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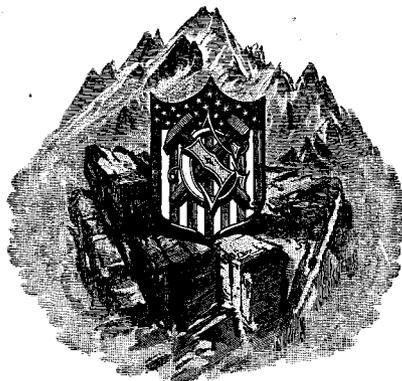
FOREST CONDITIONS

IN THE

GILA RIVER FOREST RESERVE, NEW MEXICO

BY

THEODORE F. RIXON



WASHINGTON
GOVERNMENT PRINTING OFFICE
1905

CONTENTS.

	Page.
Letter of transmittal.....	9
Location and boundaries.....	11
Topographic features.....	11
Roads and trails.....	12
Agriculture.....	13
Grazing.....	14
Mining industries.....	15
Logging.....	15
Reforestation.....	17
Forest fires.....	18
Humus, litter, and underbrush.....	18
Species.....	19
Elevations of timber zones.....	19
Size and rate of growth of trees.....	20
Stand of timber.....	21
Detailed description by townships.....	24
Township 5 south, range 16 west.....	24
Township 5 south, range 17 west.....	25
Township 5 south, range 18 west.....	26
Township 5 south, range 19 west.....	26
Township 5 south, range 20 west.....	27
Township 5 south, range 21 west.....	28
Township 6 south, range 16 west.....	28
Township 6 south, range 17 west.....	29
Township 6 south, range 18 west.....	30
Township 6 south, range 19 west.....	30
Township 6 south, range 20 west.....	31
Township 6 south, range 21 west.....	32
Township 7 south, range 16 west.....	33
Township 7 south, range 17 west.....	33
Township 7 south, range 18 west.....	34
Township 7 south, range 19 west.....	35
Township 7 south, range 20 west.....	35
Township 7 south, range 21 west.....	36
Township 8 south, range 16 west.....	37
Township 8 south, range 17 west.....	38
Township 8 south, range 18 west.....	38
Township 8 south, range 19 west.....	39

Detailed description by townships—Continued.	Page.
Township 8 south, range 20 west.....	40
Township 8 south, range 21 west.....	40
Township 9 south, range 15 west.....	41
Township 9 south, range 16 west.....	42
Township 9 south, range 17 west.....	42
Township 9 south, range 18 west.....	43
Township 9 south, range 19 west.....	44
Township 9 south, range 20 west.....	45
Township 9 south, range 21 west.....	45
Township 10 south, range 10 west.....	46
Township 10 south, range 11 west.....	46
Township 10 south, range 12 west.....	47
Township 10 south, range 13 west.....	48
Township 10 south, range 14 west.....	48
Township 10 south, range 15 west.....	49
Township 10 south, range 16 west.....	50
Township 10 south, range 17 west.....	50
Township 10 south, range 18 west.....	51
Township 10 south, range 19 west.....	52
Township 10 south, range 20 west.....	53
Township 10 south, range 21 west.....	53
Township 11 south, range 10 west.....	53
Township 11 south, range 11 west.....	54
Township 11 south, range 12 west.....	55
Township 11 south, range 13 west.....	56
Township 11 south, range 14 west.....	56
Township 11 south, range 15 west.....	57
Township 11 south, range 16 west.....	57
Township 11 south, range 17 west.....	58
Township 11 south, range 18 west.....	59
Township 11 south, range 19 west.....	60
Township 11 south, range 20 west.....	61
Township 11 south, range 21 west.....	61
Township 12 south, range 10 west.....	61
Township 12 south, range 11 west.....	62
Township 12 south, range 12 west.....	63
Township 12 south, range 13 west.....	63
Township 12 south, range 14 west.....	63
Township 12 south, range 15 west.....	64
Township 12 south, range 16 west.....	65
Township 12 south, range 17 west.....	66
Township 12 south, range 18 west.....	66
Township 12 south, range 19 west.....	67
Township 12 south, range 20 west.....	68
Township 12 south, range 21 west.....	68
Township 13 south, range 10 west.....	68
Township 13 south, range 11 west.....	69
Township 13 south, range 12 west.....	70
Township 13 south, range 13 west.....	71

CONTENTS.

Detailed description by townships—Continued.	Page.
Township 13 south, range 14 west.....	72
Township 13 south, range 15 west.....	72
Township 13 south, range 16 west.....	72
Township 13 south, range 17 west.....	73
Township 13 south, range 18 west.....	74
Township 13 south, range 19 west.....	74
Township 13 south, range 20 west.....	75
Township 13 south, range 21 west.....	75
Township 14 south, range 10 west.....	75
Township 14 south, range 11 west.....	76
Township 14 south, range 12 west.....	77
Township 14 south, range 13 west.....	77
Township 14 south, range 14 west.....	78
Township 14 south, range 15 west.....	78
Township 14 south, range 16 west.....	79
Township 14 south, range 17 west.....	80
Township 14 south, range 18 west.....	80
Township 14 south, range 19 west.....	80
Township 14 south, range 20 west.....	80
Township 14 south, range 21 west.....	81
Township 15 south, range 10 west.....	81
Township 15 south, range 11 west.....	82
Township 15 south, range 12 west.....	83
Township 15 south, range 13 west.....	83
Township 15 south, range 14 west.....	84
Township 15 south, range 15 west.....	84
Township 15 south, range 16 west.....	85
Township 15 south, range 19 west.....	85
Township 15 south, range 20 west.....	86
Township 15 south, range 21 west.....	86
Index.....	87

ILLUSTRATIONS.

	Page.
PLATE I. Land-classification map of Gila River Forest Reserve.....	In pocket.
II. Diagram showing total stand and distribution by species	22

LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
Washington, D. C., July 12, 1904.

SIR: I transmit herewith, for publication as a professional paper, a report on the forest conditions of the Gila River Forest Reserve, New Mexico, prepared from notes furnished by Mr. Theodore F. Rixon, who examined the reserve in the summer of 1903. Besides examining the lands, Mr. Rixon made a rough survey of the area and prepared a reconnaissance map, which is here used for illustration.

Very respectfully,

HENRY GANNETT,
Geographer.

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

FOREST CONDITIONS IN THE GILA RIVER FOREST RESERVE, NEW MEXICO.

By THEODORE F. RIXON.

LOCATION AND BOUNDARIES.

The Gila River Forest Reserve was established by proclamation of President McKinley on March 2, 1899. The following is a statement of the boundaries as laid down in the proclamation:

"Beginning at a point on the boundary line between New Mexico and Arizona, where it is intersected by the north line of township five (5) south, range twenty-one (21) west, New Mexico principal meridian, New Mexico; thence easterly along the township line to the northeast corner of township five (5) south, range sixteen (16) west; thence southerly along the range line between ranges fifteen (15) and sixteen (16) west, to the southeast corner of township eight (8) south, range sixteen (16) west; thence easterly along the township line to the northeast corner of township nine (9) south, range fifteen (15) west; thence southerly along the range line to the southeast corner of said township; thence easterly along the township line to the northeast corner of township ten (10) south, range ten (10) west; thence southerly along the first guide meridian west, between ranges nine (9) and ten (10) west, to its intersection with the third (3rd) standard parallel south, between townships fifteen (15) and sixteen (16) south; thence westerly along the said third (3rd) standard parallel south to the southwest corner of township fifteen (15) south, range sixteen (16) west; thence northerly along the range line to the northwest corner of said township; thence westerly along the township line to the northeast corner of township fifteen (15) south, range nineteen (19) west; thence southerly along the range line to its intersection with the third (3d) standard parallel south; thence westerly along the third (3rd) standard parallel south to its intersection with the boundary line between New Mexico and Arizona; thence northerly along said boundary line to the point where it intersects the north line of township five (5) south, range twenty-one (21) west, the place of beginning."

TOPOGRAPHIC FEATURES.

This reserve includes several prominent mountain ranges, the principal of which are the San Francisco, the Tularosa, the Mogollon, and the Black. The most conspicuous is the Mogollon group, which has several high peaks, the most prominent being Mogollon Mountain and Old Baldy, the former attaining an elevation of

10,500 feet. This mass of rocks rises abruptly on the west side, but on the east radiates in numerous directions. It is drained on the east by the West Fork of Gila River and its numerous tributaries, and on the west and north by many streams that flow in rocky canyons, with walls in places several hundred feet high and very precipitous, to San Francisco River.

The Black Range, the main divide between the Gila and Rio Grande, is a long, broken range of heavily timbered mountains, in places approaching an altitude of nearly 10,000 feet. It has a gradual slope to the west, but drops off abruptly to the east with numerous deep and rugged canyons. To the north it slopes down to fairly flat and rolling mesas.

The southwest corner of the reserve is, generally speaking, a rolling country with many prominent buttes, and is without trees except a light growth of scrub timber in patches. The extreme southwestern portion, in which Mount McMullen raises its barren summit, is very rocky and abrupt. Here the country drops perpendicularly several hundred feet into a desert tributary to San Francisco River, which lies distant 20 miles or more to the west.

The reserve as a whole is well watered, all the streams from the mountain ranges carrying a considerable flow for a long distance beyond the forest regions.

The main streams that rarely go dry and can be relied upon during the dry season are the following: The San Francisco, the Tularosa, the Nigretto, the Copper, the Silver, the Mineral (the last three only above the canyons), and the Whitewater, all tributary to the San Francisco; the West Fork, the North Fork, and Iron and Willow creeks, Gilita Diablo Canyon, the East Fork, Beaver Creek, Turkey and South Diamond creeks, Black Canyon, McKinley Creek, McKnights Canyon (the last two running all the year to within 8 miles of the southern boundary of the reserve), and Beaver Creek, all tributary to the Gila. Numerous other streams flow after heavy rains, but soon dry up or sink, so that no reliance can be placed upon them for water supply.

ROADS AND TRAILS.

The reserve is traversed by fair roads and trails, which follow the valleys. The main road from Silver City to Socorro enters the reserve near the southwest corner, in T. 14 S., R. 18 W., runs thence up Duck Creek, crossing Big and Little Dry creeks; thence goes over the divide to San Francisco River, which it follows northward to the post-office at Frisco; thence crosses over to the Tularosa at Joseph and runs northeastward, leaving the reserve in T. 5 S., R. 16 W. Several branch roads extend eastward from this main road, the most important being that which passes up the Whitewater to Graham; two others leave at Alma, one of which follows Mineral Creek to Cooney; the other follows the divide between Silver and Whitewater creeks, and drops down to Silver Creek at Mogollon; thence

it runs up Silver Creek to its head, and goes around the heads of Mineral Creek and of the waters tributary to the West Fork of the Gila, finally passing close to the southwest corner of T. 9 S., R. 16 W., where it connects with a road from Socorro which enters the reserve near the southeast corner of T. 7 S., R. 16 W.; the last road runs in a southerly direction, extending down the North Fork of the Gila, and finally connecting with the stage road from Silver City at the village of Gila.

Another road leaves Gila River at the junction of the North and East forks, runs southward and southeastward to Sapello Creek, follows Sapello Creek to its head, crosses a low divide to a branch of Mimbres River, and reaches the railroad at Santa Rita.

Another road runs up the East Fork of Gila River and leaves the reserve at the northwest corner of T. 10 S., R. 12 W. Another leaves the Mogollon stage road near the center of T. 14 S., R. 19 W., and runs in a southwesterly direction over to Mule Creek, and thence southward, passing Mount McMullen to the west, and crossing the southern boundary of the reserve near the southeast corner of T. 15 S., R. 21 W. A road from Holbrook, Ariz., enters the reserve in T. 6 S., R. 21 W., and forks after reaching Luna, one branch going southwestward down Blue River in Arizona, and the other leading along the township line for about 3 miles due east, then turning northeastward, and finally going to Socorro.

Numerous cow trails follow the main streams that flow westward from the divide of the Black Range, two of which, viz, those extending up Diamond Creek and McKnights Canyon, cross over the Black Range and lead to a mining settlement farther east. A recently cut trail starts at the head of Silver Creek, traverses the summit of the Mogollon Mountains, follows the divide between Mogollon Creek and West Fork of Gila River, and finally dropping down to Little River, follows it to its connection with West Fork of Gila River at a point near Hot Springs, in T. 15 S., R. 13 W.

A trail also leaves Luna in a southerly direction and after crossing the San Francisco Range takes an easterly course, stopping at the post-office at Frisco on San Francisco River.

AGRICULTURE.

Agriculture is carried on extensively along San Francisco River and there are a few farming settlements along Gila River. These settlers formerly found a ready market for all their produce in the mining camps at Cooney and Mogollon, but several of these camps have closed down within the last year or two, and the market in this direction has thus become restricted, so that the settlers have been obliged to look elsewhere. The main crops raised are alfalfa and corn. The prices

generally obtained vary considerably, ranging from \$15 to \$40 a ton for hay, the price increasing with the distance from market and the urgency of requirement.

The settlers along the San Francisco near Pleasanton and Alma are Mormons, while those at Lower Plaza and Frisco are mostly Mexicans, the latter owning and operating some very fine farms and being apparently well to do. Another large Mormon settlement is located at Luna near the northwest corner of the reserve. Luna is one of the oldest villages in the region, and is the seat of an important industry in farming, cattle, and horses. A great drawback is lack of water, though water could be readily obtained were there sufficient capital available to construct irrigation works.

On upper Gila River, a short distance above the junction of North Fork and East Fork, is a summer resort known as Gila Hot Springs, which is much visited from all parts of the country by people suffering from disease. In consequence a small settlement of Mexicans has located a short distance above the springs, and considerable improvement has been effected in the way of making homes and farms. Numerous scattered farms located along the East Fork and at the mouths of some of its many tributaries are occupied by Mexicans, whose source of existence is a very puzzling question, for with the exception of a few disconsolate burros nothing alive is seen around their adobe buildings.

In T. 5 S., Rs. 16 and 17 W., and immediately around Joseph, another thriving settlement has grown up, but while at Joseph the settlers are mostly Mormons, at Tularosa they are wholly Mexicans. The Mormons, however, devote most of their time to horse and cattle raising, while the Mexicans attend to the cultivation of their farms.

Agriculture is carried on to a limited extent only along such of the main streams as rarely run dry, no large agricultural area existing anywhere within the confines of the reserve. With the introduction of reservoirs and irrigating ditches the amount of available agricultural land could be largely increased, but as the market for the products of this district is so distant, being in no instance less than 90 miles away, the cost of putting new land under water would not pay.

GRAZING.

Grazing, the most important of the industries of this region, requires careful attention and supervision to prevent the almost inevitable result—the total destruction of the grass roots by overstocking. This destruction acts disastrously in more than one way. In an area where the roots have been entirely trampled out, the springs, which at one time flowed continuously, are practically dry, while the flood waters, no longer retained and allowed to gradually seep off, rush away in a few moments. The grass is obviously as important to the lower lands as the timber is to the mountains.

In T. 9 S., R. 15 W., a large area, which was entirely given up to sheep, has been overstocked, with the result that about half the township is a barren desert, not a blade of grass being seen and even the roots being entirely destroyed. When the wind blows, the sand and soil rise in vast clouds. I have been informed that this district, previous to the advent of the sheep, was a fine grazing area covered with the most succulent grasses.

A district around Tularosa, Joseph, and Frisco is in a somewhat similar state, but the conditions are not so bad. Here there has been overgrazing by both cattle and sheep, and unless the number of animals is greatly reduced the result will be the same as in T. 5 S., R. 16 W. All the country tributary to the East Fork of Gila River is covered with a fine growth of grass, as is the west slope of the Black Mountains, but the remainder of the reserve is carrying too many cattle. If the herds are not reduced for a sufficient time to allow restocking with grass the area will be ruined as grazing land.

MINING INDUSTRIES.

The mining industries in the reserve are confined to the Mogollon Mountains and practically to T. 10 S., R. 19 W., in what is commonly called the Cooney mining district, although a few prospects extend into T. 11 S., R. 19 W., on South Fork of Whitewater Creek. Settlements of considerable size have sprung up on Mineral Creek at Cooney, and on Silver Creek at Mogollon, but during the last few years five of the producing mines have closed down, leaving in operation only one, located about a quarter of a mile above Cooney. The reason for this is, presumably, that the ore is of low grade and the cost of transportation of the concentrates to the nearest shipping point, Silver City, distant about 90 miles over a rough road, consumes practically all the profits. The advent of railroad facilities would undoubtedly again bring the district to the fore, but there is little prospect of that in the near future, as the territory is practically nonproductive agriculturally and the only freight would be the ore from Cooney district.

LOGGING.

Logging operations have been carried on in a desultory manner for some years in different parts of the reserve, principally in Tps. 14 and 15 S., R. 21 W., T. 10 S., R. 19 W.; T. 15 S., Rs. 11, 12 and 13 W., and T. 14 S., R. 13 W. The only lumbering operations at present, however, are in secs. 34 and 35, T. 15 S., R. 13 W., where two small sawmills are located, one in sec. 2, T. 16 S., R. 13 W., one-eighth mile south of the reserve, and the other near the center of sec. 34, T. 15 S., R. 13 W., the machinery for which has recently been installed.

A sawmill near the headwaters of Trout Creek, close to the corners of secs. 19, 20, 29, and 30, T. 15 S., R. 13 W., has been burned.

The following sections in this township have been logged over, or, in other words, the best trees have been culled out in such a manner as to endanger the balance of the timber left standing, besides leaving an opportunity for fire to do serious damage to or destroy a magnificent body of timber standing immediately west: NE. $\frac{1}{4}$ and S. $\frac{1}{2}$ sec. 30, N. $\frac{1}{2}$ sec. 31, sec. 29, N. $\frac{1}{2}$ and SE. $\frac{1}{4}$ sec. 32, sec. 33 (except E. $\frac{1}{2}$ of NE. $\frac{1}{4}$), and most of SE. $\frac{1}{4}$ sec. 34. In all, about 5 million feet B. M. have been cut or destroyed, leaving considerable fine timber standing.

On Sapello Creek, in this same township, two or three mills were once located, but have long since been removed or destroyed by fire. Their operations were confined to the timber standing immediately along the edges of the creek bottom, and the amount cut was very small, probably not exceeding $1\frac{1}{2}$ million feet B. M. in all, scattered along from sec. 29, T. 14 S., R. 13 W., to sec. 8, T. 15 S., R. 12 W., where the remains of an old sawmill may yet be seen.

The timber which originally stood along the creek bottoms in secs. 19, 24, 25, and 26, in the same township, has also been removed, together with the timber along the bottoms of Mimbres River and McKinley Creek in secs. 20, 29, 31, 32, 33, and 27, T. 15 S., R. 11 W. All of this latter timber was removed and cut up into lumber some years ago for Government purposes in the construction of forts farther south, the total amount removed being probably not over 1 million feet B. M.

In T. 14 S., R. 21 W., the following area has been fairly cut over by a mill which some years ago was located near the center of sec. 35, T. 14 S., R. 21 W., viz, secs. 27, 26, 25, 34, and 35, in the same township, and secs. 2, 3, 10, 11, 14, 15, 23, and 24, in T. 15 S., R. 21 W. The only timber removed was that growing along the creek bottoms and on level benches like secs. 14 and 23. The hill lands were covered for the most part with scrub oak and juniper, and only the best of the juniper was sawed for posts. This mill probably cut 1 million feet B. M., so that the scattering nature of the timber can be easily comprehended.

In T. 10 S., R. 19 W., in the Cooney mining district, nearly all the timber on Silver Creek has been removed, as well as that on Mineral Creek up to a point where the road crosses over into Copper Canyon, and for at least 3 miles up Copper Canyon close to the east line of this township, where originally stood a small sawmill, long since removed. The sawmill company at Cooney is now operating a camp farther up this stream and hauling the logs to Cooney, a very expensive and slow method when the condition of the roads is taken into consideration. A sawmill has recently started about 1 mile from the head of the creek, with the intention of cutting the remainder of the timber on that stream.

The timber in this township was mostly on the creek bottoms and steep side hills, the summits of the divides being generally bare or covered with scrub oak.

The method of logging is bad. Instead of removing only the timber immediately along the canyon bottoms, loggers should be required to cut the timber also on the steep hillsides up to the top of the divides, for their present method of culling the canyons endangers the timber on the side hills from fires started among the tops and brush of the timber already logged, the natural result being that a fire, once started, would immediately rush up the hillsides, destroying all the timber in its path.

Other reasons why the operations of loggers should be confined to a smaller area and conducted more systematically are that the timber left standing is more difficult to log afterwards, and that the trees are exposed by the removal of their companions to the effects of wind and drought to a much greater extent than formerly, so that many of them are lost.

Along Gila River are large bodies of merchantable timber which can be logged only by railroads, the construction of which will not be so expensive as their maintenance, because of continual floods from cloud-bursts. The only feasible routes are up the canyons, which have no grades that will seriously affect the running of modern logging engines, whose facilities for climbing steep grades are such that they have brought within reach nearly all timber previously deemed inaccessible.

The greater part of this reserve can be logged only by sawmills located at prominent and convenient points, whence wagon roads can be constructed to haul the lumber to markets. The company operating steam-logging roads into timber belts from its mills would thus be able to cover considerable territory, and to considerably reduce the cost of hauling logs to the mills by means of wagons and teams.

REFORESTATION.

Wherever the yellow pine has been logged clean, the young growth on the lower lands is inevitably yellow pine, which is growing very rapidly in places. Especially is this noticeable on the Mimbres, McKinley, and other tributaries on the south boundary of the reserve, showing that under ordinary conditions this species of timber may be made to restock the land when the older timber is removed.

With regard to the young growth which springs up after a fire, observations could not be made on account of the limited area of the burned zone and the recent occurrence of the fires. However, upon the summits of the Black Range, signs of ancient burns can be detected, and in all cases growths of quaking aspen have immediately taken possession and grown so thickly and so rapidly as to crowd out all other species.

The young growth throughout the alpine and mountainous regions is white fir, red fir, limber pine, spruce, and balsam, and the proportion of reproduction is in the order named. The red fir descends the mountain sides farther, and the younger growth is consequently found at much lower altitudes along the north-facing walls of all the canyons than is any other timber except yellow pine.

At the lower altitudes the second-growth timber is very limited. However close their proximity to streams, the different species of cottonwood, walnut, ash, alder, box elder, and sycamore reproduce themselves to a limited extent only, mostly in shady places along deep, rugged canyons, very few being found growing in the open, exposed to the direct rays of the sun. All of these varieties are indigenous to the soil, and no difficulty is experienced in raising them in any locality so long as water can be obtained to irrigate them during the earlier stages of growth.

FOREST FIRES.

This reserve has suffered very little from fires. The only areas at all affected are a small patch on the Mogollon Mountains of about 550 acres, and another on the summit of Eagle Peak not exceeding 1,090 acres. In both instances the timber was killed but not entirely consumed, so that it is gradually rotting, falling, and encumbering the ground with a large amount of litter, which, if not attended to, may be the means of starting a more serious conflagration during an exceptionally dry season.

HUMUS, LITTER, AND UNDERBRUSH.

The depth of humus is slight, the lowlands being entirely devoid of it. The litter and the underbrush among the alpine timber are very heavy, having accumulated for ages. One class of timber, having reached maturity, decays, dies, and falls, only to be supplanted by another growth, which in time follows its predecessor.

The underbrush on the east side of the Mogollon Mountains, where the balsam fir and Arizona spruce thrive, is very slight, principally because of the intense gloom due to the thick growth of timber, and the snow is so long retained in the spring that the young seedlings have small chance of growing sufficiently hardy to resist the rigor of the following winter. In this balsam and spruce zone the trees commonly grow sixty to an acre, but in places where these species have died off and been supplanted by quaking aspen, the underbrush immediately thrives and becomes so thick as to be nearly impenetrable.

SPECIES.

Trees and shrubs indigenous to the Gila River Forest Reserve.

Yellow pine.....	Pinus ponderosa.
Red fir.....	Pseudotsuga taxifolia.
White fir.....	Abies concolor.
Engelmann spruce.....	Picea engelmanni (red, brittle bark).
Arizona spruce.....	Picea franciscana (soft, gray bark).
Balsam fir.....	Abies lasiocarpa.
Arizona pine.....	Pinus macrocarpa (large-coned var.).
Limber pine.....	Pinus flexilis.
Quaking aspen.....	Populus tremuloides.
Western walnut.....	Juglans rupestris.
Piñon pine.....	Pinus edulis.
Alligator juniper.....	Juniperus pachyphloea.
Arizona cypress.....	Cupressus guadalupensis.
Black cottonwood.....	Populus trichocarpa (flat stem to leaf, same as aspen).
Narrow-leaf cottonwood.....	Populus angustifolia.
Fremont cottonwood.....	Populus fremontii (broad leaf).
Gambel oak.....	Quercus gambelii.
Rocky Mountain oak.....	Quercus undulata.
Water oak.....	
White alder.....	Alnus rhombifolia.
California sycamore.....	Platanus racemosa.
Mountain mahogany.....	Cercocarpus ledifolius (two species, white and red).
Fringe ash.....	Fraxinus cuspidata.
Box elder.....	Acer negundo (species of maple).
Western black willow.....	Salix lasiandra.
Creeping juniper.....	Juniperus alpina (species of dwarf juniper).
Weeping cypress.....	
Weeping cottonwood.....	
Sagebrush.....	Artemisia tridentata.
Manzanita.....	
Greasewood.....	Sarcobatus.
Desert willow.....	Chilopsis linearis (found just south of reserve).
Mesquite.....	Prosopis juliflora.

ELEVATIONS OF TIMBER ZONES.

A noticeable feature in regard to the timber zones of the three main ranges of the reserve, viz, the San Francisco, the Mogollon, and the Black, is the striking difference in the distribution of the different species. On the San Francisco and the Tularosa ranges, for instance, the heaviest growth of mixed timber stands on the north-facing hillsides, while the southern ones are practically barren, being given up to scrub growths of small oaks and piñon pine. On the Mogollon Mountains the alpine species appear in their heaviest growth on the eastern slope, while

on the Black Range they are found only on the western slope. On the Mogollon Mountains the yellow pine ascends the western slope of the range very nearly to the summit, while on the east slope it does not reach within 500 feet. On the Black Range the conditions are reversed. The main cause of this striking difference is that each range has a gradual slope to Gila River, the one to the east, the other to the west, and this gradual slope is naturally the more humid, since precipitation takes the longer time to flow off and reach the main channels. Humidity is an absolute necessity for the prolific growth of alpine species; wherever the slopes are steep, alpine species become very scanty, and are generally displaced by timber peculiar to a more arid atmosphere, such as oak, juniper, and piñon pine.

Altitudinal range, in feet, of different species of timber in the Mogollon Mountains.

Species.	Lowest altitude.	Highest altitude.	Species.	Lowest altitude.	Highest altitude.
Yellow pine.....	5,900	9,000	Box elder.....	5,000	6,250
Red fir.....	6,500	10,250	Western walnut.....	5,000	6,250
Balsam fir.....	8,625	10,500	Cottonwoods.....	5,000	6,750
Engelmann spruce.....	7,600	9,250	Piñon pine.....	5,000	8,250
Arizona spruce.....	9,300	10,500	Creeping juniper.....	9,000	9,500
Quaking aspen.....	8,000	10,000	Gambel oak.....	5,000	8,250
White fir.....	6,500	10,500	California sycamore.....	5,000	6,750
Juniper.....	5,000	8,250	Fringe ash.....	5,000	6,250
Cypress.....	5,000	7,700	Black willow.....	5,000	7,400
White alder.....	5,000	6,250			

SIZE AND RATE OF GROWTH OF SPECIES.

Average sizes and rates of growth of species in the Gila River Forest Reserve.

Variety.	Height.	Diameter.	Clear height.	Age.	Growth per year.
	<i>Feet.</i>	<i>Inches.</i>	<i>Feet.</i>	<i>Years.</i>	<i>Inches.</i>
Yellow pine.....	86.5	19.31	18.5	189	0.1088
Limber pine.....	63	14.375	10	159.5	.109
Red fir.....	102.75	24.375	16.75	202.5	.119
White fir.....	61	15.375	3	89.5	.170
Engelmann spruce.....	64.66	13.08	3.33	70.33	.196
Quaking aspen.....	76.5	13.5	54	146	.095
Arizona spruce.....	93	22	22	157	.140
Balsam fir.....	94.5	19.75	15	128	.151
Average.....	80.24	17.72	17.82	142.73	.1361

STAND OF TIMBER.

The Gila River Forest Reserve, if the totally barren area is not taken into consideration, is a well-timbered region, comparing favorably with the reserves in Arizona.

The total area examined approximates 3,640 square miles. Of this, 2,593 square miles, or 71 $\frac{1}{4}$ per cent, are covered with merchantable timber of extra quality; 2 square miles have been burned; 90 square miles, or 2 $\frac{1}{2}$ per cent, have been logged; and 955 square miles, or 26 $\frac{1}{4}$ per cent, are naturally timberless.

The timber of the reserve amounts to a total of 5,867,169,750 feet B. M., giving an average stand of 3,532 feet B. M. per acre over the entire timbered belt.

Total merchantable timber in the Gila River Forest Reserve.

	Feet B. M.
Yellow pine.....	3,388,217,500
Limber pine.....	84,265,750
White fir.....	380,625,000
Red fir.....	1,664,375,000
Spruce.....	267,061,500
Balsam fir.....	82,625,000
Total.....	5,867,169,750

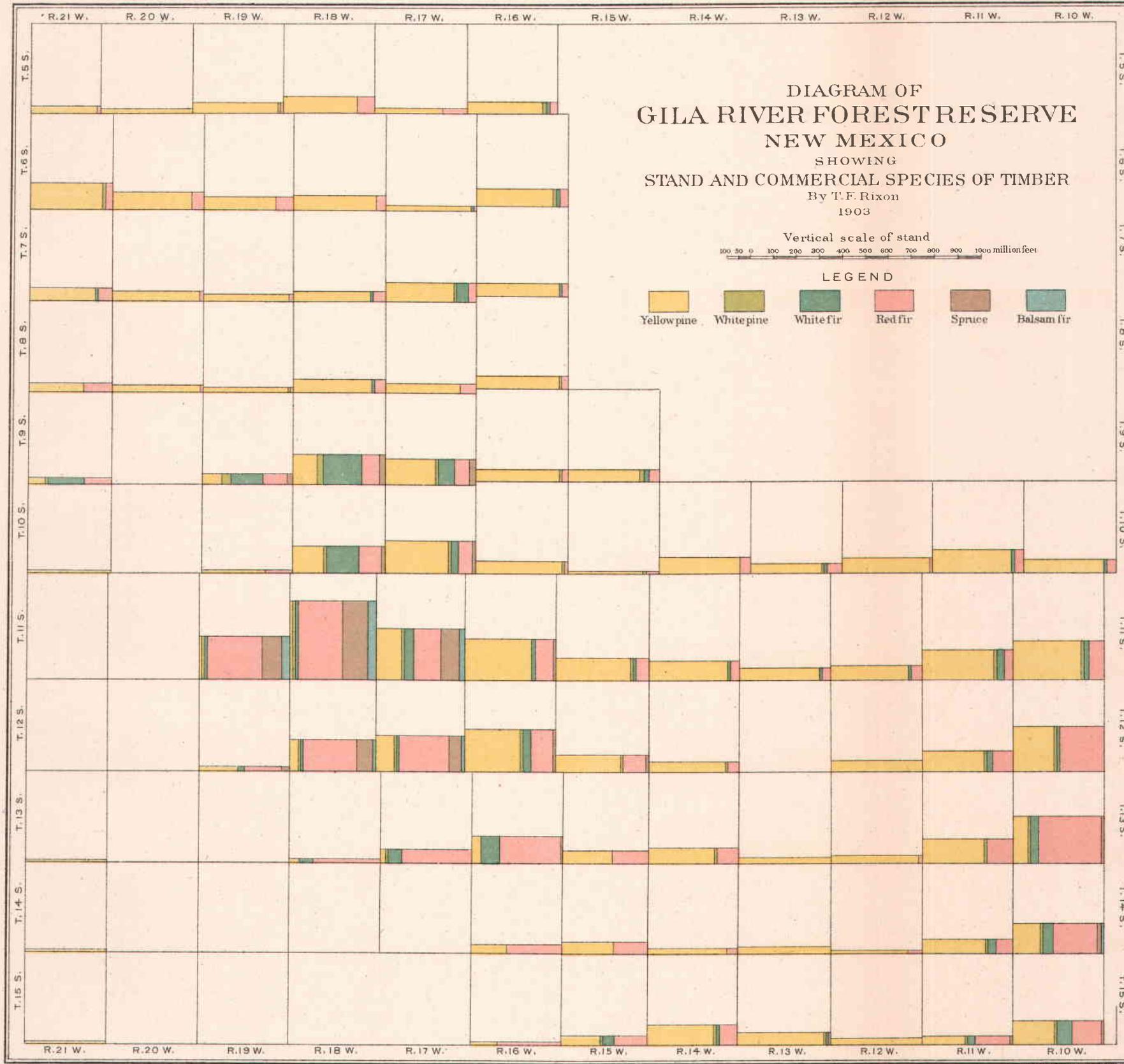
Percentage of merchantable species in the Gila River Forest Reserve.

	Per cent.
Yellow pine.....	57.75
Limber pine.....	1.43
White fir.....	6.49
Red fir.....	28.37
Spruce.....	4.55
Balsam fir.....	1.41

GILA RIVER FOREST RESERVE, NEW MEXICO.

Total stand of timber, in feet B. M., by species in each township of the Gila River Forest Reserve.

Township.	Yellow pine.	Limber pine.	White fir.	Red fir.	Spruce.	Balsam fir.	Total.
T. 5 S., R. 16 W.	40,000,000	1,281,250	1,000,000	4,875,000			47,156,250
T. 5 S., R. 17 W.	14,625,000			5,000,000			19,625,000
T. 5 S., R. 18 W.	55,000,000			12,000,000			67,000,000
T. 5 S., R. 19 W.	47,000,000	750,000		750,000			48,500,000
T. 5 S., R. 20 W.	17,125,000						17,125,000
T. 5 S., R. 21 W.	26,750,000			875,000			27,625,000
T. 6 S., R. 16 W.	64,000,000	3,000,000	2,250,000	7,500,000			76,750,000
T. 6 S., R. 17 W.	26,100,000		250,000	1,000,000			27,350,000
T. 6 S., R. 18 W.	51,750,000			6,375,000			58,125,000
T. 6 S., R. 19 W.	35,625,000			9,000,000			44,625,000
T. 6 S., R. 20 W.	58,250,000			8,000,000			66,250,000
T. 6 S., R. 21 W.	87,000,000	1,300,000		10,000,000			98,300,000
T. 7 S., R. 16 W.	47,125,000		1,500,000	4,000,000			52,625,000
T. 7 S., R. 17 W.	66,250,000	1,250,000	10,000,000	8,000,000			85,500,000
T. 7 S., R. 18 W.	34,250,000		500,000	6,000,000			40,750,000
T. 7 S., R. 19 W.	31,500,000			1,750,000			33,250,000
T. 7 S., R. 20 W.	32,750,000			1,750,000			34,500,000
T. 7 S., R. 21 W.	38,000,000		1,000,000	8,000,000			47,000,000
T. 8 S., R. 16 W.	41,125,000	1,250,000		3,875,000			46,250,000
T. 8 S., R. 17 W.	26,187,500			5,375,000			31,562,500
T. 8 S., R. 18 W.	44,500,000		750,000	6,625,000			51,875,000
T. 8 S., R. 19 W.	18,000,000	250,000		250,000			18,500,000
T. 8 S., R. 20 W.	22,000,000			250,000			22,250,000
T. 8 S., R. 21 W.	18,500,000			9,250,000			27,750,000
T. 9 S., R. 15 W.	36,750,000	2,250,000	2,250,000	6,500,000			47,750,000
T. 9 S., R. 16 W.	41,250,000	1,187,500		3,125,000	62,500		45,625,000
T. 9 S., R. 17 W.	57,062,500	5,000,000	19,125,000	17,750,000	6,500,000		105,437,500
T. 9 S., R. 18 W.	31,750,000	12,000,000	49,250,000	23,000,000	9,250,000		125,250,000
T. 9 S., R. 19 W.	8,562,500	4,375,000	14,250,000	10,500,000	2,000,000		39,687,500
T. 9 S., R. 20 W.							
T. 9 S., R. 21 W.	5,750,000	500,000	10,750,000	8,500,000			25,500,000
T. 10 S., R. 10 W.	50,750,000		500,000	5,750,000			57,000,000
T. 10 S., R. 11 W.	84,000,000		3,750,000	10,250,000			98,000,000
T. 10 S., R. 12 W.	65,250,000			750,000			66,000,000
T. 10 S., R. 13 W.	35,750,000	500,000	1,312,500	7,250,000			44,812,500
T. 10 S., R. 14 W.	61,625,000		250,000	6,750,000			68,625,000
T. 10 S., R. 15 W.	6,750,000	125,000		1,250,000			8,125,000
T. 10 S., R. 16 W.	50,625,000	500,000		2,500,000	250,000		53,875,000
T. 10 S., R. 17 W.	99,000,000	2,000,000	11,000,000	23,250,000	4,000,000		139,250,000
T. 10 S., R. 18 W.	40,000,000	2,187,500	40,000,000	28,250,000	3,375,000		113,812,500
T. 10 S., R. 19 W.	4,937,500			2,000,000			6,937,500
T. 10 S., R. 20 W.							



STAND OF TIMBER.

23

Total stand of timber, in feet B. M., by species in each township of the Gila River Forest Reserve—Continued.

Township.	Yellow pine.	Limber pine.	White fir.	Red fir.	Spruce.	Balsam fir.	Total.
T. 10 S., R. 21 W.....	1,500,000						1,500,000
T. 11 S., R. 10 W.....	121,250,000	2,375,000	8,375,000	28,250,000			160,250,000
T. 11 S., R. 11 W.....	98,500,000	2,062,500	10,250,000	13,750,000			124,562,500
T. 11 S., R. 12 W.....	44,750,000	125,000	1,250,000	5,250,000			51,375,000
T. 11 S., R. 13 W.....	40,187,500	250,000	562,500	4,062,500			45,062,500
T. 11 S., R. 14 W.....	69,500,000	500,000	750,000	8,562,500			79,312,500
T. 11 S., R. 15 W.....	80,625,000	1,375,000	2,750,000	13,500,000			98,250,000
T. 11 S., R. 16 W.....	135,000,000	312,500	5,375,000	37,625,000	1,250,000		179,562,500
T. 11 S., R. 17 W.....	68,000,000	3,375,000	23,000,000	73,000,000	44,750,000	13,875,000	226,000,000
T. 11 S., R. 18 W.....	14,000,000	4,312,500	17,000,000	173,750,000	92,562,500	38,562,500	340,187,500
T. 11 S., R. 19 W.....	6,125,000	2,000,000	10,312,500	117,125,000	40,875,000	13,250,000	189,687,500
T. 11 S., R. 20 W.....							
T. 11 S., R. 21 W.....							
T. 12 S., R. 10 W.....	83,500,000	1,000,000	4,875,000	95,250,000	625,000	125,000	185,375,000
T. 12 S., R. 11 W.....	57,875,000	1,125,000	6,000,000	19,500,000			84,500,000
T. 12 S., R. 12 W.....	42,125,000						42,125,000
T. 12 S., R. 13 W.....							
T. 12 S., R. 14 W.....	32,125,000	500,000		5,250,000			37,875,000
T. 12 S., R. 15 W.....	53,500,000	750,000	250,000	20,500,000	1,250,000		76,250,000
T. 12 S., R. 16 W.....	110,000,000	4,312,500	16,000,000	47,000,000	3,250,000		180,562,500
T. 12 S., R. 17 W.....	33,125,000	3,125,000	3,562,500	86,250,000	20,562,500	7,000,000	153,625,000
T. 12 S., R. 18 W.....	16,500,000	3,375,000	2,500,000	82,250,000	21,250,000	6,312,500	132,187,500
T. 12 S., R. 19 W.....	5,625,000		1,250,000	5,750,000	1,000,000		13,625,000
T. 12 S., R. 20 W.....							
T. 12 S., R. 21 W.....							
T. 13 S., R. 10 W.....	35,000,000	2,500,000	18,500,000	141,500,000	4,500,000		202,000,000
T. 13 S., R. 11 W.....	72,500,000	1,000,000	250,000	31,250,000	750,000		105,750,000
T. 13 S., R. 12 W.....	28,250,000			2,000,000			30,250,000
T. 13 S., R. 13 W.....	20,125,000						20,125,000
T. 13 S., R. 14 W.....	50,625,000	500,000		17,875,000			69,000,000
T. 13 S., R. 15 W.....	29,312,500	312,500		22,062,500			51,687,500
T. 13 S., R. 16 W.....	11,250,000	750,000	22,375,000	77,000,000	2,000,000		113,375,000
T. 13 S., R. 17 W.....	4,312,500	375,000	7,375,000	43,000,000			55,062,500
T. 13 S., R. 18 W.....	1,500,000		1,625,000	9,375,000			12,500,000
T. 13 S., R. 19 W.....							
T. 13 S., R. 20 W.....							
T. 13 S., R. 21 W.....	2,000,000						2,000,000
T. 14 S., R. 10 W.....	37,250,000	2,000,000	17,250,000	66,000,000	5,000,000	3,500,000	131,000,000
T. 14 S., R. 11 W.....	39,375,000	1,000,000	3,500,000	14,625,000			58,500,000
T. 14 S., R. 12 W.....	10,250,000			1,750,000			12,000,000
T. 14 S., R. 13 W.....	24,500,000						24,500,000
T. 14 S., R. 14 W.....	19,250,000			2,500,000			21,750,000

Total stand of timber, in feet B. M., by species in each township of the Gila River Forest Reserve—Continued.

Township.	Yellow pine.	Limber pine.	White fir.	Red fir.	Spruce.	Balsam fir.	Total.
T. 14 S., R. 15 W.....	29,125,000			18,687,500			47,812,500
T. 14 S., R. 16 W.....	13,250,000	125,000		20,250,000			33,625,000
T. 14 S., R. 17 W ^a							
T. 14 S., R. 18 W ^a							
T. 14 S., R. 19 W ^b							
T. 14 S., R. 20 W ^a							
T. 14 S., R. 21 W.....	3,500,000						3,500,000
T. 15 S., R. 10 W.....	48,500,000	2,125,000	17,000,000	34,500,000	1,250,000		103,375,000
T. 15 S., R. 11 W.....	13,000,000	375,000	2,625,000	10,500,000	750,000		27,250,000
T. 15 S., R. 12 W.....	22,375,000						22,375,000
T. 15 S., R. 13 W.....	49,750,000	750,000	62,500	1,250,000			51,812,500
T. 15 S., R. 14 W.....	68,000,000	1,000,000	2,000,000	20,500,000			91,500,000
T. 15 S., R. 15 W.....	15,000,000	875,000	4,312,500	12,750,000			32,937,500
T. 15 S., R. 16 W.....	1,000,000			2,500,000			3,500,000
T. 15 S., R. 17 W ^c							
T. 15 S., R. 18 W ^c							
T. 15 S., R. 19 W ^a							
T. 15 S., R. 20 W.....	40,000						40,000
T. 15 S., R. 21 W.....	2,140,000						2,140,000

^aScrub oak, piñon, and juniper.

^bEntirely timberless.

^cNot in reserve.

DETAILED DESCRIPTIONS BY TOWNSHIPS.

TOWNSHIP 5 SOUTH, RANGE 16 WEST.

This township, while very mountainous in the north and east, toward the west is a sloping plain covered with scrub oak and cedar. The streams, with the exception of Tularosa River, are in canyons from 100 to 200 feet deep, with steep walls. On the north slope the yellow pine ceases at an elevation of 8,600 feet, but on the south reaches the summit, 9,000 feet. White fir stands on the north slope from an elevation of 8,200 feet to the summit.

There is but little soil, the surface being composed mainly of volcanic rock. In the creek bottoms, however, there is a deep soil of alluvial formation.

There is no undergrowth on the mesas, but the north slopes are densely covered with young pines. The young growth is very healthy, averaging 3 to 5 feet in height and 8 years in age. The south side of Spring Creek is covered with a phenomenal growth of young yellow pine, approximating 30 feet in height and 6 inches in diameter.

This township must be logged by means of a railroad built up San Francisco and Tularosa rivers. The grades are easy and there are no engineering difficulties.

Of this township about 21,360 acres are timbered.

DETAILED DESCRIPTIONS BY TOWNSHIPS.

Stand of timber species in T. 5 S., R. 16 W.

	Feet B. M.
Yellow pine.....	40,000,000
Limber pine.....	1,281,250
White fir.....	1,000,000
Red fir.....	4,875,000
Total.....	47,156,250

Forest conditions in T. 5 S., R. 16 W.

Average total height of timber trees.....	feet.. 90
Average height, clear, of timber trees.....	do... 16
Average diameter, breast-high.....	inches.. 20
Average age.....	years.. 150

TOWNSHIP 5 SOUTH, RANGE 17 WEST.

The southern half of this township is mostly a level plateau, much cut up by streams, the northern and western portions, which are tributary to Tularosa River and Apache Creek, being very rough, steep, and mountainous.

The plateaus are covered with loose bowlders and the hills are capped with malpais rock. Along the Tularosa there is some good agricultural land, but no water.

There is very little undergrowth on the hills and none on the mesas. Considerable red fir, 75 feet high, 6 feet clear, 15 inches in diameter, and 100 years old, is found on the west side of the township, growing on northerly slopes. The juniper, piñon pine, and cedar are found on the south and west slopes, and the yellow pine and fir on the north and east.

This township must be logged by means of a railroad, as in all the country tributary to San Francisco and Tularosa rivers. The streams in this township are dry, except at a spring in section 33 and at the spot where the west town line crosses the creeks in sections 6 and 7. These run for a short distance only, being perfectly dry when they enter the dry bed of Apache Creek.

The total timbered area of this township consists of 14,400 acres.

Stand of timber species in T. 5 S., R. 17 W.

	Feet B. M.
Yellow pine.....	14,625,000
Red fir.....	5,000,000
Total.....	19,625,000

Forest conditions in T. 5 S., R. 17 W.

Average total height of timber trees.....	feet.. 120
Average height, clear, of timber trees.....	do... 19
Average diameter, breast-high.....	inches.. 17
Dead.....	per cent.. 5
Diseased.....	do... 20
Average age.....	years.. 220

TOWNSHIP 5 SOUTH, RANGE 18 WEST.

The surface of this township is very rough and broken, being traversed in numerous directions by deep and precipitous canyons, with many sharp peaks rising in all directions. As a whole the township is well timbered, the southeast corner being the only lightly covered portion.

There is but little soil, the surface being largely loose boulders and rock. In Cooper Canyon there are a few prospects which show gold, silver, and copper, but very little work has been done on them.

The undergrowth is slight, except on the north slopes, where it is mostly red fir.

This township must be logged by means of a railroad. The north half of the township and the country around the lakes contain exceptionably good timber, principally yellow pine and scattering fir. Red fir is found in all the canyons on the north and east slopes, and cottonwood, quaking aspen, and box elder along the bottoms of the canyons. Water runs in Cooper Canyon from the center of section 17 to the south town line, where it disappears, and in Wilson Canyon through sections 23 and 26. There are streams in sections 1, 2, 11, and 12 which also carry water, but the rest are dry during the summer season.

The total timbered area of this township consists of 23,340 acres.

Stand of timber species in T. 5 S., R. 18 W.

	Feet B. M.
Yellow pine.....	55,000,000
Red fir.....	12,000,000
Total.....	67,000,000

Forest conditions in T. 5 S., R. 18 W.

Average total height of timber trees.....	feet.. 100
Average height, clear, of timber trees.....	do... 15
Average diameter, breast-high.....	inches.. 23
Dead.....	per cent.. 1
Diseased.....	do... 10
Average age.....	years.. 190

TOWNSHIP 5 SOUTH, RANGE 19 WEST.

This township is traversed by a high mountain range from west to east, with a spur running to the north. The slope to San Francisco River is very steep and abrupt. The land slopes gradually to the north and west, merging in a high table-land toward the north.

There is but little soil, the surface being mostly solid malpais rock. In the northwest corner, however, the soil becomes sandy.

There is very little undergrowth. On the north slope of the south side of San Francisco River is a thriving growth of white fir.

The timber on the south will be difficult to log. San Francisco River enters a box canyon as it leaves the township line and is very nearly inaccessible. On account of floods the construction of a railroad down the stream is practically an impossibility. Therefore the timber must be manufactured on the ground and the product hauled by wagon to the various markets or consumed in the neighborhood of the village of Luna. San Francisco River is the only stream in the township which carries water all the year.

The total timbered area of this township consists of about 20,300 acres.

Stand of timber species in T. 5 S., R. 19 W.

	Feet B. M.
Yellow pine.....	47,000,000
Limber pine.....	750,000
Red fir.....	750,000
Total.....	48,500,000

Forest conditions in T. 5 S., R. 19 W.

Average total height of timber trees.....	feet.. 85
Average height, clear, of timber trees.....	do... 18
Average diameter, breast-high.....	inches.. 16
Dead.....	per cent.. 1
Diseased.....	do... 5
Average age.....	years.. 160

TOWNSHIP 5 SOUTH, RANGE 20 WEST.

This township is, for the greater part, composed of gently rolling mesas, occasionally intersected by deep canyons with nearly perpendicular walls; on the west and north, however, the surface rises very abruptly.

There is but little soil, the surface being mostly boulders and malpais rock. Upon some of the streams there are small tracts of good agricultural land.

The undergrowth is very light, consisting principally of cedar, piñon pine, scrub oak, and a few junipers. Most of the junipers have been cut by farmers at the village of Luna.

All the streams in this township carry water during the greater part of the year, but the timber is too scattered to be of great value. It could be best utilized by cutting on the ground for the use of settlers in the district.

The total timbered area of this township consists of 17,880 acres

Stand of timber species in T. 5 S., R. 20 W.

	Feet B. M.
Yellow pine.....	17,125,000

GILA RIVER FOREST RESERVE, NEW MEXICO.

Forest conditions in T. 5 S., R. 20 W.

Average total height of timber trees.....	feet..	90
Average height, clear, of timber trees.....	do...	16
Average diameter, breast-high.....	inches..	20
Dead.....	per cent..	3
Diseased.....	do...	5
Average age.....	years..	175

TOWNSHIP 5 SOUTH, RANGE 21 WEST.

The surface of this township is extremely broken and mountainous. With few exceptions the streams run through deep canyons. All of them are tributary to San Francisco River, the South Fork draining Bush Valley in Arizona.

There is but little soil, the surface being very rocky. The only agricultural tracts are located along the South Fork, near Luna.

There is very little young growth, except immediately south of San Francisco River on the side of a steep hill, where a fir growth is beginning to thrive.

The timber in this township is very scattering, but can be hauled to and cut into lumber at Luna. There is considerable juniper, oak, and piñon pine. Red fir is found along the north slopes of the canyons. Many of the principal streams rise in and are fed by springs seeping from the Escadella Mountains, and carry water during the greater part of the year.

The total timbered area of this township consists of 17,800 acres.

Stand of timber species in T. 5 S., R. 21 W.

	Feet B. M.
Yellow pine.....	26,750,000
Red fir.....	875,000
Total.....	27,625,000

Forests conditions in T. 5 S., R. 21 W.

Average total height of timber trees.....	feet..	76
Average height, clear, of timber trees.....	do...	16
Average diameter, breast-high.....	inches..	16
Dead.....	per cent..	2
Diseased.....	do...	10
Average age.....	years..	160

TOWNSHIP 6 SOUTH, RANGE 16 WEST.

The main divide between the Tularosa and the eastern watersheds passes through the center of this township. The surface is somewhat broken, and slopes gradually to the west into rolling plateaus.

There is not much soil. The surface is composed principally of malpais rock and boulders.

The eastern half of the township is heavily covered with timber on the north slopes. In sections 1 and 2 up to the top of the divide are heavy growths of white fir from 10 to 20 years old. On the south slopes the timber is piñon pine, cedar, juniper, and scrub oak. The heads of the creeks and the east slopes support considerable stands of yellow pine. The east boundary line forms the edge of the timber belt, the country to the east being entirely barren. The second growth of yellow pine is heavy, averaging 50 feet in height, 8 inches in diameter, and 60 years of age.

This township can best be logged to Tularosa River by railroad, but the product might be sent east if the demand was from that direction. The east part of the township is used extensively for sheep raising.

The total area of this township is timbered.

Stand of timber species in T. 6 S., R. 16 W.

	Feet B. M.
Yellow pine.....	64,000,000
Limber pine.....	3,000,000
White fir.....	2,250,000
Red fir.....	7,500,000
Total.....	76,750,000

Forest conditions in T. 6 S., R. 16 W.

Average total height of timber trees.....	feet.. 98
Average height, clear, of timber trees.....	do... 24
Average diameter, breast-high.....	inches.. 22
Dead.....	per cent.. 1
Diseased.....	do... 5
Average age.....	years.. 220

TOWNSHIP 6 SOUTH, RANGE 17 WEST.

This township is mostly a rolling plateau, sloping gently to the west to Tularosa River, and reaching the foothills of the Tularosa Range on the east and south. The streams are in deep canyons with perpendicular walls.

There are small areas of alluvial lands along the creeks but the mesas are covered with malpais rock.

Second-growth red fir and yellow pine are fairly represented over the timbered section. Ash, walnut, and cottonwood are found along all the canyons.

Logging roads can be constructed along all the canyons, and the timber can either be manufactured on the ground or hauled to Tularosa River. The two main streams traverse the township in a westerly direction nearly to the west boundary.

About half of the total area of the township is timbered.

GILA RIVER FOREST RESERVE, NEW MEXICO.

Stand of timber species in T. 6 S., R. 17 W.

	Feet B. M.
Yellow pine.....	26,100,000
White fir.....	250,000
Red fir.....	1,000,000
Total.....	27,350,000

Forest conditions in T. 6 S., R. 17 W.

Average total height of timber trees.....	feet.. 95
Average height, clear, of timber trees.....	do... 16
Average diameter, breast-high.....	inches.. 22
Dead.....	per cent.. 1
Diseased.....	do... 5
Average age.....	years.. 175

TOWNSHIP 6 SOUTH, RANGE 18 WEST.

The northwestern part of the township is very mountainous, the remainder sloping to Tularosa River. East of the Tularosa is a gently sloping mesa, breaking off at the river with a perpendicular wall 200 feet high.

The surface is generally malpais rock, with some alluvial soil along the streams.

There is a considerable growth of young yellow pine. On the mesas the piñon pine, oak, and juniper grow to large size.

The township can be logged by means of a railroad constructed along Tularosa River, or the timber can be manufactured on the ground. With the exception of the Tularosa all the streams are dry.

All of the township is timbered excepting about 500 acres.

Stand of timber species in T. 6 S., R. 18 W.

	Feet B. M.
Yellow pine.....	51,750,000
Red fir.....	6,375,000
Total.....	58,125,000

Forest conditions in T. 6 S., R. 18 W.

Average total height of timber trees.....	feet.. 108
Average height, clear, of timber trees.....	do... 19
Average diameter, breast-high.....	inches.. 21
Dead.....	per cent.. 2
Diseased.....	do... 10
Average age.....	years.. 195

TOWNSHIP 6 SOUTH, RANGE 19 WEST.

The San Francisco Range traverses this township from east to west. The country is very high and mountainous, rising almost perpendicularly on the south side of the range. The whole township is tributary to San Francisco River.

The surface is largely malpais rock and sandstone with occasional outcroppings of limestone. In the southeast corner is some good agricultural soil, which might be utilized if water could be brought to it.

The undergrowth is very heavy on the north slope, consisting largely of yellow pine and red and white fir. The south slope is generally covered with piñon pine and scrub oak.

This township must be logged to the north to San Francisco River, as logging to the south would be difficult on account of the character of the soil. The timber could be hauled to Luna and there manufactured. The Tularosa is the only river in the township carrying water.

All of the township is timbered excepting about 1,000 acres.

Stand of timber species in T. 6 S., R. 19 W.

	Feet B. M.
Yellow pine.....	35,625,000
Red fir.....	9,000,000
Total.....	44,625,000

Forest conditions in T. 6 S., R. 19 W.

Average total height of timber trees.....	feet.. 90
Average height, clear, of timber trees.....	do... 16
Average diameter, breast-high.....	inches.. 22
Dead.....	per cent.. 1
Diseased.....	do... 1
Average age.....	years.. 205

TOWNSHIP 6 SOUTH, RANGE 20 WEST.

The San Francisco Range traverses this township, and while the north slope is not extremely steep the south slope drops off very abruptly, with numerous perpendicular cliffs. Near the summit the range is broken by high bluffs.

There is no agricultural soil, the surface being composed wholly of rock and boulders.

On the north slope is a heavy growth of yellow pine and red fir and an abundance of white fir. The south slope supports a growth of scrub oak and piñon pine.

The north slope is tributary to Luna, and should be logged in that direction. The timber could be manufactured advantageously at that village, from which wagon roads radiate in many directions. This area can not be logged to the south. The San Francisco is the only flowing stream.

About half of this township is timbered.

GILA RIVER FOREST RESERVE, NEW MEXICO.

Stand of timber species in T. 6 S., R. 20 W.

	Feet B. M.
Yellow pine.....	58,250,000
Red fir.....	8,000,000
Total.....	66,250,000

Forest conditions in T. 6 S., R. 20 W.

Average total height of timber trees.....	feet.. 92
Average height, clear, of timber trees.....	do... 25
Average diameter, breast-high.....	inches.. 21
Dead.....	per cent.. 1
Diseased.....	do... 10
Average age.....	years.. 187

TOWNSHIP 6 SOUTH, RANGE 21 WEST.

That part of the township tributary to San Francisco River is generally a rolling, high plateau, but the portion which is drained by Blue River and its tributaries is very steep and broken.

The east slope is covered with soil, mostly alluvial, and suitable for farming purposes, but the west slope is of limestone and malpais rock.

The north slope supports a young growth of yellow pine, very prolific in places, and some white fir, but timber is very scarce on the bench lands in the eastern portion of the township. The yellow pine is exceptionally tall and strong.

Logging along Blue River will have to be conducted down that stream, as it is impossible to haul the timber up the steep bluffs. There is a road along Blue River, but it is too abrupt for practical purposes. The yellow pine tributary to San Francisco River can be hauled to Luna and manufactured there. The Blue and the San Francisco are flowing rivers for the greater part of the year.

All of this township is timbered with the exception of about 320 acres.

Stand of timber species in T. 6 S., R. 21 W.

	Feet B. M.
Yellow pine.....	87,000,000
Limber pine.....	1,300,000
Red fir.....	10,000,000
Total.....	98,300,000

Forest conditions in T. 6 S., R. 21 W.

Average total height of timber trees.....	feet.. 89
Average height, clear, of timber trees.....	do... 12
Average diameter, breast-high.....	inches.. 18
Dead.....	per cent.. 1
Diseased.....	do... 5
Average age.....	years.. 152

TOWNSHIP 7 SOUTH, RANGE 16 WEST.

The north and west portions of this township are very mountainous and rugged, while the east and south parts are a rolling prairie. The streams flowing to the south drain into Nigretto Creek, those to the north into Eagle Creek, and those to the east probably into Gila River.

The land, except of the prairie, is very rocky, and even the prairie, in the southwestern part, is covered with malpais rock. The balance of the timberless area would be good agricultural land if it could be watered.

The undergrowth is composed principally of young yellow pine and white fir and is very prolific in the timbered area, particularly on the north slope. The trees average 40 feet in height, 6 feet clear, and 12 inches in diameter. Sections 19 and 20 have a hardy growth about 15 years old. The north slope also supports a dense growth of young red fir. Facing north along Eagle Creek is a good deal of quaking aspen, about three-fourths diseased.

The north part of the township will have to be logged by rail down Eagle Creek, although the upper portion might be taken south over a low divide near the south-westerly corner of section 18 and thence by rail either down Nigretto Creek or easterly down the tributaries of Gila River.

About 14,000 acres of this township are timbered.

Stand of timber species in T. 7 S., R. 16 W.

	Feet B. M.
Yellow pine.....	47, 125, 000
White fir.....	1, 500, 000
Red fir.....	4, 000, 000
Total.....	52, 625, 000

Forest conditions in T. 7 S., R. 16 W.

Average total height of timber trees.....	feet..	73
Average height, clear, of timber trees.....	do...	8
Average diameter, breast-high.....	inches..	16
Dead.....	per cent..	1
Diseased.....	do...	10
Average age.....	years..	160

TOWNSHIP 7 SOUTH, RANGE 17 WEST.

The surface of this township is very rugged and mountainous, the land rising abruptly in peaks toward a central point called Eagle Peak. Eagle and Nigretto creeks drain the entire area, eventually flowing into San Francisco River.

There is no agricultural land in the township. The soil is rocky, mostly of malpais formation.

The north hillsides support a dense growth of young white fir. At an altitude of 8,750 feet the principal timber species are red and white fir and quaking aspen. The township, as a whole, is well timbered with yellow pine of good quality. A few years ago the timber on the summit of Eagle peak was burned, and a young growth of greenwood and blackberry vines is now springing up.

All the creeks are in very deep canyons, with precipitous walls, but suitable for building logging roads to the top of the timber belt.

All of this township is timbered except about 540 acres of burnt area.

Stand of timber species in T. 7 S., R. 17 W.

	Feet B. M.
Yellow pine.....	66,250,000
Limber pine.....	1,250,000
White fir.....	10,000,000
Red fir.....	8,000,000
Total.....	85,500,000

Forest conditions in T. 7 S., R. 17 W.

Average total height of timber trees.....	feet... 108
Average height, clear, of timber trees.....	do... 15
Average diameter, breast-high.....	inches... 25
Dead.....	per cent... 1
Diseased.....	do... 8
Average age.....	years... 190

TOWNSHIP 7 SOUTH, RANGE 18 WEST.

This township comprises an extremely rugged and mountainous area, drained by Tularosa River and Nigretto Creek. The streams flow through deep canyons with nearly perpendicular walls.

The soil is mostly rock. A small quantity of alfalfa is raised on the banks of the Nigretto, but the returns are not commensurate with the expense of clearing the land.

The undergrowth is very limited. On the south side of Nigretto Creek is a light second growth of yellow pine, and on the north side some scrub oak and yellow pine. Walnut, ash, box elder, cottonwood, sycamore, alder, and scattering red fir are found along the creeks.

Tularosa River and Nigretto Creek flow all the year.

About 18,000 acres of this township are timbered.

Stand of timber species in T. 7 S., R. 18 W.

	Feet B. M.
Yellow pine.....	34,250,000
White fir.....	500,000
Red fir.....	6,000,000
Total.....	40,750,000

Forest conditions in T. 7 S., R. 18 W.

Average total height of timber trees.....	feet..	91
Average height, clear, of timber trees.....	do...	15
Average diameter, breast-high.....	inches..	25
Dead.....	per cent..	1
Diseased.....	do...	6
Average age.....	years..	230

TOWNSHIP 7 SOUTH, RANGE 19 WEST.

This township is a rolling plateau except for a range of high hills rising in section 11, running southwesterly and reaching its greatest altitude near the south boundary of the township, and sloping off on both sides. The waters are all tributary to San Francisco River.

There is considerable agricultural land, but on account of the scarcity of water but little farming has been done.

The undergrowth is very small. On the hillsides the timber is mostly scrub oak, cedar, and piñon pine on west and south facing slopes; at the foot yellow pine is found. In section 4 about one-fourth of the yellow pine is dead, and the remainder is rapidly dying, owing to drought. The standing timber should be cut before it becomes wholly worthless.

Considerable yellow pine has been culled along the borders of the streams flowing through sections 17, 18, and 19, and sawed at a mill located in T. 8 S., R. 20 W., which has been removed or burned.

About 16,500 acres of this township are timbered area.

Stand of timber species in T. 7 S., R. 19 W.

	Feet B. M.	
Yellow pine.....	31,500,000	
Red fir.....	1,750,000	
Total.....	33,250,000	

Forest conditions in T. 7 S., R. 19 W.

Average total height of timber trees.....	feet..	115
Average height, clear, of timber trees.....	do...	20
Average diameter, breast-high.....	inches..	24
Dead.....	per cent..	2
Diseased.....	do...	10
Average age.....	years..	250

TOWNSHIP 7 SOUTH, RANGE 20 WEST.

This township is traversed from southwest to northeast by a precipitous rock ridge which on the east drops off to a bench, but on the west, after sloping for some distance, rises again to the summit of the San Francisco Range, the main divide between San Francisco and Blue rivers.

In the eastern part of the township there is much scattering agricultural land, which has been abandoned on account of lack of water. The hill lands are very rocky, and are covered with loose malpais boulders.

The undergrowth is limited, very little reproduction having taken place on the logged-off lands. The greater part of the area is covered with cedar, scrub oak, juniper, and piñon pine. Walnut, ash, box elder, sycamore, and cottonwood occur in shady places along the creeks and canyons.

The best plan will be to manufacture the timber on the ground, as there is not enough of it to warrant the building of a road. The Alariris, which is the only flowing stream, rises about one-half mile south of the south boundary of the township. Other streams rising in the foothills to the west carry water for a short distance only.

All of this township is timbered except about 500 acres.

Stand of timber species in T. 7 S., R. 20 W.

	Feet B. M.
Yellow pine.....	32,750,000
Red fir.....	1,750,000
Total.....	34,500,000

Forest conditions in T. 7 S., R. 20 W.

Average total height of timber trees.....	feet.. 90
Average height, clear, of timber trees.....	do... 18
Average diameter, breast-high.....	inches.. 20
Dead.....	per cent.. 1
Diseased.....	do... 5
Average age.....	years.. 200

TOWNSHIP 7 SOUTH, RANGE 21 WEST.

This township is traversed from north to south by the San Francisco Range. The west half drains into Blue River, and the east half into the Alariris, a tributary of San Francisco River. The township, as a whole, is very mountainous.

There is no agricultural land whatever. The soil is mostly derived from malpais rock.

The undergrowth is very limited. There is but little second growth, excepting on the west side tributary to Blue River. The west half of the township is covered with piñon pine, juniper, and scrub oak, and the east half with pine and red fir.

The timber will have to be carried by the natural watercourses—on the west side by Blue River and on the east by San Francisco River or Alariris Creek. On account of the steep hills considerable difficulty will be experienced in hauling the logs. Donkey engines, with not less than one mile of cable, would be required for handling it, as the ground is too rough for the use of wagons.

All of this township is timbered.

DETAILED DESCRIPTIONS BY TOWNSHIPS.

Stand of timber species in T. 7 S., R. 21 W.

	Feet B. M.
Yellow pine.....	38,000,000
White fir.....	1,000,000
Red fir.....	8,000,000
Total.....	47,000,000

Forest conditions in T. 7 S., R. 21 W.

Average total height of timber trees.....	feet.. 114
Average height, clear, of timber trees.....	do... 16
Average diameter, breast-high.....	inches.. 22
Dead.....	per cent.. 1
Diseased.....	do... 5
Average age.....	years.. 223

TOWNSHIP 8 SOUTH, RANGE 16 WEST.

The surface of this township is generally rolling, rising abruptly at the southeast corner to Elk Mountain; the northeast portion is a prairie. The streams flowing to the south run into Middle Fork, and those to the east into the East Fork of Gila River. The western portion is tributary to Nigretto Creek.

There is considerable soil, and large areas of prairie land could be utilized for farming if the country could be watered.

Throughout the timbered portion is a thriving growth of yellow pine, with fir and limber pine growing on the higher north slopes of the different spurs. Red fir is found on the north slopes along all the creeks.

This township can be logged down the Nigretto or the Middle Fork of Gila River, but a movable sawmill would be best adapted to the needs of this and the surrounding country. All the streams are dry during the greater part of the year, flowing only during thunderstorms.

Of this township about 14,200 acres are timbered.

Stand of timber species in T. 8 S., R. 16 W.

	Feet B. M.
Yellow pine.....	41,125,000
Limber pine.....	1,250,000
Red fir.....	3,875,000
Total.....	46,250,000

Forest conditions in T. 8 S., R. 16 W.

Average total height of timber trees.....	feet.. 75
Average height, clear, of timber trees.....	do... 16
Average diameter, breast-high.....	inches.. 20
Dead.....	per cent.. 1
Diseased.....	do... 5
Average age.....	years.. 200

TOWNSHIP 8 SOUTH, RANGE 17 WEST.

This township has a generally rolling surface, rising abruptly at the northeast corner, and much broken on the east line by steep and abrupt canyons. All the township is tributary to Nigretto Creek.

The prairie and timber belt are covered with malpais rock and bowlders,

Toward the southeast corner is a slender second growth of pine and fir. The timber at the northeast corner consists of a heavy growth of scrub oak, juniper, and piñon pine, with a scattering of cypress.

The timber can be logged down the Nigretto to San Francisco River by means of a logging road, but a portable sawmill would be better adapted to the requirements of the country. The South Fork of the Nigretto runs a considerable volume of water, but the North Fork contains water only a mile above its junction with the South Fork. The remaining streams are dry.

Of this township about 12,300 acres are timbered.

Stand of timber species in T. 8 S., R. 17 W.

	Feet B. M.
Yellow pine.....	26,187,500
Red fir.....	5,375,000
Total.....	31,562,500

Forest conditions in T. 8 S., R. 17 W.

Average total height of timber trees.....	feet.. 90
Average height, clear, of timber trees.....	do... 11
Average diameter, breast-high.....	inches.. 19
Dead.....	per cent.. 1
Diseased.....	do... 7
Average age.....	years.. 180

TOWNSHIP 8 SOUTH, RANGE 18 WEST.

The southwestern part of this township is a high, mountainous plateau, gradually sloping to the east, and draining into Nigretto Creek. The western portion is rough and broken.

The land is very rocky, and there is but little alluvial soil in the township.

Upon the higher plateau and on the north and east slopes are second growths of yellow pine and red and white fir. The area, as a whole, is very well timbered. The yellow pine is of average quality, but does not grow as tall as on lower altitudes.

The timber should be manufactured locally and hauled out by wagons. The West Fork of the Nigretto carries considerable water during the greater part of the year, and in summer frequently becomes a raging torrent through the occurrence of cloud-bursts.

All of this township is timbered with the exception of about 600 acres.

Stand of timber species in T. 8 S., R. 18 W.

	Feet B. M.
Yellow pine.....	44, 500, 000
White fir.....	750, 000
Red fir.....	6, 625, 000
Total.....	51, 875, 000

Forest conditions in T. 8 S., R. 18 W.

Average total height of timber trees.....	feet.. 85
Average height, clear, of timber trees.....	do... 12
Average diameter, breast-high.....	inches.. 19
Dead.....	per cent.. 1
Diseased.....	do... 7

TOWNSHIP 8 SOUTH, RANGE 19 WEST.

The surface of this township is very rugged and mountainous. It is traversed by San Francisco River, which flows for the entire distance through deep canyons with steep mountain ranges on either side.

The timber is scattering; the hills are generally covered with scrub oak, piñon pine, and juniper, with a few cedars along the creek bottoms.

There is very little undergrowth. Walnut, cottonwood, sycamore, alder, box elder, and wild grapes in great profusion grow along the canyons.

The township will have to be logged to San Francisco River, where the timber can be manufactured or hauled by road up or down the river, but the small amount of timber on this area will not warrant any great expense in getting it to market. The San Francisco is the only stream flowing all the year.

This township is sparsely timbered, about half the total stand being confined to 4 or 5 sections.

Stand of timber species in T. 8 S., R. 19 W.

	Feet B. M.
Yellow pine.....	18, 000, 000
Limber pine.....	250, 000
Red fir.....	250, 000
Total.....	18, 500, 000

Forest conditions in T. 8 S., R. 19 W.

Average total height of timber trees.....	feet.. 80
Average height, clear, of timber trees.....	do... 12
Average diameter, breast-high.....	inches.. 18
Dead.....	per cent.. 1
Diseased.....	do... 5
Average age.....	years.. 184

TOWNSHIP 8 SOUTH, RANGE 20 WEST.

The surface of this township is very rough and broken, particularly on the west side, where numerous spurs from the San Francisco Range break off abruptly from the main divide. The country is drained by the Alariris, a tributary of San Francisco River, which for a long distance runs through deep and precipitous canyons.

There is very little agricultural soil. The land is generally rocky, with but few fertile areas along the river.

The undergrowth is scarce, very little young growth being found even along the creeks. The hills are generally covered with scrub oak, juniper, and piñon pine, with a scattering of cedar along the canyons.

This township will have to be logged by means of a portable mill located at some suitable point, as there is not enough timber to warrant the building of wagon roads.

The Alariris generally carries water during all the seasons.

All of this township is timbered with the exception of about 160 acres.

Stand of timber species in T. 8 S., R. 20 W.

	Feet B. M.
Yellow pine.....	22,000,000
Red fir.....	250,000
Total.....	22,250,000

Forest conditions in T. 8 S., R. 20 W.

Average total height of timber trees.....	feet.. 100
Average height, clear, of timber trees.....	do... 18
Average diameter, breast-high.....	inches.. 20
Dead.....	per cent.. 10
Diseased.....	do... 15
Average age.....	years.. 200

TOWNSHIP 8 SOUTH, RANGE 21 WEST.

The San Francisco Range traverses this township from the northeast corner to the southwest, its numerous spurs breaking the surface with deep canyons and rocky ridges, the east slope being the most abrupt. The west slope drains into Blue River, to which it slopes gradually.

The timber is very scattering, the growth consisting of brush, such as scrub oak, greasewood, manzanita, and a few junipers and piñon pines.

The only feasible method for logging this township is by portable mills. The timber is located principally in the immediate vicinity of the streams, but the

country is so steep that great difficulty and expense would be involved in removing the logs. The yellow pine is short, and, although of fair average height in the clear, of poor quality.

Stand of timber species in T. 8 S., R. 21 W.

	Feet B. M.
Yellow pine.....	18,500,000
Red fir.....	9,250,000
Total.....	27,750,000

Forest conditions in T. 8 S., R. 21 W.

Average total height of timber trees.....	feet... 75
Average height, clear, of timber trees.....	do... 14
Average diameter, breast-high.....	inches... 17
Dead.....	per cent... 1
Diseased.....	do... 18
Average age.....	years... 175

TOWNSHIP 9 SOUTH, RANGE 15 WEST.

The northwest corner of this township is mountainous, leading up to Elk Mountain. The southern part, which is undulating and for the most part prairie land, slopes gently to the creeks.

There are considerable areas of cultivable land, but water is so scarce as to render them of little value. The land is mostly malpais rock.

The undergrowth of white and red fir and limber pine is prolific on the higher slopes of Elk Mountain. A species of mountain juniper is also found in great profusion. The yellow pine on the two north tiers of sections is small, but that on the third tier is of excellent quality. The fourth tier supports a small growth, 40 years of age, having an average height of 40 feet.

As the township is wholly tributary to the Middle Fork of Gila River, this stream is the natural outlet for logging operations, whether the timber is cut on the ground or shipped by rail up that stream. The streams are generally dry except during violent thunderstorms.

Of this township about 12,000 acres are timbered.

Stand of timber species in T. 9 S., R. 15 W.

	Feet B. M.
Yellow pine.....	36,750,000
Limber pine.....	2,250,000
White fir.....	2,250,000
Red fir.....	6,500,000
Total.....	47,750,000

GILA RIVER FOREST RESERVE, NEW MEXICO.

Forest conditions in T. 9 S., R. 15 W.

Average total height of timber trees.....	feet..	70
Average height, clear, of timber trees.....	do...	14
Average diameter, breast-high.....	inches..	17
Dead.....	per cent..	2
Diseased.....	do...	6
Average age.....	years..	108

TOWNSHIP 9 SOUTH, RANGE 16 WEST.

The surface of this township slopes gradually from the north, and with the exception of some five sections, drains into Middle Gila River. The yellow-pine timber is mixed with small trees of the same species, averaging 45 feet high, 6 feet clear, 13 inches in diameter, and 70 years of age. The timber is sound but full of pin knots.

There is practically no undergrowth or young brush. This area has been used to a large extent for sheep grazing. A few years ago the grass grew luxuriantly, but now it is completely trampled out, owing to overstocking.

This township can be logged down the Gila by a road constructed along its bottom. The territory on the west and southwest adjacent to this township is extremely well timbered, and a mill located at any point on Gila River could be used to advantage.

Of this township about 9,200 acres are timbered.

Stand of timber species in T. 9 S., R. 16 W.

	Feet B. M.
Yellow pine.....	41,250,000
White pine.....	1,187,500
Red fir.....	3,125,000
Spruce.....	62,500
Total.....	45,625,000

Forest conditions in T. 9 S., R. 16 W.

Average total height of timber trees.....	feet..	100
Average height, clear, of timber trees.....	do...	24
Average diameter, breast-high.....	inches..	24
Dead.....	per cent..	1
Diseased.....	do...	5
Average age.....	years..	200

TOWNSHIP 9 SOUTH, RANGE 17 WEST.

This township is rough and broken, very mountainous near the southwest corner, and gradually slopes to the north. It is drained by tributaries of Nigretto Creek, which runs water above section 27 only during storms.

There is some agricultural land in sections 35 and 36 devoted to the raising of alfalfa, but the rest of the land is extremely rocky.

A very heavy growth of yellow pine, averaging 6 feet high and 15 years old, grows abundantly on the north slope at the lower elevations and at a higher altitude on the south slope. Above 9,000 feet the second growth is white and red fir, which is so dense on the east slope that it can only be penetrated with difficulty. Engelmann spruce is found at an altitude of 8,100 feet along the creek bottoms, its height increasing in lower elevations and sometimes reaching 125 feet, but with no clear trunk. White fir and limber pine commence at an elevation of 8,250 feet and continue to the highest altitudes.

This township can be logged by railroad down Nigretto Creek or the Middle Fork of the Gila, but a portable sawmill would be more economical. After being manufactured the lumber could be hauled by wagon to the nearest constructed road and thence transported by Gila or San Francisco rivers.

This township is extremely well timbered, about 18,400 acres being covered. There is much prairie land.

Stand of timber species in T. 9 S., R. 17 W.

	Feet B. M.
Yellow pine.....	57,062,500
Limber pine.....	5,000,000
White fir.....	19,125,000
Red fir.....	17,750,000
Spruce.....	6,500,000
Total.....	105,437,500

Forest conditions in T. 9 S., R. 17 W.

Average total height of timber trees.....	feet.. 97
Average height, clear, of timber trees.....	do... 16
Average diameter, breast-high.....	inches.. 22
Dead.....	per cent.. 1
Diseased.....	do... 9
Average age.....	years.. 200

TOWNSHIP 9 SOUTH, RANGE 18 WEST.

This township is a high, mountainous country, draining into Nigretto Creek. Its surface is very rocky, covered with a malpais capping.

There is a dense undergrowth of white and red fir, which thrives on the slopes, the soil being generally damp.

The timber will have to be taken down Nigretto Creek by means of stationary engines, as the grade is too steep for locomotives. The branch of Nigretto Creek flows during times of storm, but at other seasons is usually dry.

All of this township is timbered with the exception of about 640 acres.

GILA RIVER FOREST RESERVE, NEW MEXICO.

Stand of timber species in T. 9 S., R. 18 W.

	Feet B. M.
Yellow pine.....	31,750,000
Limber pine.....	12,000,000
White fir.....	49,250,000
Red fir.....	23,000,000
Spruce.....	9,250,000
Total.....	125,250,000

Forest conditions in T. 9 S., R. 18 W.

Average total height of timber trees.....	feet..	90
Average height, clear, of timber trees.....	do..	10
Average diameter, breast-high.....	inches..	22
Dead.....	per cent..	1
Diseased.....	do..	13
Average age.....	years..	190

TOWNSHIP 9 SOUTH, RANGE 19 WEST.

The surface of this township is extremely rough, being broken by lofty hills and intersected by numerous deep canyons. The greater part of the area drains westerly into San Francisco River and is very sparsely timbered.

Undergrowth of manzanita and greasewood is conspicuous on the timberless areas, particularly on the steep sidehills, where it is mixed with scattering scrub oak and piñon pine.

The amount of timber in the township is too small to pay for the cost of removing it and is not likely to be used unless the development of some mining industry should call for its consumption on the ground.

The streams are practically dry at all times excepting when converted to raging torrents by occasional cloud-bursts.

Of this township about 17,200 acres are sparsely timbered.

Stand of timber species in T. 9 S., R. 19 W.

	Feet B. M.
Yellow pine.....	8,562,500
Limber pine.....	4,375,000
White fir.....	14,250,000
Red fir.....	10,500,000
Spruce.....	2,000,000
Total.....	39,687,500

Forest conditions in T. 9 S., R. 19 W.

Average total height of timber trees.....	feet..	100
Average height, clear, of timber trees.....	do..	7
Average diameter, breast-high.....	inches..	18
Dead.....	per cent..	1
Diseased.....	do..	13
Average age.....	years..	210

TOWNSHIP 9 SOUTH, RANGE 20 WEST.

This township is traversed by San Francisco River. The country east of the river is very rugged, but the balance is generally rolling, except for the high hills on the north and west boundaries.

Rock outcrops in several places, the mesas toward the south being covered with malpais boulders.

The undergrowth is dense in places, consisting principally of greasewood and small scrub oak, with a scattering of piñon pine.

There is practically no timber in the township, only a few cottonwoods, box elders, and walnut trees growing along the bottoms of the canyons. San Francisco River and Pueblo Creek flow considerable water, but the latter occasionally sinks during the dry season.

TOWNSHIP 9 SOUTH, RANGE 21 WEST.

The western portion of this township is extremely rough and mountainous, rising abruptly to a height of several thousand feet along the boundary line between New Mexico and Arizona. The southern and eastern portions are mostly undulating mesas.

The mesas are mostly covered by malpais rock.

Along the streams are some scattering growths of walnut, ash, box elder, cottonwood, alder, and wild grapes. There is very little timber elsewhere in the township, and being located at such great altitudes and on steep mountain sides it is practically inaccessible.

Of this township about 13,750 acres are sparsely timbered.

Stand of timber species in T. 9 S., R. 21 W.

	Feet B. M.
Yellow pine.....	5,750,000
Limber pine.....	500,000
White fir.....	10,750,000
Red fir.....	8,500,000
Total.....	25,500,000

Forest conditions in T. 9 S., R. 21 W.

Average total height of timber trees.....	feet.. 80
Average height, clear, of timber trees.....	do.... 10
Average diameter, breast-high.....	inches.. 21
Dead.....	per cent.. 1
Diseased.....	do.... 16
Average age.....	years.. 175

TOWNSHIP 10 SOUTH, RANGE 10 WEST.

This township is characterized by a central mountain, part of the Black Range, forming the divide between Rio Grande and Gila River. Spurs radiate from this mountain, the southeast corner of the township being extremely rugged and mountainous and intersected by deep canyons, while the east and north portions are fairly level. The main timber belt is located in the south and west. The east portion is covered with juniper, piñon pine, and scrub oak, with walnut, box elder, sycamore, and cottonwood along the creek bottoms.

This township can best be logged by means of a railroad up Gila River. From the forks of the Gila, numerous branches with easy grades stretch off eastward to their heads at the summit of the Black Range. Nearly all the streams flow during the entire year, the Gila having a large volume of water.

Of this township about 11,700 acres are timbered.

Stand of timber species in T. 10 S., R. 10 W.

	Feet B. M.
Yellow pine.....	50,750,000
White fir.....	500,000
Red fir.....	5,750,000
Total.....	57,000,000

Forest conditions in T. 10 S., R. 10 W.

Average total height of timber trees.....	feet.. 95
Average height, clear, of timber trees.....	do... 25
Average diameter, breast-high.....	inches.. 24
Dead.....	per cent.. 1
Diseased.....	do... 8
Average age.....	years.. 223

TOWNSHIP 10 SOUTH, RANGE 11 WEST.

The north portion of this township is a high, rolling plateau, intersected by numerous streams, which in their course south become deep, rocky canyons. The plateau drops perpendicularly at Gila River and rises as abruptly on the south side. The north and northwest portions, tributary to the west, are very level and are for the most part heavily timbered, but open occasionally into small prairies.

The timber is of exceptionally good quality, and stands in a park-like country free from underbrush and young growths.

All the timber belt is tributary to Gila River either south or west. The stream flowing west has the better grades, and a road can easily be constructed throughout its entire length. An exceedingly fine timber belt, perhaps better than any other in the reserve, would thus be made accessible. The Gila is the only stream that flows throughout the year.

This township is generally well timbered.

DETAILED DESCRIPTIONS BY TOWNSHIPS.

Stand of timber species in T. 10 S., R. 11 W.

	Feet B. M.
Yellow pine.....	84,000,000
White fir.....	3,750,000
Red fir.....	10,250,000
Total.....	98,000,000

Forest conditions in T. 10 S., R. 11 W.

Average total height of timber trees.....	feet.. 98
Average height, clear, of timber trees.....	do... 19
Average diameter, breast-high.....	inches.. 22
Dead.....	per cent.. 1
Diseased.....	do... 6
Average age.....	years.. 224

TOWNSHIP 10 SOUTH, RANGE 12 WEST.

This township consists of a generally level plateau, sloping gently to the south, and tributary to Gila River. There is a good growth of yellow pine of excellent quality, but this is the only timber represented excepting a few isolated red fir trees along some of the streams.

There is no undergrowth, the area being totally free from all young growths.

The country is well situated for logging. The timber can be hauled over logging roads built in a north or northeast direction. In the southwest quarter of section 31 the river breaks into a deep canyon, and it is doubtful if a road could be constructed up the Gila beyond that point. Canyon Creek flows water in sections 31, 32, and 28, but is dry above that point. All the other streams, with the exception of the Gila in section 36, are dry.

This township is generally well timbered.

Stand of timber species in T. 10 S., R. 12 W.

	Feet B. M.
Yellow pine.....	65,250,000
White fir.....	750,000
Total.....	66,000,000

Forest conditions in T. 10 S., R. 12 W.

Average total height of timber trees.....	feet.. 100
Average height, clear, of timber trees.....	do... 20
Average diameter, breast-high.....	inches.. 26
Dead.....	per cent.. 4
Diseased.....	do... 15
Average age.....	years.. 220

TOWNSHIP 10 SOUTH, RANGE 13 WEST.

The north part of this township consists of rolling mesas, devoid of timber except along the creeks. The southern area is very rough and mountainous, ascending rapidly to the summit of Little Black Range, a spur of which traverses the south tier of sections. The timber on the north slope is yellow pine, but along the canyons is a scattering of red and white fir.

The mesas are covered with malpais rock.

The underbrush is very thick on the higher elevations, consisting of white and red fir with a few yellow pine. Near the heads of the canyons and following them for some distance are thick growths of quaking aspen, at least three-fourths of them affected by decay.

The timber can be logged in any direction required, as the character of the land is such as to permit the construction of roads. All the streams run dry immediately after a storm, owing to the porous nature of the soil.

Of this township about 10,000 acres are timbered.

Stand of timber species in T. 10 S., R. 13 W.

	Feet B. M.
Yellow pine.....	35,750,000
Limber pine.....	500,000
White fir.....	1,312,500
Red fir.....	7,250,000
Total.....	44,812,500

Forest conditions in T. 10 S., R. 13 W.

Average total height of timber trees.....	feet.. 88
Average height, clear, of timber trees.....	do... 27
Average diameter, breast-high.....	inches.. 24
Dead.....	per cent.. 2
Diseased.....	do... 10
Average age.....	years.. 272

TOWNSHIP 10 SOUTH, RANGE 14 WEST.

The east half of this township is a fairly level prairie; the west portion rises gradually to the summit of a high, timbered butte, which drops off steeply to the south and slopes gently to the north.

The prairie and the mountains are covered with a heavy coating of malpais rock.

On the north slope is a good reproduction of young yellow pine, small and hardy. There is also an undergrowth of red and white fir. On the north slope and along the creek bottoms the yellow pine is of exceptionally fine quality and large size.

This timber belt can be logged in any direction desired, as the character of the surface offers no serious obstructions to the building of logging roads. The streams to the south carry water for at least 2 miles from the south boundary line, and flow to the Middle Fork of Gila River.

Of this township about 13,000 acres are timbered.

Stand of timber species in T. 10 S., R. 14 W.

	Feet B. M.
Yellow pine.....	61,625,000
White fir.....	250,000
Red fir.....	6,750,000
Total.....	68,625,000

Forest conditions in T. 10 S., R. 14 W.

Average total height of timber trees.....	feet.. 115
Average height, clear, of timber trees.....	do... 24
Average diameter, breast-high.....	inches.. 24
Average age.....	years.. 225

TOWNSHIP 10 SOUTH, RANGE 15 WEST.

This township, except for a few sections along the east side, is a rolling prairie covered with malpais rock, and is used largely for stock raising.

On sections 12, 13, and 24 are small growths of yellow pine and red fir. The remainder of the timbered area is covered with scrub oak and piñon pine, averaging about 5 cords to the acre.

The timber in this township can be logged down Iron Creek or taken north, or it can be hauled east to T. 10 S., R. 14 W., and logged in connection with that body of timber. Iron Creek runs water through sections 27 and 34 only.

Of this township about 4,000 acres are timbered.

Stand of timber species in T. 10 S., R. 15 W.

	Feet B. M.
Yellow pine.....	6,750,000
Limber pine.....	125,000
Red fir.....	1,250,000
Total.....	8,125,000

Forest conditions in T. 10 S., R. 15 W.

Average total height of timber trees.....	feet.. 72
Average height, clear, of timber trees.....	do... 9
Average diameter, breast-high.....	inches.. 19
Dead.....	per cent.. 1
Diseased.....	do... 7
Average age.....	years.. 177

TOWNSHIP 10 SOUTH, RANGE 16 WEST.

The surface of this township slopes gradually to the east on the west side of Gila River, and rises rapidly to the summit of a high butte on the east side.

The land is generally covered with malpais rock. A few good tracts of agricultural land could be found along the Gila in sections 9, 16, and 21, but as the river flows underground until its junction with Snow Creek, the cost of irrigation would be too great for the area involved. Excellent dam sites exist at the mouths of the creeks entering Gila River, and no difficulty would be experienced in impounding flood waters.

There is some excellent timber on the west side of Gila River, being a part of the belt that extends to the summit of the Mogollon Range. This timber can be logged by roads with easy grades constructed up the numerous tributaries. Water is found in all the streams at some point along the route. Snow Creek drains the Mogollon Mountains in this township; it is a large stream, well stocked with mountain trout, but is being rapidly depleted owing to lack of proper protection.

Of this township about 13,400 acres are timbered.

Stand of timber species in T. 10 S., R. 16 W.

	Feet B. M.
Yellow pine.....	50,625,000
Limber pine.....	500,000
Red fir.....	2,500,000
Spruce.....	250,000
Total.....	53,875,000

Forest conditions in T. 10 S., R. 16 W.

Average total height of timber trees.....	feet.. 90
Average height, clear, of timber trees.....	do.. 16
Average diameter, breast-high.....	inches.. 22
Dead.....	per cent.. 1
Diseased.....	do.. 5
Average age.....	years.. 180

TOWNSHIP 10 SOUTH, RANGE 17 WEST.

The surface of this township slopes gradually to the east from a high mountain in the extreme northwest corner. The west boundary of the township is approximately the divide between Gila and San Francisco rivers, and is, in fact, the main divide of the reserve. It is one of the best-timbered townships in the reserve for merchantable lumber, the yellow pine and other species being of exceptionally good quality. Engelmann spruce is found along the damp creek bottoms and on the north-facing slopes of the creeks.

The surface, except along some of the creeks, is very rocky, The Cooney mineral belt approaches this section, but lead has not been found on the east side of the divide.

The undergrowth on the lower altitudes is of yellow and limber pine, with white and red fir on the higher elevations, the fir being especially abundant.

This township is tributary to Gila River. The timber could be manufactured on the ground and hauled to Cooney or Mogollon. A good road with easy grades has been constructed to Mogollon, but owing to its elevation it is often impassable in winter by snow.

Nearly all the streams in this township flow throughout the entire year.

Stand of timber species in T. 10 S., R. 17 W.

	Feet B. M.
Yellow pine.....	99,000,000
Limber pine.....	2,000,000
White fir.....	11,000,000
Red fir.....	23,250,000
Spruce.....	4,000,000
Total.....	139,250,000

Forest conditions in T. 10 S., R. 17 W.

Average total height of timber trees.....	feet... 115
Average height, clear, of timber trees.....	do... 19
Average diameter, breast-high.....	inches... 29
Dead.....	per cent... 1
Diseased.....	do... 9
Average age.....	years... 242

TOWNSHIP 10 SOUTH, RANGE 18 WEST.

The part of this township lying between Mineral and Copper creeks is a high table-land intersected by numerous deep canyons. North of Copper Creek the country ascends very rapidly to the main divide. South of Nigretto Creek, Copper and Mineral creeks have cut channels in the rock to a depth of several hundred feet below the surface of the surrounding country, the walls being so steep in the case of Mineral Creek as to render the river almost inaccessible throughout its length. On the north slope, between Mineral and Copper creeks, the timber is principally yellow pine. Along the canyons walnut, ash, box elder, cottonwood, alder, sycamore, and wild grapes are found growing at the lower altitudes, with spruce and white fir at the higher levels.

The undergrowth along all the north slopes is very dense, and along the canyon bottoms consists of red and white fir, limber pine, and Engelmann spruce. On the

south slope, between Mineral and Copper creeks, and facing Mineral Creek, the land is generally timberless, being covered with numerous species of cacti, scrub oak, and greasewood.

The timber can be logged down the different canyons to the mining districts, or manufactured on the ground by portable sawmills, and flumed down the streams from such elevations as are not too steep. The cost of making and maintaining roads along such canyons is very expensive and adds greatly to the cost of logging. All the streams run considerable water during the entire year; Mineral Creek has a large volume.

This township is heavily timbered.

Stand of timber species in T. 10 S., R. 18 W.

	Feet B. M.
Yellow pine.....	40,000,000
Lumber pine.....	2,187,500
White fir.....	40,000,000
Red fir.....	28,250,000
Spruce.....	3,375,000
Total.....	113,812,500

Forest conditions in T. 10 S., R. 18 W.

Average total height of timber trees.....	feet.. 105
Average height, clear, of timber trees.....	do... 11
Average diameter, breast-high.....	inches.. 27
Dead.....	per cent.. 1
Diseased.....	do... 18
Average age.....	years.. 210

TOWNSHIP 10 SOUTH, RANGE 19 WEST.

The surface of this township is more broken than that of any other in the reserve, owing in part to the hills, but more to the numerous streams which intersect it, separating the ridges with deep, impenetrable canyons, which afford the only means of ingress to the township. Once entered, these canyons in many instances can not be left for miles. Generally the canyons do not exceed 8 to 10 feet in width at the bottom, and run hundreds of feet without any perceptible widening. The towns of Cooney and Mogollon are built along the canyons.

The rock is mineral bearing, yielding gold, silver, and copper. Twenty dollars to the ton is considered a low-grade ore and difficult to work. The introduction of railroads would undoubtedly render this an extremely prosperous mining district, but the lack of any such facilities has resulted in the closing of all the mines, with a single exception. The concentrates are hauled by wagon to Silver City, a distance of nearly 100 miles, an expensive method of transportation which consumes the profits.

Nearly all the timber has been cut within a reasonable distance of the settlements. Two sawmills are at present operating, one at the head of Silver Creek, the other at Cooney. The latter is logging on Copper Creek, and hauling the logs by wagon to Cooney. Originally most of the timber stood along the canyons, the summits of the ridges being practically bare with the exception of a few isolated piñon pine and scrub oak.

Stand of timber species in T. 10 S., R. 19 W.

	Feet B. M.
Yellow pine.....	4,937,500
Red fir.....	2,000,000
Total.....	<u>6,937,500</u>

TOWNSHIP 10 SOUTH, RANGE 20 WEST.

This township comprises a rolling, timberless country, draining into San Francisco River.

The prairies are covered with malpais rock, but along the San Francisco there are large tracts of good agricultural land. At the present time nearly all the river-bottom land in the township is owned by one stock-raising company.

Cottonwood, walnut, alder, and sycamore trees are found along nearly all the streams and in shady spots in the canyons.

TOWNSHIP 10 SOUTH, RANGE 21 WEST.

This township is principally a timberless prairie, draining to the southeast. A small amount of timber found along the canyon creeks consists chiefly of walnut, ash, box elder, and cottonwood, with a few yellow pine and a scattering of scrub oak. A limited amount of piñon pine and juniper are found along the steep sides of the creeks.

Stand of timber species in T. 10 S., R. 21 W.

	Feet B. M.
Yellow pine.....	1,500,000

TOWNSHIP 11 SOUTH, RANGE 10 WEST.

In this township the two east tiers of sections are very rough and mountainous, dropping off to the east into numerous deep canyons, but the west portion assumes a more gradual slope, draining into Diamond and Turkey creeks and other tributaries of Gila River. The streams flowing to the east are tributary to the Rio Grande. The Black Range, the main divide between the Gila and Rio Grande watersheds, traverses the eastern boundary of the township. The yellow pine is of particularly fine quality, that growing along the creeks averaging 125 feet in height, 24 feet clear, and 3 feet in diameter. The red and white fir generally stand on the north and east slopes.

The formation is limestone, shaly sandstone, and porphyry, showing numerous mineral deposits, and is probably a continuation of the belt found 10 or 12 miles farther east.

The hills support a good growth of young red and white fir and of yellow and limber pine, averaging 60 feet in height, 10 feet clear, and 10 inches in diameter. The red fir grows very large in places, some trees being 48 inches in diameter.

This township can be easily logged by means of roads constructed along the numerous streams. These roads are hard, with slight grades, and there are no engineering difficulties.

This township is one of the most heavily timbered in the reserve, and the timber is of excellent quality.

Stand of timber species in T. 11 S., R. 10 W.

	Feet B. M.
Yellow pine.....	121,250,000
Limber pine.....	2,375,000
White fir.....	8,375,000
Red fir.....	28,250,000
Total.....	160,250,000

Forest conditions in T. 11 S., R. 10 W.

Average total height of timber trees.....	feet.. 100
Average height, clear, of timber trees	do... 15
Average diameter, breast-high.....	inches.. 20
Dead.....	per cent.. 1
Diseased.....	do... 8
Average age.....	years.. 255

TOWNSHIP 11 SOUTH, RANGE 11 WEST.

The northwestern part of this township is very broken and mountainous, particularly where it descends to Gila River. The remainder is generally a rolling prairie, intersected by numerous streams and by canyons about 200 feet deep. The township supports an excellent growth of yellow pine.

The surface is generally covered by malpais rock, with outcroppings of shaly sandstone.

The undergrowth is very healthy and well stocked with a mixed species of young timber.

The timber can be easily logged by means of roads constructed along the main streams.

This township is well covered with an excellent quality of timber.

Stand of timber species in T. 11 S., R. 11 W.

	Feet B. M.
Yellow pine.....	98,500,000
Limber pine.....	2,062,500
White fir.....	10,250,000
Red fir.....	13,750,000
Total.....	124,562,500

Forest conditions in T. 11 S., R. 11 W.

Average total height of timber trees.....	feet.. 100
Average height, clear, of timber trees.....	do... 16
Average diameter, breast-high.....	inches.. 20
Dead.....	per cent.. 1
Diseased.....	do... 9
Average age.....	years.. 240

TOWNSHIP 11 SOUTH, RANGE 12 WEST.

The surface of this township is generally rolling. The northeast corner, however, is extremely broken and mountainous, and is intersected by Gila River, which flows through a rocky canyon several hundred feet deep, with precipitous walls on either side. The west half of the township is prairie land, supporting very little timber, there being but a scattering of juniper, piñon pine, and scrub oak. The valleys of the streams are timbered with walnut, cottonwood, box elder, and alder, with a profusion of wild-grape vines.

There are some strips of agricultural lands along the creeks which were at one time cultivated, but were of necessity abandoned owing to the scarcity of water in the dry season. The soil is generally derived from malpais rock.

The eastern part of the township can be logged by means of roads constructed along the streams.

All of this township, with the exception of about 6,000 acres, is timbered.

Stand of timber species in T. 11 S., R. 12 W.

	Feet B. M.
Yellow pine.....	44,750,000
Limber pine.....	125,000
White fir.....	1,250,000
Red fir.....	5,250,000
Total.....	51,375,000

Forest conditions in T. 11 S., R. 12 W.

Average total height of timber trees.....	feet.. 102
Average height, clear, of timber trees.....	do... 23
Average diameter, breast-high.....	inches.. 23
Dead.....	per cent.. 1
Diseased.....	do... 11
Average age.....	years.. 260

TOWNSHIP 11 SOUTH, RANGE 13 WEST.

This township is generally prairie land, supporting a few isolated piñon pines and scrub oaks. The northwest corner is rugged and mountainous, sloping in a generally southeasterly direction, and is tributary to Gila River. The main timber belt is of good quality. The yellow pine is exceptionally tall, clear of trunk, sound, and free from defects.

There is no agricultural land in the township. The soil is generally of malpais formation.

The timber can be logged in any direction, but must go with the slope of the country, as the streams, which are all dry, are in deep beds about 150 feet below the level of the land.

Of this township about 11,500 acres are timbered.

Stand of timber species in T. 11 S., R. 13 W.

	Feet B. M.
Yellow pine.....	40, 187, 500
Limber pine.....	250, 000
White fir.....	562, 500
Red fir.....	4, 062, 500
Total.....	45, 062, 500

Forest conditions in T. 11 S., R. 13 W.

Average total height of timber trees.....	feet.. 98
Average height, clear, of timber trees.....	do... 20
Average diameter, breast-high.....	inches.. 20
Dead.....	per cent.. 1
Diseased.....	do... 7

TOWNSHIP 11 SOUTH, RANGE 14 WEST.

This township is mainly a high plateau rising gently toward the northeast corner, but dropping perpendicularly at the intersections of streams, which have cut chasms through the rock, in some cases hundreds of feet in depth. The north part of the township and that lying south of Gila River are well timbered with first-class yellow pine. White and red fir, walnut, box elder, cottonwood, and sycamore are found growing along the canyons, with piñon pine and scrub oak scattered sparingly over the timberless area.

All the timbered country is tributary to the Middle Fork of Gila River, down which the timber must be logged by means of roads constructed for that purpose.

All the large streams run water except during extremely dry periods.

Of this township about 21,200 acres are timbered.

DETAILED DESCRIPTIONS BY TOWNSHIPS.

Stand of timber species in T. 11 S., R. 14 W.

	Feet B. M.
Yellow pine.....	69,500,000
Limber pine.....	500,000
White fir.....	750,000
Red fir.....	8,562,500
Total.....	79,312,500

Forest conditions in T. 11 S., R. 14 W.

Average total height of timber trees.....	feet.. 98
Average height, clear, of timber trees.....	do... 19
Average diameter, breast-high.....	inches.. 22
Dead.....	per cent.. 1
Diseased.....	do... 7

TOWNSHIP 11 SOUTH, RANGE 15 WEST.

This township consists of fairly level plateaus intersected by numerous deep canyons. The north portion is tributary to the Middle Fork, and the south part to the West Fork of Gila River. The Little Range traverses the township, but does not assume mountainous proportion until after passing the west boundary. All this area is well covered with first quality yellow pine mixed with red and white fir, the latter growing principally on the north slopes of the canyons.

The timber is immediately tributary to the two branches of Gila River, and can be hauled to those streams, and thence to market by a railroad constructed for that purpose.

Stand of timber species in T. 11 S., R. 15 W.

	Feet B. M.
Yellow pine.....	80,625,000
Limber pine.....	1,375,000
White fir.....	2,750,000
Red fir.....	13,500,000
Total.....	98,250,000

Forest conditions in T. 11 S., R. 15 W.

Average total height of timber trees.....	feet.. 97
Average height, clear, of timber trees.....	do... 17
Average diameter, breast-high.....	inches.. 24
Dead.....	per cent.. 1
Diseased.....	do... 8

TOWNSHIP 11 SOUTH, RANGE 16 WEST.

This township is a rough, mountainous country, breaking into high peaks along the Little Range. Iron Creek and West Fork of Gila River have cut chasms

in the rock, in some places hundreds of feet in depth. This area is covered with an extra heavy growth of yellow pine and red fir, with considerable white fir at the higher altitudes and Engelmann spruce along the creek bottoms.

The country is very rocky and difficult to traverse.

The young growth is dense, and at the higher elevations thrives to perfection, the yellow pine growing particularly well on the south slopes.

This township is tributary to Gila River, but difficulties will be encountered in building roads down the canyons, as falls are numerous, and the bed of the stream very narrow in places. The upland country can not be utilized on account of the numerous canyons. Nearly all the streams are flowing. Iron Creek and the West Fork of the Gila carry a very large volume of water, being fed from springs and snow on the Mogollon Mountains.

This township is very heavily timbered.

Stand of timber species in T. 11 S., R. 16 W.

	Feet B. M.
Yellow pine.....	135,000,000
Limber pine.....	312,500
White fir.....	5,375,000
Red fir.....	37,625,000
Spruce.....	1,250,000
Total.....	179,562,500

Forest conditions in T. 11 S., R. 16 W.

Average total height of trees.....	feet.. 94
Average height, clear, of timber trees.....	do... 16
Average diameter, breast-high.....	inches.. 24
Dead.....	per cent.. 1
Diseased.....	do... 9

TOWNSHIP 11 SOUTH, RANGE 17 WEST.

This township is generally rugged and mountainous, and forms, with the township immediately to the south, the highest portion of the reserve. The topography to the southwest is steep, the country being intersected by numerous deep, rocky canyons with perpendicular walls several thousand feet high, and subject to occasional huge rock slides from the summits of the mountains to the creek bottoms. The greater part of the township drains to the northeast into Gila River. The main divide of the Mogollon Range cuts off a corner of this area which drains into Mogollon and Whitewater creeks. The timber consists of an equal division of alpine species, with yellow pine growing at the lower altitudes. It is all of good size and quality, supporting, in some places, 60 trees to the acre, consisting of

Arizona spruce (a gray-barked tree closely resembling the spruce of the Pacific coast) and balsam fir, with a mixture of quaking aspen.

The undergrowth is very dense on certain areas. The top of the divide and the east slope for a distance of half a mile are utterly devoid of young growth, but the litter of dead timber is heavy. The young timber is chiefly white and red fir, quaking aspen, balsam, and white pine.

The timber must necessarily be logged down the streams. The haul by donkey engine would be very long before meeting a railroad, as the surface is too steep and rough to permit the laying of track. All the streams flow a considerable volume of water throughout the year.

This township is one of the most heavily timbered in the reserve.

Stand of timber species in T. 11 S., R. 17 W.

	Feet B. M.
Yellow pine.....	68,000,000
Limber pine.....	3,375,000
White fir.....	23,000,000
Red fir.....	73,000,000
Spruce.....	44,750,000
Balsam fir.....	13,875,000
Total.....	226,000,000

Forest conditions in T. 11 S., R. 17 W.

Average total height of timber trees.....	feet..	90
Average height, clear, of timber trees.....	do...	15
Average diameter, breast-high.....	inches..	24
Dead.....	per cent..	3
Diseased.....	do...	15
Average age.....	years..	205

TOWNSHIP 11 SOUTH, RANGE 18 WEST.

This township comprises the most precipitous and mountainous country in the reserve. It is intersected by numerous canyons several thousand feet deep, draining generally to the west. A high spur of the Mogollon Mountains runs in a northwesterly direction from the southeast corner of the township. The whole area is covered with a thick growth of mixed timber, the heaviest being red fir and Arizona spruce.

The land is extremely rocky. The Cooney mineral belt extends into this township, but up to the present time nothing has been done beyond prospecting.

The second growth is very dense, comprising a reproduction in about the same proportion as the standing timber.

Great difficulty will be experienced in logging this region, the ground being unusually rough, and the canyons narrow, with numerous falls. The country is tributary to Whitewater, Mineral, Willow, and Big Dry creeks, all but Willow Creek being tributary to San Francisco River.

This township is the most heavily timbered in the reserve.

Stand of timber species in T. 11 S., R. 18 W.

	Feet B. M.
Yellow pine.....	14,000,000
Limber pine.....	4,312,500
White fir.....	17,000,000
Red fir.....	173,750,000
Spruce.....	92,562,500
Balsam fir.....	38,562,500
Total.....	340,187,500

Forest conditions in T. 11 S., R. 18 W.

Average total height of timber trees.....	feet.. 103
Average height, clear, of timber trees.....	do... 13
Average diameter, breast-high.....	inches.. 27
Dead.....	per cent.. 1
Diseased.....	do... 20
Average age.....	years.. 200

TOWNSHIP 11 SOUTH, RANGE 19 WEST.

The surface of this township is extremely rough, being traversed by the Mogollon Range and broken by many deep, precipitous canyons, all draining into streams tributary to San Francisco River. A spur of the Mogollon Mountains on the west side breaks off perpendicularly several thousand feet to the prairie below, presenting an imposing spectacle.

The undergrowth is very compact along the eastern slope, red fir and Arizona spruce predominating.

This township will be difficult to log, owing to the rough nature of the ground. It is tributary to San Francisco River, the greater part being drained by Whitewater Creek.

All of this township is timbered with the exception of 2,360 acres.

Stand of timber species in T. 11 S., R. 19 W.

	Feet B. M.
Yellow pine.....	6,125,000
Limber pine.....	2,000,000
White fir.....	10,312,500
Red fir.....	117,125,000
Spruce.....	40,875,000
Balsam fir.....	13,250,000
Total.....	189,687,500

Forest conditions in T. 11 S., R. 19 W.

Average total height of timber trees.....	feet..	106
Average height, clear, of timber trees.....	do...	13
Average diameter, breast-high.....	inches..	29
Dead.....	per cent..	1
Diseased.....	do...	20
Average age.....	years..	210

TOWNSHIP 11 SOUTH, RANGE 20 WEST.

This township is traversed by San Francisco River and its tributaries. It is a rolling country, utterly devoid of timber with the exception of a few isolated patches of juniper, cedar, piñon pine, and scrub oak, in all about 5,000 cords, on the hillsides, and cottonwood, sycamore, and walnut along the creek bottoms.

The soil is derived from malpais rock.

San Francisco River and Whitewater Creek are the only streams flowing throughout the year.

This township is only valuable for grazing.

TOWNSHIP 11 SOUTH, RANGE 21 WEST.

This township is high, mountainous, covered with a heavy capping of malpais rock, and sparsely watered. It is destitute of timber except a scattering of juniper, cedar, piñon pine, and scrub oak, with a few cottonwood, sycamore, and walnut trees along the creek bottoms.

This area is valuable only as grazing land. The San Francisco is the only stream carrying water.

TOWNSHIP 12 SOUTH, RANGE 10 WEST.

The surface of this township rises gradually from the west side to the center line, where it ascends rapidly to the summit of the Black Range, and drops off very sharply to the east. The country is almost wholly tributary to Gila River, being drained by branches of Diamond Creek. On the east slope the timber is principally red fir and yellow pine; Engelmann spruce thrives along the creek bottoms.

The undergrowth consists of red and white fir, with yellow pine at the lower altitudes. The quaking aspen thickets are very dense, particularly on the north-facing slopes.

This township can be logged down the different branches of Diamond Creek by means of railroads built along the bottoms. There are no engineering difficulties.

This township is heavily timbered.

GILA RIVER FOREST RESERVE, NEW MEXICO.

Stand of timber species in T. 12 S., R. 10 W.

	Feet B. M.
Yellow pine.....	83,500,000
Limber pine.....	1,000,000
White fir.....	4,875,000
Red fir.....	95,250,000
Spruce.....	625,000
Balsam fir.....	125,000
Total.....	185,375,000

Forest conditions in T. 12 S., R. 10 W.

Average total height of timber trees.....	feet.. 112
Average height, clear, of timber trees.....	do... 18
Average diameter, breast-high.....	inches.. 27
Dead.....	per cent.. 1
Diseased.....	do... 12
Average age.....	years.. 285

TOWNSHIP 12 SOUTH, RANGE 11 WEST.

The surface of this township slopes gradually to the west. It is traversed by many streams, flowing in a general westerly direction at a depth of 200 feet below the level of the country, all tributary to Gila River. The timber is of good quality, yellow pine and red fir being most abundant.

The land is covered with malpais rock, with occasional outcroppings of limestone.

The young growth is not heavy. Reproduction decreases with the elevation, particularly on areas covered with malpais rock.

The creek bottoms are well adapted for railroad construction, and the timber can be easily logged by this method.

Stand of timber species in T. 12 S., R. 11 W.

	Feet, B. M.
Yellow pine.....	57,875,000
Limber pine.....	1,125,000
White fir.....	6,000,000
Red fir.....	19,500,000
Total.....	84,500,000

Forest conditions in T. 12 S., R. 11 W.

Average total height of timber trees.....	feet.. 117
Average height, clear, of timber trees.....	do.... 19
Average diameter, breast-high.....	inches.. 25
Dead.....	per cent.. 1
Diseased.....	do.... 10
Average age.....	years.. 265

TOWNSHIP 12 SOUTH, RANGE 12 WEST.

This township consists of a plateau gradually sloping to the west and draining into Diamond Creek, a tributary of Gila River. This plateau breaks into open parks, supporting a few scattered piñon pine and scrub oak. The only merchantable timber species represented is yellow pine, which is limited to a small amount on the north slopes of the creeks.

The surface is covered with malpais rock and boulders.

The timber can be easily logged by means of roads built down the streams, which have wide bottoms and slight grades. With the exception of the Gila, the streams are mostly dry, appearing above the surface in places for short distances and then sinking underground.

Of this township, about 21,600 acres are timbered.

Stand of timber species in T. 12 S., R. 12 W.

	Feet, B. M.
Yellow pine.....	42, 125, 000

Forest conditions in T. 12 S., R. 12 W.

Average total height of timber trees.....	feet..	112
Average height, clear, of timber trees.....	do....	16
Average diameter, breast-high.....	inches..	20
Dead.....	per cent..	1
Diseased.....	do....	5
Average age.....	years..	260

TOWNSHIP 12 SOUTH, RANGE 13 WEST.

This township consists of sloping mesas, dropping off abruptly into deep canyons, in which flow Gila River and its numerous tributaries. The plateaus are barren of timber, except for a scattering of scrub oak and piñon pine. Walnut, cottonwood, sycamore, and box elder, covered with wild-grape vines, grow along the creek bottoms, walnut predominating.

The mesas are covered with malpais rock.

Gila River carries a large quantity of water. During thunderstorms the volume is greatly increased, but soon recedes to the normal flow.

TOWNSHIP 12 SOUTH, RANGE 14 WEST.

This township is a high, fairly level plateau, traversed by Gila and Little rivers, which have cut channels through the rock. In places these channels are hundreds of feet deep, with perpendicular walls. The timber is chiefly yellow pine of good quality, with a few red fir and white pine.

The agricultural land is confined to a few small farms along the Gila. The surface is generally covered with malpais rock, with outcroppings of limestone.

The undergrowth, principally yellow pine, is not in a thriving condition.

The timber can be logged down Gila and Little rivers. Little River can not be followed its entire length, as it becomes very narrow and breaks into high falls a few miles from its mouth.

This township is rather sparsely timbered.

Stand of timber species in T. 12 S., R. 14 W.

	Feet, B. M.
Yellow pine.....	32, 125, 000
Limber pine.....	500, 000
Red fir.....	5, 250, 000
Total.....	37, 875, 000

Forest conditions in T. 12 S., R. 14 W.

Average total height of timber trees.....	feet... 98
Average height, clear, of timber trees.....	do.... 16
Average diameter, breast-high.....	inches... 24
Dead.....	per cent.. 1
Diseased.....	do.... 10
Average age.....	years.. 250

TOWNSHIP 12 SOUTH, RANGE 15 WEST.

The surface of this township is generally rough, breaking into mountains with sharp peaks in the southwest corner. The main divides of the Mogollon and Diablo ranges intersect at this point and radiate in all directions. Timber thrives particularly well on the west side. The country is tributary to Gila and Little rivers.

In section 7 the Gila has a series of falls in a rocky canyon, and just above this point opens into a wide bottom land, affording an ideal site for a dam, as the water would be backed for quite a distance.

Reproduction is medium with reference to amount and quality, increasing with the altitude, particularly on the north slope.

This township is fairly well timbered.

Stand of timber species in T. 12 S., R. 15 W.

	Feet, B. M.
Yellow pine.....	53, 500, 000
Limber pine.....	750, 000
White fir.....	250, 000
Red fir.....	20, 500, 000
Spruce.....	1, 250, 000
Total.....	76, 250, 000

Forest conditions in T. 12 S., R. 15 W.

Average total height of timber trees.....	feet..	98
Average height, clear, of timber trees.....	do....	14
Average diameter, breast-high.....	inches..	24
Dead.....	per cent..	1
Diseased.....	do....	6
Average age.....	years..	225

TOWNSHIP 12 SOUTH, RANGE 16 WEST.

The northeast half of this township is fairly level up to the foot of the Mogollon Mountains, where it rises steeply to the summit of the range; on the south side it drops precipitously into the numerous canyons which drain into Mogollon Creek, a tributary of the Gila. All the streams to the east and north are in deep canyons, with nearly perpendicular walls on either side. The timber is chiefly yellow pine and red fir.

The second growth is extremely good, approximating 15 years of age, and consisting of yellow pine, with red and white fir at the higher altitudes. Engelmann spruce is found along the creek bottoms.

The greater part of the timber is tributary to the West Fork of Gila River and the rest to Mogollon Creek. The best method of logging this area is by means of portable mills, carrying out the product by flumes built for the purpose. The construction of roads up Mogollon Creek would be very expensive on account of the large amount of rock and the frequency of cloud-bursts in the mountains. All the large streams and some of the smaller ones carry water practically throughout the year.

This township supports a large amount of timber of excellent quality.

Stand of timber species in T. 12 S., R. 16 W.

	Feet B. M.
Yellow pine.....	110,000,000
Limber pine.....	4,312,500
White fir.....	16,000,000
Red fir.....	47,000,000
Spruce.....	3,250,000
Total.....	180,562,500

Forest conditions in T. 12 S., R. 16 W.

Average total height of timber trees.....	feet..	96
Average height, clear, of timber trees.....	do....	12
Average diameter, breast-high.....	inches..	25
Dead.....	per cent..	1
Diseased.....	do....	11
Average age.....	years..	215

TOWNSHIP 12 SOUTH, RANGE 17 WEST.

This township is extremely rough and mountainous. The Mogollon Range in section 10 rises to an elevation of 10,500 feet, and from it the land drops rapidly in all directions, the steepest slope being on the south side, which is tributary to Mogollon Creek. The red fir timber is of fair quality and very large size. On the hills the yellow pine reaches a greater elevation on the south sides than on the north sides. Balsam fir and Arizona spruce are found on the highest ridges facing north. The two south tiers of sections are covered with manzanita and greasewood.

The young growth is very heavy, red and white fir and limber pine predominating, with much quaking aspen at the heads of the northeast-flowing streams. In Snow Park a few young yellow pines once stood, half a mile distant from the main yellow-pine timber belt, but this young growth was killed by sheep grazing along the summit of the Mogollon Mountains south of Mogollon Peak.

The timber tributary to Mogollon Creek will be difficult to log on account of the steep character of the ground and the large boulders in the canyons. These canyons are narrow and full of falls.

This township is excellently timbered.

Stand of timber species in T. 12 S., R. 17 W.

	Feet B. M.
Yellow pine.....	33, 125, 000
Limber pine.....	3, 125, 000
White fir.....	3, 562, 500
Red fir.....	86, 250, 000
Spruce.....	20, 562, 500
Balsam fir.....	7, 000, 000
Total.....	153, 625, 000

Forest conditions in T. 12 S., R. 17 W.

Average total height of timber trees.....	feet.. 104
Average height, clear, of timber trees.....	do... 17
Average diameter, breast-high.....	inches.. 29
Dead.....	per cent.. 1
Diseased.....	do... 15
Average age.....	years.. 250

TOWNSHIP 12 SOUTH, RANGE 18 WEST.

The surface of this township is exceptionally rough and broken, dropping off rapidly to the west. With the exception of Mogollon and Saccaton creeks, which flow into the Gila, the whole west portion is tributary to San Francisco River. The timber is mostly red fir and Arizona spruce, the latter attaining a maximum diameter of 5 feet at the heads of Mogollon and Big Dry creeks. The young growth, embracing all the species, is very prolific at the higher altitudes and along the slopes.

This township can be logged down all the streams by means of engines, but the ground is too steep and rocky for horses or for road construction. The streams carry good volumes of water at all times, but sink immediately on reaching the barren mesas at the foot of the steep slopes.

This township is well timbered.

Stand of timber species in T. 12 S., R. 18 W.

	Feet B. M.
Yellow pine.....	16, 500, 000
Limber pine.....	3, 375, 000
White fir.....	2, 500, 000
Red fir.....	82, 250, 000
Spruce.....	21, 250, 000
Balsam fir.....	6, 312, 500
Total.....	132, 187, 500

Forest conditions in T. 12 S., R. 18 W.

Average total height of timber trees.....	feet.. 105
Average height, clear, of timber trees.....	do... 16
Average diameter, breast-high.....	inches.. 28
Dead.....	per cent.. 1
Diseased.....	do... 16
Average age.....	years.. 243

TOWNSHIP 12 SOUTH, RANGE 19 WEST.

This township is very mountainous in the northeast corner and drops off rapidly to the mesas below, which consist of rolling plains destitute of timber except for a few trees growing along the creek bottoms.

The ground is covered with malpais rock.

The sidehills close to the messa are densely covered with manzanita and greasewood. The lower country is entirely free from second growth.

The amount of timber in this township is too small to warrant the expense of removing it. The country is tributary to San Francisco River, and the timber would of necessity have to be hauled in that direction.

Of this township about 8,000 acres are timbered.

Stand of timber species in T. 12 S., R. 19 W.

	Feet B. M.
Yellow pine.....	5, 625, 000
White fir.....	1, 250, 000
Red fir.....	5, 750, 000
Spruce.....	1, 000, 000
Total.....	13, 625, 000

GILA RIVER FOREST RESERVE, NEW MEXICO.

Forest conditions in T. 12 S., R. 19 W.

Average total height of timber trees	feet..	85
Average height, clear, of timber trees.....	do...	10
Average diameter, breast-high.....	inches..	21
Dead.....	per cent..	1
Diseased.....	do...	15
Average age.....	years..	175

TOWNSHIP 12 SOUTH, RANGE 20 WEST.

This township consists of rolling hills of malpais, rising to the highest altitudes near the center of the township, where a small area is covered with juniper, scrub oak, piñon pine, and a few oak trees. A scant growth of similar species is found along the creeks and gulleys, valuable only for posts and cord wood. This territory is tributary to San Francisco River, which enters a box canyon hundreds of feet deep, with perpendicular walls just above its junction with Big Dry Creek. Along the banks of the stream are growths of cottonwood, alder, walnut, sycamore, and box elder.

This river carries a large volume of water, which is used for irrigation by settlers along its course. The principal products of these agricultural areas are alfalfa, corn, and fruits, nearly all of which are shipped to the Cooney mining district.

At the present time the timber in this township is inaccessible.

TOWNSHIP 12 SOUTH, RANGE 21 WEST.

The surface of this township is generally rolling, covered in places with a mixed growth of piñon pine, juniper, and scrub and jack oak upon the hills. The land has a nearly perpendicular drop of several hundred feet at San Francisco River and rises in a similar manner on the south side.

The hills are covered with a heavy deposit of malpais rock.

This township is valuable only for grazing purposes, and numerous cattle are herded upon it throughout the year. San Francisco River, which runs through the south two tiers of sections and drains the township, is the only stream carrying water. The other streams are entirely dry during the hot season except when filled by thunderstorms.

Of this township but 2 500 acres are timbered.

TOWNSHIP 13 SOUTH, RANGE 10 WEST.

This township is a high mountainous country. The east tier of sections is traversed from north to south by the Black Range, the divide between the Gila and Rio Grande watersheds. Numerous rugged spurs leave the range in all direc-

tions, the principal one extending along the south line of the township. From it rise numerous high peaks, the most prominent being Mimbres Peak, over 9,800 feet high. All of this range is heavily timbered, red fir predominating.

A second growth of red and white fir thrives along the west slope and on the summit. At the heads of the streams the quaking aspen is so thick as to crowd out the younger growths. Engelmann spruce is found along the streams.

The greater part of the timber can be logged down the Black Canyon to Gila River. No difficulties in the construction of logging roads will be encountered throughout its entire course.

Stand of timber species in T. 13 S., R. 10 W.

	Feet B. M.
Yellow pine.....	35,000,000
Limber pine.....	2,500,000
White fir.....	18,500,000
Red fir.....	141,500,000
Spruce.....	4,500,000
Total.....	202,000,000

Forest conditions in T. 13 S., R. 10 W.

Average total height of timber trees.....	feet.. 84
Average height, clear, of timber trees.....	do... 10
Average diameter, breast-high.....	inches.. 22
Dead.....	per cent.. 1
Diseased.....	do... 18
Average age.....	years.. 213

TOWNSHIP 13 SOUTH, RANGE 11 WEST.

The surface of this township is rolling, broken by deep canyons with abrupt walls, and by many timbered buttes along the south boundary. The whole township is tributary to Gila River by Black Canyon and Apache creeks. The country is well timbered, yellow pine and red fir being the most prominent species. Along the north side of Black Canyon Creek, on the summit of the mesa, timber grows only on the north and west slopes, the rest being scantily wooded with juniper and scrub oak. Cottonwood, alder, walnut, sycamore, box elder, and ash thrive along all the watercourses, particularly in the shady canyons.

The surface is generally covered with malpais rock.

There is a healthy young growth, especially of yellow pine, on the north hillsides.

The timber can be logged without great difficulty by railroads down the large streams to Gila River. Black Canyon Creek runs water through the township, the other streams being dry.

GILA RIVER FOREST RESERVE, NEW MEXICO.

Stand of timber species in T. 13 S., R. 11 W.

	Feet B. M.
Yellow pine.....	72,500,000
Limber pine.....	1,000,000
White fir.....	250,000
Red fir.....	31,250,000
Spruce.....	750,000
Total.....	105,750,000

Forest conditions in T. 13 S., R. 11 W.

Average total height of timber trees.....	feet.. 82
Average height, clear, of timber trees.....	do.... 15
Average diameter, breast-high.....	inches.. 23
Dead.....	per cent.. 5
Diseased.....	do.... 12
Average age.....	years.. 168

TOWNSHIP 13 SOUTH, RANGE 12 WEST.

The surface of this township slopes gradually to the west, breaking into park-like openings covered with a heavy capping of malpais rock. There is very little timber on the north and west portions, this little consisting of a second growth about 60 years old, with no clear trunk. Red fir is found only on the north slopes of the canyons and is of inferior quality.

The township is all tributary to Gila River, and the natural outlet for the timber is down Black Canyon and Apache creeks, which flow throughout the year for their entire length. These stream bottoms can be advantageously used in the construction of logging roads.

Of this township about 18,000 acres are sparsely timbered.

Stand of timber species in T. 13 S., R. 12 W.

	Feet B. M.
Yellow pine.....	28,250,000
Red fir.....	2,000,000
Total.....	30,250,000

Forest conditions in T. 13 S., R. 12 W.

Average total height of timber trees.....	feet.. 45
Average height, clear, of timber trees.....	do.... 10
Average diameter, breast-high.....	inches.. 15
Dead.....	per cent.. 1
Diseased.....	do.... 5
Average age.....	years.. 130

TOWNSHIP 13 SOUTH, RANGE 13 WEST.

The surface of this township is rough and is intersected by many deep and precipitous canyons. The country is sparsely wooded. A small amount of timber grows on the north slope near the summit of a high range of hills along the south boundary. The rest of the township is mostly open prairie, with a few scattering scrub oak, juniper, and cedar growing in the malpais formation.

The young growth is light, but near the south line a few yellow pines are commencing to thrive. Just beyond the divide in the township adjoining on the south the growth of yellow pine is heavy.

All the timber is tributary to Gila River and can be logged by means of railroads.

Stand of timber species in T. 13 S., R. 13 W.

	Feet B. M.
Yellow pine.....	20,125,000

Forest conditions in T. 13 S., R. 13 W.

Average total height of timber trees.....	feet.. 75
Average height, clear, of timber trees.....	do.... 12
Average diameter, breast-high.....	inches.. 20
Dead.....	per cent.. 1
Diseased.....	do.... 10
Average age.....	years.. 160

TOWNSHIP 13 SOUTH, RANGE 14 WEST.

The south half of this township is very mountainous, dropping off rapidly at the border of Gila River. The north part, or that portion draining into Little River, has a gradual slope, and is covered with a heavy stand of yellow pine of superior quality.

The surface is generally covered by malpais rock with outcroppings of limestone.

The young growth is hardy on the north slope, but the south slope is covered with dense growths of mesquite, greasewood, and short scrub oak.

The timber in this township will have to be logged to Little River, down which it can be hauled to North Fork of Gila River. Little and Gila rivers are the only streams carrying water, the latter flowing in a deep box canyon with walls hundreds of feet high.

Stand of timber species in T. 13 S., R. 14 W.

	Feet B. M.
Yellow pine.....	50,625,000
Limber pine.....	500,000
Red fir.....	17,875,000
Total.....	69,000,000

GILA RIVER FOREST RESERVE, NEW MEXICO.

Forest conditions in T. 13 S., R. 14 W.

Average total height of timber trees.....	feet..	121
Average height, clear, of timber trees.....	do...	14
Average diameter, breast-high.....	inches..	25
Dead.....	per cent..	1
Diseased.....	do...	9
Average age.....	years..	265

TOWNSHIP 13 SOUTH, RANGE 15 WEST.

This township consists of a very broken and mountainous country draining into Gila and Little rivers and Mogollon Creek. The timber is about equally divided between red fir and yellow pine. The south slope is covered generally with a heavy growth of brush, which becomes very dense on the steep sidehills facing Gila River.

The undergrowth is very limited except on the north and east slopes and close to the summit of the Diablo Range.

The timber on the east can be logged through the low divide to Little River. That on the west side is too scattering and the country too rough to pay for its removal.

This township is rather thinly timbered.

Stand of timber species in T. 13 S., R. 15 W.

	Feet B. M.
Yellow pine.....	29,312,500
Limber pine.....	312,500
Red fir.....	22,062,500
Total.....	51,687,500

Forest conditions in T. 13 S., R. 15 W.

Average total height of timber trees.....	feet..	105
Average height, clear, of timber trees.....	do...	13
Average diameter, breast-high.....	inches..	24
Dead.....	per cent..	1
Diseased.....	do...	11
Average age.....	years..	252

TOWNSHIP 13 SOUTH, RANGE 16 WEST.

This township presents an exceptionally broken surface. The Diablo Range, with its many rocky and abrupt peaks, traverses the country from east to west near the north boundary line. Its many spurs radiate in all directions and break up the surface, which drains into Gila River and Mogollon Creek. The main timber belt faces north on the south side of Mogollon Creek, where the red fir, mixed with white fir, stands very thick and attains a large size, but with a small height of clear trunk.

The young growth is very thick on the south side of Mogollon Creek, but on the north there is very little timber, brush predominating, consisting of manzanita, mesquite, and greasewood.

The timber to the north can be logged down Mogollon Creek, but the rest is scattered over such rough country that it would be unprofitable to log it.

This township is fairly well timbered.

Stand of timber species in T. 13 S., R. 16 W.

	Feet B. M.
Yellow pine.....	11,250,000
Limber pine.....	750,000
White fir.....	22,375,000
Red fir.....	77,000,000
Spruce.....	2,000,000
Total.....	113,375,000

Forest conditions in T. 13 S., R. 16 W.

Average total height of timber trees.....	feet..	77
Average height, clear, of timber trees.....	do...	6
Average diameter, breast-high.....	inches..	22
Dead.....	per cent..	1
Diseased.....	do...	20
Average age.....	years..	182

TOWNSHIP 13 SOUTH, RANGE 17 WEST.

This township is rough and mountainous on the north and east, but drops off on the southwest to low, level mesas of malpais, dotted here and there with scrub oak and juniper. The only timber in this township stands on the south side of Mogollon Creek, and consists of red fir with a sparse mixture of white fir and white pine. The south and west slopes of the mountains are practically bare of timber.

The young growth, which is principally red and white fir, stands on the north slopes, thriving exceedingly well in places.

This township can be logged by roads built up Mogollon Creek, which is tributary to Gila River.

Of this township about 10,000 acres are timbered.

Stand of timber species in T. 13 S., R. 17 W.

	Feet B. M.
Yellow pine.....	4,312,500
Limber pine.....	375,000
White fir.....	7,375,000
Red fir.....	43,000,000
Total.....	55,062,500

GILA RIVER FOREST RESERVE, NEW MEXICO.

Forest conditions in T. 13 S., R. 17 W.

Average total height of timber trees.....	feet..	115
Average height, clear, of timber trees.....	do...	10
Average diameter, breast-high.....	inches..	30
Dead.....	per cent..	1
Diseased.....	do...	15
Average age.....	years..	220

TOWNSHIP 13 SOUTH, RANGE 18 WEST.

The north two tiers of sections in this township are very rough, ascending rapidly to the summit of the Mogollon Mountains. The whole area drains south into Gila River, with the exception of section 6, which is tributary to the San Francisco. A few red firs stand on the northeast portion, but the balance of the township is mostly prairie of malpais formation, with occasional stands of juniper and scrub oak.

The red fir can be hauled to market down Mogollon Creek, which has a good grade, and down which a large amount of timber is to be hauled from the south slope of the Mogollon Mountains. This is the only feasible route.

Of this township about 8,600 acres are sparsely timbered.

Stand of timber species in T. 13 S., R. 18 W.

	Feet B. M.
Yellow pine.....	1,500,000
White fir.....	1,625,000
Red fir.....	9,375,000
Total.....	12,500,000

Forest conditions in T. 13 S., R. 18 W

Average total height of timber trees.....	feet..	100
Average height, clear, of timber trees.....	do...	10
Average diameter, breast-high.....	inches..	20
Dead.....	per cent..	1
Diseased.....	do...	20
Average age.....	years..	220

TOWNSHIP 13 SOUTH, RANGE 19 WEST.

This township is a level prairie covered with malpais rock, and is of value only as a grazing area. Certain tracts might be utilized for agricultural purposes could they be irrigated.

The main divide between Gila and San Francisco rivers crosses the township, but is so low as to be almost unnoticeable.

This township is barren of timber.

TOWNSHIP 13 SOUTH, RANGE 20 WEST.

The surface of this township is generally rolling, draining to the north to San Francisco River.

The land is covered with malpais rock, and is of use only for grazing. A few scrub oaks are scattered over the country, possibly one in twenty acres; vast tracts of land extend for miles without a trace of shrubbery.

Mule Creek, the only flowing stream in the township, is dry above section 7. This township is destitute of timber.

TOWNSHIP 13 SOUTH, RANGE 21 WEST.

This township consists of a high, rolling plateau, rising abruptly on the north and west, and covered with malpais rock, and is valuable only as a grazing area for sheep and cattle. The timber is principally juniper, piñon pine, and scrub oak, suitable only for posts and cordwood.

A small settlement occupied by cattlemen is located near the southeast corner of the township at Mule Springs. Corn can be raised in this district, but it is generally damaged more or less each year by frost.

Of this township about 6,600 acres are very lightly timbered.

Stand of timber species in T. 13 S., R. 21 W.

	Feet B. M.
Yellow pine.....	2,000,000

Forest conditions in T. 13 S., R. 21 W.

Average total height of timber trees.....	feet... 70
Average height, clear, of timber trees.....	do... 8
Average diameter, breast-high.....	inches... 15
Dead.....	per cent... 1
Diseased.....	do... 10
Average age.....	years... 100

TOWNSHIP 14 SOUTH, RANGE 10 WEST.

The eastern part of this township is traversed by the Black Range. The surface is very rough and mountainous, sloping to the west to gradually rolling spurs, intersected by deep, rocky canyons. The timber is of mixed species, red fir predominating. Engelmann spruce and balsam fir are found on the north and east slopes of the streams flowing to the west.

The surface is covered with malpais rock and limestone.

The young growth is very heavy along the higher altitudes, decreasing rapidly with the elevation. Numerous patches of young growth stand on the north slopes near the heads of ravines.

As the ground is too rough for road building, the timber will have to be hauled down the numerous watercourses. All the streams carry water for the greater part of the year, being fed from springs in the mountains.

This township is heavily timbered.

Stand of timber species in T. 14 S., R. 10 W.

	Feet B. M.
Yellow pine.....	37,250,000
Limber pine.....	2,000,000
White fir.....	17,250,000
Red fir.....	66,000,000
Spruce.....	5,000,000
Balsam fir.....	3,500,000
Total.....	131,000,000

Forest conditions in T. 14 S., R. 10 W.

Average total height of timber trees.....	feet..	86
Average height, clear, of timber trees.....	do..	15
Average diameter, breast-high.....	inches..	30
Dead.....	per cent..	1
Diseased.....	do..	15
Average age.....	years..	215

TOWNSHIP 14 SOUTH, RANGE 11 WEST.

This township consists of a rolling park-like mesa, becoming mountainous along the north tier of sections. All the streams flow through deep, rocky canyons. The areas of merchantable timber are confined to the north part of the township and creek bottoms. The mesas are covered with hardy growths of piñon pine, scrub oak, and juniper, with a scattering of cypress along the creeks.

The ridges are generally flat on top and covered with a heavy capping of malpais rock.

Young growth thrives on the Black Canyon watershed, but elsewhere is exceedingly scarce.

All the timber is tributary to Black Canyon and Sapello creeks and Mimbres River. The timber on the Sapello can be hauled down Mimbres River if necessary.

Stand of timber species in T. 14 S., R. 11 W.

	Feet B. M.
Yellow pine.....	39,375,000
Limber pine.....	1,000,000
White fir.....	3,500,000
Red fir.....	14,625,000
Total.....	58,500,000

Forest conditions in T. 14 S., R. 11 W.

Average total height of timber trees.....	feet..	82
Average height, clear, of timber trees.....	do...	15
Average diameter, breast-high.....	inches..	21
Dead.....	per cent..	1
Diseased.....	do...	9

TOWNSHIP 14 SOUTH, RANGE 12 WEST.

This township has a rolling, mountainous surface, draining principally into Sapello Creek. It supports but a slender growth of merchantable timber, chiefly yellow pine. Considerable amounts of piñon pine and scrub oak stand on the south slope, mixed with a limited number of junipers.

The soil is derived from limestone and malpais rock.

The amount of young growth is limited and is confined to the north slope.

The greater part of the timber is tributary to Apache Creek, but is very much scattered and will be expensive to log.

Stand of timber species in T. 14 S., R. 12 W.

	Feet B. M.
Yellow pine.....	10,250,000
Red fir.....	1,750,000
Total.....	12,000,000

Forest conditions in T. 14 S., R. 12 W.

Average total height of timber trees.....	feet..	70
Average height, clear, of timber trees.....	do...	8
Average diameter, breast-high.....	inches..	15
Dead.....	per cent..	1
Diseased.....	do...	5
Average age.....	years..	160

TOWNSHIP 14 SOUTH, RANGE 13 WEST.

This township is very rough and mountainous and is about half covered with piñon pine and scrub oak with a scattering of junipers. The merchantable timber is confined to the bottoms and slopes of creeks and consists wholly of yellow pine. This area is tributary to Sapello Creek.

The undergrowth is very light and has not started to reproduce in logged areas about Sapello Creek.

On account of the box canyon just west of this township, through which Sapello Creek flows, it will be impossible to send the timber by that stream. The timber must necessarily be logged east to Mimbres River over the divide. A logging road can easily be constructed, as there are no difficult grades.

GILA RIVER FOREST RESERVE, NEW MEXICO.

Stand of timber species in T. 14 S., R. 13 W.

Yellow pine.....	Feet B. M.
	24,500,000

Forest conditions in T. 14 S., R. 13 W.

Average total height of timber trees.....	feet..	85
Average height, clear, of timber trees.....	do...	12
Average diameter, breast-high.....	inches..	20
Dead.....	per cent..	1
Diseased.....	do...	5
Average age.....	years..	200

TOWNSHIP 14 SOUTH, RANGE 14 WEST.

This township comprises an extremely rough and mountainous country, covered largely with brush. The only timbered portion is toward the southwest, south of Gila River. Along the river bottoms cottonwood, walnut, box elder, sycamore, and wild grape flourish in the shady spots. The hillsides are mostly bare, with occasional dottings of mesquite, greasewood, and cactus. Gila River and Sapello Creek have worn chasms several thousand feet deep.

The timber in the southwest corner can be hauled to Trout Creek and thence by road down the Gila to market.

This township supports a very light growth of timber.

Stand of timber species in T. 14 S., R. 14 W.

Yellow pine.....	Feet B. M.
	19,250,000
Red fir.....	2,500,000
Total.....	21,750,000

Forest conditions in T. 14 S., R. 14 W.

Average total height of timber trees.....	feet..	100
Average height, clear, of timber trees.....	do...	16
Average diameter, breast-high.....	inches..	22
Dead.....	per cent..	1
Diseased.....	do...	5
Average age.....	years..	175

TOWNSHIP 14 SOUTH, RANGE 15 WEST.

This township has a mountainous surface, rising abruptly to the Diablo Range on the north side of Gila River. On the south of the river is a high table-land, gradually sloping to Gila Canyon, where it drops off perpendicularly hundreds of feet. Practically all the timber stands on the south side of the river, and is of excellent quality, consisting of yellow pine and red fir. To the north of the Gila yellow pine stands only on the bottoms and on the sloping sides of the creeks.

The young growth is abundant on the north-facing slopes, but elsewhere is very light.

The timber can be hauled to Trout Creek to the east and thence to Gila River, or it can be sent down chutes by cable to the main Gila at some favorable place.

Stand of timber species in T. 14 S., R. 15 W.

	Feet B. M.
Yellow pine.....	29, 125, 000
Red fir.....	18, 687, 500
Total.....	47, 812, 500

Forest conditions in T. 14 S., R. 15 W.

Average total height of timber trees.....	feet.. 110
Average height, clear, of timber trees.....	do... 14
Average diameter, breast-high.....	inches.. 24
Dead.....	per cent.. 1
Diseased.....	do... 11
Average age.....	years.. 240

TOWNSHIP 14 SOUTH, RANGE 16 WEST.

This township comprises a very mountainous country, draining into Gila River, which flows in an extremely deep canyon. The ground is mostly covered with brush. The timber is very much scattered and stands principally in the canyons.

The young growth, yellow pine and red fir, is very scarce, and is located principally in sections 23, 24, 25, 26, and 36.

The only timber worth removing is situated on the south side of Gila River, and can be logged by that stream.

Stand of timber species in T. 14 S., R. 16 W.

	Feet B. M.
Yellow pine.....	13, 250, 000
Limber pine.....	125, 000
Red fir.....	20, 250, 000
Total.....	33, 625, 000

Forest conditions in T. 14 S., R. 16 W.

Average total height of timber trees.....	feet.. 106
Average height, clear, of timber trees.....	do... 10
Average diameter, breast-high.....	inches.. 22
Dead.....	per cent.. 1
Diseased.....	do... 14
Average age.....	years.. 192

TOWNSHIP 14 SOUTH, RANGE 17 WEST.

This township consists of fairly level mesas, draining in a southerly direction into Mogollon and Duck creeks. The surface is cut in all directions by numerous dry creeks with banks about 150 feet high.

This township is destitute of merchantable timber. A few scattering scrub oaks, junipers, and cedars are found along the creek bottoms, and some walnut and cottonwood trees along flowing streams.

Mogollon Creek is the only running stream.

TOWNSHIP 14 SOUTH, RANGE 18 WEST.

This township, with the exception of sections 31 and 32, is a gradually sloping mesa, draining to the south into Duck Creek.

The areas along the creek bottoms are well adapted for argicultural purposes and, if irrigated, would be capable of an abundant production of corn, alfalfa, and fruit. Precautions would have to be taken, however, in case of irrigation, to guard against floods during the summer months. This area is timberless with the exception of scrub oak in the creek bottoms.

Buckhorn Creek, the only stream flowing during the greater part of the year, sinks in numerous places, running above ground for short distances only.

TOWNSHIP 14 SOUTH, RANGE 19 WEST.

The surface of this township is generally rolling, breaking at the center into several very high buttes. The ground is covered with a heavy layer of malpais rock, and drains in an easterly direction to Gila River by Buckhorn and Duck creeks. This township supports no merchantable timber, but along the sides of the creeks are scatterings of scrub oak, walnut, and cottonwood.

Buckhorn Creek is the only stream carrying water during the greater part of the year. This township is suitable only for grazing; at the present time large herds of cattle are roaming over it.

TOWNSHIP 14 SOUTH, RANGE 20 WEST.

The northeast quarter of this township is very rough, rising in numerous sharp peaks. The balance is generally a rolling, malpais country, utterly barren of timber, except for a few patches of piñon pine, scrub oak, juniper, and jack oak. Walnut, cottonwood, box elder, fringe ash, and the wild grape flourish along the bottoms of the main streams.

This township is valuable only for grazing purposes, but the patch of timber in the northeast corner is of good quality and stands close, and in the event of the

introduction of irrigation in the neighborhood would doubtless become of considerable value.

The streams are all dry excepting that in section 31, which sinks at the north line of the section and does not reappear for some miles.

TOWNSHIP 14 SOUTH, RANGE 21 WEST.

This township is mountainous in the southwest corner, and slopes gradually to the east. It is tributary to San Francisco River by numerous branches of Mule Creek, which traverse the township in deep, rocky canyons. The timber along the upper stretches of Mill Creek was removed years ago and shipped south to the mining district. In certain places the growths of juniper, piñon pine, and scrub and jack oaks are of exceptionally good quality.

Reproduction is very backward over the cleared areas, caused by a complete logging of the yellow pine timber.

All the streams are dry excepting during thunderstorms, when they are converted into torrents.

This township is practically barren of merchantable timber.

Stand of timber species in T. 14 S., R. 21 W.

	Feet B. M.
Yellow pine.....	3,500,000

TOWNSHIP 15 SOUTH, RANGE 10 WEST.

The surface of this township is extremely rough and mountainous. In the eastern part the Black Range rises in many abrupt, rocky peaks. West of these mountains the streams flow into Mimbres River through deep, rocky canyons, most of which carry water for considerable distances from their heads. The red and white fir grow profusely on the north and west slopes and the yellow pine on the south and east. Engelmann spruce stands along the bottoms of all the creeks and canyons, approximating 60 feet in height, 3 feet clear trunk, and 15 inches in diameter.

The young growth is exceptionally good, and the conditions for its reproduction are excellent. Large stands of young quaking aspen are found at the heads of all the streams on the north slope. These locations are very favorable for the propagation of the species, but nevertheless the trees are badly affected by decay. They average 50 feet high, 24 feet clear trunk, and 8 inches in diameter.

All this timber, with the exception of that tributary to the Rio Grande, can be hauled down the numerous canyons to Mimbres River. Shepherd Creek, however, can not be so used, as the stream flows in a narrow canyon, with several falls.

This township is well timbered.

GILA RIVER FOREST RESERVE, NEW MEXICO.

Stand of timber species in T. 15 S., R. 10 W.

	Feet B. M.
Yellow pine.....	48,500,000
Limber pine.....	2,125,000
White fir.....	17,000,000
Red fir.....	34,500,000
Spruce.....	1,250,000
Total.....	103,375,000

Forest conditions in T. 15 S., R. 10 W.

Average total height of timber trees.....	feet.. 115
Average height, clear, of timber trees.....	do... 21
Average diameter, breast-high.....	inches.. 23
Dead.....	per cent.. 1
Diseased.....	do... 14
Average age.....	years.. 225

TOWNSHIP 15 SOUTH, RANGE 11 WEST.

This township consists of a high, fairly level plateau, intersected by numerous deep canyons draining into the Mimbres River. The timber stands mostly along the creek bottoms. The plateaus support a considerable growth of juniper, scrub oak, and piñon pine.

The timber which formerly grew along the streams for 1 or 2 miles above the south line of section 31 was cut and removed years ago. A young, healthy growth of yellow pine has sprung up and is thriving well, demonstrating the fact that this species can be reproduced at this low elevation.

The plateau is covered with a deposit of malpais rock, cement gravel, and limestone.

This township is well adapted to grazing purposes.

Stand of timber species in T. 15 S., R. 11 W.

	Feet B. M.
Yellow pine.....	13,000,000
Limber pine.....	375,000
White fir.....	2,625,000
Red fir.....	10,500,000
Spruce.....	750,000
Total.....	27,250,000

Forest conditions in T. 15 S., R. 11 W.

Average total height of timber trees.....	feet.. 90
Average height, clear, of timber trees.....	do... 10
Average diameter, breast-high.....	inches.. 20
Dead.....	per cent.. 1
Diseased.....	do... 10
Average age.....	years.. 162

TOWNSHIP 15 SOUTH, RANGE 12 WEST.

This township is traversed from northeast to southwest by the main divide between Sapello Creek and Mimbres River. The country is generally rolling and cut by numerous creeks in deep beds. A small amount of available timber along Sapello Creek and Skates Canyon has been removed, the remainder being scattered along the creeks. The timber is evenly distributed over the area bounded by Skates Canyon, Sapello Creek, and Mimbres River. The township is also covered with a slender growth of juniper and scrub oak, which becomes heavier on the north of Sapello Creek.

The formation is of malpais rock, limestone, and cement gravel.

Stand of timber species in T. 15 S., R. 12 W.

	Feet B. M.
Yellow pine.....	22,375,000

Forest conditions in T. 15 S., R. 12 W.

Average total height of timber trees.....	feet..	110
Average height, clear, of timber trees.....	do...	12
Average diameter, breast-high.....	inches..	18
Dead.....	per cent..	1
Diseased.....	do...	5
Average age.....	years..	200

TOWNSHIP 15 SOUTH, RANGE 13 WEST.

This township consists of a gently sloping country draining into Sapello Creek. A considerable area toward the south has been logged of the best timber, leaving the remainder of the standing timber in the neighborhood unprotected. The timber was hauled south to Pinos Altos or to Silver City, the natural outlet for this region.

The surface is principally covered with malpais rock and limestone.

The young growth is at present limited, but it is probable that reforestation can be successfully undertaken over the culled areas.

Most of the streams carry water for short distances and then sink.

This township is fairly timbered with first-class yellow pine.

Stand of timber species in T. 15 S., R. 13 W.

	Feet B. M.
Yellow pine.....	49,750,000
Limber pine.....	750,000
White fir.....	62,500
Red fir.....	1,250,000
Total.....	51,812,500

GILA RIVER FOREST RESERVE, NEW MEXICO.

Forest conditions in T. 15 S., R. 13 W.

Average total height of timber trees.....	feet..	100
Average height, clear, of timber trees.....	do...	16
Average diameter, breast-high.....	inches..	22
Dead.....	per cent..	1
Diseased.....	do...	5
Average age.....	years..	215

TOWNSHIP 15 SOUTH, RANGE 14 WEST.

A high mountainous range traverses this township from northwest to southeast, forming the divide between the watersheds of Trout and Bear creeks. The north slope is a gradual incline, but to the south the mountains drop off precipitously to the malpais mesas below.

The second growth of yellow pine and red fir thrives on the north slope, but the steep hillsides of the south slope are clothed with brush. Scrub oak, piñon pine, and juniper cover the mesas below.

The yellow-pine belt can be logged into Trout Creek and taken down Gila River, or back to Pinos Altos and Silver City.

This township is well wooded, particularly with yellow-pine timber on the north slope.

Stand of timbered species in T. 15 S., R. 14 W.

	Feet B. M.
Yellow pine.....	68,000,000
Limber pine.....	1,000,000
White fir.....	2,000,000
Red fir.....	20,500,000
Total.....	91,500,000

Forest conditions in T. 15 S., R. 14 W.

Average total height of timber trees.....	feet..	113
Average height, clear, of timber trees.....	do...	15
Average diameter, breast-high.....	inches..	29
Dead.....	per cent..	1
Diseased.....	do...	9
Average age.....	years..	218

TOWNSHIP 15 SOUTH, RANGE 15 WEST.

A high, rocky range traverses this township along the north, dropping off abruptly to the south, and draining into Bear Creek. The only timber of value stands on the northern slopes, the south-facing slopes being covered with brush. The mesas support small growths of scrub oak, piñon pine, and juniper.

The general formation is limestone and malpais rock.

DETAILED DESCRIPTIONS BY TOWNSHIPS.

Stand of timber species in T. 15 S., R. 15 W.

	Feet B. M.
Yellow pine.....	15,000,000
Limber pine.....	875,000
White fir.....	4,312,500
Red fir.....	12,750,000
Total.....	<u>32,937,500</u>

Forest conditions in T. 15 S., R. 15 W.

Average total height of timber trees.....	feet.. 95
Average height, clear, of timber trees.....	do... 13
Average diameter, breast-high.....	inches.. 27
Average age.....	years.. 225

TOWNSHIP 15 SOUTH, RANGE 16 WEST.

This township consists of a rough, broken country, gradually sloping to the west to Gila River and Bear Creek. Juniper, piñon pine, and scrub oak grow on the mesas, and cottonwood, walnut, ash, box elder, alder, and wild grape flourish along the bottoms of canyons.

In section 31 is an excellent site for a dam, the canyon being narrow with high walls. West of this point the country broadens and the bed of the stream becomes wider with very low banks.

Bear Creek carries water for certain distances, but can not be relied upon for a continuous supply.

This township is practically timberless, being best adapted for grazing purposes.

Stand of timber species in T. 15 S., R. 16 W.

	Feet B. M.
Yellow pine.....	1,000,000
Red fir.....	2,500,000
Total.....	<u>3,500,000</u>

Forest conditions in T. 15 S., R. 16 W.

Average total height of timber trees.....	feet.. 98
Average height, clear, of timber trees.....	do... 12
Average diameter, breast-high.....	inches.. 18
Dead.....	per cent.. 1
Diseased.....	do... 5
Average age.....	years.. 170

TOWNSHIP 15 SOUTH, RANGE 19 WEST.

This township is a high, rolling, timberless country covered with malpais rock. Numerous peaks rise from the different spurs.

This area is suitable only for grazing at certain seasons of the year when the streams are flowing. In the dry season the herds are pastured elsewhere, and as a result the grass grows luxuriantly over the district.

This township supports a limited growth of scrub oak, piñon pine, and juniper.

TOWNSHIP 15 SOUTH, RANGE 20 WEST.

The surface of this township is high and mountainous, broken by deep ravines, sloping to the north and south. The timber stands heavy on the north slope, but the south slope is practically barren. There is no merchantable timber in this township.

The land is covered with malpais rock.

The streams flow only during and immediately after heavy thunder showers, and the grass grows very tall.

Stand of timbered species in T. 15 S., R. 20 W.

	Feet B. M.
Yellow pine.....	40,000

TOWNSHIP 15 SOUTH, RANGE 21 WEST.

This township is exceptionally rough and mountainous to the west and north, breaking off abruptly several thousand feet to a barren malpais district. The east slope is gradual, and some good agricultural lands exist along the heads of the streams, but lack of water prevents their utilization. The western slope is rocky and is covered with dense growths of manzanita. Certain sections of the township are heavily stocked with juniper, scrub oak, piñon pine, and a few cypress.

In sections 14, 23, and 24 the logged areas are rapidly restocking with yellow pine of a healthy growth, and it is probable that the entire east slope is capable of successful reforestation.

Stand of timbered species in T. 15 S., R. 21 W.

	Feet B. M.
Yellow pine.....	2,140,000

INDEX.

Page.			Page.
	Abies concolor. <i>See</i> Fir, white.		
	Abies lasiocarpa. <i>See</i> Fir, balsam.		
	Acer negundo. <i>See</i> Elder, box.		
	Agriculture, extent of	13-14	
	Alder, white, altitudinal range of	20	
	occurrence of	19, 34, 39, 45, 51, 53, 55, 68, 69, 85	
	reproduction of	18	
	Alnus, rhombifolia. <i>See</i> Alder, white.		
	Altitudinal range of timber species in Mongollon Mountains, list of	20	
	Arizona spruce. <i>See</i> Spruce, Arizona.		
	Artemisia tridentata, occurrence of	19	
	Ash, fringe, altitudinal range of	20	
	occurrence of	19, 29, 51, 69, 80	
	reproduction of	18	
	Aspen, quaking, altitudinal range of	20	
	occurrence of	19, 26, 33, 34, 48, 59, 61, 66, 81	
	reproduction of	17	
	size and rate of growth of	20	
	Balsam, reproduction of	18	
	Balsam fir. <i>See</i> Fir, balsam.		
	Black Range, altitude of	12	
	reproduction on	17	
	timber zones on	19, 20	
	Black willow. <i>See</i> Willow, black.		
	Box elder. <i>See</i> Elder, box.		
	Cacti, occurrence of	52, 78	
	California sycamore. <i>See</i> Sycamore, California.		
	Cedar, occurrence of	25, 27, 29, 35, 36, 39, 40, 71, 80	
	Cercocarpus ledifolius, occurrence of	19	
	Chilopsis linearis, occurrence of	19	
	Cottonwood, altitudinal range of	20	
	reproduction of	18	
	<i>For definite localities, see</i> Townships.		
	Cottonwood, black, occurrence of	19	
	Cottonwood, Fremont, occurrence of	19	
	Cottonwood, narrow-leaf, occurrence of	19	
	Cottonwood, weeping, occurrence of	19	
	Creeping juniper. <i>See</i> Juniper, creeping.		
	Crops, character of	13-14	
	Cupressus guadalupensis. <i>See</i> Cypress, Arizona.		
	Cypress, altitudinal range of	20	
	occurrence of	19, 38, 76, 86	
	Cypress, weeping, occurrence of	19	
	Elder, box, altitudinal range of	20	
	reproduction of	18	
	<i>For definite localities, see</i> Townships.		
	Engelmann spruce. <i>See</i> Spruce, Engelmann.		
	Fir, balsam, altitudinal range of	20	
	amount of, by townships, table showing	22-24	
	merchantable	21	
	percentage of merchantable	21	
	size and rate of growth of	20	
	<i>For definite localities, see</i> Townships.		
	Fir, red, altitudinal range of	20	
	amount of, by townships, table showing	22-24	
	merchantable	21	
	percentage of merchantable	21	
	reproduction of	18	
	size and rate of growth of	20	
	<i>For definite localities, see</i> Townships.		
	Fir, white, altitudinal range of	20	
	amount of, by townships, table showing	22-24	
	merchantable	21	
	percentage of merchantable	21	
	reproduction of	18	
	size and rate of growth of	20	
	<i>For definite localities, see</i> Townships.		
	Fires, damage to forests by	18	
	Forest conditions. <i>For definite localities, see</i> Townships.		
	Forests, damage to, by fire	18	
	Fraxinus cuspidata. <i>See</i> Ash, fringe.		
	Fringe ash. <i>See</i> Ash, fringe.		
	Gambel oak. <i>See</i> Oak, gambel.		
	Gannett, Henry, letter of transmittal by	9	
	Gila River Forest Reserve, agriculture in	13-14	
	area examined	21	
	creation and boundaries of	11	
	crops of	13-14	
	fires in, damage by	18	
	grazing in	14-15	
	humus, litter, and underbrush in	18	
	logging in	15-17	
	map of, showing classification of lands. In pocket.		
	mining in	15	
	reproduction in	17-18	
	roads and trails in	12-13	
	streams in	12	
	timber in, size and rate of growth of	20	
	stand of	21-24	
	stand and commercial species of, by townships, diagram showing	22	
	total stand of, by townships	22-24	
	merchantable, amount of, table showing	21	
	percentage of, table showing	21	
	timber zones in, elevations of	19-20	
	topographic features of	11-12	
	trees and shrubs indigenous to, list of	19	
	Grazing, extent of	14-15	
	Greasewood, occurrence of	19, 40, 44, 45, 52, 66, 67, 71, 73, 78	
	Juglans rupestris. <i>See</i> Walnut, western.		
	Juniper, altitudinal range of	20	
	<i>For definite localities, see</i> Townships.		
	Juniper, alligator, occurrence of	19	
	Juniper, creeping, altitudinal range of	20	
	occurrence of	19	
	Juniperus alpina. <i>See</i> Juniper, creeping.		

	Page.		Page.
Juniperus pachyphloea, occurrence of.....	19	San Francisco Range, timber zones on.....	19, 20
Land, classification of, map showing.....	In pocket.	Sarcobatus. <i>See</i> Greasewood.	
Limber pine. <i>See</i> Pine, limber.		Scrub, oak. <i>See</i> Oak, scrub.	
Litter, character and amount of.....	18	Shrubs indigenous to Gila River Forest Reserve, list of.....	19
<i>For definite localities, see</i> Townships.		Spruce, amount of, by townships, table showing.....	22-24
Logging, extent of.....	15-17	amount of merchantable.....	21
methods of.....	17	percentage of merchantable.....	21
Mahogany, mountain, occurrence of.....	19	reproduction of.....	18
Manzanita, occurrence of.....	19, 40, 44, 66, 67, 73, 86	<i>For definite localities, see</i> Townships.	
Mesquite, occurrence of.....	19, 71, 73, 78	Spruce, Arizona, altitudinal range of.....	20
Mexican settlements, location of.....	14	size and rate of growth of.....	20
Mining, extent and character of.....	15	Spruce, Engelmann, altitudinal range of.....	20
Mongollon Mountains, elevation of.....	11-12	size and rate of growth of.....	20
timber species in, altitudinal range of.....	18, 20	Sycamore, occurrence of.....	19,
timber zones on.....	19, 20	34, 36, 39, 46, 51, 53, 56, 61, 63, 68, 69, 78	
Mormon settlements, location of.....	14	reproduction of.....	18
Mount McMullen, location of.....	12	Sycamore, California, altitudinal range of.....	20
Mountain mahogany. <i>See</i> Mahogany, mountain.		Timber, altitudinal range and species of, in Mongollon	
Oak, gambel, altitudinal, range of.....	20	Mountains.....	20
occurrence of.....	19	amount of merchantable, table showing.....	21
Oak, jack, occurrence of.....	80, 81	stand of.....	21-24
Oak, Rocky Mountain, occurrence of.....	19	stand and commercial species of, by townships,	
Oak, scrub, occurrence of.....	27, 29,	diagram showing.....	22
31, 34, 35, 38, 39, 40, 44, 45, 46, 49, 52, 53, 55, 56,		total stand of, by townships.....	22-24
61, 63, 68, 71, 74, 75, 76, 77, 80, 81, 82, 83, 84, 86		<i>For definite localities, see</i> Townships.	
Oak, water, occurrence of.....	19	Timber zones, elevations of.....	19-20
Picea engelmanni. <i>See</i> Spruce, Engelmann.		Topography, character of.....	11-12
Picea franciscana. <i>See</i> Spruce, Arizona.		Townships, conditions in:	
Pine, limber, amount of, by townships, table showing.....	22-24	T. 5 S., R. 16 W.....	22, 24-25
amount of merchantable.....	21	T. 5 S., R. 17 W.....	22, 25
percentage of merchantable.....	21	T. 5 S., R. 18 W.....	22, 26
reproduction of.....	18	T. 5 S., R. 19 W.....	22, 26-27
size and rate of growth of.....	20	T. 5 S., R. 20 W.....	22, 27-28
<i>For definite localities, see</i> Townships.		T. 5 S., R. 21 W.....	22, 28
Pine, piñon, altitudinal range of.....	20	T. 6 S., R. 16 W.....	22, 28-29
<i>For definite localities, see</i> Townships.		T. 6 S., R. 17 W.....	22, 29-30
Pine, yellow, altitudinal range of.....	20	T. 6 S., R. 18 W.....	22, 30
amount of, by townships, table showing.....	22-24	T. 6 S., R. 19 W.....	22, 30-31
merchantable.....	21	T. 6 S., R. 20 W.....	22, 31-32
percentage of merchantable.....	21	T. 6 S., R. 21 W.....	22, 32
reproduction of.....	17	T. 7 S., R. 16 W.....	22, 33
size and rate of growth of.....	20	T. 7 S., R. 17 W.....	22, 33-34
<i>For definite localities, see</i> Townships.		T. 7 S., R. 18 W.....	22, 34-35
Piñon pine. <i>See</i> Pine, piñon.		T. 7 S., R. 19 W.....	22, 35
Pinus edulis. <i>See</i> Pine, piñon.		T. 7 S., R. 20 W.....	22, 35-36
Pinus flexilis. <i>See</i> Pine, limber.		T. 7 S., R. 21 W.....	22, 36-37
Pinus macrocarpa. <i>See</i> Pine, Arizona.		T. 8 S., R. 16 W.....	22, 37
Pinus ponderosa. <i>See</i> Pine, yellow.		T. 8 S., R. 17 W.....	22, 38
Platanus racemosa. <i>See</i> Sycamore, California.		T. 8 S., R. 18 W.....	22, 38-39
Populus angustifolia, occurrence of.....	19	T. 8 S., R. 19 W.....	22, 39
Populus fremontii, occurrence of.....	19	T. 8 S., R. 20 W.....	22, 40
Populus tremuloides. <i>See</i> Aspen, quaking.		T. 8 S., R. 21 W.....	22, 40-41
Populus trichocarpa, occurrence of.....	19	T. 9 S., R. 15 W.....	15, 22, 41-42
Prosopis juliflora. <i>See</i> Mesquite.		T. 9 S., R. 16 W.....	22, 42
Pseudotsuga taxifolia. <i>See</i> Fir, red.		T. 9 S., R. 17 W.....	22, 42-43
Quaking aspen. <i>See</i> Aspen, quaking.		T. 9 S., R. 18 W.....	22, 43-44
Quercus gambelii. <i>See</i> Oak, gambel.		T. 9 S., R. 19 W.....	22, 44
Quercus undulata, occurrence of.....	19	T. 9 S., R. 20 W.....	22, 45
Railroad facilities, advantages of.....	15	T. 9 S., R. 21 W.....	22, 45
Red fir. <i>See</i> Fir, red.		T. 10 S., R. 10 W.....	22, 46
Reforestation. <i>See</i> Reproduction.		T. 10 S., R. 11 W.....	22, 46-47
Reproduction, extent of.....	17-18	T. 10 S., R. 12 W.....	22, 47
Roads, course of, and places reached by.....	12-13	T. 10 S., R. 13 W.....	22, 48
Rocky Mountain oak. <i>See</i> Oak, Rocky Mountain.		T. 10 S., R. 14 W.....	22, 48-49
Sagebrush, occurrence of.....	19	T. 10 S., R. 15 W.....	22, 49
Salix lasiandra. <i>See</i> Willow, black.		T. 10 S., R. 16 W.....	22, 50

Townships, conditions in—Continued.	Page.	Townships, conditions in—Continued.	Page.
T. 10 S., R. 17 W	22, 50-51	T. 13 S., R. 21 W	23, 75
T. 10 S., R. 18 W	22, 51-52	T. 14 S., R. 10 W	23, 75-76
T. 10 S., R. 19 W	15, 22, 52-53	T. 14 S., R. 11 W	23, 76-77
T. 10 S., R. 20 W	22, 53	T. 14 S., R. 12 W	23, 77
T. 10 S., R. 21 W	23, 53	T. 14 S., R. 13 W	23, 77-78
T. 11 S., R. 10 W	23, 53-54	T. 14 S., R. 14 W	23-78
T. 11 S., R. 11 W	23, 54-55	T. 14 S., R. 15 W	24, 78-79
T. 11 S., R. 12 W	23, 55	T. 14 S., R. 16 W	24, 79
T. 11 S., R. 13 W	23, 56	T. 14 S., R. 17 W	24, 80
T. 11 S., R. 14 W	23, 56-57	T. 14 S., R. 18 W	24, 80
T. 11 S., R. 15 W	23, 57	T. 14 S., R. 19 W	24, 80
T. 11 S., R. 16 W	23, 57-58	T. 14 S., R. 20 W	24, 80-81
T. 11 S., R. 17 W	23, 58-59	T. 14 S., R. 21 W	24, 81
T. 11 S., R. 18 W	23, 59-60	T. 15 S., R. 10 W	24, 81-82
T. 11 S., R. 19 W	15, 23, 60-61	T. 15 S., R. 11 W	24, 82
T. 11 S., R. 20 W	23, 61	T. 15 S., R. 12 W	24, 83
T. 11 S., R. 21 W	23, 61	T. 15 S., R. 13 W	24, 83-84
T. 12 S., R. 10 W	23, 61-62	T. 15 S., R. 14 W	24, 84
T. 12 S., R. 11 W	23, 62	T. 15 S., R. 15 W	24, 84-85
T. 12 S., R. 12 W	23, 63	T. 15 S., R. 16 W	24, 85
T. 12 S., R. 13 W	23, 63	T. 15 S., R. 17 W	24
T. 12 S., R. 14 W	23, 63-64	T. 15 S., R. 18 W	24
T. 12 S., R. 15 W	23, 64-65	T. 15 S., R. 19 W	24, 85-86
T. 12 S., R. 16 W	23, 65	T. 15 S., R. 20 W	24, 86
T. 12 S., R. 17 W	23, 66	T. 15 S., R. 21 W	24, 86
T. 12 S., R. 18 W	23, 66-67	Trails, course of, and places reached by	13
T. 12 S., R. 19 W	23, 67-68	Trees indigenous to Gila River Forest Reserve, list of	19
T. 12 S., R. 20 W	23, 68	Underbrush, character of	18
T. 12 S., R. 21 W	23, 68	Walnut, western, altitudinal range of	20
T. 13 S., R. 10 W	23, 68-69	reproduction of	18
T. 13 S., R. 11 W	23, 69-70	<i>For definite localities, see Townships.</i>	
T. 13 S., R. 12 W	23, 70	Water oak. <i>See</i> Oak, water.	
T. 13 S., R. 13 W	23, 71	Western walnut. <i>See</i> Walnut, western.	
T. 13 S., R. 14 W	23, 71-72	White alder. <i>See</i> Alder, white.	
T. 13 S., R. 15 W	23, 72	White fir. <i>See</i> Fir, white.	
T. 13 S., R. 16 W	23, 72-73	Willow, black, altitudinal range of	20
T. 13 S., R. 17 W	23, 73-74	Willow, desert, occurrence of	19
T. 13 S., R. 18 W	23, 74	Willow, western black, occurrence of	19
T. 13 S., R. 19 W	23, 74	Yellow pine. <i>See</i> Pine, yellow.	
T. 13 S., R. 20 W	23, 75		

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