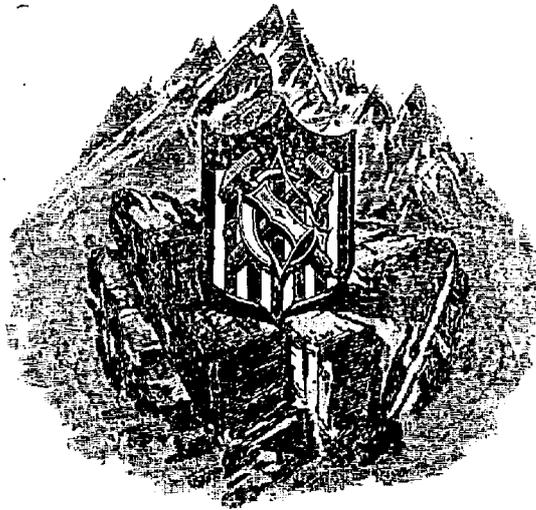


DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

FOREST CONDITIONS
IN THE
LINCOLN FOREST RESERVE, NEW MEXICO

BY

FRED. G. PLUMMER AND M. G. GOWSELL



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WASHINGTON
GOVERNMENT PRINTING OFFICE
1904

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LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
Washington, D. C., March 8, 1904.

SIR: I transmit herewith for publication in the series of Professional Papers a report on forest conditions in the Lincoln Forest Reserve, in New Mexico, prepared by Messrs. Fred. G. Plummer and M. G. Gowsell.

Very respectfully,

HENRY GANNETT,
Geographer.

HON. CHARLES D. WALCOTT,
Director United States Geological Survey.

FOREST CONDITIONS IN THE LINCOLN FOREST RESERVE, N. MEX.

By FRED. G. PLUMMER and M. G. GOWSELL.

BOUNDARIES.

The Lincoln Forest Reserve, New Mexico, was created by proclamation of the President dated July 26, 1902, the description of the included area being given by townships and subdivisions as follows:

“Township seven (7) south, ranges eleven (11) and twelve (12) east, New Mexico principal meridian, New Mexico; sections thirteen (13) to thirty-six (36), both inclusive, township seven (7) south, range thirteen (13) east; township seven (7) south, ranges fourteen (14) and fifteen (15) east; sections thirteen (13) to thirty-six (36), both inclusive, township seven (7) south, ranges sixteen (16) and seventeen (17) east; township eight (8) south, ranges eleven (11) and twelve (12) east; sections one (1) to ten (10), both inclusive, and fifteen (15) to eighteen (18) both inclusive, township eight (8) south, range thirteen (13) east; sections one (1) to twenty (20), both inclusive, and the north half of sections twenty-nine (29) and thirty (30), township eight (8) south, range fourteen (14) east; township eight (8) south, ranges fifteen (15), sixteen (16), and seventeen (17) east; township nine (9) south, ranges ten (10), eleven (11), and twelve (12) east; township nine (9) south, range seventeen (17) east; township ten (10) south, ranges nine (9), ten (10), eleven (11), and twelve (12) east; sections seventeen (17) to twenty (20), both inclusive, and twenty-nine (29) to thirty-two (32), both inclusive, township ten (10) south, range thirteen (13) east; township eleven (11) south, range nine and one-half ($9\frac{1}{2}$) east; all of township eleven (11) south, range ten (10) east, which is not included in the Mescalero Apache Indian Reservation; sections five (5) to eight (8), both inclusive, sections seventeen (17) to twenty (20), both inclusive, and sections twenty-nine (29) to thirty-two (32), both inclusive, township eleven (11) south, range thirteen (13) east; township twelve (12) south, range ten (10) east; township thirteen (13) south, ranges ten (10) and eleven (11) east.”

Petitions and recommendations for additions to this forest reserve cover the following areas: Portion of township 8 south, range 13 east; township 8 south, range 18 east; township 9 south, range 13 east; township 9 south, range 18 east; portion of township 10 south, range 13 east; township 10 south, range 14 east; township 10 south, range 15 east; portion of township 11 south, range 10 east;

township 11 south, range 11 east; portion of township 11 south, range 13 east; township 11 south, range 14 east; township 11 south, range 15 east; township 12 south, range 11 east; township 12 south, range 12 east.

All the areas above mentioned are described in this report and are shown on Pl. I (in pocket).

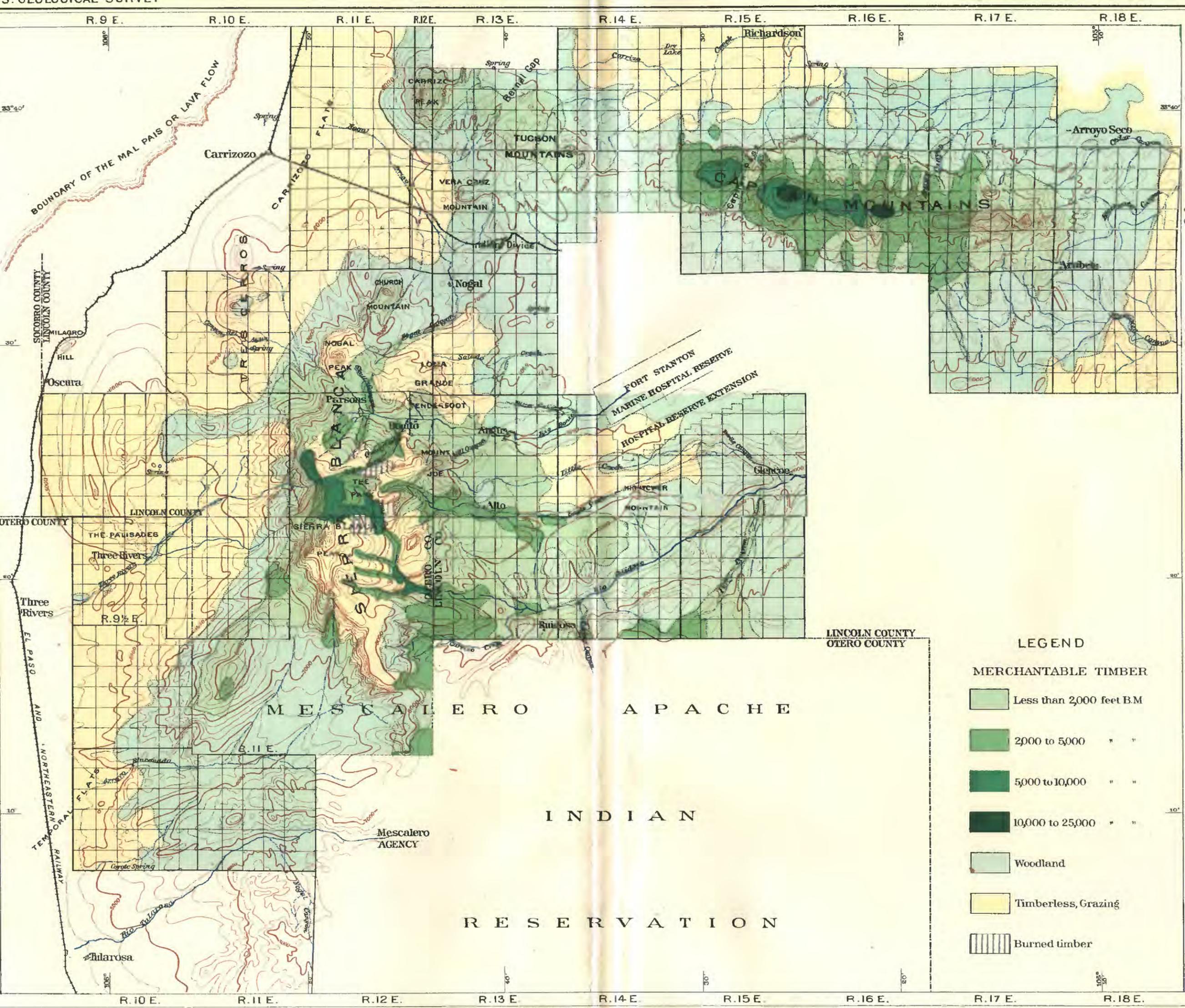
GENERAL DESCRIPTION.

In southern New Mexico, between the Rio Grande del Norte and the Rio Pecos, is an elevated region 140 miles wide, from the center of which rises an irregular mass of mountains whose summits and higher slopes are covered with timber, and whose lower declivities and spurs support a scattering woodland. Deciduous trees follow, or attempt to follow, for short distances, the water courses which radiate from these summits. There are four well-defined ranges—Sacramento Mountains, Sierra Blanca or White Mountains, Capitan Mountains, and Jicarilla Mountains. In the most southerly of these, the Sacramento Mountains, little of the land is owned by the Government, and the timber is being logged and marketed at Alamogordo, a station on the El Paso and Northeastern Railway 14 miles south of Tularosa. The southern portion of the Sierra Blanca is included within the present boundaries of the Mescalero Apache Indian Reservation. The remaining portions of these mountainous areas which are timbered, wooded, or important parts of watersheds are included in or are adjacent to the Lincoln Forest Reserve.

East of these mountains the surface slopes steadily to the Rio Pecos, but toward the west the slope is interrupted by the San Andreas Range and is not therefore directly tributary to the Rio Grande del Norte. The depression between the San Andreas Range and the area under consideration is arid and has no permanent surface drainage, the few small streams and springs immediately sinking into the earth. The Malpais, an ancient flood of lava which flowed from two craters, followed the central trough of the depression southward a distance of 40 miles to a point near the border of an ancient salt lake. This is a dry, unpromising region, without water or prospect of water for irrigation.

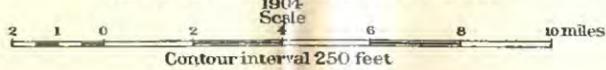
The general elevation of the region adjacent to the mountain ranges is 5,000 feet above the sea. The highest summit is Sierra Blanca Peak, which is in the northwest portion of the Mescalero Apache Indian Reservation, and which reaches an altitude of 11,882 feet. The axis of the range of the same name trends north and south from this summit. The Capitan Mountains bear east and west at right angles to the Sierra Blanca. Three low passes cut the mountains, but in other places the high relief is continuous.

Upon the higher slopes of the mountains are numerous small perpetual streams, varying in length according to the protection afforded by forest or woodland. Some of these unite to form "rivers," a term here applied to such



LINCOLN FOREST RESERVE, NEW MEXICO

SHOWING LAND CLASSIFICATION AND STAND OF MERCHANTABLE TIMBER
 BY FRED. G. PLUMMER AND M. G. GOWSELL



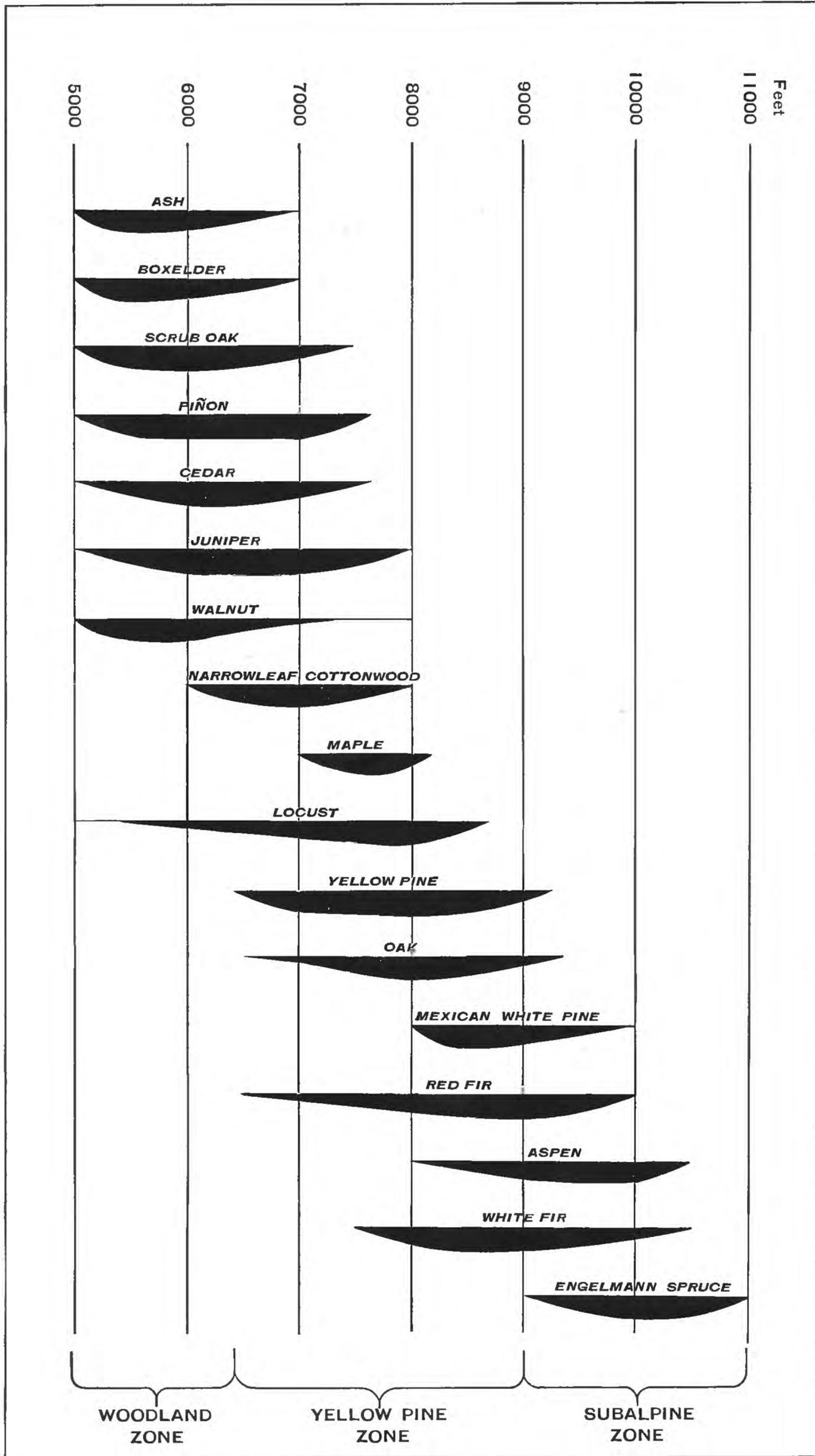


DIAGRAM SHOWING RANGE AND DEVELOPMENT OF TREE SPECIES.

of the watercourses as can advance a few miles desertward. These are mentioned more particularly under the heading "Irrigation" (pp. 16-18).

The El Paso and Northeastern Railway runs near the western boundary of the reserve. From Carrizozo a branch line crosses the mountains by Indian Pass and handles the output of the coal mines at Capitan. Wagon roads run everywhere over the flats, plains, and mesas, and the mountainous regions are accessible by numerous trails.

The forests are of a type common to the mountains of the Southwest—open and often scattered with light underbrush, almost lacking in humus except on some of the broad summits. Inasmuch as better lumber can be imported to the markets bordering this region, and as good water is the scarcest of commodities, these forests have their greatest value as water conservers.

FOREST ZONES.

For convenience, the areas in which timber and woodland growths are found may be divided into zones determined by altitudes, although these should not be considered as being clearly defined over the entire region examined. The ranges of the species vary greatly according to soil, moisture, and exposure, and only after a careful tabulation of all the data was the classification made. The custom of botanists and the precedent of former reports of this Survey on forest reserves make this method desirable, as it enables the relatively small and isolated forests under consideration to be compared with the forests in other regions.

The subalpine zone is found between altitudes of 9,000 and 11,000 feet. The principal tree is Engelmann spruce, with subordinate amounts of white fir, red fir, Mexican white pine, and aspen, generally in groves.

The yellow-pine zone ranges from 6,400 to 9,000 feet. The principal tree is yellow pine, with red fir, white fir, Mexican white pine, and oak. Along the streams and canyons are locust, maple, cottonwood, and other deciduous species overlapping from the woodland zone.

The woodland zone occurs between altitudes of 5,000 to 6,400 feet. The species composing it are piñon, juniper, cedar, scrub oak, and along streams ash, box elder, and walnut.

On the diagram, Pl. II, are shown the altitudinal ranges of these various species, and also, by the thickness of the figures, the elevation at which they reach best development.

Along Three Rivers, extending out into the desert about 10 miles beyond the lower limit of the woodland, is a narrow broken fringe of deciduous trees which deserves mention. The lands have long since passed from Government control, and there has been some culling among the trees for fuel. The best growth was

found near Three Rivers post-office, where an acre was measured and estimated as follows:

Number of trees on 1 acre near Three Rivers, N. Mex.

Species.	Diameter in inches.									
	2.	4.	6.	8.	10.	12.	14.	16.	18.	24.
Black walnut	1	5	1	4	2	5	6	2	1	.....
Box elder	1	2	.....	4	7	6	3	.....	.....	1
Ash .....	.....	.....	.....	.....	1	1	.....	.....	.....	.....
Locust .....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....

The trees fork low, are very crooked, and very little clear lumber could be cut from each. Nevertheless, such an exceptional acre would run over 1,000 feet B. M. The entire fringe of trees will not average 30 per cent of the above.

DESCRIPTIONS OF TREES.

Yellow pine (Pinus ponderosa).—This is the chief timber tree in both the Sierra Blanca and the Capitan mountains. It ranges between 6,400 and 9,250 feet elevation above the sea and forms 61 per cent of the entire forest stand. It rarely forms pure forests, being more or less associated with the woodland species at its lower range, and at higher elevations being mixed with all of the other timber species. The average mature tree has a height of 45 feet, with 11 feet of clear trunk and a diameter of 10 inches. Veterans attain a height of 100 feet and 30 inches in diameter.

Mexican white pine (Pinus strobiformis).—This species is found as a member of the mixed forests at the higher elevations throughout the reserve. It is a valuable timber tree for this locality, and in quality is considered second only to the yellow pine. It has been culled for lumber along the headwaters of Eagle Creek, and also along the western summits of the Capitan Mountains, where it has been worked for shingles under the local name of "sugar pine." It comprises 7 per cent of the entire forest stand. Average trees are 38 feet high, with 11 feet of clear trunk and 9 inches diameter. A few veterans reach a height of 100 feet and a diameter of 30 inches.

Piñon (Pinus edulis).—This piñon is the principal constituent of the woodland, and is frequently associated with yellow pine at the lower altitudinal range of the latter. It is a remarkably hardy tree, and is the leader in the slow advance of the woodland upon the bordering arid lands. Mature trees at higher elevations reach a height of 30 feet and have a diameter of 9 inches, but are

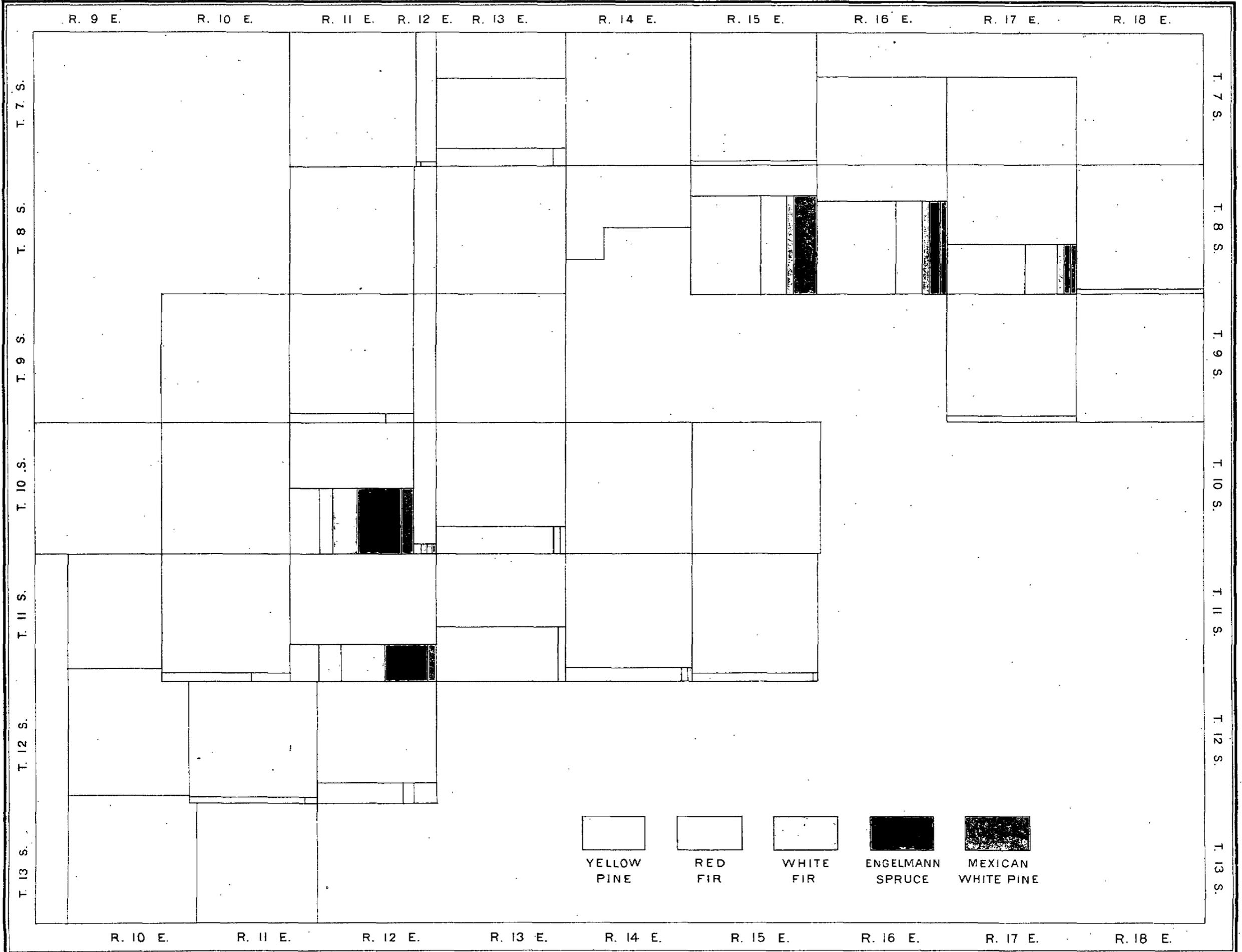


DIAGRAM OF THE LINCOLN FOREST RESERVE, NEW MEXICO

SHOWING STAND OF COMMERCIAL SPECIES OF TIMBER AND PROPORTION OF EACH SPECIES, BY TOWNSHIPS

very crooked and are of use only for fuel. Once in about four years they set an abundance of cones, the seeds of which are edible.

Red fir (Pseudotsuga taxifolia).—This tree, the most important member of the heavy forests of the North Pacific coast, reaches in this locality a point near its eastern and southern limits of distribution. It is here an intruder on the domain of the yellow pine and the Engelmann spruce, and reaches a very inferior development when compared with localities where it ranks first in importance. The average mature tree is only 40 feet in height, with 8 feet clear trunk and a diameter of 8 inches, although veterans attain a diameter of 30 inches and a height of 90 feet.

White fir (Abies concolor).—This fir has a large altitudinal range, extending from 7,500 to 10,500 feet. Together with the red fir it is an important tree in the transition from the yellow-pine zone to the subalpine zone, and is estimated to form 8 per cent of the total forest stand. Its heavy foliage affords good shade and protection on the more elevated slopes and in most of the principal canyons. Mature trees reach a diameter of 34 inches, with a height of 85 feet, but the average is the same as of the red fir.

Subalpine fir (Abies lasiocarpa).—Foliage of this species was found, closely resembling the lower foliage of *Abies amabilis*, in T. 10 S., R. 11 E., but no cones could be obtained for its positive identification, although careful search was made. The trees were young and formed part of a new growth succeeding the dying Engelmann spruce.

Engelmann spruce (Picea engelmanni).—This species is limited to elevations above the 9,000-foot contour, where it frequently forms pure forests. The conditions for its best development are found along the high ridges north of Sierra Blanca Peak, at the headwaters of the Rio Ruidoso, and also along the broad summits of the Capitan Mountains. Notwithstanding the fact that the summits of the Sierra Blanca afford apparently ideal conditions for the growth of the spruce, about 20 per cent of the standing trees are dead or dying. This gives the forest the appearance of having been scorched by a fire not severe enough to utterly destroy it. For this no cause was found. The mature trees reach a diameter of 24 inches and a height of about 75 feet, with branches nearly to the ground.

Cedar (Juniperus monosperma).—This species (also called savin) is found throughout the wooded districts, and its altitudinal range is the same as that of piñon. It furnishes 13 per cent of the total estimated cord wood. Although it is a very scraggy tree, yet, owing to its ability to withstand ground-rot, it is much prized for fence posts and rails. Mature trees attain a height of 20 feet and a diameter of 9 inches.

Alligator juniper (*Juniperus pachyphloea*).—This is a valuable fuel tree, forming 30 per cent of the woodland. It has a greater altitudinal range than the piñon, being frequently found in the middle of the yellow-pine zone, where its position is generally on the open mountain sides or elevated mesas rather than in canyons or other waterways. Mature trees reach a diameter of 14 inches, but the average tree is about 4 inches in diameter and 15 feet in height. The trees are generally symmetrical and often beautiful, and their abundant crops of berries are considered edible after the first frosts of early winter.

Rocky Mountain oak (*Quercus undulata*).—This tree is common above an altitude of 7,000 feet, forming characteristic groves on otherwise timberless slopes or spurs, particularly in the Sierra Blanca region. It is also found along the summits of the Capitan Mountains, associated with timber species. It is usually about 15 feet in height, with 4 feet clear trunk, and a diameter of 3 inches, although veterans attain 40 feet in height and a diameter of 10 inches. It is afflicted with dry rot over the western end of the Capitan Mountain region.

Gambel oak (*Quercus gambelii*).—This small tree is common to nearly all of the woodland, being associated with the piñon and cedar. It is not in demand for any purpose except fuel or an occasional fence post.

Aspen (*Populus tremuloides*).—A common tree in the subalpine zone, where it is frequently found in isolated groves, which, in every instance, appear to be restockings of very old burns. On the north side of Sierra Blanca and among the dying spruce this species is doing considerable restocking. In T. 8 S., R. 16 E., it comprises about 20 per cent of the forest cover in the subalpine zone. Average trees attain a height of 30 feet, 10 feet clear trunk, and a diameter of 6 inches.

Narrow-leaf cottonwood (*Populus angustifolia*).—This species is represented along nearly all streams, where it forms a part of the mixed forests. It thrives best at about 7,000 feet elevation, but has been cultivated at lower altitudes. The average tree is 40 feet in height, having 10 feet clear trunk and a diameter of 9 inches.

Fremont cottonwood (*Populus fremontii*).—This tree is found in the cultivated districts throughout the reserve, chiefly along irrigating ditches, where it is a very serviceable shade tree.

Mexican walnut (*Juglans rupestris*).—This tree is common to nearly all water-courses throughout this region, and is found at its best along Three Rivers and the Rio Ruidoso. It has a more rapid growth than any other tree found in the reserve. Average trees reach a height of 40 feet and a diameter of 11 inches, with 6 feet clear trunk.

Box elder (Acer negundo).—The box elder is closely associated with Mexican walnut and other deciduous trees along the principal streams. The trunks are very crooked and would afford very little clear lumber. It is a beautiful shade tree. Average trees have a height of 40 feet, 4 feet clear trunk, and a diameter of about 9 inches.

Leather-leaf ash (Fraxinus velutina).—The leather-leaf ash is an uncommon tree in this region. It is much sought on account of its strength and endurance. It is found along Three Rivers and Eagle Creek, and also in the Capitan Mountains. The average tree reaches 35 feet in height, 7 feet clear trunk, and 10 inches in diameter.

Large-tooth maple (Acer saccharum grandidentatum).—This species is represented in the Capitan Mountains, in T. 8 S., R. 16 E., but is more common in Nogal Canyon, on the east slopes of the Sierra Blanca, at an altitude of 7,000 to 8,000 feet, where it is closely associated with aspen and other deciduous trees. It has been cut chiefly for cord wood. Mature trees attain a diameter of 10 inches and a height of 50 feet.

New Mexican locust (Robinia neomexicana).—This tree has an extensive distribution through this region. While small and unimportant for either timber or cord wood, it is very serviceable as a water conserver on some of the high eastern spurs of the Sierra Blanca, where, after the manner of the oak, it forms numerous small groves and thickets. It was seen at its best toward the head of Carrizo Creek, at an elevation of 8,300 feet, in T. 12 S., R. 12 E.

Rate of growth of trees in Lincoln Forest Reserve, N. Mex.

Species.	Radius.	Annual rings.	Year's growth per inch.
	<i>Inches.</i>		
Yellow pine	108.55	1,340	12.30
Mexican white pine	13.50	244	18.00
Piñon	4.95	168	34.00
Red fir	33.50	388	11.50
White fir	14.40	151	10.40
Alligator juniper	16.00	593	35.80
Large-tooth maple	17.35	390	22.40
Rocky Mountain (scrub) oak	9.11	167	18.30
Black walnut	9.92	54	5.44
Black ash	3.80	28	7.37

PRICES OF LUMBER.

West of the forest reserve, along the line of the El Paso and Northeastern Railway, the lumber is generally obtained in the Sacramento Mountains. East of the reserve, along the Pecos Valley and Northeastern Railway, the supply is obtained from Arkansas or from the Pacific coast. At Alamogordo the principal woods used are locally known as "red spruce" (*Pseudotsuga taxifolia*) and "mountain pine" (*Pinus ponderosa*). In this report they are referred to as "red fir" and "yellow pine." Prices of local and imported lumber do not vary materially and are as follows:

Prices of lumber in Lincoln Forest Reserve, N. Mex., per M feet B. M.

1 by 3, 1 by 4, 1 by 6, surfaced two sides.....	\$26
1 by 8, 1 by 10, surfaced two sides.....	27
1 by 12, surfaced two sides.....	30
2 by 8, 2 by 10, surfaced two sides.....	29
2 by 12, surfaced two sides.....	32
1 by 4, 1 by 6, 1 by 8, surfaced one side.....	16
1 by 10, surfaced one side.....	17
1 by 12, surfaced one side.....	19
4 by 8 to 8 by 8, 4 by 10 to 12 by 12, surfaced one side.....	20
Flooring and ceiling.....	\$20 to 26
Shingles, per 1,000.....	5
Laths, per 1,000.....	4
Heart stock brings \$2.50 extra per M feet B. M.	

IRRIGATION.

On all sides of the mountains are broad stretches of gently sloping plains and mesas, in which the soil, climate, and topography are favorable to agriculture, but the most important of all factors, water, is lacking. The Rio Bonito, Rio Ruidoso, and Rio Tularosa are the only streams which have a surface flow extending any considerable distance over the arid area, and none of their perpetual normal flow is permitted to waste. The cultivated lands in the area examined aggregate only 4,197 acres, an insignificant percentage of the enormous areas which could be irrigated if water could be secured.

Artificial "tanks" are frequently employed for the storage of intermittent surface flows where water is used for domestic purposes and irrigation, but no works have as yet been constructed for the impounding of flood waters for general distribution.

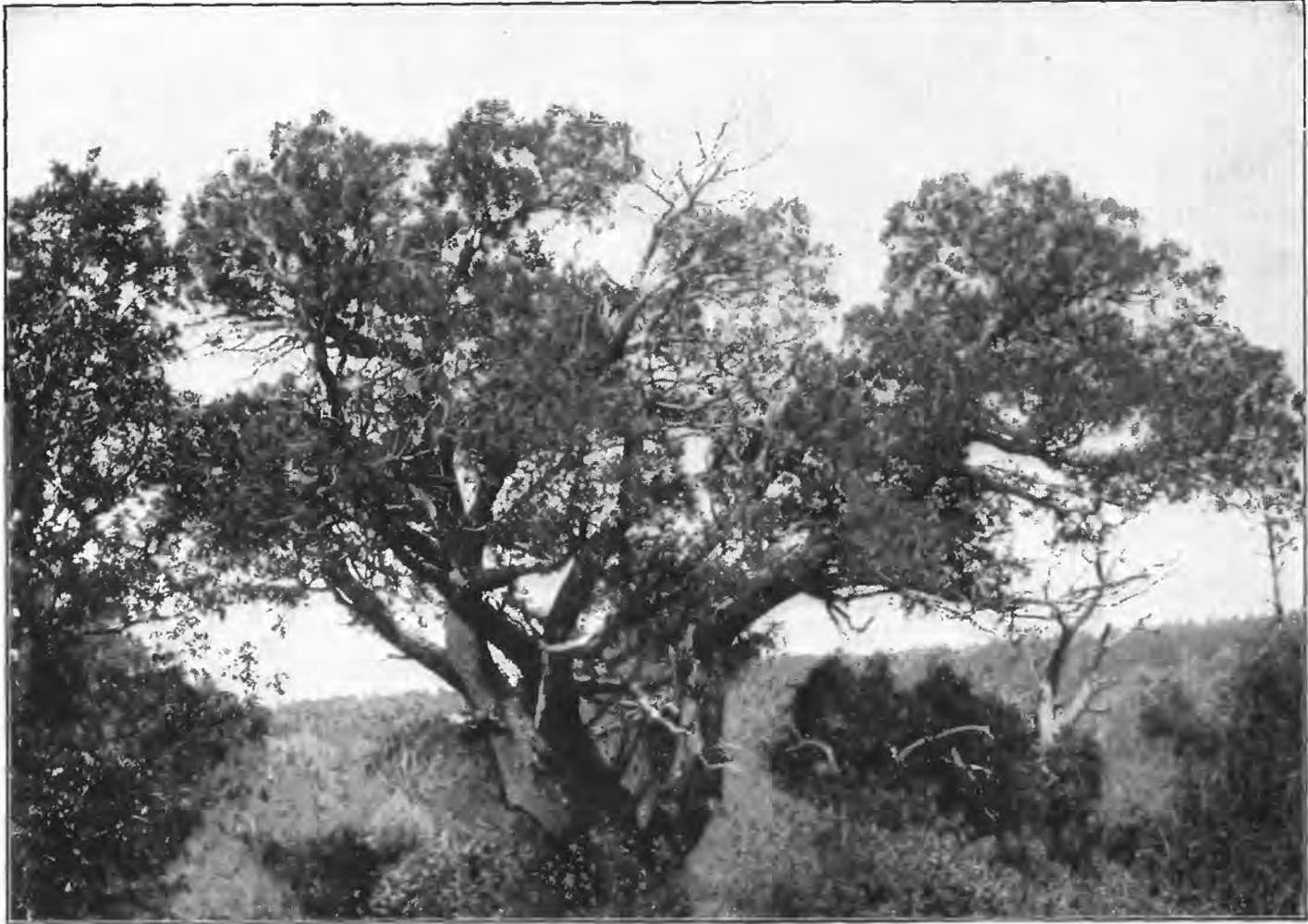
The Rio Tularosa furnishes the supply for the Mescalero Apache Indian Reservation Agency; also for the irrigation of several small farms outside of the reservation and for the town of Tularosa. There are about 150 claimants in Tularosa, to



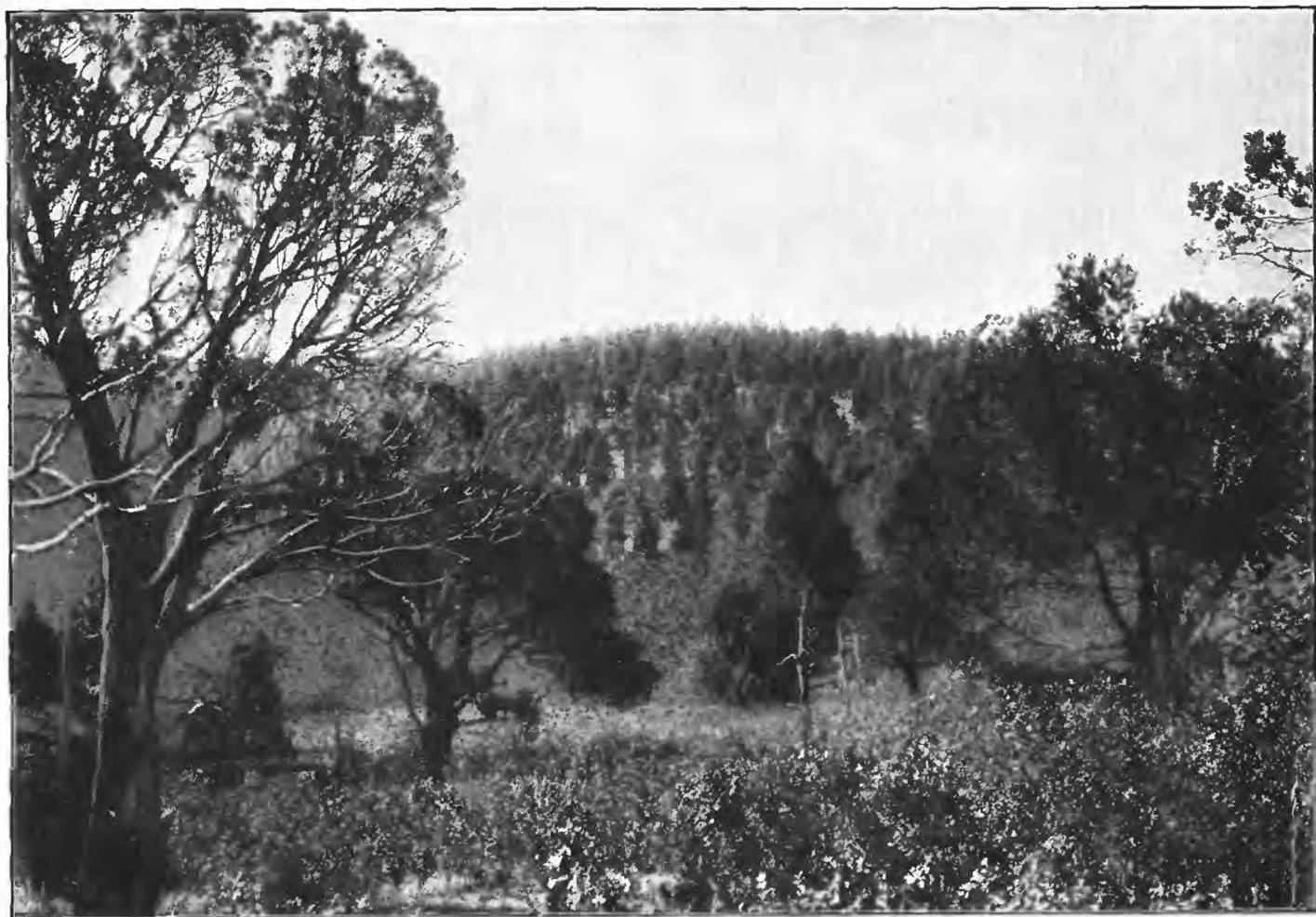
A. SCRUB OAKS NEAR THREE RIVERS.



B. FREMONT COTTONWOODS ALONG IRRIGATING DITCH.



A. ALLIGATOR JUNIPER IN THE WOODLAND.



B. YELLOW PINE AND WOODLAND.

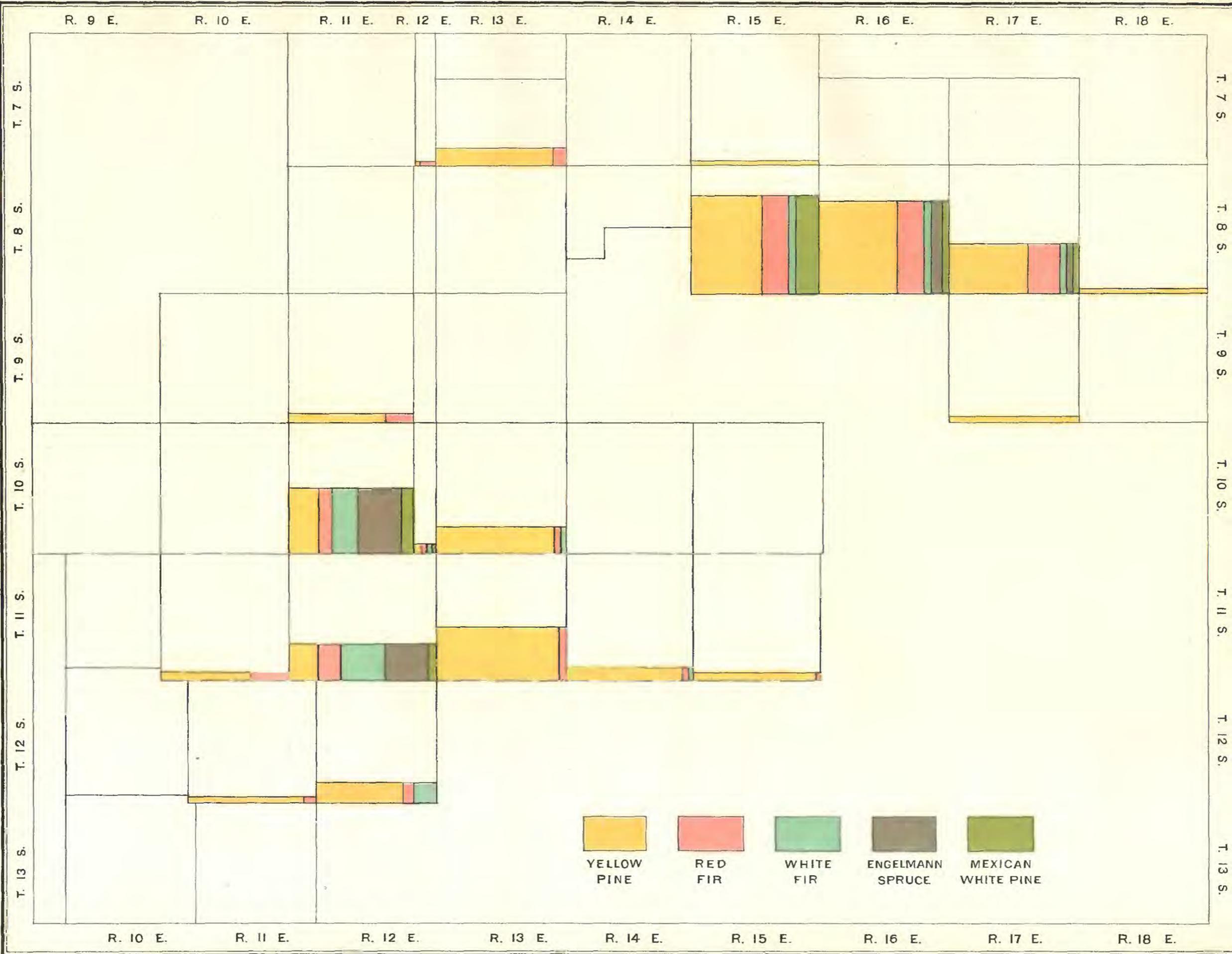


DIAGRAM OF THE LINCOLN FOREST RESERVE, NEW MEXICO

SHOWING STAND OF COMMERCIAL SPECIES OF TIMBER AND GROWTH

Little Creek and Eagle Creek are of comparatively little importance, and the small perpetual flow at their heads is used only in T. 10 S., R. 13 E. There are some promising mesa lands bordering these streams, but so far their cultivation without water has not proved a success.

The Rio Ruidoso is important for irrigation outside of the present limits of the forest reserve and within the area shown on the map (Pl. I). It is partly for this reason that settlers have petitioned for the inclusion of this stream in the reserve.

GRAZING.

Over the greater portion of the forest reserve forage grasses form an important part of the ground cover. They are not only a factor in regulating the run-off after heavy rains or melting snows, but retard the excessive evaporation. The areas shown in yellow on Pl. I include only such grazing lands as support neither woodland nor timber, but all of the forest reserve might be classified as grazing land so far as its natural utility for that purpose is concerned. The elevated timberless spurs from the Sierra Blanca are well covered with forage grasses, and together with the forested summits of the Capitan Mountains are at present the best areas for stock grazing. The lower slopes and plains, lying below the 7,000-foot contour, have been more accessible, and for this reason have been irreparably damaged by overgrazing. In some places the extermination of the gramma grasses and other ground cover has permitted deep and extensive erosion, actually changing the topography and laying waste large areas which formally supported a luxuriant growth of valuable forage grasses. This effect was particularly noticed in the northwest portion of T. 10 S., R. 14 E., but is observable in the western tiers of townships, which include Carrizozo Flats, where the grazing value is very low as a result of overgrazing, and where the grasses will be extinct ere long. Mountain mahogany is plentiful in the Capitan Mountains and furnishes the principal winter browse.

BURNS.

The total burned area was estimated at 1,480 acres, or less than 1 per cent of the entire timbered area examined. The areas classified as burned include only such as are so recent as to contain no merchantable timber, and it must not be inferred that fires are of rare occurrence in this region. Very small burns are numerous, and considerable areas have been overrun by fires which resulted in the partial destruction of the trees. This is particularly true in the Capitan Mountains, where sapling conifers and scrub oak have been the greatest sufferers. Since the establishment of the forest reserve most of these small fires have ceased, owing partly to the vigorous patrol which has been



A. YELLOW PINES.



B. INCEPTION OF AN ARROYO IN AN OVERGRAZED AREA.

maintained, and also to the changed sentiment of the people, who are now fully alive to the benefits of forest protection.

Traces of very old burns are frequently seen throughout the timbered areas, particularly near the summits. In many cases the restocking has been by aspen (*Populus tremuloides*) where the original forest was undoubtedly coniferous.

T. 10 S., R. 11 E., has sustained the greatest loss from fires, which, according to the testimony of residents, have resulted in a visible decrease in the minimum flow of the streams. These burns occurred in 1895, as did also the burn in sec. 3, T. 11 S., R. 11 E. The resulting litter from these fires, together with the dead and dying Engelmann spruce, which is mentioned elsewhere in this report, is a constant menace to the standing forests, and will necessitate the utmost vigilance on the part of the rangers to prevent a most disastrous conflagration, the effects of which would be far-reaching for the reason that the most important streams rise in these townships.

MINING.

The area examined covers portions of eight mining districts—White Oaks, Vera Cruz, Nogal, White Mountain, Rio Tularosa, Tularosa, Capitan, and Bonito. The region has been well prospected for gold, silver, and copper, which have been found in paying quantities. A 15-stamp mill has been installed 2 miles south of Nogal town site to work the free-milling output from the Helen Rae, American, and adjacent properties. There has been considerable development work in the vicinity of Bonito and Parsons, where promising ledges of gold-bearing quartz have been uncovered in the porphyritic formations.

Measures of bituminous coal are found in the vicinity of Capitan, in T. 9 S., R. 14 E., and also near White Oaks. The former are being worked by the New Mexico Railway and Coal Company, and in 1901 yielded 200,000 tons.

Further details regarding these and other mining properties will be found in the report of the governor of New Mexico, 1902, page 523 et seq.

DESCRIPTIONS OF TOWNSHIPS.

TOWNSHIP 7 SOUTH, RANGE 11 EAST.

The eastern third of this township is steep and rocky, lying on the west slope of Carrizo Peak. The rest is a gently rolling and sloping plain, which supports neither woodland nor forest. The surface is cut by shallow arroyos which drain westerly to the Malpais. There has been much overgrazing, particularly in the southern portions. A goat ranch is located in sec. 24, where there is a small spring. In sec. 28 is a ranch with a well 50 feet deep giving good soft water. All the woodland is on the slopes of Carrizo Peak. The

reproduction is good, and there has been some culling for fuel in sec. 23. There is no timber.

Stand of trees in T. 7 S., R. 11 E.

	Cords.
Piñon	4,000
Juniper	1,600
Cedar	1,600
Oak	800
Total	<u>8,000</u>

TOWNSHIP 7 SOUTH, RANGE 12 EAST.

This irregular township contains but six sections. It lies on both sides of Carrizo Peak, which has an elevation of about 9,500 feet and a rough and precipitous surface. Only the higher elevations are timbered, the lower slopes being scattering woodland. It has been grazed by goats.

Stand of trees in T. 7 S., R. 12 E.

	Cords.	Feet B. M.
Yellow pine		643,000
Red fir		1,502,000
Piñon	2,280	
Juniper	1,140	
Cedar	380	
Total	<u>3,800</u>	<u>2,145,000</u>

Conditions of timber trees in T. 7 S., R. 12 E.

Average total height	feet..	30
Average height, clear	do..	10
Average diameter, breast-high	inches..	12
Dead	per cent..	1
Average age	years..	70
Reproduction		Good.

TOWNSHIP 7 SOUTH, RANGE 13 EAST.

Secs. 13 to 36, inclusive, are within the reserve. The surface is rough and mountainous, traversed by a divide which has a general northwest-southeast trend, and is cut by Bernal Gap. The northeastern portion is cut by numerous arroyos which drain into Carrizo Creek. In the southwestern portion Bernal Gap drains into Nogal Arroyo. All the township has been grazed, principally by cattle. A small sawmill is operating intermittently on sec. 9, outside the reserve.

DESCRIPTIONS OF TOWNSHIPS.

Stand of trees in T. 7 S., R. 13 E.

	Cords.	Feet B. M.
Yellow pine.....		9,810,000
Red fir.....		1,090,000
Piñon.....	5,400	.....
Juniper.....	4,200	.....
Cedar.....	1,800	.....
Oak.....	600	.....
Total.....	12,000	10,900,000

Conditions of timber trees in T. 7 S., R. 13 E.

Average total height.....	feet..	50
Average height, clear.....	do....	10
Average diameter, breast-high.....	inches..	10
Dead.....	per cent..	1
Diseased.....	do....	1
Average age.....	years..	60
Reproduction.....		Good.

TOWNSHIP 7 SOUTH, RANGE 14 EAST.

The surface is gently sloping and rolling toward the north and east and is drained by Carrizo Creek, the flow of which is perpetual in portions of its bed and sinks in others. In the creek valley are about 1,000 acres of arable land, of which 60 acres are in cultivation. The entire township has been grazed, principally by cattle. In the southern and western portions there has been some culling of the trees for fuel and fencing. In sec. 32 is a well, but the water is strongly impregnated with gypsum.

Stand of trees in T. 7 S., R. 14 E.

	Cords.	Feet B. M.
Yellow pine.....		560,000
Piñon.....	18,000	.....
Juniper.....	9,000	.....
Cedar.....	1,500	.....
Oak.....	1,500	.....
Total.....	30,000	560,000

Conditions of timber trees in T. 7 S., R. 14 E.

Average total height.....	feet..	40
Average height, clear.....	do....	10
Average diameter, breast-high.....	inches..	8
Dead.....	per cent..	2
Diseased.....	do....	1
Average age.....	years..	50
Reproduction.....		Medium.

TOWNSHIP 7 SOUTH, RANGE 15 EAST.

The surface has an easy gradient to the north and is drained by arroyos tributary to Carrizo Creek. It has all been closely grazed. In secs. 28 and 35 the water for domestic purposes and for watering stock has been piped a distance of $1\frac{1}{2}$ miles. There is no other water in the township. A sawmill was formerly located in sec. 34, for which some culling was done in the canyons and arroyos in the immediate neighborhood.

Stand of trees in T. 7 S., R. 15 E.

	Cords.	Feet B. M.
Yellow pine.....		2,540,000
Piñon.....	19,350	.....
Juniper.....	21,500	.....
Oak.....	2,150	.....
Total.....	43,000	2,540,000

Conditions of timber trees in T. 7 S., R. 15 E.

Average total height.....	feet..	40
Average height, clear.....	do....	10
Average diameter, breast-high.....	inches..	8
Dead.....	per cent..	5
Diseased.....	do....	1
Average age.....	years..	50
Reproduction.....		Good.

TOWNSHIP 7 SOUTH, RANGE 16 EAST.

Secs. 13 to 36, inclusive, are within the reserve. The surface has a gentle slope to the north and is cut by numerous arroyos. A well 100 feet deep in sec. 22 furnishes an abundance of good water for a small settlement of Mexicans. The Block ranch, with headquarters at Richardson, in the northwestern part of this township, brings water a distance of over 6 miles through an open ditch from streams which head in the Capitan Mountains, in T. 8 S., R. 16 E. All this township is being grazed by cattle. Fifteen years ago portable sawmills operated in the canyons in the southern portion.

Stand of trees in T. 7 S., R. 16 E.

	Cords.	Feet B. M.
Yellow pine.....		1,120,000
Piñon.....	28,800	.....
Juniper.....	28,800	.....
Oak.....	6,400	.....
Total.....	64,000	1,120,000

Conditions of timber trees in T. 7 S., R. 16 E.

Average total height	feet..	40
Average height, clear	do....	10
Average diameter, breast-high.....	inches..	8
Dead	per cent..	5
Diseased	do....	2
Average age	years..	50
Reproduction		Medium.

TOWNSHIP 7 SOUTH, RANGE 17 EAST.

Secs. 13 to 36, inclusive, are within the reserve. The surface has a gentle slope to the north and east and is cut by a number of small arroyos. Water has been brought 5 miles by flume from sec. 15, T. 8 S., R. 17 E., and is used in sec. 26 for domestic and other purposes. All this township has been closely grazed by cattle, and also bears evidence of having been oversheeped in the past. In the southern part there has been some culling for cord wood and posts.

Stand of trees in T. 7 S., R. 17 E.

	Cords.	Feet B. M.
Yellow pine.....		180,000
Piñon.....	27,500	.....
Juniper	16,500	.....
Cedar	2,750	.....
Oak.....	8,250	.....
Total	55,000	180,000

Conditions of timber trees in T. 7 S., R. 17 E.

Average total height	feet..	40
Average height, clear.....	do....	10
Average diameter, breast-high.....	inches..	8
Dead	per cent..	5
Diseased	do....	3
Average age.....	years..	50
Reproduction		Good.

TOWNSHIP 8 SOUTH, RANGE 11 EAST.

The northern portion of this township is a nearly level plain lying between Carrizo Peak and the northern end of the Sierra Blanca, known locally as Carrizozo Flats. The southern portion is steep and rocky and is cut by numerous deep arroyos which drain northwesterly toward the Malpais. There are some mining claims and a rancher in sec. 33, where there has been some culling for fuel. The entire township has been badly overgrazed and the ground cover ruined. Under these conditions it is not likely that the woodland, which extends into the southern

tier of sections, will naturally reclaim any of these areas, although the reproduction is good.

Stand of trees in T 8 S., R. 11 E.

	Cords.
Piñon	500
Cedar	500
Total	1,000

TOWNSHIP 8 SOUTH, RANGE 12 EAST.

This irregular township contains less than 7 sections. The surface is gently rolling valley land, which is tributary to Nogal Arroyo. There is no timber, and the only woodland is at the southern boundary.

Stand of trees in T 8 S., R. 12 E.

	Cords.
Piñon	250
Cedar	250
Total	500

TOWNSHIP 8 SOUTH, RANGE 13 EAST.

This township lies on the divide between the Rio Pecos and the Malpais desert, including in part the Vera Cruz Mountains and the Tucson Mountains, which reach an elevation of 8,000 feet. Its lowest point is at Indian divide, which has an elevation of 6,952 feet and is crossed by the Carrizozo-Capitan branch of the El Paso and Northeastern Railway. The surface is rough. The grazing value is very low, owing to overstocking. The drainage is westward by Nogal Arroyo and its tributaries and eastward by Indian Canyon, both of which are intermittent streams of little consequence.

Stand of trees in T. 8 S., R. 13 E.

	Cords.	Feet B. M.
Yellow pine		510,000
Piñon	24,000	.....
Juniper	4,000	.....
Cedar	12,000	.....
Total	40,000	510,000

Conditions of timber trees in T. 8 S., R. 13 E.

Average total height	feet..	40
Average height, clear	do....	12
Average diameter, breast-high	inches..	9
Dead	per cent..	2
Diseased	do....	1
Average age	years..	55
Reproduction		Medium.



A GROVE OF ROCKY MOUNTAIN OAKS.



B. ARTIFICIAL "TANK" FOR WATER SUPPLY.



A. LITTER LEFT AFTER CULLING FOR LOGS.



B. ROOTS OF BLACK WALNUT EXPOSED IN CREEK BED.

TOWNSHIP 8 SOUTH, RANGE 14 EAST.

Twenty-one sections of this township are in the reserve. The area covers a low divide in the Capitan Mountains, and its principal drainage is by Gyp Springs Canyon, a tributary of Salado Creek. At Jacobs ranch, in sec. 1, is an abundance of spring water for local use and for the irrigation of a small orchard. There is also good drinking water in sec. 18. The entire township has been grazed—the southern portion, which is outside the reserve, to an injurious extent. The large percentage of dead trees is attributed by the settlers to the continued droughts.

Stand of trees in T. 8 S., R. 14 E.

	Cords.	Feet B. M.
Yellow pine.....		840,000
Piñon.....	39,600	.....
Juniper.....	19,800	.....
Cedar.....	6,600	.....
Total.....	66,000	840,000

Conditions of timber trees in T. 8 S., R. 14 E.

Average total height.....	feet..	50
Average height, clear.....	do....	12
Average diameter, breast-high.....	inches..	10
Dead (95 per cent Piñon).....	per cent..	10
Diseased.....	do....	5
Average age.....	years..	60
Reproduction.....		Medium.

TOWNSHIP 8 SOUTH, RANGE 15 EAST.

The southwestern portion of this township is rolling land of easy gradient, but the surface is generally rocky and boulder strewn. The rest of the township is traversed by the rounded summits of the Capitan Mountains, which are cut by Capitan Pass. The township is comparatively inaccessible for stock, and therefore has not been badly overgrazed.

Settlers in the southern part haul water from sec. 35, to which point it has been conveyed by troughs a distance of 2 miles, from the foot of the Capitan Mountains. Several attempts have been made to get water by sinking wells, and on sec. 31, at a depth of 100 feet, a supply was obtained, which subsequently failed.

There has been considerable culling for railroad ties in the northwest portion of this township, and in secs. 35 and 36 several years ago there was culling for fuel for the supply of Fort Stanton. The forests are mixed, and the estimated stand is the heaviest in the reserve.

FOREST CONDITIONS IN LINCOLN RESERVE, NEW MEXICO.

Stand of trees in T. 8 S., R. 15 E.

	Cords.	Feet B. M.
Yellow pine.....		32,917,000
Red fir.....		11,970,000
White fir.....		2,993,000
Mexican white pine.....		11,970,000
Piñon.....	23,400	.....
Juniper.....	11,700	.....
Cedar.....	3,900	.....
Total.....	39,000	59,850,000

Conditions of timber trees in T. 8 S., R. 15 E.

Average total height.....	feet..	50
Average height, clear.....	do..	14
Average diameter, breast-high.....	inches..	12
Dead, woodland.....	per cent..	10
Dead, timber trees.....	do..	1
Diseased.....	do..	1
Average age.....	years..	80
Reproduction.....		Good.

TOWNSHIP 8 SOUTH, RANGE 16 EAST.

This township is mountainous and rugged. The sharp backbone of the Capitan Mountains divides it into equal parts, which drain north into Carrizo Creek through numerous small canyons and south into Salado Creek. The mountains of this range reach their highest elevation, over 10,000 feet, in sec. 15. At the higher elevations, mainly on the north slope, are numerous small springs, and in sec. 34 is a spring which is being used in secs. 3 and 10, T. 9 S., R. 16 E., and supplies sufficient water for 200 head of cattle and for two ranchers. The grazing value of this township is good. About fifteen years ago several small portable sawmills operated on the north slope and culled from the principal canyons.

Stand of trees in T. 8 S., R. 16 E.

	Cords.	Feet B. M.
Yellow pine.....		34,252,000
Red fir.....		11,417,000
White fir.....		2,854,000
Engelmann spruce.....		5,709,000
Mexican white pine.....		2,854,000
Piñon.....	5,400	.....
Juniper.....	6,750	.....
Cedar.....	1,350	.....
Total.....	13,500	57,086,000

DESCRIPTIONS OF TOWNSHIPS.

Conditions of timber trees in T. 8 S., R. 16 E.

Average total height	feet..	40
Average height, clear	do...	8
Average diameter, breast-high.....	inches..	8
Dead	per cent..	10
Diseased	do...	3
Average age	years..	60
Reproduction.....		Very good.

TOWNSHIP 8 SOUTH, RANGE 17 EAST.

This township includes the eastern portion of the Capitan Mountains and is exceedingly rough and broken. It has not been overgrazed by cattle, because of its comparative inaccessibility. At higher elevations in all canyons there is running water in small quantities. In the northern portion there has been some culling of the woodland for fuel.

Stand of trees in T. 8 S., R. 17 E.

	Cords.	Feet B. M.
Yellow pine.....		18,060,000
Red fir.....		7,525,000
White fir		1,505,000
Engelmann spruce.....		1,505,000
Mexican white pine		1,505,000
Piñon.....	6,000	.....
Juniper	9,000	.....
Cedar.....	9,000	.....
Oak.....	6,000	.....
Total	30,000	30,100,000

Conditions of timber trees in T. 8 S., R. 17 E.

Average total height	feet..	40
Average height, clear.....	do....	10
Average diameter, breast-high.....	inches..	9
Dead	per cent..	10
Diseased	do....	3
Average age	years..	55
Reproduction		Very good.

TOWNSHIP 8 SOUTH, RANGE 18 EAST.

The surface along the western boundary is very rugged and precipitous, marking the abrupt termination of the Capitan Mountains. In the central portions the gradient is very gentle, while in the eastern areas are limestone hills, cut by small canyons to a depth of about 150 feet. The drainage is eastward by Cedar Canyon and its numerous smaller tributaries, all of which are intermittent.

There are numerous wells and springs on settled lands. There has been considerable culling all over the woodland; in fact, the majority of the settlers have for years earned their livelihood by hauling cordwood to Roswell, a distance of 50 miles, where there is an increasing market for fuel and fencing. The grazing value is low, owing to overstocking.

Stand of trees in T. 8 S., R. 18 E.

	Cords.	Feet B. M.
Yellow pine.....		2,465,000
Piñon.....	19,600	.....
Juniper.....	14,700	.....
Oak.....	14,700	.....
Total.....	49,000	2,465,000

Conditions of timber trees in T. 8 S., R. 18 E.

Average total height.....	feet..	40
Average height, clear.....	do....	10
Average diameter, breast-high.....	inches..	10
Dead.....	per cent..	3
Discased.....	do....	1
Average age.....	years..	70
Reproduction, woodland.....		Very good.
Reproduction, yellow pine.....		Medium.

TOWNSHIP 9 SOUTH, RANGE 10 EAST.

This township is a gently rolling plain from which rise two of the three hills known as Tres Cerros. These three hills are nearly equidistant, range due north and south, and are a prominent feature of the landscape. The drainage is westward toward the Malpais. At the head of Canyon del Agua is the only perpetual flow of water in the township. The plain is the southern extension of Carrizozo Flats and has been badly overgrazed by both cattle and sheep.

Stand of trees in T. 9 S., R. 10 E.

	Cords.	Feet B. M.
Yellow pine.....		200,000
Piñon.....	1,050	.....
Cedar.....	450	.....
Total.....	1,500	200,000

Conditions of timber trees in T. 9 S., R. 10 E.

Average total height.....	feet..	35
Average height, clear.....	do....	10
Average diameter, breast-high.....	inches..	8
Dead.....	per cent..	1
Average age.....	years..	60
Reproduction.....		Medium.



A. EASTERN END OF CAPITAN MOUNTAINS.



B. ENGELMANN SPRUCE AND MEXICAN WHITE PINE.

TOWNSHIP 9 SOUTH, RANGE 11 EAST.

This township covers in part the northern end of the Sierra Blanca and has a very rough and broken surface. At the higher elevations are several small perpetual streams, which become intermittent before reaching the adjoining plains. The grazing value is good. There has been some culling for saw logs in Nogal Canyon, near the eastern boundary.

Stand of trees in T. 9 S., R. 11 E.

	Cords.	Feet B. M.
Yellow pine.....		4,720,000
Red fir.....		1,180,000
Piñon.....	7,250	.....
Juniper.....	4,350	.....
Cedar.....	2,900	.....
Total.....	14,500	5,900,000

Conditions of timber trees in T. 9 S., R. 11 E.

Average total height.....	feet..	60
Average height, clear.....	do....	12
Average diameter, breast-high.....	inches..	12
Dead.....	per cent..	2
Diseased.....	do....	1
Average age.....	years..	70
Reproduction.....		Good.

TOWNSHIP 9 SOUTH, RANGE 12 EAST.

This irregular township is unsurveyed, but is assumed to be of about the same area as the irregular townships on the north and south. It covers in part the foothills of the Sierra Blanca and drains easterly into Nogal Canyon. The southern portion supports neither woodland nor forest, but is good grazing land.

Stand of trees in T. 9 S., R. 12 E.

	Cords.	Feet B. M.
Yellow pine.....		432,000
Red fir.....		48,000
Piñon.....	2,700	.....
Juniper.....	1,350	.....
Cedar.....	450	.....
Total.....	4,500	480,000

Conditions of timber trees in T. 9 S., R. 12 E.

Average total height.....	feet..	50
Average height, clear.....	do....	12
Average diameter, breast-high.....	inches..	10
Average age.....	years..	60
Reproduction.....		Good.

TOWNSHIP 9 SOUTH, RANGE 13 EAST.

The surface of this township, while not strictly a mesa, generally goes by that name. It is rolling, with an easy gradient toward the east, and is cut by numerous arroyos, which drain into Salado Creek or Nogal Canyon. A plentiful supply of good well water has been obtained in the southern portions.

Stand of trees in T. 9 S., R. 13 E.

	Cords.	Feet B. M.
Yellow pine		160,000
Piñon	21,250	.....
Juniper	12,750	.....
Cedar	8,500	.....
Total.....	42,500	160,000

Conditions of timber trees in T. 9 S., R. 13 E.

Average total height.....	feet..	40
Average height, clear	do..	12
Average diameter, breast-high	inches..	8
Dead	per cent..	1
Average age	years..	50
Reproduction.....		Poor.

TOWNSHIP 9 SOUTH, RANGE 17 EAST.

This township has not a very steep gradient, as it includes the long spurs from the Capitan Mountains. The surface is generally rocky and boulder strewn. The drainage is by numerous arroyos, which are tributary to Bluewater Canyon. The township is being grazed, principally by goats. There has been some culling in the woodland of secs. 8, 13, 17, 20, 28, 29, and 33 for fuel and fencing.

Stand of trees in T. 9 S.; R. 17 E.

	Cords.	Feet B. M.
Yellow pine		3,480,000
Piñon	7,200	.....
Juniper	14,400	.....
Cedar	10,800	.....
Oak	1,800	.....
Other species	1,800	.....
Total.....	36,000	3,480,000

Conditions of timber trees in T. 9 S., R. 17 E.

Average total height.....	feet..	35
Average height, clear	do....	10
Average diameter, breast-high	inches..	10
Average age	years..	65
Reproduction.....		Good.

TOWNSHIP 9 SOUTH, RANGE 18 EAST.

The surface is mainly a series of limestone hills cut by dry canyons, which in the eastern part are 100 to 200 feet deep. The drainage is eastward by Bluewater Canyon and its numerous tributaries, all of which are intermittent. An abundance of good water has been found at a depth of 4 feet in sec. 16. The grazing value is low, owing to overstocking. All of the western portion has been culled for fuel and fencing, which was marketed at Roswell.

Stand of trees in T. 9 S., R. 18 E.

	Cords.
Juniper	13,500
Cedar	2,700
Oak	8,100
Other species	2,700
Total	27,000

TOWNSHIP 10 SOUTH, RANGE 9 EAST.

The surface is broken by a long and partly detached spur from the Sierra Blanca, the highest point being 7,000 feet elevation, or nearly 2,000 feet above the surrounding plain. The western and southeastern portions are nearly level. The entire township has been badly overgrazed by cattle and sheep, and at the present time has a very low grazing value. There is no timber, and the only woodland is a small area in the northeastern portion.

Stand of trees in T. 10 S., R. 9 E.

	Cords.
Piñon	250
Cedar	250
Total	500

TOWNSHIP 10 SOUTH, RANGE 10 EAST.

The southwestern portion of this township is a nearly level drainage basin of one of the branches of Three Rivers. The rest is rough, being broken by spurs and foothills from the Sierra Blanca. The flow of Three Rivers is perpetual for about 2½ miles in this township. The grazing value is low, owing to overgrazing by cattle and sheep.

Stand of trees in T. 10 S., R. 10 E.

	Cords.	Feet B. M.
Yellow pine		44,000
Engelmann spruce		396,000
Piñon	3,250	
Juniper	650	
Cedar	1,300	
Oak	1,300	
Total	6,500	440,000

Conditions of timber trees in T. 10 S., R. 10 E.

Average total height	feet..	40
Average height, clear (yellow pine)	do....	14
Average diameter, breast-high	inches..	10
Average age	years..	70
Reproduction		Poor.

TOWNSHIP 10 SOUTH, RANGE 11 EAST.

This township has a very high relief, as it includes the northern summits of the Sierra Blanca, the highest mountains in this portion of New Mexico. Although it does not support as great a stand of timber as other townships in the reserve, in respect of drainage it is perhaps the most important. All the streams are perpetual within the township, and two—Rio Bonito and Rio Ruidoso—are perpetual throughout their length and are important for irrigation. The grazing value is high, as the area has never been overstocked.

Above 9,000 feet the Engelmann spruce is gradually dying out. There have been several burns on the eastern slopes, and the litter which has resulted is now a menace to the standing forest. For the foregoing reasons this township deserves a more careful patrol than any other within this reserve.

Stand of trees in T. 10 S., R. 11 E.

	Cords.	Feet B. M.
Yellow pine		10,194,000
Red fir		4,078,000
White fir		8,155,000
Engelmann spruce		14,271,000
Mexican white pine		4,077,000
Piñon	80	.....
Juniper	80	.....
Total	160	40,775,000

Conditions of timber trees in T. 10 S., R. 11 E.

Average total height	feet..	40
Average height, clear	do....	11
Average diameter, breast-high	inches..	10
Dead (principally spruce)	per cent..	20
Average age	years..	70
Reproduction		Medium.

TOWNSHIP 10 SOUTH, RANGE 12 EAST.

This is an irregular, partly surveyed township containing less than seven sections. It covers a portion of the steep and broken slopes of the Sierra Blanca and is drained by the Rio Bonito and Eagle Creek. It has all been grazed, but not



A. SAWMILL AND CULLED TIMBER.



B. CULTIVATED VALLEY IN THE WOODLAND AREA.

overstocked. Eight years ago there was some culling of logs for lumber in sec. 1 along Kraut Gulch, a tributary of the Rio Bonito.

Stand of trees in T. 10 S., R. 12 E.

	Feet B. M.
Yellow pine.....	2,232,000
Red fir.....	1,116,000
White fir.....	1,116,000
Mexican white pine.....	1,116,000
Total	5,580,000

Conditions of timber trees in T. 10 S., R. 12 E.

Average total height	feet..	45
Average height, clear.....	do....	10
Average diameter, breast-high	inches..	10
Dead	per cent..	2
Average age	years..	70
Reproduction		Good.

TOWNSHIP 10 SOUTH, RANGE 13 EAST.

The surface of the western part is bold, consisting of spurs from the Sierra Blanca, flattening in the eastern part into a general mesa-like surface, which is cut by three streams and their tributaries. The drainage is by the Rio Bonito, a perpetual stream, and by Little and Eagle creeks, which are intermittent, all draining eastward. About ten years ago some portable sawmills operated in all the principal canyons, and the methods of logging were wasteful. A sawmill of small capacity is now located in sec. 31 and supplies the local demand. The grazing value is good in the western portions of this township, but the central and eastern portions have been badly overstocked.

Stand of trees in T. 10 S., R. 13 E.

	Cords.	Feet B. M.
Yellow pine.....		14,895,000
Red fir.....		827,000
White fir.....		828,000
Piñon.....	15,300	
Juniper.....	13,600	
Cedar.....	3,400	
Oak.....	1,700	
Total.....	34,000	16,550,000

Condition of timber trees in T. 10 S., R. 13 E.

Average total height.....	feet..	50
Average height, clear.....	do....	10
Average diameter, breast-high.....	inches..	10
Dead.....	per cent..	5
Diseased.....	do....	1
Average age.....	years..	65
Reproduction.....		Good.

TOWNSHIP 10 SOUTH, RANGE 14 EAST.

The eastern portion of this township is cut by two canyons 150 feet deep, through which flow Little and Eagle creeks, but in the central and western portions are extensive mesas, which are covered with a luxuriant growth of black gramma grass. The drainage is by Little and Eagle creeks, which are intermittent, and by the Rio Bonito, which is perpetual. The entire township has been overstocked for years, and the grazing value is low. The denudation of the surface has permitted the cutting of numerous water runs and gullies.

Stand of trees in T. 10 S., R. 14 E.

	Cords.	Feet B. M.
Yellow pine.....		180,000
Piñon.....	15,400	
Juniper.....	17,325	
Cedar.....	5,775	
Total.....	38,500	180,000

Conditions of timber trees in T. 10 S., R. 14 E.

Average total height.....	feet..	45
Average height, clear.....	do....	10
Average diameter, breast-high.....	inches..	9
Dead.....	per cent..	3
Diseased.....	do....	1
Average age.....	years..	55
Reproduction.....		Medium.

TOWNSHIP 10 SOUTH, RANGE 15 EAST.

The greater portion of the surface is composed of limestone hills which are cut by canyons over 100 feet deep. The drainage is by the Rio Ruidoso, a perpetual stream, and by Little and Eagle creeks, which are intermittent. Springs and wells in secs. 9 and 34 furnish an abundance of water for domestic purposes and for the herds of goats which are raised in this vicinity. The northern portion of this township is being rapidly culled for fuel, which is marketed at the marine hospital at Fort Stanton. It was the former custom to remove only the dead



A. BLACK WALNUT NEAR THREE RIVERS



B. TYPICAL PIÑON IN VERY SCATTERED WOODLAND.

wood, but much of the living woodland was included in the recent cuttings. The grazing value is low, owing partly to the rock-strewn, eroded surface and partly to overstocking.

Stand of trees in T. 10 S., R. 15 E.

	Cords.	Feet B. M.
Yellow pine.....		85,000
Red fir.....		4,000
Piñon.....	36,300	
Juniper.....	18,150	
Cedar.....	6,050	
Total.....	60,500	89,000

Conditions of timber trees in T. 10 S., R. 15 E. •

Average total height.....	feet..	45
Average height, clear.....	do....	10
Average diameter, breast-high.....	inches..	8
Dead.....	per cent..	2
Average age.....	years..	50
Reproduction.....		Poor.

TOWNSHIP 11 SOUTH, RANGE 9½ EAST.

This irregular township includes a portion of the valley of Three Rivers, which is bordered on the north by high, rocky escarpments known as the "Palisades" and on the south by rolling and mesa lands. About 3,000 acres of bottoms along the "river" bed are arable, of which 11 per cent is in cultivation, the rest being covered in part with groves of walnut, box elder, and ash. According to testimony the stream was formerly perpetual, but is now intermittent in and west of this township. The whole township has been overgrazed, and its value now is low. There has been some slight culling for fuel among the deciduous trees.

Stand of trees in T. 11 S., R. 9½ E.

	Cords.
Oak.....	150
Walnut.....	1,500
Box elder.....	1,300
Ash.....	50
Total.....	3,000

TOWNSHIP 11 SOUTH, RANGE 10 EAST.

The eastern portion is mountainous, changing gradually westward into rolling and mesa lands. A branch of Three Rivers crosses the northern portion and is perpetual for the greater part of its length. Other valleys and arroyos

have intermittent flows. The grazing value is medium, but the western part has been sheeped.

Stand of trees in T. 11 S., R. 10 E.

	Cords.	Feet B. M.
Yellow pine.....		3,458,000
Red fir.....		1,482,000
Piñon.....	1,400	
Juniper.....	350	
Cedar.....	350	
Walnut.....	700	
Box elder.....	630	
Oak.....	70	
Total.....	3,500	4,940,000

Conditions of timber trees in T. 11 S., R. 10 E.

Average total height.....	feet..	45
Average height, clear.....	do....	8
Average diameter, breast-high.....	inches..	10
Dead.....	per cent..	1
Average age.....	years..	65
Reproduction.....		Good.

TOWNSHIP 11 SOUTH, RANGE 11 EAST.

The following description and estimates include a strip of land which, when surveyed, may be known as T. 11 S., R. 12 E. The entire area is at present within the Mescalero Apache Indian Reservation. It includes the highest area in southeastern New Mexico, and at Sierra Blanca reaches an elevation of 11,882 feet. It is the highest point on the divide between the Rio Pecos and the basin of the Malpais, and from it radiate several small but important streams. It includes, together with the township bordering it on the north, the most important watershed of the region. It has all been sheeped, but fortunately not to great excess, and its grazing value is still good.

Stand of trees in T. 11 S., R. 11 E.

	Cords.	Feet B. M.
Yellow pine.....		4,764,000
Red fir.....		3,573,000
White fir.....		7,146,000
Engelmann spruce.....		7,146,000
Mexican white pine.....		1,191,000
Piñon.....	700	
Oak.....	3,500	
Other species.....	2,800	
Total.....	7,000	23,820,000

Conditions of timber trees in T. 11 S., R. 11 E.

Average total height	feet..	45
Average height, clear	do....	7
Average diameter, breast-high	inches..	8
Dead	per cent..	5
Diseased	do....	1
Average age	years..	60
Reproduction		Good.

TOWNSHIP 11 SOUTH, RANGE 13 EAST.

The western third of this township covers steep slopes of the Sierra Blanca. The rest has an easy gradient toward the southeast and is drained by the Rio Ruidoso, a perpetual stream. A water-power sawmill of small capacity was operated in sec. 26 about sixteen years ago, but most of the logging for its supply was done on the Mescalero Apache Indian Reservation. The western portion of this township is a favorite resort for campers and health seekers. The grazing value is good.

Stand of trees in T. 11 S., R. 13 E.

	Cords.	Fect B. M.
Yellow pine.....		32, 371, 000
Red fir.....		1, 704, 000
Piñon.....	10, 200	.....
Juniper.....	3, 400	.....
Cedar.....	3, 400	.....
Total.....	17, 000	34, 075, 000

Conditions of timber trees in T. 11 S., R. 13 E.

Average total height	feet..	50
Average height, clear.....	do....	12
Average diameter, breast-high	inches..	10
Dead, principally woodland	per cent..	3
Diseased	do....	1
Average age	years..	65
Reproduction		Very good.

TOWNSHIP 11 SOUTH, RANGE 14 EAST.

The surface is high, rolling, rather bold, and bounded on the south by high mesas which are cut by numerous small arroyos and some unimportant canyons. The drainage is mainly into the Rio Ruidoso. There has been a small amount of culling in the woodland for the domestic use of settlers. The grazing value is medium. At present the range is being used for cattle and goats; in the past it has been badly overstocked.

Stand of trees in T. 11 S., R. 14 E.

	Cords.	Feet B. M.
Yellow pine.....		8,092,000
Red fir.....		449,000
White fir.....		449,000
Piñon.....	52,800	
Juniper.....	26,400	
Cedar.....	8,800	
Total.....	88,000	8,990,000

Conditions of timber trees in T. 11 S., R. 14 E.

Average total height.....	feet..	50
Average height, clear.....	do....	11
Average diameter, breast-high.....	inches..	10
Dead.....	per cent..	3
Diseased.....	do....	1
Average age.....	years..	70
Reproduction.....		Very good.

TOWNSHIP 11 SOUTH, RANGE 15 EAST.

The surface is interrupted by limestone hills, which in the northern portion of the township are badly cut by dry canyons from 100 to 200 feet deep. Toward the head of the canyons in the southern portion the surface has a more easy gradient. The drainage is northward into the Rio Ruidoso by numerous dry canyons. The grazing value is good, as the land has not been badly overstocked, owing, perhaps, to the lack of water.

Stand of trees in T. 11 S., R. 15 E.

	Cords.	Feet B. M.
Yellow pine.....		6,042,000
Red fir.....		318,000
Piñon.....	48,600	
Juniper.....	16,200	
Cedar.....	16,200	
Total.....	81,000	6,360,000

Conditions of timber trees in T. 11 S., R. 15 E.

Average total height.....	feet..	50
Average height, clear.....	do....	12
Average diameter, breast-high.....	inches..	10
Dead.....	per cent..	3
Diseased.....	do....	2
Average age.....	years..	70
Reproduction.....		Medium.

TOWNSHIP 12 SOUTH, RANGE 10 EAST.

The east half is rough and mountainous; the west half slopes gently toward the Malpais. There are no perpetual streams, and only one well, in sec. 8, which is used as a watering station for cattle. The supply is small and of inferior quality. The land has been grazed by both cattle and sheep. There is no timber, and the woodland is a very scattering growth in the southeastern part of the township.

Stand of trees in T. 12 S., R. 10 E.

	Cords.
Piñon.....	1,200
Cedar.....	800
	<hr/>
Total.....	2,000

TOWNSHIP 12 SOUTH, RANGE 11 EAST.

The western portion includes, in part, one of the high spurs of the Sierra Blanca. The eastern portion lies in the nearly level basin of the Rinconada, an intermittent stream which flows westerly toward the Malpais. The stream flows in sec. 35, but the water is of very poor quality. The overgrazing by sheep and cattle has contributed to the loosening of the top soil, which the freshets are eroding rapidly. There has been some culling for fuel.

Stand of trees in T. 12 S., R. 11 E.

	Cords.	Feet B. M.
Yellow pine.....		2,772,000
Red fir.....		308,000
Piñon.....	8,750	.....
Juniper.....	5,250	.....
Cedar.....	3,500	.....
	<hr/>	<hr/>
Total.....	17,500	3,080,000

Conditions of timber trees in T. 12 S., R. 11 E.

Average total height.....	feet..	35
Average height, clear.....	do....	8
Average diameter, breast-high.....	inches..	7
Dead.....	per cent..	3
Diseased.....	do....	1
Reproduction.....		Poor.

TOWNSHIP 12 SOUTH, RANGE 12 EAST.

The southern termination of the Sierra Blanca runs into this township and makes the topography very rough and rocky. The higher elevations are timberless, and the streams are all intermittent. There has been slight culling of fuel for domestic use, and several years ago there was some culling of yellow-pine

logs for a sawmill located in T. 11 S., R. 13 E. It is all good grazing land, and its value for this purpose is high, as the greater portion has not been badly overstocked.

Stand of trees in T. 12 S., R. 12 E.

	Cords.	Feet B. M.
Yellow pine.....		9,058,000
Red fir.....		1,294,000
White fir.....		2,588,000
Piñon.....	13,650	.....
Juniper.....	9,100	.....
Cedar.....	4,550	.....
Oak.....	18,200	.....
Total.....	45,500	12,940,000

Conditions of timber trees in T. 12 S., R. 12 E.

Average total height.....	feet..	50
Average height, clear.....	do....	11
Average diameter, breast-high.....	inches..	12
Dead.....	per cent..	2
Diseased.....	do....	1
Average age.....	years..	75
Reproduction.....		Very poor.

TOWNSHIP 13 SOUTH, RANGE 10 EAST.

Except along the west boundary, this township has a very broken surface. It has been ruined by overgrazing. There is a well and windmill in sec. 2, and in sec. 32 is a perpetual spring, but the water in both is very poor. There is no timber, and only a very scattering growth of woodland on the eastern portion.

Stand of trees in T. 13 S., R. 10 E.

	Cords.
Piñon.....	1,800
Cedar.....	1,200
Total.....	3,000

TOWNSHIP 13 SOUTH, RANGE 11 EAST.

This township comprises broken hills of limestone and gypsum, cut by the narrow valleys of the Rio Tularosa and Arroyo Rinconada, the latter an intermittent stream. The surface is rough. The township has all been sheeped, and its grazing value is only medium. There has been some culling of fuel in the woodland.

Stand of trees in T. 13 S., R. 11 E.

	Cords.
Piñon.....	24,700
Cedar.....	13,300
Total.....	38,000



A. VETERAN MEXICAN WHITE PINE.



B. YELLOW-PINE LITTER AFTER CUTTING RAILROAD TIES.

SUMMARY.

Percentages of timber-tree species in and adjacent to Lincoln Forest Reserve, New Mexico.

Township.	Range.	Yellow pine.	Red fir.	White fir.	Engelmann spruce.	Mexican white pine.
7 south	11 east					
7 south	12 east	30	70			
7 south	13 east	90	10			
7 south	14 east	100				
7 south	15 east	100				
7 south	16 east	100				
7 south	17 east	100				
8 south	11 east					
8 south	12 east					
8 south	13 east	100				
8 south	14 east	100				
8 south	15 east	55	20	5		20
8 south	16 east	60	20	5	10	5
8 south	17 east	60	25	5	5	5
8 south	18 east	100				
9 south	10 east	100				
9 south	11 east	80	20			
9 south	12 east	90	10			
9 south	13 east	100				
9 south	17 east	100				
9 south	18 east					
10 south	9 east					
10 south	10 east	10			90	
10 south	11 east	25	10	20	35	10
10 south	12 east	40	20	20		20
10 south	13 east	90	5	5		
10 south	14 east	100				
10 south	15 east	95	5			
11 south	9½ east					
11 south	10 east	70	30			
11 south	11 east	20	15	30	30	5
11 south	13 east	95	5			
11 south	14 east	90	5	5		
11 south	15 east	95	5			
12 south	10 east					
12 south	11 east	90	10			
12 south	12 east	70	10	20		
13 south	10 east					
13 south	11 east					

Stand and classification of timber in and adjacent to Lincoln Forest Reserve, New Mexico.

Township.	Range.	Total stand.	Average stand per acre.	Yellow pine.	Red fir.	White fir.	Engelmann spruce.	Mexican white pine.
		<i>M feet B. M.</i>	<i>Feet B. M.</i>	<i>M feet B. M.</i>	<i>M feet B. M.</i>	<i>M feet B. M.</i>	<i>M feet B. M.</i>	<i>M feet B. M.</i>
7 south	11 east							
7 south	12 east	2,145	1,500	643	1,502			
7 south	13 east	10,900	1,222	9,810	1,090			
7 south	14 east	560	1,166	560				
7 south	15 east	2,540	1,984	2,540				
7 south	16 east	1,120	1,400	1,120				
7 south	17 east	180	500	180				
8 south	11 east							
8 south	12 east							
8 south	13 east	510	500	510				
8 south	14 east	840	953	840				
8 south	15 east	59,850	4,661	32,917	11,970	2,993		11,970
8 south	16 east	57,086	2,623	34,252	11,417	2,854	5,709	2,854
8 south	17 east	30,100	1,563	18,060	7,525	1,505	1,505	1,505
8 south	18 east	2,465	1,185	2,465				
9 south	10 east	200	500	200				
9 south	11 east	5,900	1,046	4,720	1,180			
9 south	12 east	480	1,500	432	48			
9 south	13 east	160	500	160				
9 south	17 east	3,480	853	3,480				
9 south	18 east							
10 south	9 east							
10 south	10 east	440	500	44			396	
10 south	11 east	40,775	2,347	10,194	4,078	8,155	14,271	4,077
10 south	12 east	5,580	1,516	2,232	1,116	1,116		1,116
10 south	13 east	16,550	1,151	14,895	827	828		
10 south	14 east	180	500	180				
10 south	15 east	89	500	85	4			
11 south	9½ east							
11 south	10 east	4,940	1,357	3,458	1,482			
11 south	11 east	23,820	2,282	4,764	3,573	7,146	7,146	1,191
11 south	13 east	34,075	1,642	32,371	1,704			
11 south	14 east	8,990	1,208	8,092	449	449		
11 south	15 east	6,360	1,169	6,042	318			
12 south	10 east							
12 south	11 east	3,080	770	2,772	308			
12 south	12 east	12,940	2,432	9,058	1,294	2,588		
13 south	10 east							
13 south	11 east							
Total		336,335	1,913	207,076	49,885	27,634	29,027	22,713

DESCRIPTIONS OF TOWNSHIPS.

Classification of lands in and adjacent to Lincoln Forest Reserve, New Mexico.

Township.	Range.	Total area.	Timbered area.	Wooded area.	Burned area.	Naturally timberless area.	Cultivated area.
		<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
7 south	11 east ^a ..	23,046.34		4,140		18,906.34	
7 south	12 east ..	3,324.84	1,430	1,894.84			
7 south	13 east ^b ..	15,431	8,920	6,511			100
7 south	14 east ..	23,149.92	480	10,040		12,629.92	60
7 south	15 east ..	22,984.93	1,280	6,360		15,344.93	25
7 south	16 east ^b ..	15,357	800	11,440		3,117	80
7 south	17 east ^b ..	15,450	360	13,850		1,240	100
8 south	11 east ^a ..	22,010.71		1,300		20,710.71	
8 south	12 east ..	4,166.24		400		3,766.24	
8 south	13 east ^c ..	23,079.68	1,020	19,379.68		2,680	80
8 south	14 east ^b ..	13,461	880	12,581			90
8 south	15 east ..	22,893.37	12,840	10,053.37			40
8 south	16 east ..	23,044.50	21,760	1,284.50			
8 south	17 east ..	23,147.38	19,260	3,887.38			20
8 south	18 east ^d ..	23,145.63	2,080	21,065.63			80
9 south	10 east ..	23,041.66	400	1,520		21,121.66	
9 south	11 east ..	22,010.71	5,640	10,100		6,270.71	60
9 south	12 east ..	4,166.24	320	2,060		1,786.24	40
9 south	13 east ^d ..	22,436.14	320	16,616		5,500.14	369
9 south	17 east ..	21,982.78	4,080	17,902.78			30
9 south	18 east ^d ..	23,171.46		9,691		13,480.46	80
10 south	9 east ..	23,011.37		440		22,571.37	
10 south	10 east ..	23,036.58	880	6,720		15,436.58	182
10 south	11 east ..	22,010.71	17,370	160	920	3,560.71	120
10 south	12 east ..	4,166.24	3,680			486.24	30
10 south	13 east ^c ..	22,802.54	14,380	5,470		2,952.54	282
10 south	14 east ^d ..	22,824	360	12,520		9,944	230
10 south	15 east ^d ..	23,017.07	179	22,120.07		718	1,000
11 south	9½ east ..	15,323.76		520		14,803.76	330
11 south	10 east ^c ..	23,080.72	3,640	7,100		12,340.72	100
11 south	11 east ^d ..	27,200	10,440	1,680	560	14,520	
11 south	13 east ^c ..	23,058.45	20,750	2,308.45			84
11 south	14 east ^d ..	23,049.36	7,443	15,606.36			400
11 south	15 east ^d ..	22,887.57	5,440	17,447.57			40
12 south	10 east ..	21,631.23		7,000		14,631.23	
12 south	11 east ^d ..	21,600	4,000	17,600			
12 south	12 east ^d ..	21,000	5,320	13,520		2,160	45
13 south	10 east ..	23,540.79		11,420		12,120.79	
13 south	11 east ..	21,886.82		21,886.82			100
Total		775,628.74	175,752	345,596.45	1,480	252,800.29	4,197

^a Part of these townships proposed to be eliminated.
^b A portion only of this township in the reserve.

^c Portion in the reserve, balance in proposed addition.
^d Proposed additions to the reserve.

Estimated cords of fuel in and adjacent to Lincoln Forest Reserve, New Mexico.

Township.	Range.	Total.	Piñon.	Juniper.	Cedar.	Oak.	Other species.
		<i>Cords.</i>	<i>Cords.</i>	<i>Cords.</i>	<i>Cords.</i>	<i>Cords.</i>	<i>Cords.</i>
7 south	11 east ..	8,000	4,000	1,600	1,600	800	.....
7 south	12 east ..	3,800	2,280	1,140	380	.....	.....
7 south	13 east ..	12,000	5,400	4,200	1,800	600	.....
7 south	14 east ..	30,000	18,000	9,000	1,500	1,500	.....
7 south	15 east ..	43,000	19,350	21,500	.....	2,150	.....
7 south	16 east ..	64,000	28,800	28,800	.....	6,400	.....
7 south	17 east ..	55,000	27,500	16,500	2,750	8,250	.....
8 south	11 east ..	1,000	500	.....	500	.....	.....
8 south	12 east ..	500	250	.....	250	.....	.....
8 south	13 east ..	40,000	24,000	4,000	12,000	.....	.....
8 south	14 east ..	66,000	39,600	19,800	6,600	.....	.....
8 south	15 east ..	39,000	23,400	11,700	3,900	.....	.....
8 south	16 east ..	13,500	5,400	6,750	1,350	.....	.....
8 south	17 east ..	30,000	6,000	9,000	9,000	6,000	.....
8 south	18 east ..	49,000	19,600	14,700	.....	14,700	.....
9 south	10 east ..	1,500	1,050	.....	450	.....	.....
9 south	11 east ..	14,500	7,250	4,350	2,900	.....	.....
9 south	12 east ..	4,500	2,700	1,350	450	.....	.....
9 south	13 east ..	42,500	21,250	12,750	8,500	.....	.....
9 south	17 east ..	36,000	7,200	14,400	10,800	1,800	1,800
9 south	18 east ..	27,000	.....	13,500	2,700	8,100	2,700
10 south	9 east ..	500	250	.....	250	.....	.....
10 south	10 east ..	6,500	3,250	650	1,300	1,300	.....
10 south	11 east ..	160	80	80	.....	.....	.....
10 south	12 east ..	.....	.....	.....	.....	.....	.....
10 south	13 east ..	34,000	15,300	13,600	3,400	1,700	.....
10 south	14 east ..	38,500	15,400	17,325	5,775	.....	.....
10 south	15 east ..	60,500	36,300	18,150	6,050	.....	.....
11 south	9½ east ..	3,000	.....	.....	.....	150	2,850
11 south	10 east ..	3,500	1,400	350	350	.....	1,400
11 south	11 east ..	7,000	700	.....	.....	3,500	2,800
11 south	13 east ..	17,000	10,200	3,400	3,400	.....	.....
11 south	14 east ..	88,000	52,800	26,400	8,800	.....	.....
11 south	15 east ..	81,000	48,600	16,200	16,200	.....	.....
12 south	10 east ..	2,000	1,200	.....	800	.....	.....
12 south	11 east ..	17,500	8,750	5,250	3,500	.....	.....
12 south	12 east ..	45,500	13,650	9,100	4,550	18,200	.....
13 south	10 east ..	3,000	1,800	.....	1,200	.....	.....
13 south	11 east ..	38,000	24,700	13,300
Total	1,026,460	497,910	305,545	136,305	75,150	11,550

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