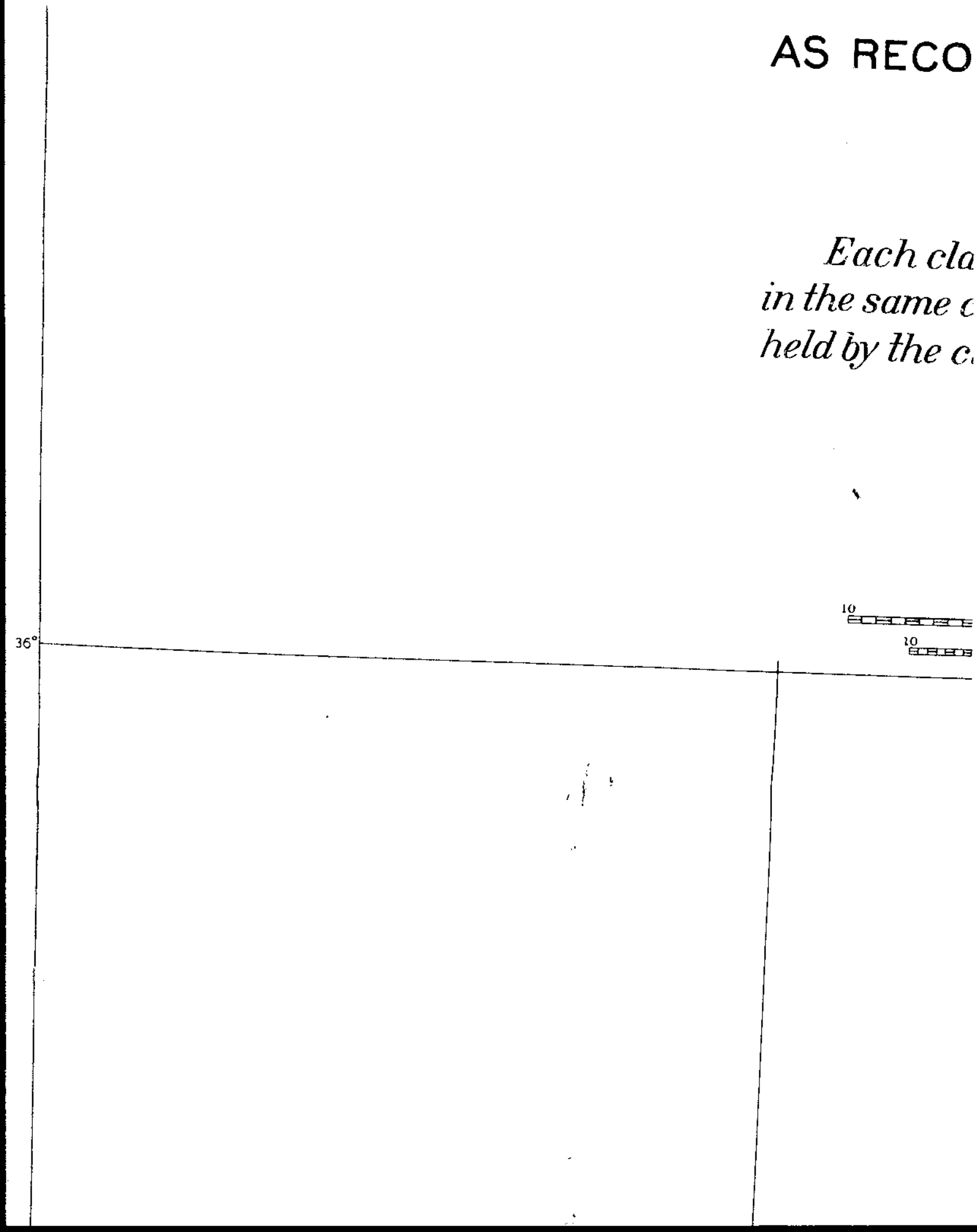
69
Eayt
C O L N
Delamar
Jbseco
Elgin
Cliffdale
37°
Box

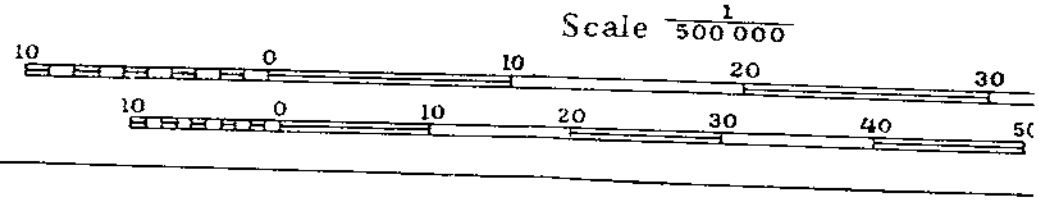
AS RECO

Each cla
in the same c
held by the c



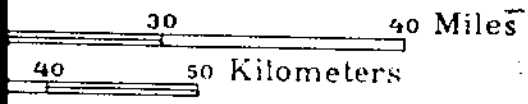
AS RECORDED IN THE STATE
OFFICE TO JULY, 192

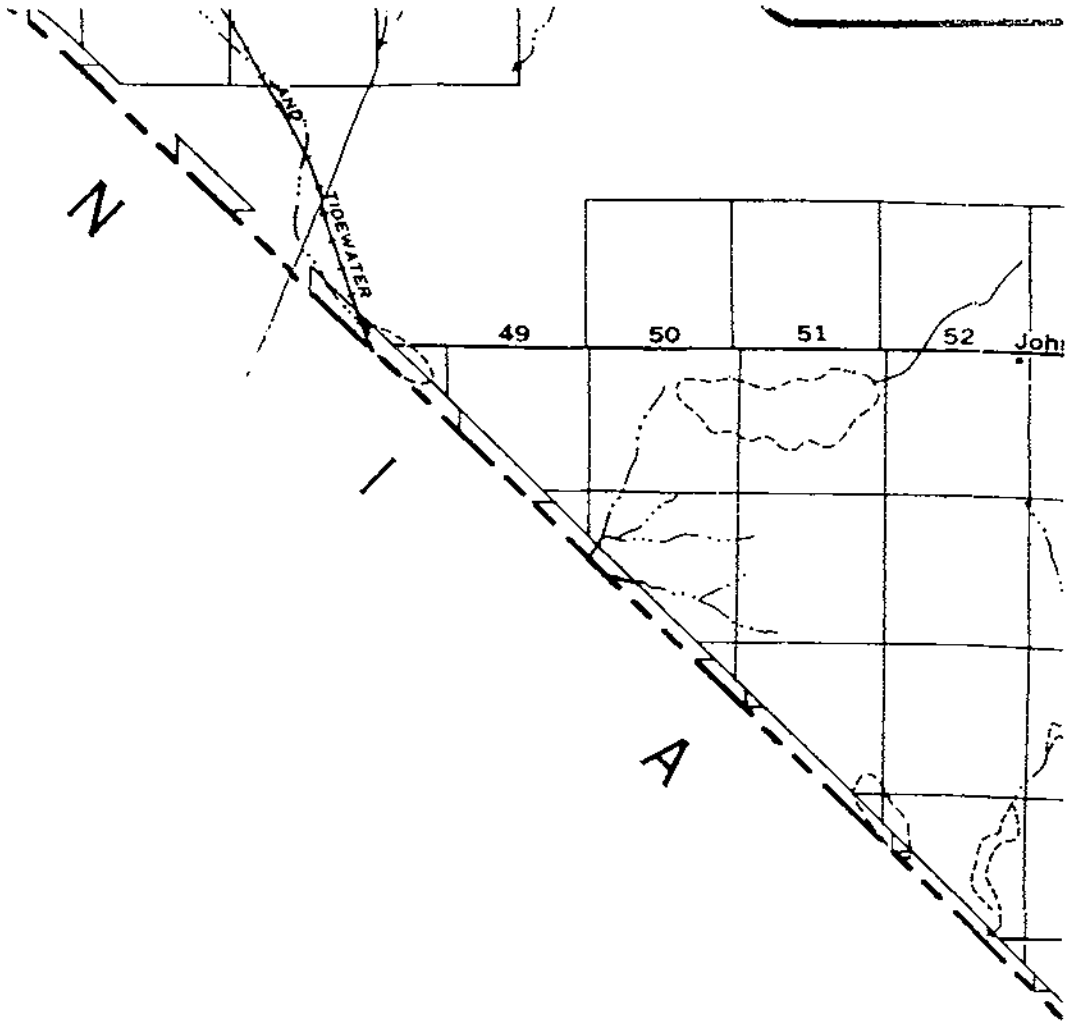
Each claim is bounded by a colored
in the same color, and the area of owned o
held by the claimant is shown in the same



ATE ENGINEERS
Y, 1929

lored line, numbered
yned or leased land
e same color.




TIDEWATER
49
50
51
52
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I
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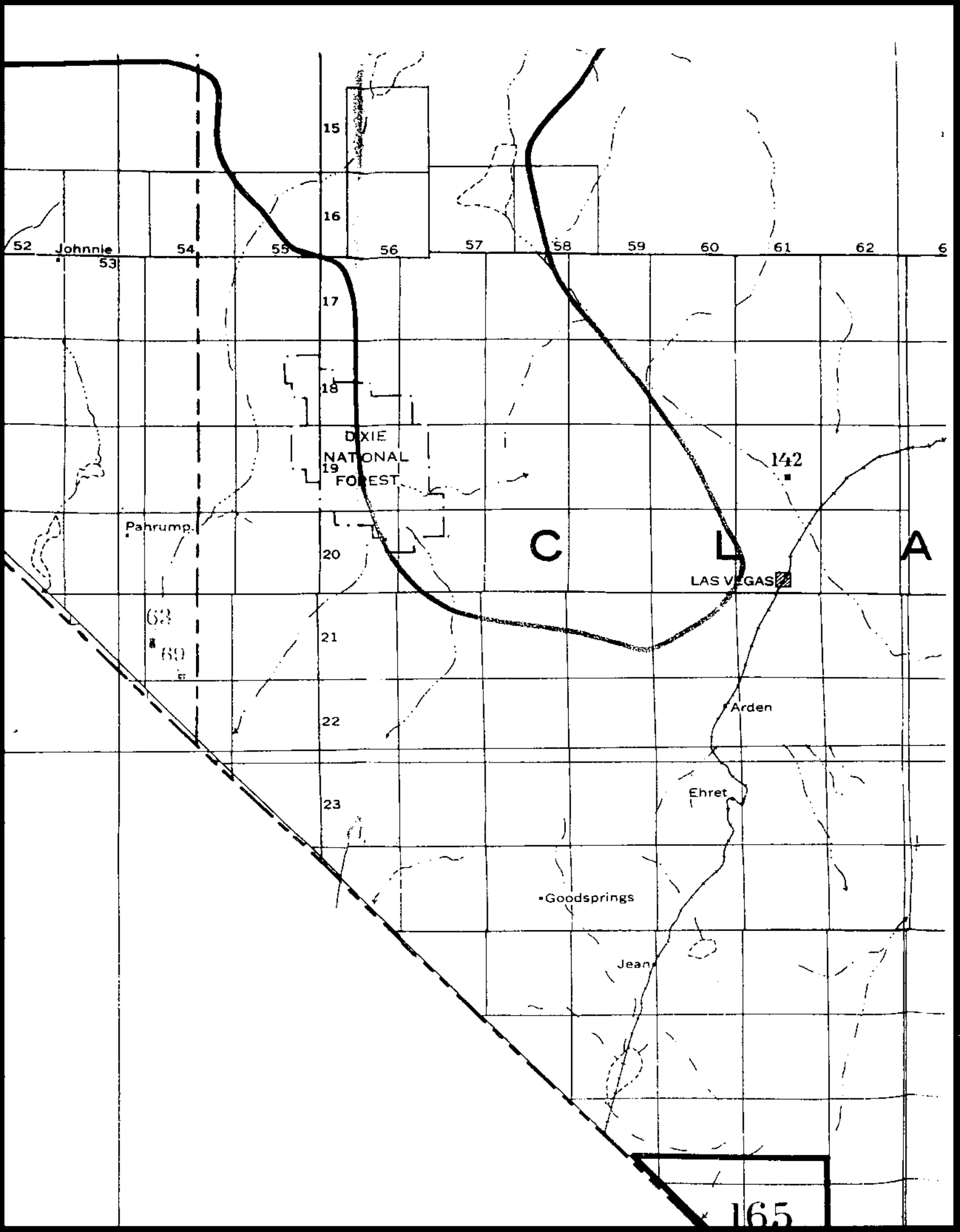
15
16
52
Johnnie
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54
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56
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59
60
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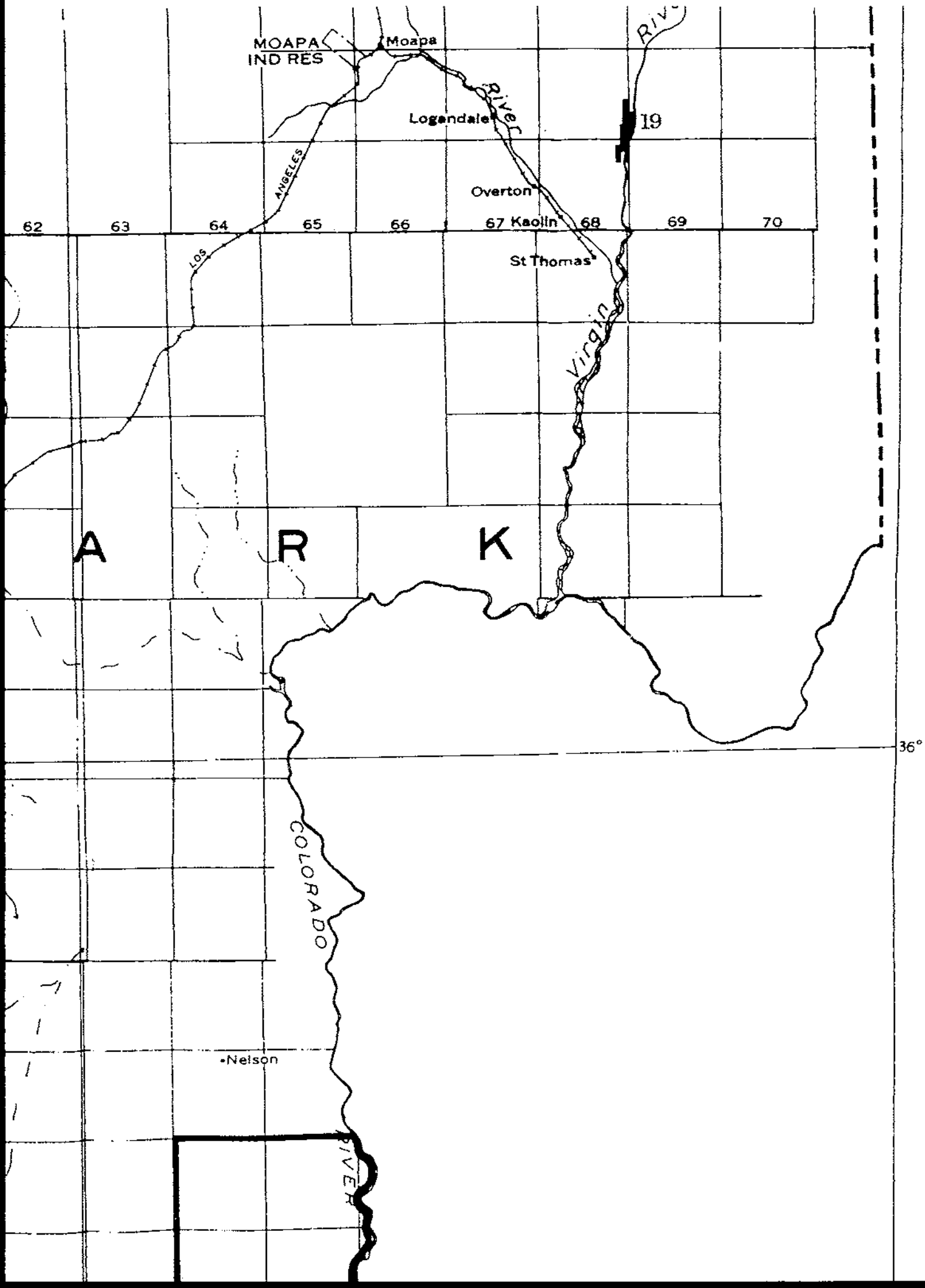
62
17
18
DIXIE
NATIONAL
19
FOREST
142
Pahrump
20
C
L
A
LAS VEGAS
63
89
21
Arden
22
Ehret
23
Goodsprings
Jean
165


MOAPA IND RES
Moapa
Logandale
Overton
St Thomas
Kaolin
River
ANGELES
LOS
Virgin
19
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70
A
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K
36°
COLORADO
Nelson
RIVER

37°

NEVAD

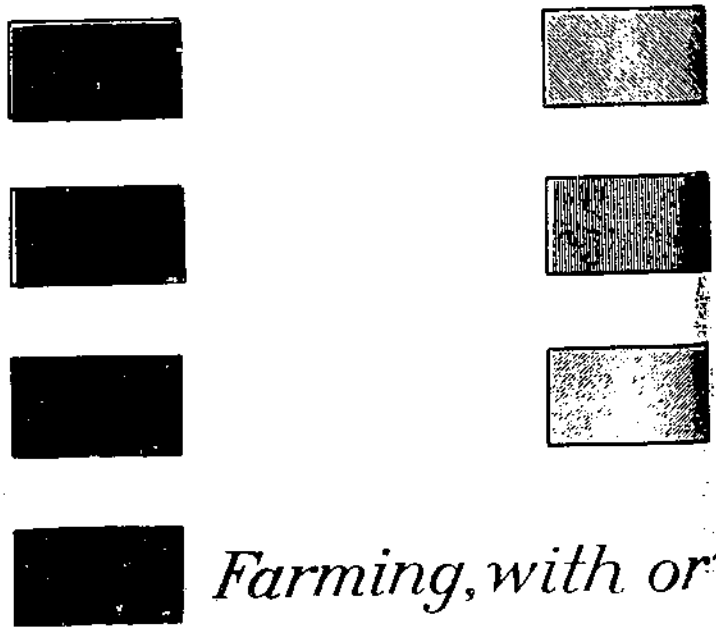
OWNED LAND

Farmi

Miscel

NEVADA LAND

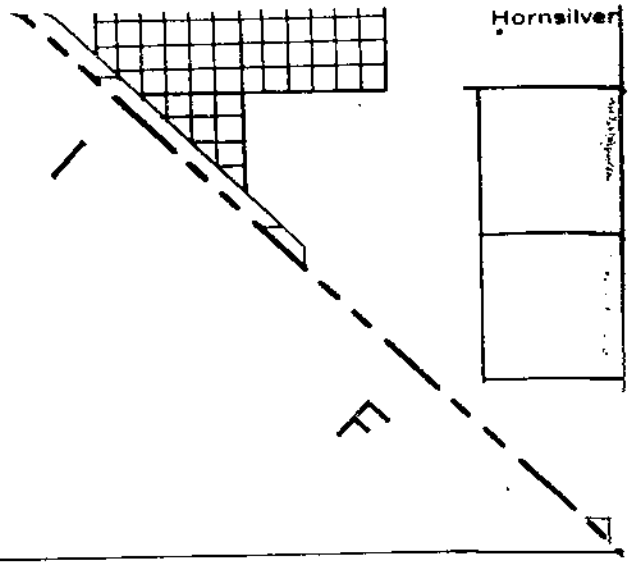
OWNED LAND LEASED LAND



Farming, with or without a fe

Miscellaneous, not used by ow
bad debts, minera

(THIS AREA SOMEWHAT L



D TENURE

D LAND USE

Cattle raising

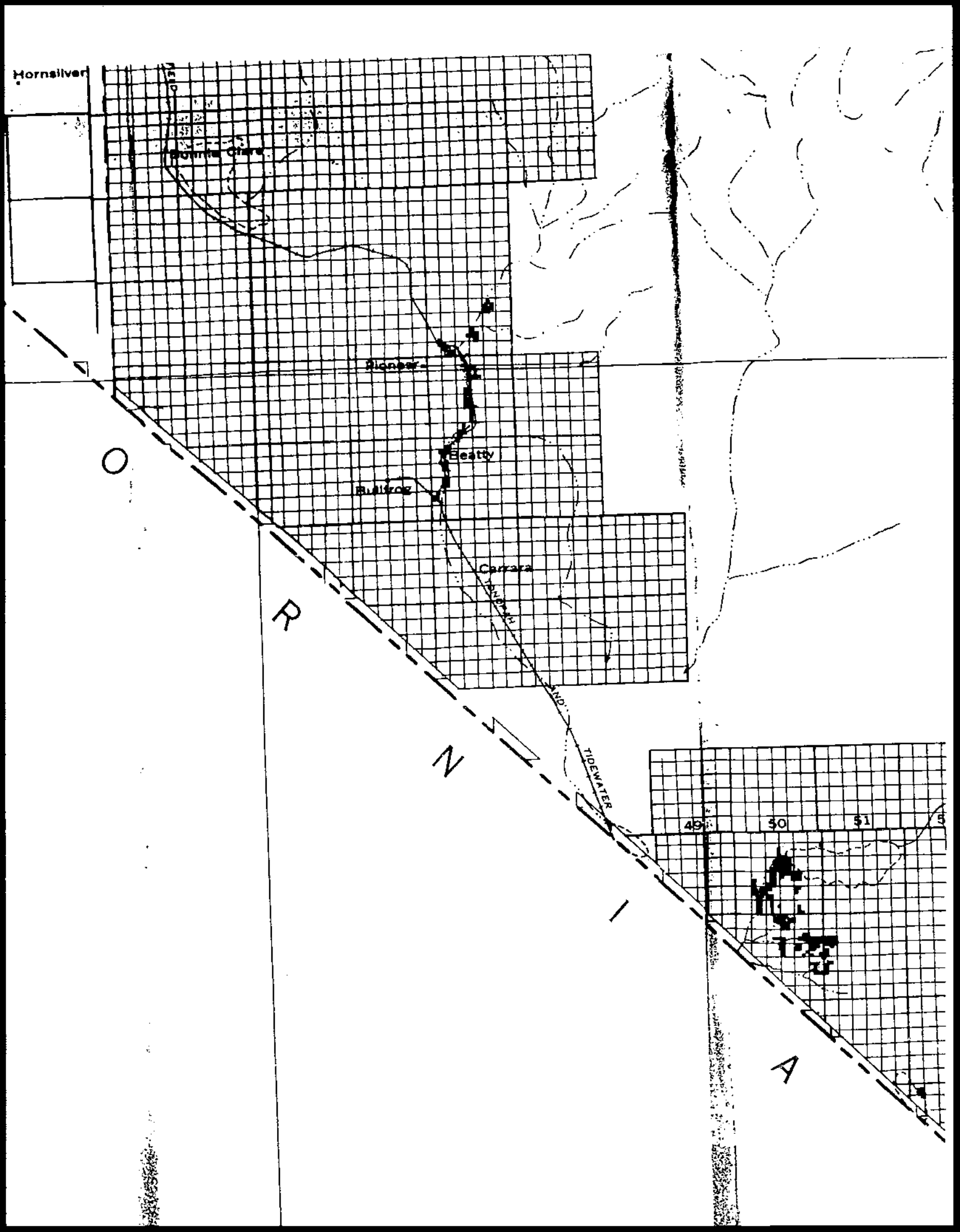
Sheep raising

Cattle and sheep raising

t a few range animals

by owners, speculatively held,
neral claims, etc.

EWHAT EXAGGERATED)


Hornsilver
Belle Clare
Pioneer
Beatty
Bullfrog
Carrara
TONOPAH
AND
TIDEWATER
49
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51
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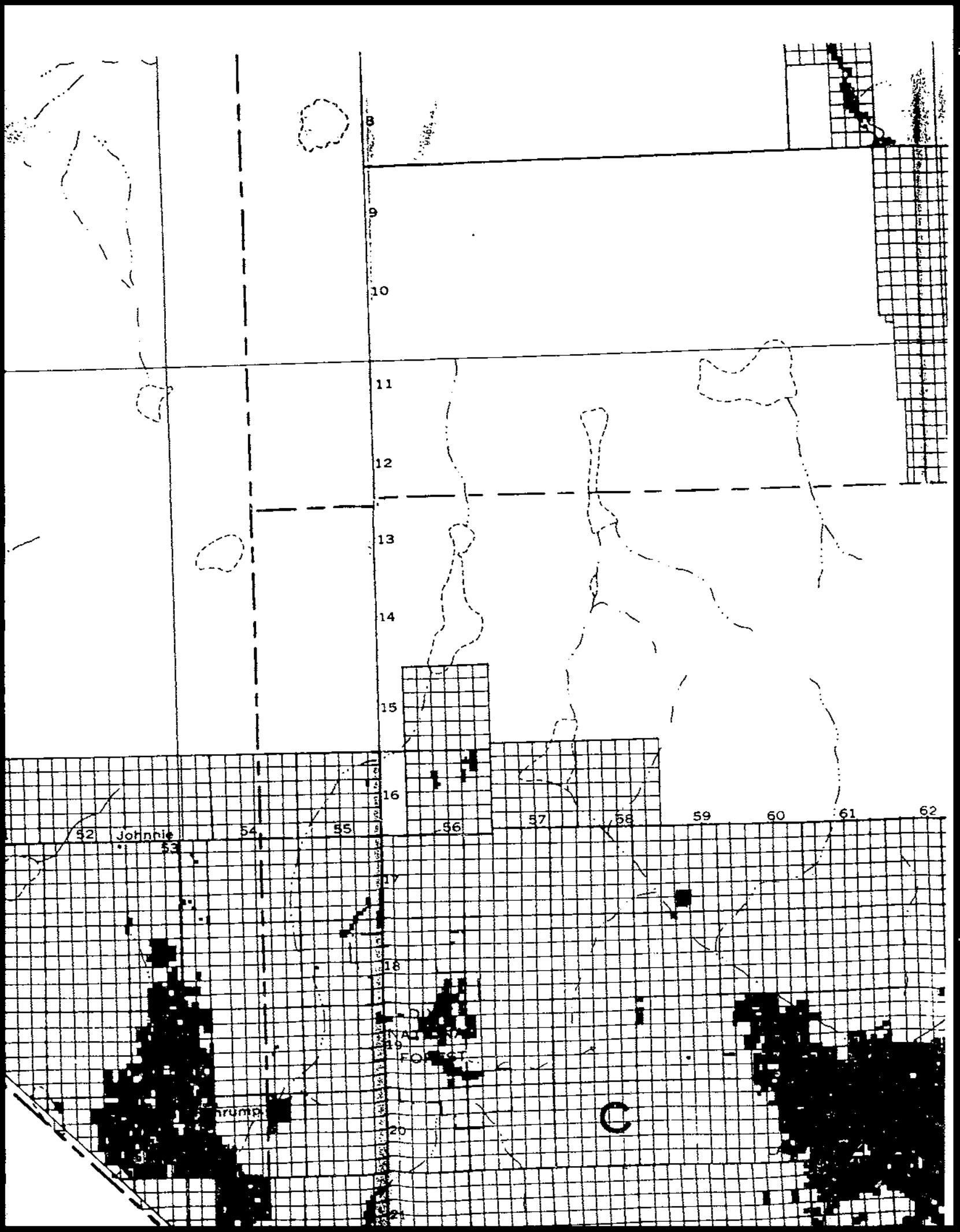
8
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Johnnie
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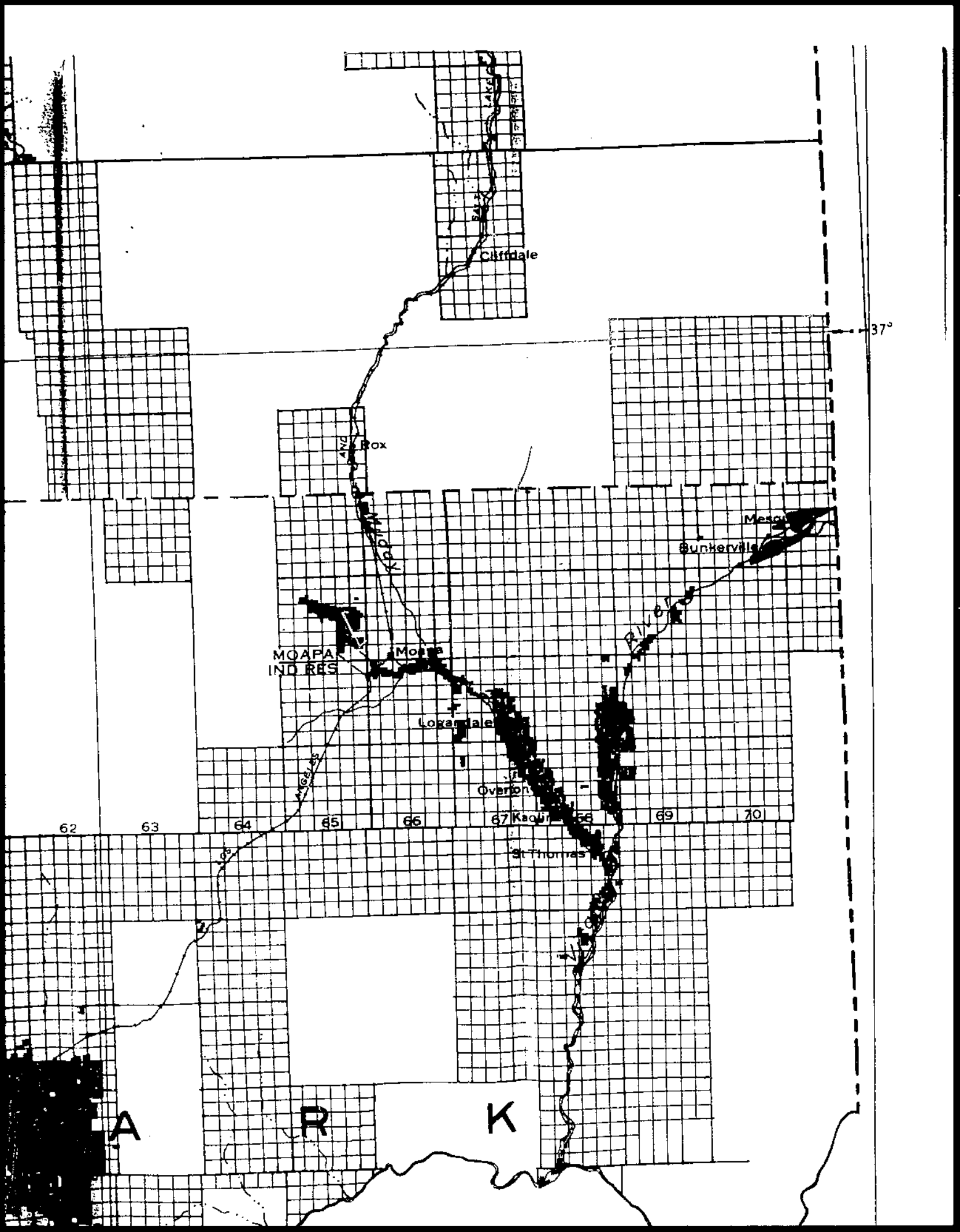
C


Cliffdale
37°
Rox
Bunkerville
MOAPA
IND RES
Logandale
Overton
St Thomas
62
63
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A
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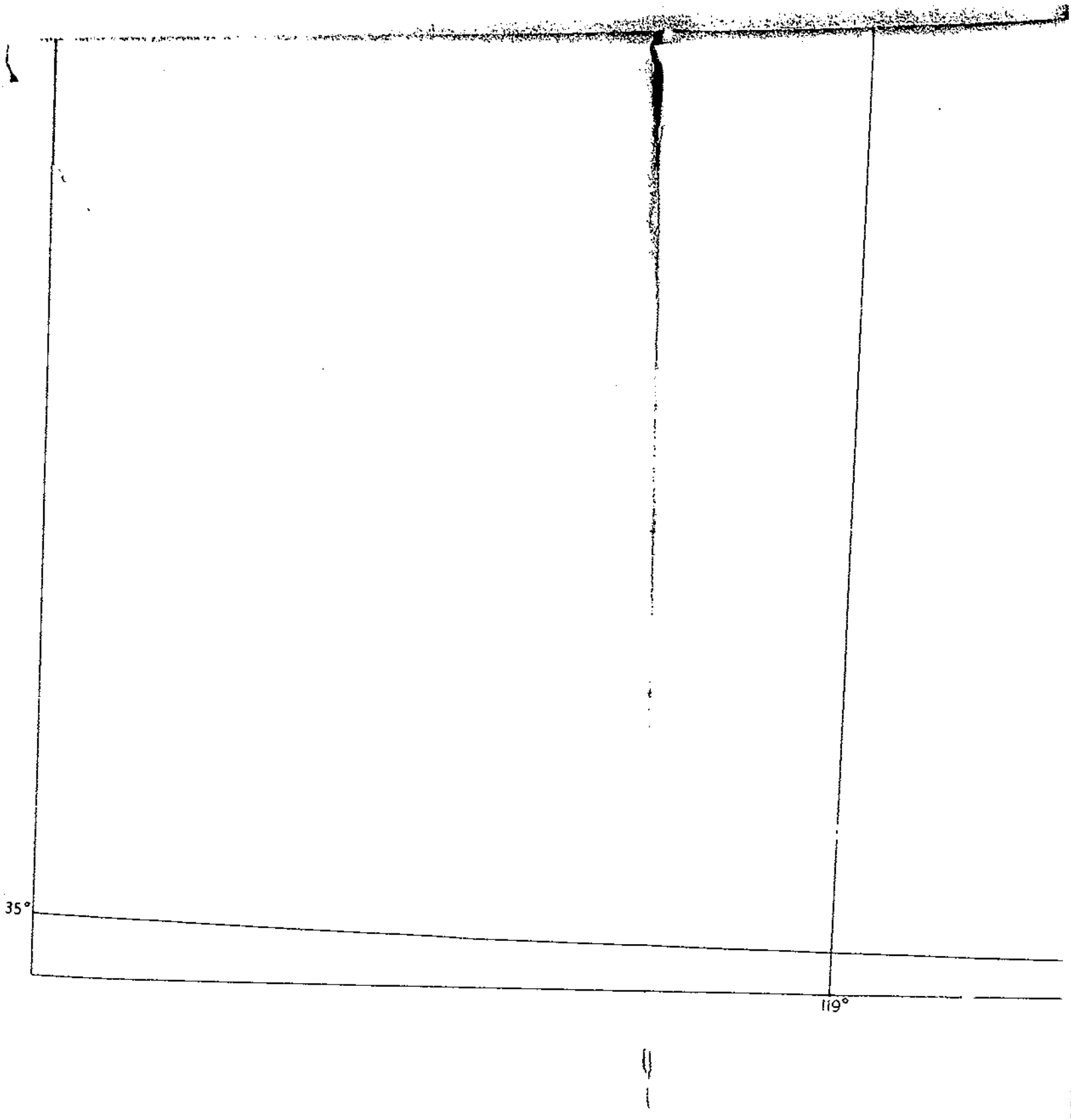
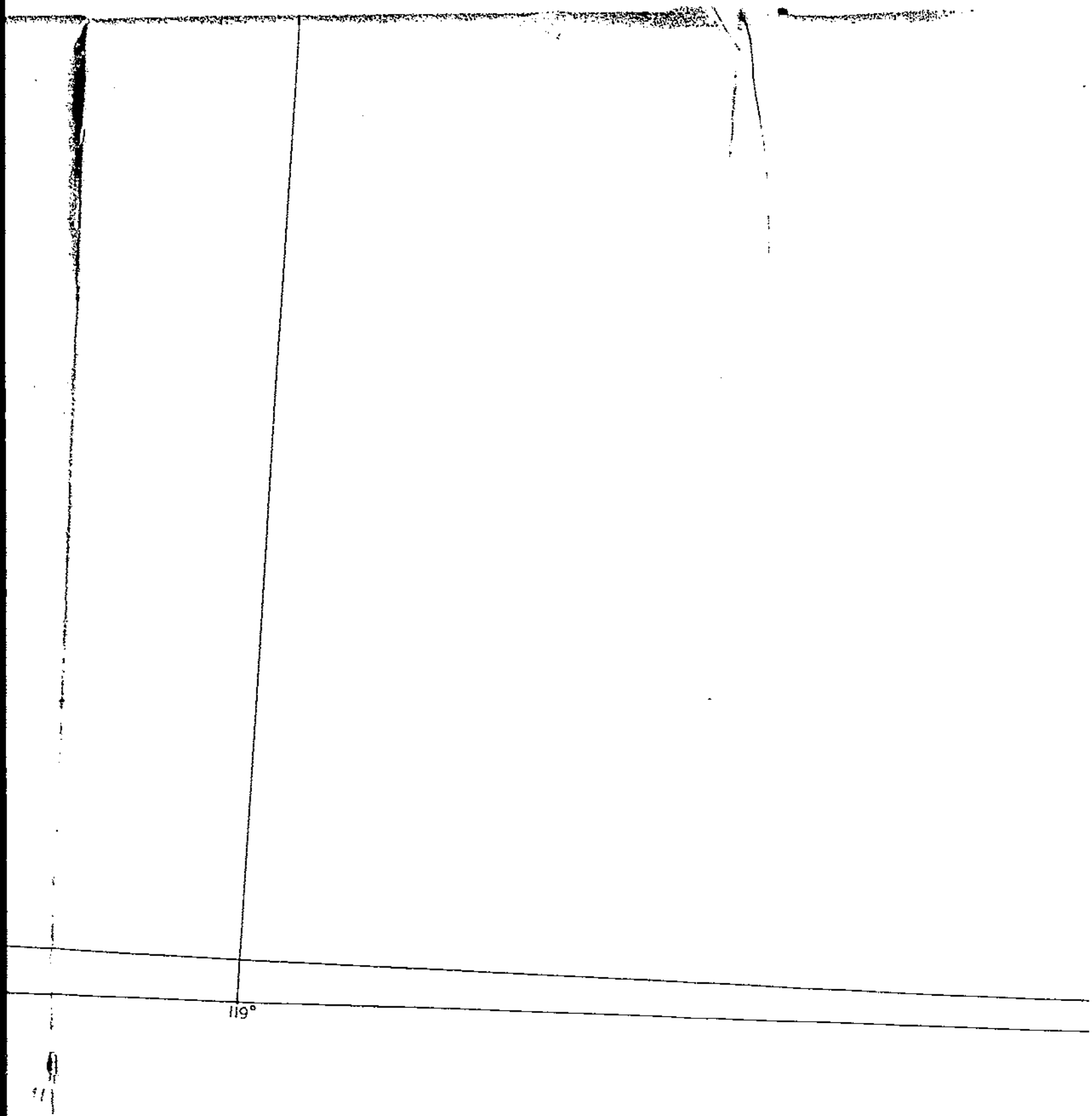
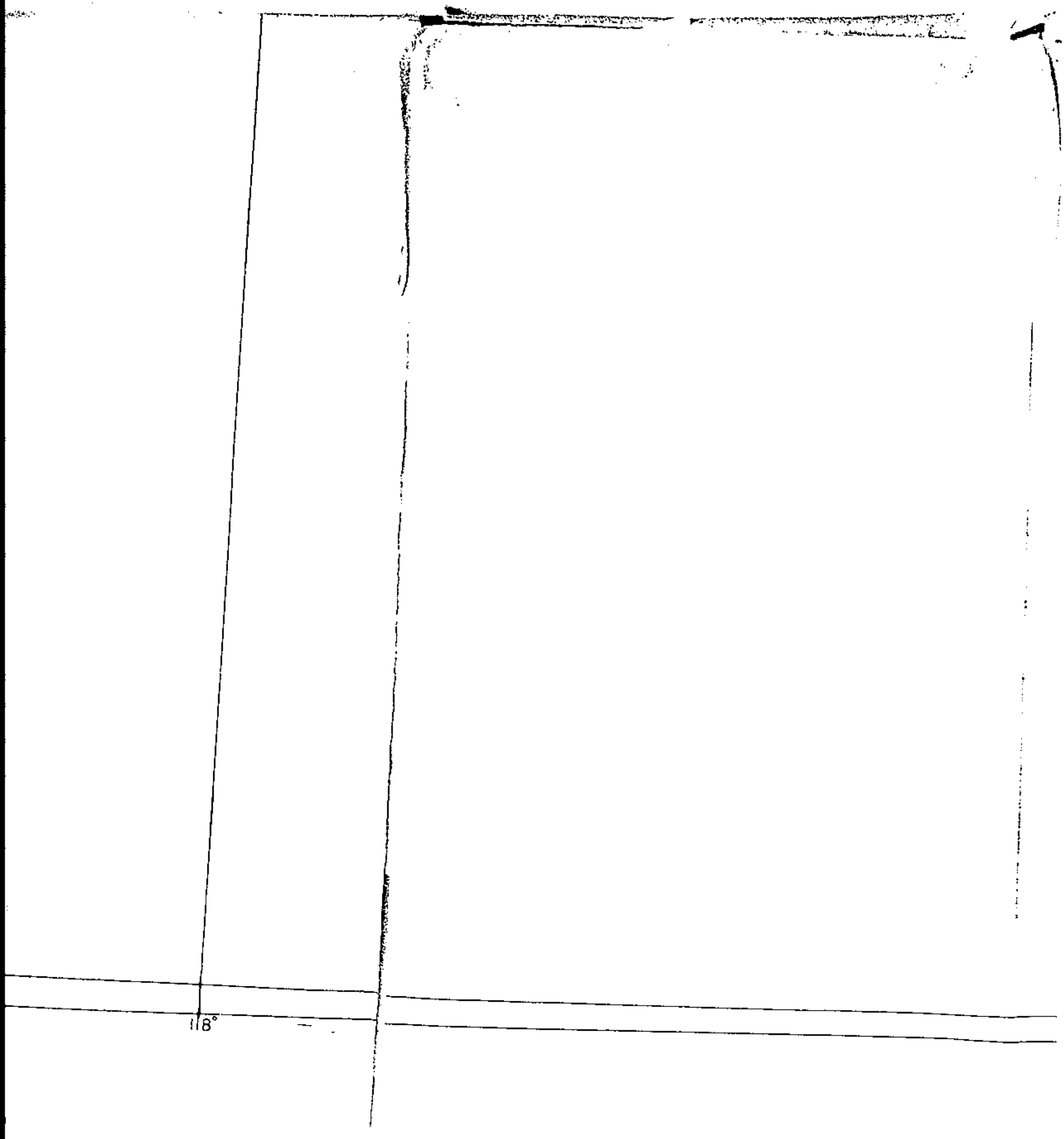
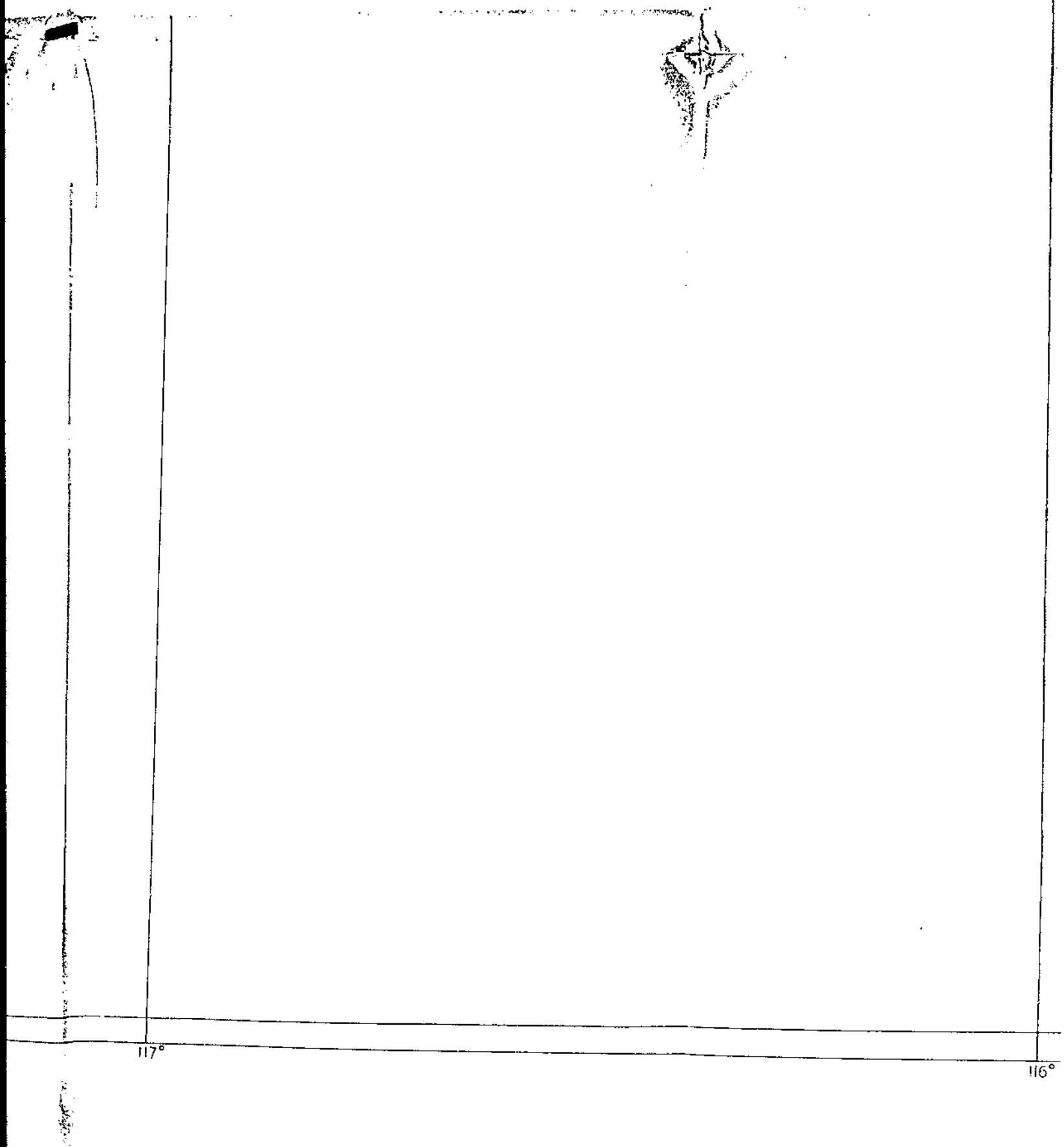
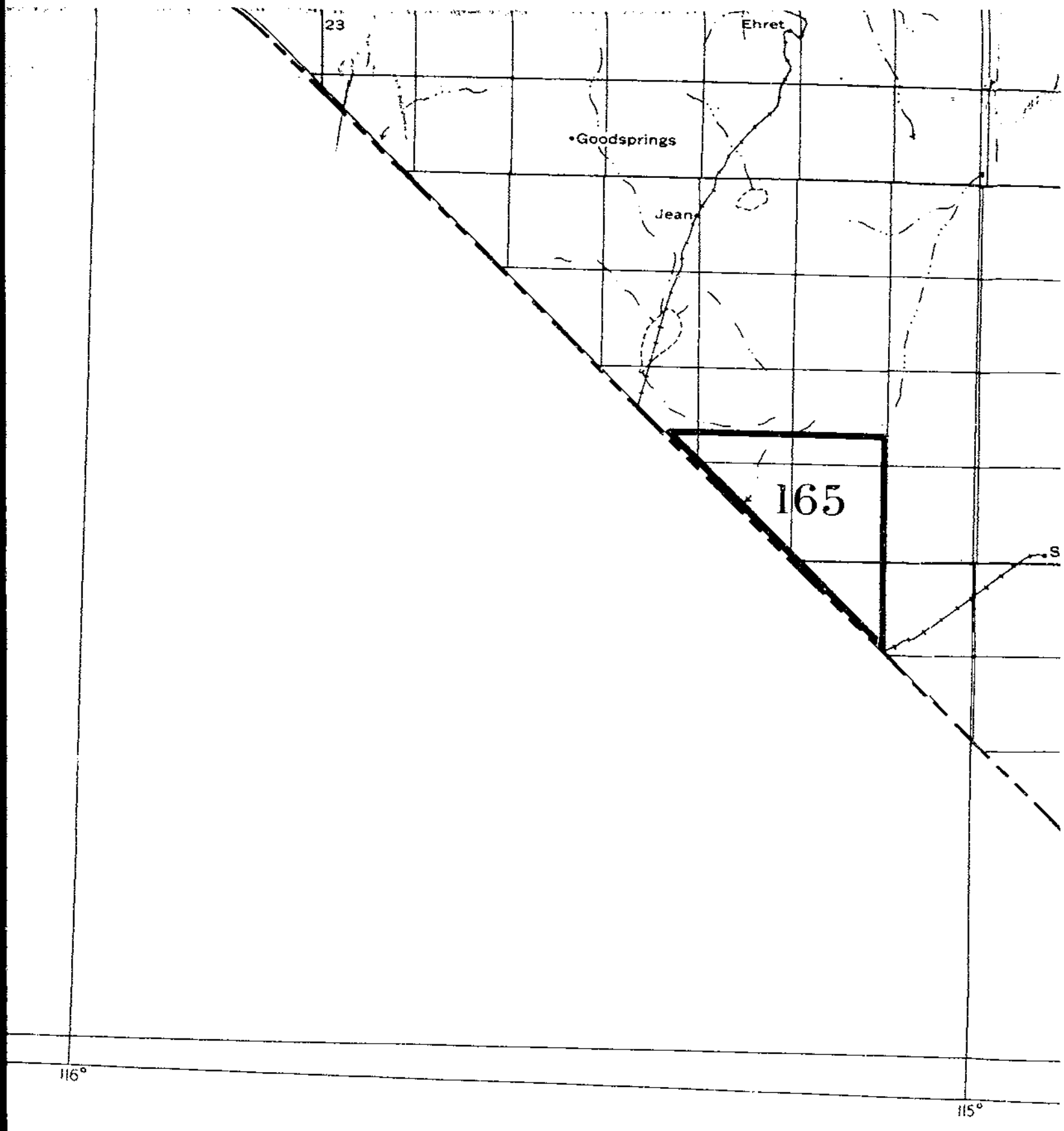
K

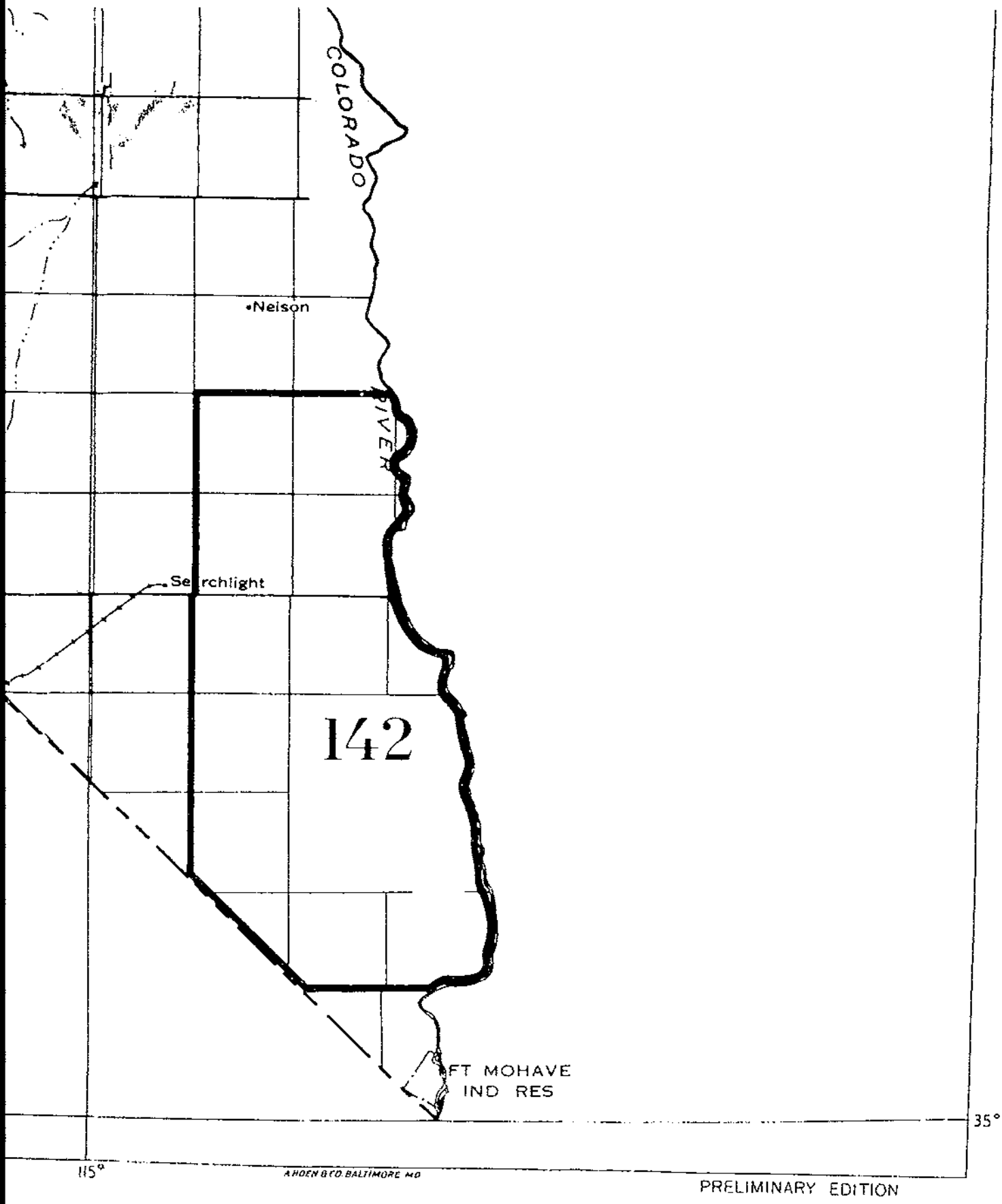

35°
119°


119°

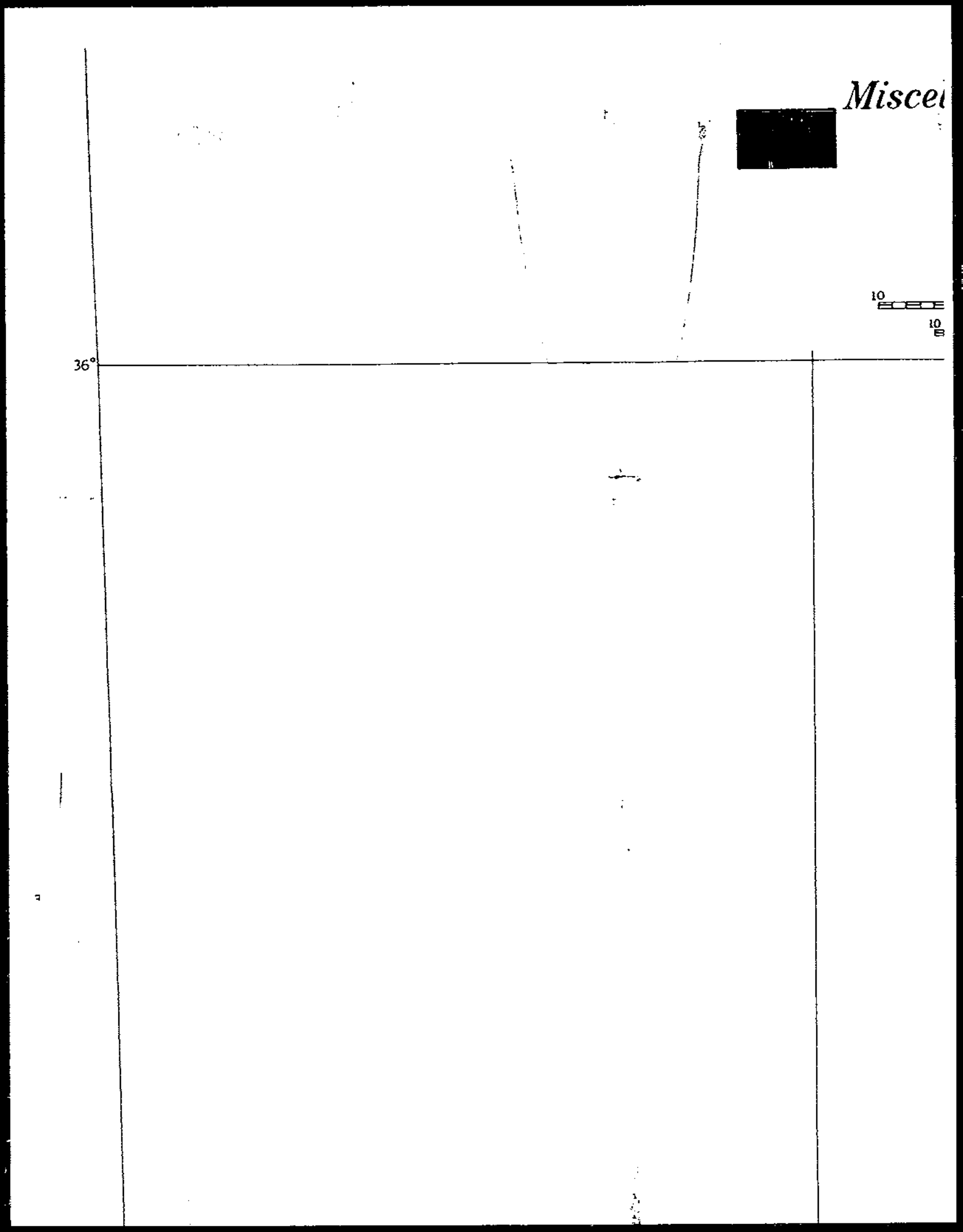

118°


117°
116°


23
Ehret
•Goodsprings
Jean
165
S
116°
115°



PRELIMINARY EDITION


Miscel
10
10
36°

Miscellaneous, not used by owners,
bad debts, mineral clai

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Scale $\frac{1}{500\,000}$

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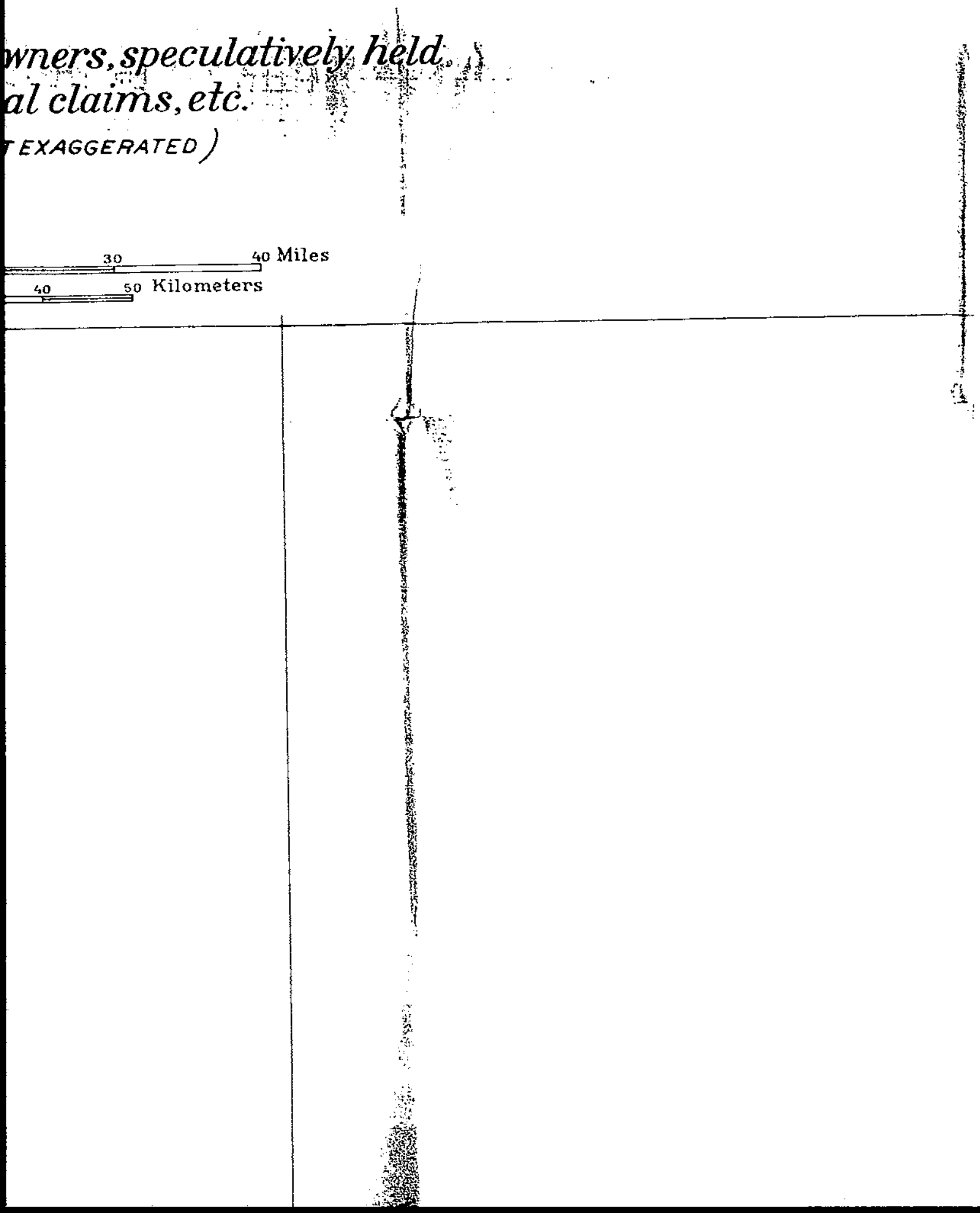
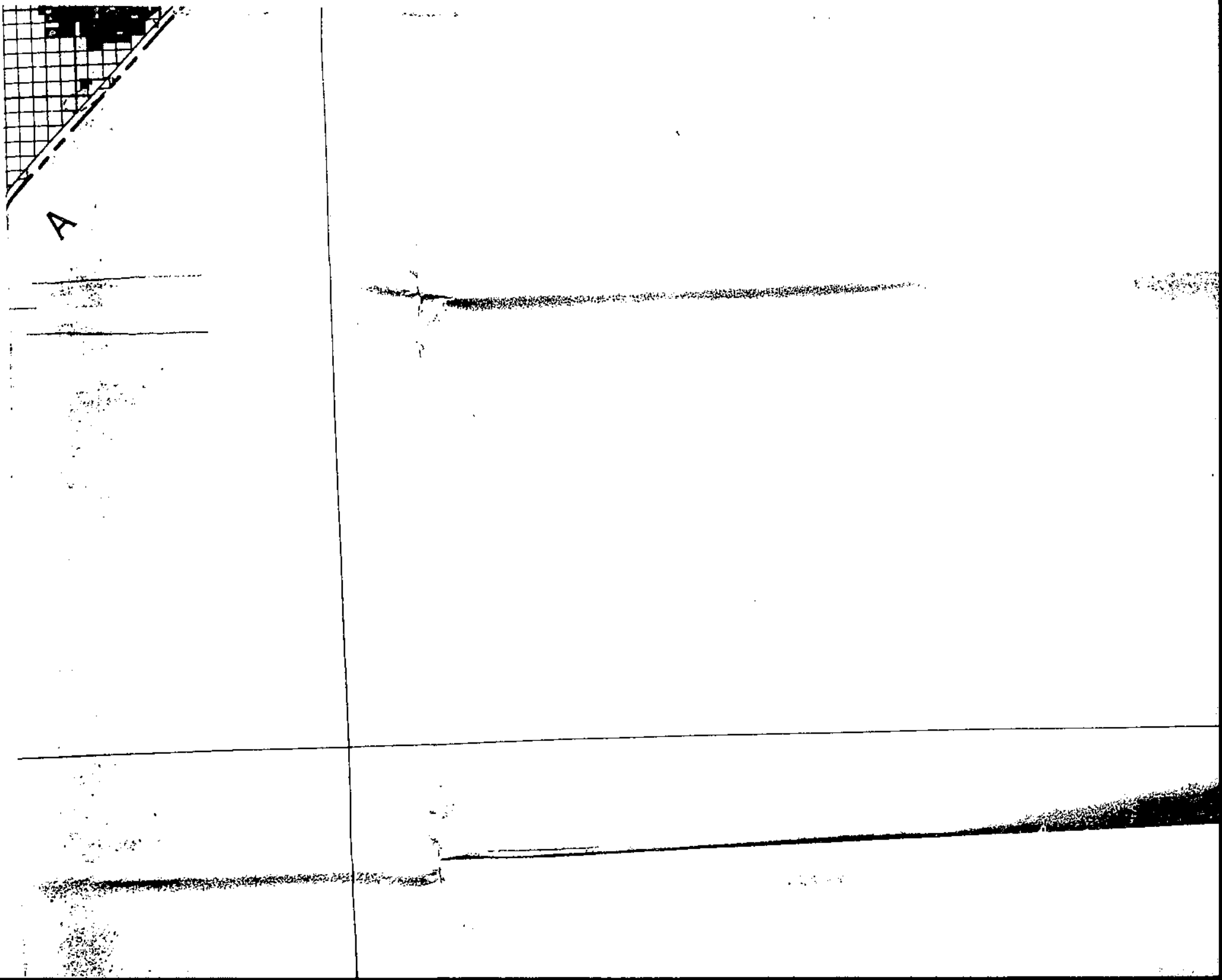
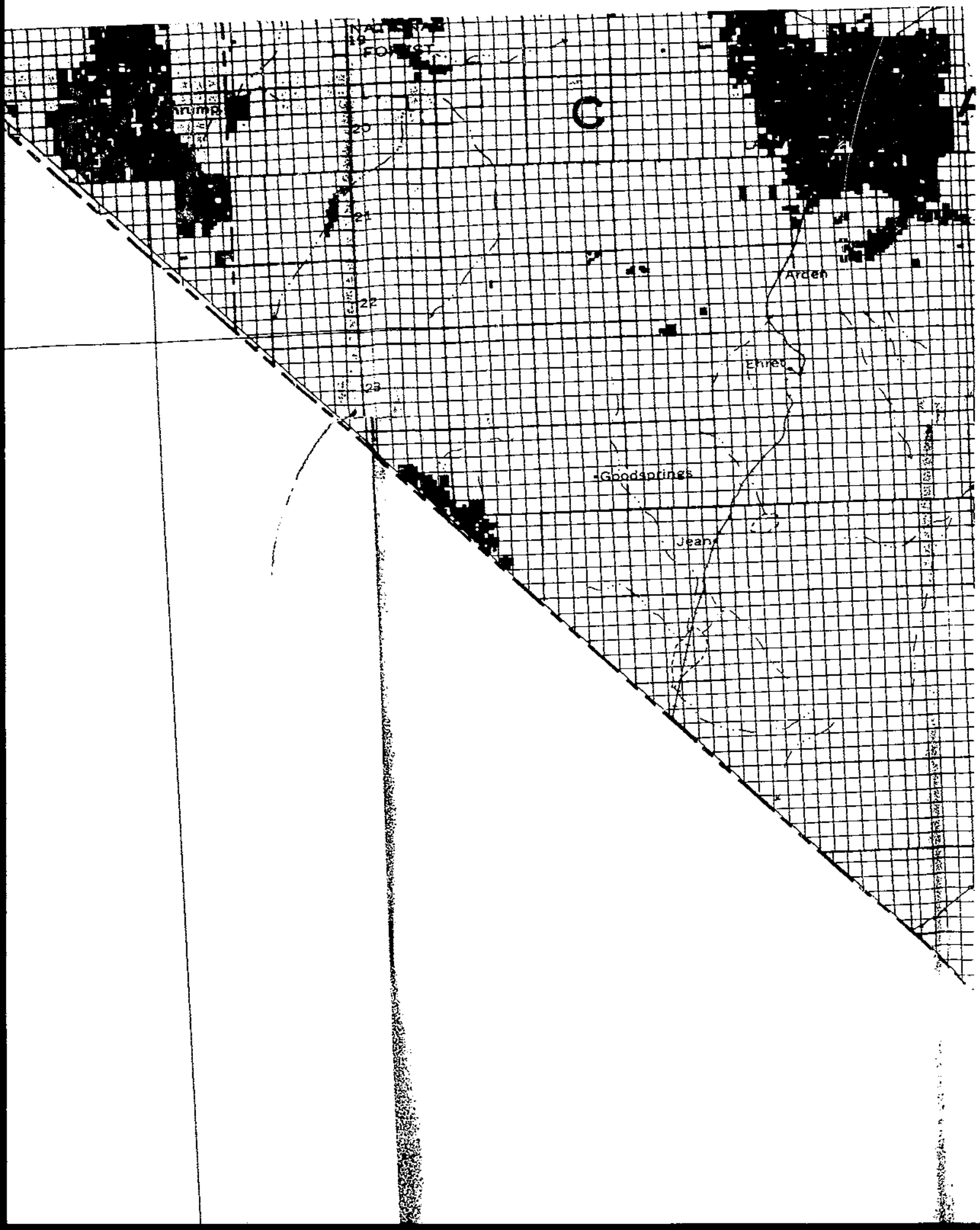
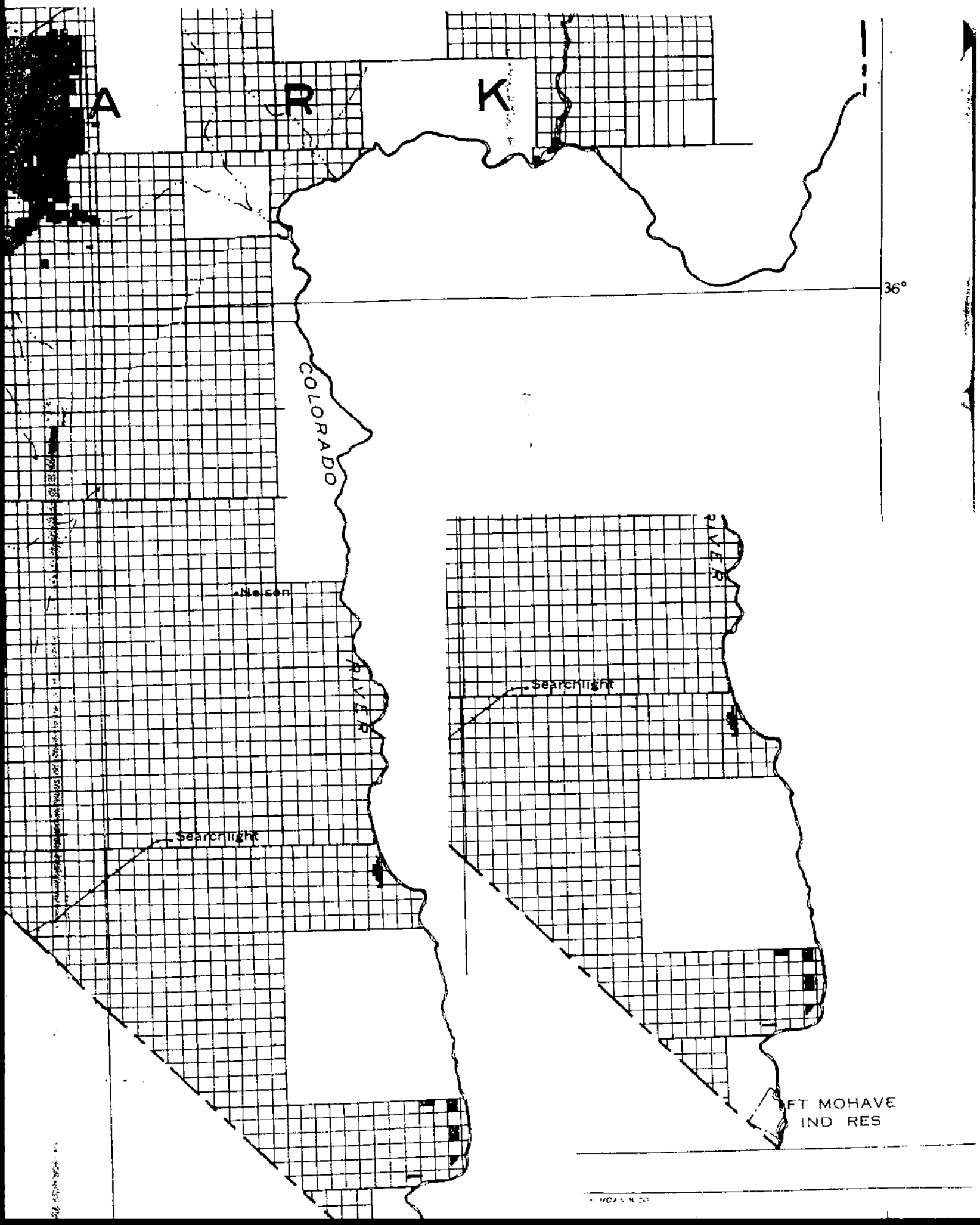

wners, speculatively held
al claims, etc.
T EXAGGERATED)
30
40 Miles
40
50 Kilometers


A


C
Arden
Ehret
Goodsprings
Jean


A
R
K
36°
COLORADO
Nelson
Searchlight
Searchlight
FT MOHAVE
IND RES

END