

Professional Paper No. 23

Series H, Forestry, 8

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

FOREST CONDITIONS

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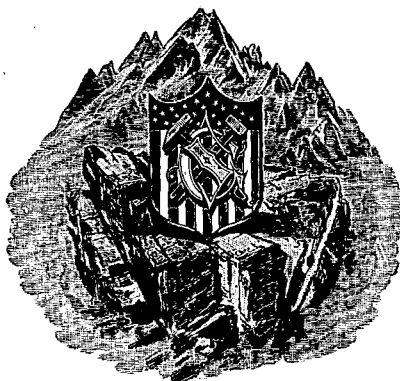
BLACK MESA FOREST RESERVE, ARIZONA

PREPARED BY

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FROM NOTES BY

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WASHINGTON
GOVERNMENT PRINTING OFFICE
1904

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LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,

UNITED STATES GEOLOGICAL SURVEY,

Washington, D. C., October 10, 1903.

SIR: I transmit herewith, for publication in the Professional Paper series, a report on the Black Mesa Forest Reserve, in Arizona, prepared by F. G. Plummer from notes by Theodore F. Rixon and Arthur Dodwell.

Very respectfully,

HENRY GANNETT,
Geographer.

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

FOREST CONDITIONS IN THE BLACK MESA FOREST RESERVE, ARIZONA.

Prepared by G. F. PLUMMER, from notes by THEODORE F. RIXON and ARTHUR DODWELL.

BOUNDARIES.

The Black Mesa Forest Reserve, in Arizona, was created by proclamation of President McKinley dated August 17, 1898. The following are its boundaries:

"Beginning at a point on the boundary line between Arizona and New Mexico where it is intersected by the north line of township seven (7) north, range thirty-one (31) east, Gila and Salt River meridian, Arizona; thence westerly along the township line to the southeast corner of township eight (8) north, range twenty-seven (27) east; thence northerly to the northeast corner of said township; thence westerly along the second (2nd) standard parallel north to the southeast corner of township nine (9) north, range twenty-six (26) east; thence northerly to the northeast corner of said township; thence westerly along the township line to the southeast corner of township ten (10) north, range twenty-two (22) east; thence northerly to the northeast corner of said township; thence westerly along the township line to the southeast corner of township eleven (11) north, range nineteen (19) east; thence northerly along the range line to its point of intersection with the forty miles limit of the grant to the Atlantic and Pacific Railroad Company; thence westerly following the forty miles limit of said grant to its intersection with the range line between ranges five (5) and six (6) east, in township fifteen (15) north; thence southerly to the southwest corner of said township; thence easterly along the township line to the northwest corner of township fourteen (14) north, range seven (7) east; thence southerly along the range line to the southwest corner of township thirteen (13) north, range seven (7) east; thence easterly along the third (3rd) standard parallel north to the northwest corner of township twelve (12) north, range eight (8) east; thence southerly to the southwest corner of said township; thence easterly along the township line to the northwest corner of township eleven (11) north, range twelve (12) east; thence southerly to the southwest corner of said township; thence easterly to the northwest corner of the White Mountain Indian Reservation; thence in a general easterly, southeasterly, and southerly direction along the northern and eastern boundaries of said reservation to its intersection with the Gila and Salt River base line; thence easterly along said base line to its intersection with the boundary line between Arizona and New Mexico; thence northerly along said boundary line to the point where it intersects the north line of township seven (7) north, range thirty-one (31) east, the place of beginning."

TOPOGRAPHIC FEATURES.

The reserve comprises an area of 2,786 square miles, or 1,783,040 acres, and includes parts of Yavapai, Coconino, Gila, Navajo, Apache, and Graham counties. It is an irregular strip of land running from central Arizona in a general southeasterly direction to the New Mexico boundary. It follows and lies principally on the north slope of the Colorado-Gila divide, and for a distance of about 200 miles follows the northern and eastern boundaries of White Mountain Indian Reservation. The character of this divide, known as Black Mesa, is that of a southwest-facing escarpment of nearly perpendicular rock 1,500 to 2,000 feet high, and, except in a few places, inaccessible to the most daring climber. The central portion of the reserve, bordering White Mountain Reservation, is of less bold topography, but in detail the surface is very rough and broken, being cut by numerous canyons tributary to the Colorado. East of this, in Apache County, the topography is of entirely different character, rising in many sharp and lofty peaks, the highest of which is Green Peak, 10,115 feet high. The general name for the range in this vicinity is White Mountains. The topography of the southeastern portion of the reserve is of a still different type; the surface is more rolling, with several high plateaus, and is cut by deep canyons of Eagle Creek, Salt River, and Blue River. Several peaks in this area exceed in elevation 11,000 feet, but their height is not appreciated because of the general great elevation of the surrounding country.

The classification of the lands in Black Mesa Forest Reserve, as determined from the examination, is as follows:

Classification of lands in Black Mesa Forest Reserve.

Class.	Percentage.	Square miles.
Timbered area	80.70	2,248.5
Woodland	14.04	391
Timberless area	5.02	140
Burned area .....	.20	5.5
Logged area .....	.04	1
Total	100.00	2,786

DRAINAGE.

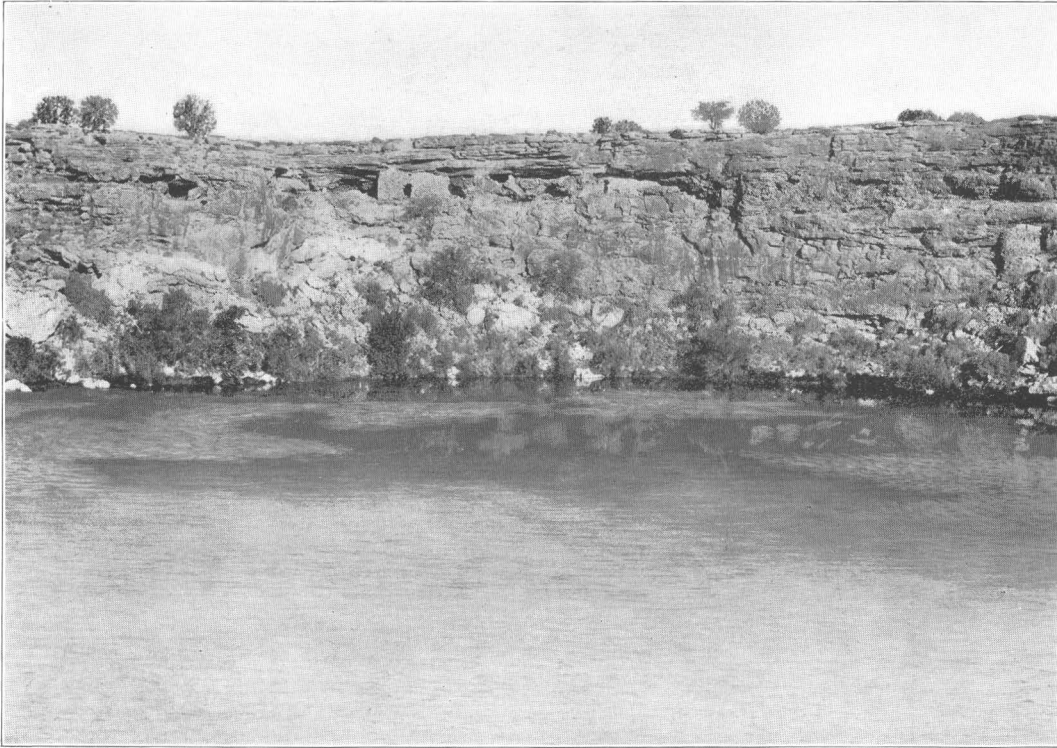
The reserve is drained on the south by West Clearwater Creek, Beaver Creek, and Fossil Creek, all of which are tributaries of Verde River, and by Eagle Creek, Salt River, and Blue River, tributaries of San Francisco River, the whole being part of the Gila River system. On the north side the Nutrioso, Little Colorado,



A. GREEN MOUNTAINS FROM MOUNT BALDWIN.



B. MOUNT OLIPHANT FROM MOUNT ROSE.



A. MONTEZUMA WELL.



B. WHITE MOUNTAIN PRAIRIE.

Showlow, Heber, Chevalon, and East Clearwater are tributary to Colorado River through the Little Colorado. The last-named stream heads in numerous springs on the east slopes of Mount Baldy and Ord Peak, in T. 6 N., R. 26 E.

WATER SUPPLY.

Water is very scarce. Within the reserve the streams mentioned above are perpetual, but flow only a short distance outside before sinking. There are over a hundred arroyos having small flows of water at their heads in the higher elevations. Eight years ago the reserve was well watered, but successive seasons of drought have rendered it exceedingly dry, and unless a change for the better occurs there is no doubt that the cattlemen and sheepmen will desert the country. At Heber, Pinedale, and Nutrioso, where the inhabitants once formed a prosperous community, people are rapidly leaving, and the few that remain do so with the forlorn hope that each succeeding year will bring a heavy snowfall or that a rainy season will again replenish their water supply in order that farming may be resumed under favorable conditions.

AGRICULTURE.

Eight years ago numerous small areas were profitably farmed, but in recent years the lack of precipitation has caused a falling off in this industry, and at the present time the only farming settlements of any importance are at Beaver Creek, Showlow Creek, and at the town of Alpine at the head of Blue River. The latter point has an elevation of 8,400 feet, and although subject to early frosts, wheat has been successfully raised when there was sufficient moisture. Three years ago the crop was 5,000 bushels, but fell the following year to 2,500 bushels. Last season the crop amounted to only 800 bushels, and it is evident that the country will become worthless unless the water supply is increased by natural or artificial means.

GRAZING.

The entire reserve is a natural range and grazing has been the main industry in this and adjacent regions. In recent years this industry has suffered greatly owing to the continued droughts, and the only remaining areas which are used solely for cattle range are on the Blue and Salt River and Eagle Creek. The Double Circle cattle ranch, which used to graze over 100,000 head, has been compelled to gradually decrease its herd, until it now numbers not more than 9,000. Range for this herd is very limited, and large areas are being rented from the Apache Indians in the White Mountain Indian Reservation.

Wild forage grasses naturally grow luxuriantly all over the reserve, even under the heaviest forest shade, but the best growths are nearly always found at some

distance from water, and are consequently not available for the stock which are not able to make the trip from water to pasture. As perpetual water is approached the effect of grazing is seen by the gradual, and finally total disappearance of the grasses. Numerous carcasses of cattle and horses testify to their having attempted long trips from water to pasture, but, failing to return in time, perished from thirst. It is probable that under careful management this condition could be improved.

The Verde slope in the Beaver Creek watershed is an example of repeated overstocking. This district was formerly a source of great wealth to settlers and stockmen in that vicinity, but the excessive number of cattle and horses has finally resulted in the complete annihilation of the pasture. To-day an animal can not get a bite for miles around, and even the roots of the grasses have been so thoroughly trampled upon that it is doubtful if any reproduction would follow without artificial means. Unless stringent rules are adopted, regulating the number of stock and the areas on which they shall be grazed on each permit, this condition will sooner or later obtain throughout the reserve. Instead of working an injustice or hardship upon the stockmen, a proper reserve policy which would protect the source of their wealth would in time permit them to range a greater number of animals, and, at the same time, permit the reproduction of the forage grasses which are native to this excellent grazing area.

LUMBERING.

Very little logging has been carried on within the reserve. Some timber has been cut in the vicinity of Pine, Pinedale, Pinetop, and Alpine, and the lumber has been used locally by settlers in building houses and for fencing. At three points on Blue River timber has been culled for shipment to Clifton, a thriving mining center in the southeastern part of Arizona. Pine lumber brings \$40 per thousand feet B. M. delivered, but as the only means of transportation is by wagon it costs about \$20 for the delivery.

All of the lumber is used for mining purposes, principally for stoops, and for this purpose the quality is good when the timber is sound and free from rot. The system of operating sawmills has generally been to cut all the convenient timber within a radius of 1 or 2 miles, and then to remove the mill to another favorable location, it being easier to move the mill than to pay the extra cost of hauling logs out by wagon. All of the mills are small, cutting from 3,000 to 10,000 feet B. M. per day. Water power and steam are both in use, but the former is very uncertain, and, even with the assistance of storage, does not insure a continuous run.

MINING.

The only area which appears to be classifiable as mineral land is in the southeastern portion of the reserve, in the watershed of Blue River. The mineral belt of Clifton apparently extends in a northerly direction as far as the south boundary of the reserve, but no locations of any importance have been made very far north of that belt, and there is at this time no mining within the boundaries of the reserve. The exposed rock is generally limestone, and the plateaus are covered with malpais rock, which is very hard and of volcanic origin.

LIST OF TREES AND STAND OF TIMBER.

Timber species in Black Mesa Forest Reserve.

Yellow pine	<i>Pinus ponderosa.</i>
Limber pine	<i>Pinus flexilis.</i>
Mexican white pine	<i>Pinus strobiformis.</i>
Engelmann spruce	<i>Picea engelmanni.</i>
Arizona spruce	<i>Picea engelmanni</i> var. <i>franciscana.</i>
Red fir	<i>Pseudotsuga taxifolia.</i>
White fir	<i>Abies concolor.</i>
Alligator juniper	<i>Juniperus pachyphloea.</i>
Cottonwood	<i>Populus trichocarpa.</i>
Aspen	<i>Populus tremuloides.</i>
Arizona cypress	<i>Cupressus guadalupensis.</i>
Gambel oak	<i>Quercus gambelii.</i>
Emory oak	<i>Quercus emoryi.</i>
Alder	<i>Alnus rhombifolia.</i>
Sycamore	<i>Platanus racemosa.</i>

Stand of timber species in Black Mesa Forest Reserve.

	Feet B. M.
Yellow pine	3,445,960,000
Engelmann spruce	279,425,000
White pine	131,950,000
Red fir	130,780,000
White fir	93,383,000
Total	4,081,498,000
	Cords of fuel.
Gambel oak	155,340
Alligator juniper	86,135
Arizona cypress	18,285
Total	259,760

TIMBER ZONES.

The altitudinal range of timber species in this reserve is not clearly defined, for the reason that the area presents throughout its great length so wide a diversity of climatic conditions and exposures. The noticeable characteristics of the distribution of the various species is their preference for the northern or southern slopes of the canyon. For example, at the headwaters of East Clearwater, a tributary of the Little Colorado, in the western part of the reserve, all the canyon slopes facing northward are timbered with red fir and white fir, while on the opposite sides of the canyons the entire forest is of yellow pine. Only a few individual red firs seem to be able to live in the face of the intense midday sun, and the lowest elevation at which this species was found in this watershed was 6,970 feet.

In the southeastern portion of the reserve the red fir and the white fir are likewise found on the northern slopes and on the east side of canyons, while on the opposite sides the timber is entirely yellow pine.

There is a well-defined series of timber zones on Mount Baldy and Escudilla Peak. Yellow pine reaches an altitude of 9,500 feet; red fir ranges from 9,000 to 9,500 feet, white fir from 9,000 to 10,000 feet, and Engelmann spruce, which is the principal timber of the high altitude, ranges from 9,000 feet to the summit. It is noticeable, however, that on the southern slopes of these mountains the lower limit of the spruce is at 9,500 feet.

North and west of Black River the yellow pine prefers the southern and western exposure, but in the watersheds tributary to Eagle Creek and Blue River its habits appear to be reversed, and it is found principally on the slopes facing the north; in fact, it is found where red fir and white fir would naturally be expected. The barren slopes are generally on the southern exposures.

DESCRIPTION OF TREES.

Yellow pine is the principal timber tree of the reserve and the only lumber at present used for manufacturing purposes. It is distributed generally throughout the entire length of the reserve, except such small areas as are shown on the map (Pl. VI) as being wooded, without merchantable timber. From range 15 to 24, inclusive, it forms a pure forest. Along the top of Black Mesa, in ranges 9 to 14, inclusive, there is a small mixture of red fir and white fir. To the east and southeast of White Mountain are many diversified conditions, the mixed forest being composed of two, three, or four species of timber, together with other species suitable only for fuel or fencing. Taking only the merchantable timber into consideration, the average height of the yellow pine is about 125 feet, having 24

feet of clear trunk and a diameter of 18 inches, breast high, with an approximate age of 125 to 150 years.

Engelmann spruce is found in the more moist areas above an altitude of 9,000 feet, and attains its best development on the north slopes. The tree is generally small and thickly limbed with branches to the ground, leaving practically no clear trunk. It will average 70 feet high and 10 inches in diameter, with an age of 50 to 75 years. This is an extremely rapid growth, doubtless due to its surroundings. A variety of Engelmann spruce is the Arizona spruce (*Picea engelmanni* var. *franciscana*), which has identically the same range and distribution, except the upper altitudinal limit, which is not so great. It will average 100 feet high and 20 feet of clear trunk, with a diameter of 18 inches. Its best growth is found on the divide at the head of Little Colorado River, at an elevation of 10,000 feet. A considerable portion of this timber has matured and has rapidly decayed, as high as 25 per cent being diseased.

Red fir is found in three areas within the reserve—on the mesa east of Bakers Butte, on the White Mountains near Green Peak, and along and to the south of the divide from Ord Peak to Escudilla Peak. It prefers the northern slopes of this broken country, and will cling to the abrupt sides of canyons. Like the spruces, it thrives best in the more moist and sheltered areas of the higher altitudes. Although this tree is valuable for manufacturing purposes, it is considerably inferior to that found in Oregon and Washington, both as to size and as to clear height of trunk.

White fir is found along the mesa from Baker Butte to the head of Chevalon Canyon, and forms part of the mixed forests east of range 25. It is not important commercially.

Western white pine forms a portion of the mixed forests along the mesa east of Bakers Butte and in the southeastern part of the reserve. It has a wide range of altitude, from 7,500 to 10,700 feet, and would be a valuable timber commercially if the better trees were more accessible.

Alligator juniper and Arizona cypress are found generally distributed over the area classified as woodland on Pl. VI, but also form a portion of the undergrowth in the yellow pine and mixed forests. They are used by settlers for fence posts, and for this purpose are durable and will last for an indefinite period.

Deciduous trees border the streams and marshy places. The quaking aspen is often a guide to the location of subterranean water, as it seeks a location where its roots can reach moister ground, and it thus manages to exist when other species are seriously affected by drought.

RATE OF GROWTH.

The rate of growth of the principal timber trees in and near Black Mesa Forest Reserve was determined by the measurement of 1,683 annual rings, and is equal to 0.129 inch per year. The rate for the different species is as follows:

Rate of growth of principal timber species.

	Inches per year.
Red fir	0.266
Engelmann spruce .....	.209
White pine .....	.179
Alligator juniper .....	.094
Yellow pine .....	.114

REPRODUCTION.

Upon the higher altitudes the species which seem to thrive and reproduce exceptionally well are the white fir, red fir, and Engelmann spruce; upon the lower altitudes the yellow pine predominates, both in the forest and in the young growth. In Tps. 12 and 13 N., R. 12 E., exceptionally heavy stands of young timber were noticed. These trees average about 10 or 12 inches in diameter and 125 feet in height. In this same area was a still later generation of smaller pines of thrifty growth. In this hot climate it is absolutely necessary that the young forest growth shall have the protection of the parent trees, and it is evident that in areas which have been logged off completely the young growth has been unable to stand the extreme heat. In T. 9 N., R. 23 E., a small area has been logged, the mature trees having been culled, but a large number of smaller trees were not disturbed and afforded protection in the reforestation, and the result has demonstrated that under favorable conditions the young trees will start, grow, and mature anywhere within the yellow-pine belt of this reserve. There is no doubt that reproduction is a practical impossibility without this sheltering of the larger trees, but under proper forestry regulations logging can be accomplished.

EFFECTS OF RECENT DROUGHT.

The scarcity of precipitation which for the last eight years has afflicted this region is shown by the condition of the yellow pine, alligator juniper, and Arizona cypress, which trees, as a rule, stand an extreme drought. In the vicinity of Heber, in T. 12 N., Rs. 16 and 17 E., the scattering growth of yellow pine is rapidly being killed, as the trees do not stand sufficiently close to afford mutual protection, and the whole of them are dead or so far diseased as to be beyond resuscitation. At Blue post-office, in T. 3 N., R. 30 E. (unsurveyed), the effects of the excessive heat and drought are still more marked, and large areas of sparsely timbered country will lose hundreds of thousands of feet of timber unless it is immediately logged.

ROUTES OF TRAVEL.

Numerous roads and trails traverse the reserve, but some are mere cattle paths and difficult to follow. On the rocky plateaus traveling for man or beast is very difficult and tiresome. A fairly good road runs along the rim for the entire distance from Baker Butte, in T. 12 N., R. 9 E., to Nutrioso, in T. 7 N., R. 30 E., and from it branch roads lead to the several cattle ranches and settlements. Another road leaves Nutrioso for Clifton, which is located about 25 miles south of the reserve boundaries. It follows Blue River, but on account of numerous crossings which are not bridged the road is practicable only during low stages of the river. Excepting the canyons and heavily littered areas, one can ride a horse almost anywhere throughout the reserve. The main road from Camp Apache to Holbrook crosses the reserve via Pinetop and Showlow.

CLIMATIC CONDITIONS.

Although there is a difference in latitude of only $1^{\circ} 20'$ between the northern and southern boundaries of the reserve, the climatic conditions have a wide range during the summer months. On Beaver Creek, at the extreme west edge of the reserve, and at an elevation of 3,400 feet, the thermometer during August registered 108° , 112° , and 115° on three successive days. On the main divide, at an elevation of 8,000 feet, the daily temperature would range from 90° at noon to freezing point at night, making the use of several pairs of blankets an absolute necessity.

Thunderstorms are frequent but of short duration, and although accompanied by magnificent electrical displays, are very erratic as regards precipitation. In some instances all the phenomena of a violent storm prevail without a drop of water falling, while on other occasions the torrents resemble a cloudburst, falling in sheets and filling all the arroyos and making the small streams raging torrents.

UNDERBRUSH, LITTER, AND HUMUS.

Throughout the area in which yellow pine predominates the amount of litter and underbrush is very small, the forest floor being very clean, with a scanty covering of humus. In those areas where the alligator juniper and Arizona cypress thrive the growth is in some places so thick and scrubby as to be almost impenetrable, as these trees are naturally short bodied and almost entirely crowned. On the open area of the mesas and plateaus there are numerous species of cacti. In the southeastern portion of the reserve, in Graham County, there is a considerable growth of dense underbrush, which makes traveling difficult and in places impossible.

In the higher zones lying east of range 26, where Engelmann spruce abounds in the mixed forests, the litter caused by fallen timber is very heavy. This is

particularly true on the Blue Mountain plateau, where it is not uncommon to find a stand of 200 trees to the acre. This litter is not only the result of matured trees which died and fell, but also of a large number of smaller and weaker trees having been killed by crowding and overshadowing.

FOREST FIRES.

There has been very little damage to the timber of this reserve by fires, for the reason that there is so little underbrush and litter. A few old burns were noticed in the neighborhood of Alpine, at the head of Blue River, but their scope is very limited and the amount of timber destroyed is very small. The largest burn is located in T. 6 N., R. 27 E., and in this case the timber was killed, but the dead trunks are still standing. The amount destroyed does not exceed two and one-half million feet of yellow pine, red fir, and white fir, all of exceedingly poor quality.

DESCRIPTIONS OF TOWNSHIPS.

TOWNSHIP 15 NORTH, RANGE 6 EAST.

The south half of this township is included within the reserve, and it contains no timber of merchantable value. Along the Beaver Creek bottom are sycamore and cottonwood, which are used by the settlers as fuel. The surface is nearly all rolling or broken, except a narrow strip along Beaver Creek. The soil is very stony, with some clay along the creek bottom.

TOWNSHIP 13 NORTH, RANGE 7 EAST.

This township has no timber of merchantable value. The surface is all steep and broken, with a small scattering of cypress and cactus. The greater portion of the township is an open desert with stony soil.

TOWNSHIP 14 NORTH, RANGE 7 EAST.

This township has no timber of any value, except some scattering cypress and alligator juniper, which are chiefly used for fencing. The surface is rough and broken, with a stony soil with some clay.

TOWNSHIP 15 NORTH, RANGE 7 EAST.

The south third of this township is included within the reserve, and contains a fair growth of scattering cypress, but most of the surface is open, barren, or grazing land.

Stand of species in T. 15 N., R. 7 E.

Arizona cypress.....	Cords. 925
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A. YELLOW PINE.



B. GAMBEL OAK AND YELLOW PINE.

TOWNSHIP 12 NORTH, RANGE 8 EAST.

The timber is chiefly yellow pine, small and of poor quality, and stands mainly in the northeastern portion of the township. There is some scattering scrub oak on all the benches, which is of value only for fuel. On the west side of the township is scattering cypress. The surface is rough and broken, except a narrow strip of land along Strawberry Creek, which will average about 80 rods in width. Fossil Creek flows through a very deep canyon.

All the timber will have to be logged to the south, and will be difficult and expensive to handle, owing to the rough ground.

Stand of species in T. 12 N., R. 8 E.

	Cords.	Feet B. M.
Yellow pine		14,000,000
Arizona cypress.....	1,110	
Gambel oak	4,525	
Total.....	5,635	

Forest conditions in T. 12 N., R. 8 E.

Average total height of yellow pine	feet..	80
Average height, clear	do...	10
Average diameter, breast high	inches..	16
Dead	per cent..	2
Diseased	do...	20
Average age	years..	170
Litter.....		Light.

TOWNSHIP 13 NORTH, RANGE 8 EAST.

The only timber of value is in the southeastern portion of the township, and is yellow pine, of which 40 per cent is of good quality and the rest is rough and short. The greater portion of the township is rough and broken desert land, with scattering growths of cypress and cactus.

Stand of species in T. 13 N., R. 8 E.

	Cords.	Feet B. M.
Yellow pine		12,000,000
Arizona cypress.....	6,200	
Gambel oak	2,400	
Total.....	8,600	

Forest conditions in T. 13 N., R. 8 E.

Average total height of yellow pine.....	feet..	85
Average height, clear	do...	14
Average diameter, breast high.....	inches..	15
Dead	per cent..	2
Diseased	do...	15
Average age	years..	180
Litter		Light.

TOWNSHIP 14 NORTH, RANGE 8 EAST.

The only timber in this township is some yellow pine along the east boundary, the rest of the township being an open desert, with scattering cypress and oak. The surface is steep and broken, with a stony clay soil.

Stand of species in T. 14 N., R. 8 E.

	Cords.	Feet B. M.
Yellow pine		3,000,000
Alligator juniper	3,750	
Gambel oak	475	
Total	4,225	

Forest conditions in T. 14 N., R. 8 E.

Average total height of yellow pine	feet..	80
Average height, clear	do..	10
Average diameter, breast high	inches..	16
Dead	per cent..	5
Diseased	do..	20
Average age	years..	170
Litter		Dight.

TOWNSHIP 15 NORTH, RANGE 8 EAST.

The south third of this township is included within the reserve. The only timber is yellow pine, in sections 25, 26, 35, and 36. The remainder of the fraction of the township is open desert land, with scattered cypress and some oak brush.

Stand of species in T. 15 N., R. 8 E.

	Cords.	Feet B. M.
Yellow pine		1,750,000
Alligator juniper	1,900	
Gambel oak	650	
Total	2,550	

Forest conditions in T. 15 N., R. 8 E.

Average total height of yellow pine	feet..	80
Average height, clear	do..	10
Average diameter, breast high	inches..	16
Dead	per cent..	5
Diseased	do..	20
Average age	years..	170
Litter		Light.

TOWNSHIP 12 NORTH, RANGE 9 EAST.

This township is very rough and broken, with deep canyons along creeks. It reaches an elevation of 8,180 feet at Baker Butte, which is on the divide between Strawberry and East Clearwater creeks. The timber is chiefly yellow pine, of

which about 30 per cent is of good quality. Most of the timber will have to be logged to the south, the exception being a small area on the north slope, which will handle to the west. Owing to the roughness of the surface it will be difficult and expensive to log. There is a light undergrowth of yellow pine and Gambel oak.

Stand of species in T. 12 N., R. 9 E.

	Cords.	Feet B. M.
Yellow pine		53, 250, 000
Gambel oak	3, 425	

Forest conditions in T. 12 N., R. 9 E.

Average total height of yellow pine	feet..	80
Average height, clear	do...	9
Average diameter, breast high	inches..	16
Dead	per cent..	2
Diseased	do...	15
Average age	years..	160
Litter		Light.

TOWNSHIP 13 NORTH, RANGE 9 EAST.

This township is very rough and broken, and has a general slope toward the northwest, and all the timber would be logged in that direction into the valley of the West Clearwater. The timber is principally yellow pine of good quality. Along the south boundary are a few areas of red fir and lovely fir, which are of very poor quality. There is a very light undergrowth of yellow pine, Gambel oak, and Arizona cypress.

Stand of species in T. 13 N., R. 9 E.

	Cords.	Feet B. M.
Yellow pine		87, 500, 000
Red fir		600, 000
White fir		225, 000
Arizona cypress	700	
Gambel oak	5, 625	
Total	6, 325	88, 325, 000

Forest conditions in T. 13 N., R. 9 E.

Average total height of timber trees	feet..	90
Average height, clear	do...	16
Average diameter, breast-high	inches..	17
Dead	per cent..	2
Diseased	do...	15
Average age	years..	155
Litter		Light.

TOWNSHIP 14 NORTH, RANGE 9 EAST.

This township is steep and broken and drains westerly into West Clearwater Creek. The timber is chiefly yellow pine, of which 50 per cent is good quality. It will log to the west to good advantage. The Gambel oak is of small value except for fuel or fencing.

Stand of species in T. 14 N., R. 9 E.

	Cords.	Feet B. M.
Yellow pine		103,000,000
Arizona cypress	350	
Gambel oak	2,650	
Total	3,000	

Forest conditions in T. 14 N., R. 9 E.

Average total height of yellow pine	feet..	90
Average height, clear	do..	16
Average diameter, breast-high	inches..	18
Dead	per cent..	2
Diseased	do..	10
Average age	years..	180
Litter		Light.

TOWNSHIP 15 NORTH, RANGE 9 EAST.

The south half of this township is included within the reserve. It supports a fair growth of yellow pine, of which about 50 per cent is of good quality. It will log to the south and west to great advantage. There is considerable growth of Gambel oak, which is fit only for fuel.

Stand of species in T. 15 N., R. 9 E.

	Cords.	Feet B. M.
Yellow pine		31,500,000
Gambel oak	5,500	

Forest conditions in T. 15 N., R. 9 E.

Average total height of yellow pine	feet..	90
Average height, clear	do..	16
Average diameter, breast-high	inches..	18
Dead	per cent..	4
Diseased	do..	10
Average age	years..	180
Litter		Light.

TOWNSHIP 12 NORTH, RANGE 10 EAST.

This township will be very difficult to log, as the surface is very rough and steep. It will naturally log north of the mesa rim toward the East Clearwater, and south of the rim into East Verde River. Of the yellow-pine timber about 30

per cent is of good quality. The red fir is along the banks of the creeks and is all of poor quality. White pine is small and rough. There is some Gambel oak in the undergrowth.

Stand of timber species in T. 12 N., R. 10 E.

	Feet B. M.
Yellow pine	36,500,000
White pine	500,000
Red fir	1,000,000
Total	38,000,000

Forest conditions in T. 12 N., R. 10 E.

Average total height	feet..	85
Average height, clear	do..	13
Average diameter, breast-high	inches..	16
Dead	per cent..	2
Diseased	do..	12
Average age	years..	140
Litter	Light.	

TOWNSHIP 13 NORTH, RANGE 10 EAST.

This township drains northeastward into East Clearwater Creek. The surface is very rough and broken, but the timber can be logged very cheaply into the canyon. There is a heavy growth of yellow pine of fair quality. Along the creek there is some red fir and aspen.

Stand of species in T. 13 N., R. 10 E.

	Cords.	Feet B. M.
Yellow pine		84,000,000
Red fir		4,350,000
Gambel oak	2,025	.....
Total	2,025	88,350,000

Forest conditions in T. 13 N., R. 10 E.

Average total height of timber trees	feet..	100
Average height, clear	do..	14
Average diameter, breast high	inches..	19
Dead	per cent..	2
Diseased	do..	.8
Average age	years..	155
Litter	Light.	

TOWNSHIP 14 NORTH, RANGE 10 EAST.

This township is upon the divide between the West Clearwater and the East Clearwater, and will log into the valley of these streams. Yellow pine is of very good quality and stands heavy on some of the sections.

FOREST CONDITIONS IN BLACK MESA RESERVE, ARIZONA.

Stand of species in T. 14 N., R. 10 E.

	Cords.	Feet B. M.
Yellow pine		73,500,000
Gambel oak	3,375	

Forest conditions in T. 14 N., R. 10 E.

Average total height of yellow pine	feet..	100
Average height, clear	do...	24
Average diameter, breast high	inches..	20
Dead	per cent..	1
Diseased	do...	10
Average age	years..	180
Litter		Light.
Reproduction		Very good.

TOWNSHIP 15 NORTH, RANGE 10 EAST.

Sections 7 to 36, inclusive, of this township are within the reserve. The surface is gently rolling with stony soil and some clay. The timber is chiefly yellow pine, of which 40 per cent is of good quality. Among the west boundary is some scattering cypress and alligator juniper.

Stand of species T. 15 N., R. 10 E.

	Cords.	Feet B. M.
Yellow pine		28,500,000
Arizona cypress	2,250	
Gambel oak	4,600	
Total	6,850	

Forest conditions in T. 15 N., R. 10 E.

Average total height of yellow pine	feet..	80
Average height, clear	do...	12
Average diameter, breast high	inches..	16
Dead	per cent..	2
Diseased	do...	15
Average age	years..	160
Litter		Light.

TOWNSHIP 12 NORTH, RANGE 11 EAST.

The brink of Black Mesa traverses this township from southeast to northwest and divides the drainage. It would be very difficult and expensive to log, as the surface is rough and broken. Timber is chiefly yellow pine, of which 30 per cent is of good quality. The white pine, red fir, and white fir are all of poor quality, and are found mainly in the creek bottom.

DESCRIPTIONS OF TOWNSHIPS.

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Stand of timber species in T. 12 N., R. 11 E.

	Feet B. M.
Yellow pine	42,500,000
White pine	510,000
Red fir	1,430,000
White fir	2,425,000
Total	46,865,000

Forest conditions in T. 12 N., R. 11 E.

Average total height	feet..	95
Average height, clear	do..	12
Average diameter, breast high	inches..	16
Dead	per cent..	2
Diseased	do..	8
Average age	years..	150
Litter	Light.	

TOWNSHIP 13 NORTH, RANGE 11 EAST.

This township slopes toward the northeast and is drained by East Clearwater Creek. The timber is chiefly yellow pine, which is of very good quality, except along the canyons, where it is found with red fir and white fir. It will log to the northeast to good advantage, except the small amount which is found in the rough canyon. There is some aspen and Gambel oak in the undergrowth.

Stand of timber species in T. 13 N., R. 11 E.

	Feet B. M.
Yellow pine	75,500,000
Red fir	2,250,000
White fir	1,250,000
Total	79,000,000

Forest conditions in T. 13 N., R. 11 E.

Average total height	feet..	105
Average height, clear	do..	18
Average diameter, breast-high	inches..	19
Dead	per cent..	1½
Diseased	do..	7
Average age	years..	107
Litter	Light.	

TOWNSHIP 14 NORTH, RANGE 11 EAST.

The surface of this township is steep, rolling, and broken, and the natural outlet for the timber is toward the east, but, there being no railroads or water transportation in this vicinity, it is probable that logging will be done for portable mills located

at convenient places. About 50 per cent of the yellow pine is of good quality, the rest being rough and knotty. There is considerable growth of Gambel oak, suitable only for fuel and fencing. There is a light growth of aspen with the undergrowth.

Stand of species in T. 14 N., R. 11 E.

	Cords.	Feet B. M.
Yellow pine		62,000,000
Gambel oak	6,825	

Forest conditions in T. 14 N., R. 11 E.

Average total height of yellow pine	feet..	85
Average height, clear	do...	14
Average diameter, breast-high	inches..	18
Dead	per cent..	2
Diseased	do...	10
Average age	years..	170
Litter		Light.

TOWNSHIP 15 NORTH, RANGE 11 EAST.

Sections 7 to 36, inclusive, of this township are included within the reserve. Sections 25 to 36, inclusive, support a fair growth of yellow pine, mostly of very good quality. The remainder is poor growth of Arizona cypress, of no value except for fuel or fencing.

Stand of species in T. 15 N., R. 11 E.

	Cords.	Feet B. M.
Yellow pine		21,000,000
Arizona cypress.....	6,500	

Forest conditions in T. 15 N., R. 11 E.

Average total height of yellow pine	feet..	85
Average height, clear	do...	14
Average diameter, breast-high	inches..	18
Dead	per cent..	2
Diseased	do...	12
Average age	years..	170
Litter.....		None.

TOWNSHIP 11 NORTH, RANGE 12 EAST.

This township lies mainly to the south of Black Mesa and is drained by Tonto Creek. The yellow pine is of poor quality and very rough and knotty.

Stand of timber species in T. 11 N., R. 12 E.

	Feet B. M.
Yellow pine	54,750,000

DESCRIPTIONS OF TOWNSHIPS.

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Forest conditions in T. 11 N., R. 12 E.

Average total height.....	feet..	90
Average height, clear	do...	14
Average diameter, breast-high	inches..	18
Dead	per cent..	2
Diseased	do...	15
Average age	years..	160
Litter	Light.	

TOWNSHIP 12 NORTH, RANGE 12 EAST.

This township is mainly upon the summit plateau of the mesa, and has a general slope toward the northeast. With the exception of the timber bordering the creeks in the canyon, it can be logged very cheaply. The yellow pine is almost all of good quality. White fir of poor quality is found along the creeks. There is a light growth of aspen and Gambel oak in the underbrush.

Stand of timber species in T. 12 N., R. 12 E.

	Feet B. M.
Yellow pine	107,000,000
White fir.....	800,000
	<hr/> 107,800,000

Forest conditions in T. 12 N., R. 12 E.

Average total height.....	feet..	110
Average height, clear	do...	18
Average diameter, breast-high	inches..	18
Dead	per cent..	1
Diseased	do...	8
Average age	years..	150
Litter	Light.	

TOWNSHIP 13 NORTH, RANGE 12 EAST.

The surface of this township is rolling, with a general slope toward the north. The timber will log in that direction. About 60 per cent of the yellow pine is of good quality. There is a heavy stand all over the township. Along the creeks there is a small sprinkling of red fir, which is generally of poor quality. There is some Gambel oak in the undergrowth.

Stand of species in T. 13 N., R. 12 E.

	Cords.	Feet B. M.
Yellow pine		130,000,000
Red fir.....		750,000
Gambel oak	1,140	
Total.....	<hr/> 1,140	<hr/> 130,750,000

FOREST CONDITIONS IN BLACK MESA RESERVE, ARIZONA.

Forest condition in T. 13 N., R. 12 E.

Average total height of timber trees	feet..	115
Average height, clear	do...	20
Average diameter, breast high	inches..	20
Dead	per cent..	1
Diseased	do...	5
Average age	years..	155
Litter	Light.	

TOWNSHIP 14 NORTH, RANGE 12 EAST.

Sections 3 to 10, 15 to 22, and 25 to 36, all inclusive, are within the boundaries of the reserve. The general slope is toward the northeast and will permit of logging to good advantage and very cheaply. About 40 per cent of the yellow pine is of good quality. Gambel oak, suitable for fencing or fuel, is scattered all over the township.

Stand of species in T. 14 N., R. 12 E.

	Cords.	Feet B. M.
Yellow pine		40, 250, 000
Gambel oak	3, 050	

Forest conditions in T. 14 N., R. 12 E.

Average total height of yellow pine	feet..	90
Average height, clear	do...	18
Average diameter, breast high	inches..	20
Dead	per cent..	2
Diseased	do...	10
Average age	years..	170
Litter	Light.	

TOWNSHIP 15 NORTH, RANGE 12 EAST.

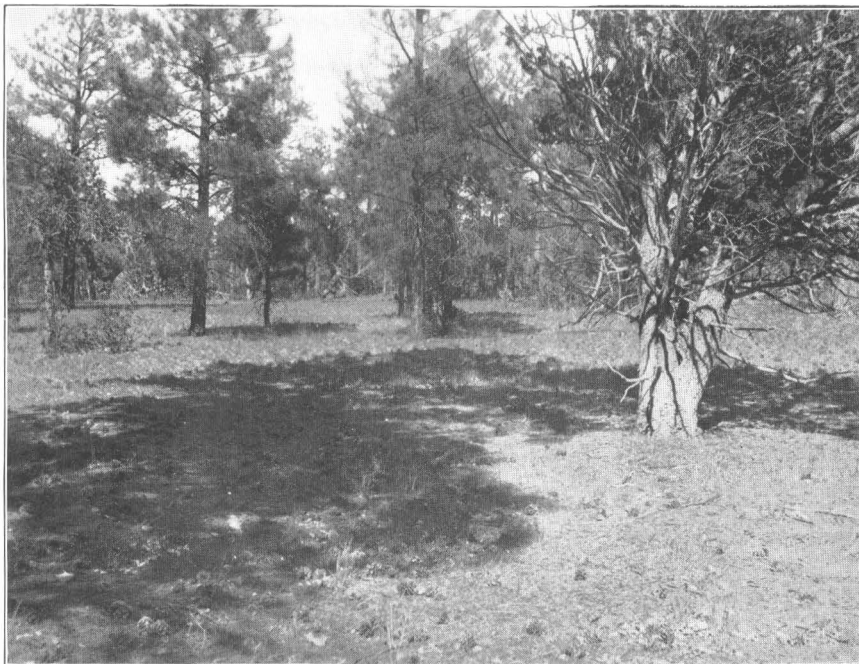
Sections 31 to 34, inclusive, are within the reserve. Yellow pine is of very good quality.

Stand of species in T. 15 N., R. 12 E.

	Cords.	Feet B. M.
Yellow pine		6, 000, 000
Arizona cypress	250	

Forest conditions in T. 15 N., R. 12 E.

Average total height of yellow pine	feet..	80
Average height, clear	do...	12
Average diameter, breast high	inches..	16
Dead	per cent..	2
Diseased	do...	20
Average age	years..	160



A. ALLIGATOR JUNIPER AND YELLOW PINE.



B. LARGE GROWTH OF ALLIGATOR JUNIPER.

TOWNSHIP 11 NORTH, RANGE 13 EAST.

The brink of Grand Mesa traverses this township from southeast to northwest. The timber on the north side can be logged toward the East Clearwater, and on the south it will handle best to the valleys below the rim. Of the yellow pine about 40 per cent is of good quality, but is small and rough along the divide. There is some Gambel oak in the undergrowth.

Stand of timber species in T. 11 N., R. 13 E.

	Feet B. M.
Yellow pine	51,500,000

Forest conditions in T. 11 N., R. 13 E.

Average total height	feet..	100
Average height, clear	do...	18
Average diameter, breast high	inches..	17
Dead	per cent..	2
Diseased	do...	10
Average age	years..	150
Litter		Light.

TOWNSHIP 12 NORTH, RANGE 13 EAST.

The surface is steep and rolling, with a general slope toward the north. The timber will log best toward the northeast, and, except some along the creeks in the canyons, may be handled cheaply. There is a heavy stand of yellow pine all over the township, with some white fir along the creeks, which is poor and rough. There is some aspen and Gambel oak in the undergrowth.

Stand of timber species in T. 12 N., R. 13 E.

	Feet B. M.
Yellow pine	118,500,000
White fir	1,200,000
Total	119,700,000

Forest conditions in T. 12 N., R. 13 E.

Average total height	feet..	125
Average height, clear	do...	20
Average diameter, breast high	inches..	18
Dead	per cent..	1
Diseased	do...	7
Average age	years..	150
Litter		Light.

TOWNSHIP 13 NORTH, RANGE 13 EAST.

This township has a gently rolling surface with a general slope toward the north, in which direction it can be logged cheaply. The yellow pine is nearly all good quality and there is a heavy stand all over the township. There is some fair quaking aspen and Gambel oak in the undergrowth.

Stand of timber species in T. 13 N., R. 13 E.

	Feet B. M.
Yellow pine	134,000,000

Forest conditions in T. 13 N., R. 13 E.

Average total height	feet..	125
Average height, clear	do...	24
Average diameter, breast-high	inches..	18
Dead	per cent..	1
Diseased	do...	5
Average age	years..	150
Litter		Light.

TOWNSHIP 14 NORTH, RANGE 13 EAST.

Sections 28 to 33, inclusive, of this township are within the boundaries of the reserve. The surface has a gentle slope toward the north and supports a growth of yellow pine, of which about 33 per cent is of good quality.

Stand of species in T. 14 N., R. 13 E.

	Cords.	Feet B. M.
Yellow pine		6,000,000
Gambel oak	350	

Forest conditions in T. 14 N., R. 13 E.

Average total height of yellow pine	feet..	80
Average height, clear	do...	15
Average diameter, breast-high	inches..	16
Dead	per cent..	2
Diseased	do...	15
Average age	years..	160

TOWNSHIP 11 NORTH, RANGE 14 EAST.

The greater portion of this township is on the high plateau, having a general slope toward the north, and the yellow-pine timber can be handled best in that direction, except only the small area below the rim of the mesa. The best of the timber is toward the north and is yellow pine, with a small amount of white fir along the creeks.

Stand of timber species in T. 11 N., R. 14 E.

	Feet B. M.
Yellow pine.....	86,250,000
White fir.....	575,000
Total.....	86,825,000

Forest conditions in T. 11 N., R. 14 E.

Average total height.....	feet..	95
Average height, clear.....	do...	15
Average diameter, breast-high.....	inches..	17
Dead.....	per cent..	2
Diseased.....	do...	10
Average age.....	years..	150
Litter.....	Light.	

TOWNSHIP 12 NORTH, RANGE 14 EAST.

The surface is steep and rolling, with a general slope to the north, in which direction the timber can be logged very cheaply, except the few trees bordering the creeks. Yellow pine is of good quality and is mixed with white fir of poor quality along the creeks.

Stand of timber species in T. 12 N., R. 14 E.

	Feet B. M.
Yellow pine.....	138,000,000
White fir.....	950,000
Total.....	138,950,000

Forest conditions in T. 12 N., R. 14 E.

Average total height.....	feet..	105
Average height, clear.....	do...	16
Average diameter, breast-high.....	inches..	20
Dead.....	per cent..	2
Diseased.....	do...	10
Average age.....	years..	155
Litter.....	Light.	

TOWNSHIP 13 NORTH, RANGE 14 EAST.

The south half of this township is included within the reserve. Its general slope is toward the north. It can be logged very cheaply. About 50 per cent of the yellow pine is of good quality.

Stand of species in T. 13 N., R. 14 E.

	Cords.	Feet B. M.
Yellow pine.....		32,500,000
Alligator juniper.....	1,250	

Forest conditions in T. 13 N., R. 14 E.

Average total height of yellow pine	feet..	90
Average height, clear	do..	18
Average diameter, breast-high	inches..	18
Dead	per cent..	2
Diseased	do..	15
Average age	years..	150
Litter		Light.

TOWNSHIP 11 NORTH, RANGE 15 EAST.

That portion of this township lying north of the brink of the mesa is included within the reserve. Its general slope is toward the north and it can be logged to very good advantage, although in some areas it will be expensive to handle. About 40 per cent of the yellow pine is of good quality.

Stand of species in T. 11 N., R. 15 E.

	Cords.	Feet B. M.
Yellow pine		53,000,000
Gambel oak	825	

Forest conditions in T. 11 N., R. 15 E.

Average total height of yellow pine	feet..	85
Average height, clear	do..	14
Average diameter, breast-high	inches..	15
Dead	per cent..	3
Diseased	do..	17
Average age	years..	140
Litter		Light.

TOWNSHIP 12 NORTH, RANGE 15 EAST.

The surface of this township is gently rolling and sloping toward the northwest and northeast, and the timber will handle very cheaply by skid roads to portable mills. About 50 per cent of the yellow pine is of good quality, and there is a heavy stand. There is some Gambel oak in the undergrowth.

Stand of species in T. 12 N., R. 15 E.

	Cords.	Feet B. M.
Yellow pine		113,500,000
Gambel oak	3,750	

Forest conditions in T. 12 N., R. 15 E.

Average total height of yellow pine	feet..	100
Average height, clear	do..	16
Average diameter, breast-high	inches..	18
Dead	per cent..	2
Diseased	do..	15
Average age	years..	170
Litter		Light.

TOWNSHIP 13 NORTH, RANGE 15 EAST.

The south half of this township is included within the reserve. The surface is gently rolling and slopes toward the north. The yellow pine is of rather poor quality, but can be logged very cheaply.

Stand of species in T. 13 N., R. 15 E.

	Cords.	Feet B. M.
Yellow pine.....		21,000,000
Alligator juniper.....	2,700	

Forest conditions in T. 13 N., R. 15 E.

Average total height of yellow pine.....	feet..	80
Average height, clear	do...	12
Average diameter, breast-high	inches..	16
Dead	per cent..	4
Diseased	do...	15
Average age	years..	150

TOWNSHIP 11 NORTH, RANGE 16 EAST.

The surface of this township is steep, rolling, and broken, with a general slope toward the north, and drains into Heber Creek. It can best be logged by building a railroad up Heber Creek. The yellow pine is nearly all of good quality, and stands heavy on the southern portion of the township. There is a very poor growth of oak along the creeks.

Stand of timber species in T. 11 N., R. 16 E.

	Feet B. M.
Yellow pine.....	124,000,000

Forest conditions in T. 11 N., R. 16 E.

Average total height	feet..	95
Average height, clear	do...	18
Average diameter, breast-high	inches..	18
Dead	per cent..	2
Diseased	do...	10
Average age	years..	180
Litter		Light.

TOWNSHIP 12 NORTH, RANGE 16 EAST.

Sections 7 to 36, inclusive, are within the boundaries of the reserve. The surface is steep and rolling, with rocky benches. In Heber Valley the soil is mostly clay. There is a fair stand of timber, which is of very poor quality. It is naturally tributary to Heber Valley and to the town of Heber, which is located in section 13.

FOREST CONDITIONS IN BLACK MESA RESERVE, ARIZONA

Stand of species in T. 12 N., R. 16 E.

	Cords.	Feet B. M.
Yellow pine		23, 250, 000
Alligator juniper	16, 300	
Gambel oak	2, 875	
Total	19, 175	

Forest conditions in T. 12 N., R. 16 E.

Average total height of yellow pine	feet..	75
Average height, clear	do..	12
Average diameter, breast-high	inches..	16
Dead	per cent..	5
Diseased	do..	25
Average age	years..	160
Litter		Light.

TOWNSHIP 11 NORTH, RANGE 17 EAST.

The surface of this township is steep, rough, and broken. The yellow-pine timber is generally of poor quality, except in the southern part of the township.

Stand of species in T. 11 N., R. 17 E.

	Cords.	Feet B. M.
Yellow pine		44, 000, 000
Alligator juniper	925	

Forest conditions in T. 11 N., R. 17 E.

Average total height of yellow pine	feet..	95
Average height, clear	do..	12
Average diameter, breast-high	inches..	14
Dead	per cent..	3
Diseased	do..	20
Average age	years..	140
Litter		Light.

TOWNSHIP 12 NORTH, RANGE 17 EAST.

Sections 7 to 36, inclusive, are within the reserve. There is very little timber, consisting of yellow pine and alligator juniper of very poor quality.

Stand of species in T. 12 N., R. 17 E.

	Cords.	Feet B. M.
Yellow pine		3, 750, 000
Alligator juniper	21, 250	

Forest conditions in T. 12 N., R. 17 E.

Average total height of yellow pine	feet..	70
Average height, clear	do..	8
Average diameter, breast-high	inches..	16
Dead	per cent..	5
Diseased	do..	25
Average age	years..	160

TOWNSHIP 11 NORTH, RANGE 18 EAST.

The general slope of this township is toward the north and the surface is very steep and rolling. In the southern portion of the township about 50 per cent of the yellow pine is of good quality; the rest is very poor and is mixed with a growth of alligator juniper and Gambel oak, which is valuable only for fuel.

Stand of species in T. 11 N., R. 18 E.

	Cords.	Feet B. M.
Yellow pine		42, 750, 000
Alligator juniper.....	5, 250	
Gambel oak	1, 900	
Total.....	7, 150	

Forest conditions in T. 11 N., R. 18 E.

Average total height of yellow pine.....	feet..	85
Average height, clear	do..	12
Average diameter, breast high	inches..	16
Dead	per cent..	3
Diseased	do..	20
Average age	years..	155
Litter		Light.

TOWNSHIP 12 NORTH, RANGE 18 EAST.

The south half of this township is included within the reserve. The surface is gently sloping toward the north. Most of the area is open grazing land, with some scattering yellow pine and alligator juniper.

Stand of species in T. 12 N., R. 18 E.

	Cords.	Feet B. M.
Yellow pine		750, 000
Alligator juniper.....	2, 175	

Forest conditions in T. 12 N., R. 18 E.

Average total height of yellow pine.....	feet..	80
Average height, clear	do..	8
Average diameter, breast high	inches..	16
Dead	per cent..	5
Diseased	do..	25
Average age	years..	170
Litter		Light.

TOWNSHIP 10 NORTH, RANGE 19 EAST.

The brink of Black Mesa traverses the township from southeast to northwest, and forms the boundary line between the forest reserve and the White Mountain Reservation. About 50 per cent of the yellow pine is of good quality, and will handle best northward.

FOREST CONDITIONS IN BLACK MESA RESERVE, ARIZONA.

Stand of species in T. 10 N., R. 19 E.

	Cords.	Feet B. M.
Yellow pine		31,500,000
Gambel oak	7,950	

Forest conditions in T. 10 N., R. 19 E.

Average total height of yellow pine	feet..	90
Average height, clear	do...	10
Average diameter, breast high	inches..	20
Dead	per cent..	2
Diseased	do...	15
Average age	years..	180
Litter		Light.

TOWNSHIP 11 NORTH, RANGE 19 EAST.

The surface is rolling and is broken with deep canyons along the creeks in the northern portion of the township. The general slope is toward the north, and the timber will have to be handled in that direction. Yellow pine is nearly all small growth and of poor quality. There is some alligator juniper and Gambel oak, which follow the creeks.

Stand of species in T. 11 N., R. 19 E.

	Cords.	Feet B. M.
Yellow pine		25,750,000
Alligator juniper	5,550	
Gambel oak	6,425	
Total	11,975	

Forest conditions in T. 11 N., R. 19 E.

Average total height of yellow pine	feet..	80
Average height, clear	do...	12
Average diameter, breast high	inches..	16
Dead	per cent..	5
Diseased	do...	20
Average age	years..	160
Litter		Light.

TOWNSHIP 10 NORTH, RANGE 20 EAST.

The greater portion of this township lies north of the brink of the mesa and is included within the forest reserve. Its general slope is toward the north, but the surface is very rough, and the timber will be very expensive to handle. Only 33 per cent of the yellow pine is of good quality. There is some alligator juniper and Gambel oak, which is fit only for fuel or fencing.

Stand of species in T. 10 N., R. 20 E.

	Cords.	Feet B. M.
Yellow pine		46,000,000
Alligator juniper	1,425	
Gambel oak	8,850	
Total	10,275	

Forest conditions in T. 20 N., R. 20 E.

Average total height of yellow pine	feet..	90
Average height, clear	do...	14
Average diameter, breast high	inches..	17
Dead	per cent..	3
Diseased	do...	16
Average age	years..	170
Litter		Light.

TOWNSHIP 10 NORTH, RANGE 21 EAST.

The general slope of this township is toward the north. The timber is generally small and rough, the best yellow pine being along the creek.

Stand of species in T. 10 N., R. 21 E.

	Cords.	Feet B. M.
Yellow pine		23,250,000
Alligator juniper	8,575	
Gambel oak	2,825	
Total	11,400	

Forest conditions in T. 10 N., R. 21 E.

Average total height of yellow pine	feet..	75
Average height, clear	do...	10
Average diameter, breast high	inches..	16
Dead	per cent..	3
Diseased	do...	20
Average age	years..	165
Litter		Light.

TOWNSHIP 9 NORTH, RANGE 22 EAST.

The boundary between the forest reserve and White Mountain Indian Reservation traverses this township from northeast to southwest. That portion contained within the forest reserve is nearly level and slopes toward the north. The yellow pine is all of poor quality, except some good trees standing in the ravines. There is a small sawmill in operation in sections 25 and 26, having a capacity of about 5,000 feet per day.

FOREST CONDITIONS IN BLACK MESA RESERVE, ARIZONA.

Stand of species in T. 9 N., R. 22 E.

	Cords.	Feet B. M.
Yellow pine		25,750,000
Alligator juniper	2,650	
Gambel oak	4,700	
Total	7,350	

Forest conditions in T. 9 N., R. 22 E.

Average total height of yellow pine	feet..	80
Average height, clear	do..	16
Average diameter, breast high	inches..	16
Dead	per cent..	5
Diseased	do..	20
Average age	years..	160
Litter		Light.

TOWNSHIP 10 NORTH, RANGE 22 EAST.

The eastern portion of this township is almost level, with some rolling land on the west. All the timber stands in the southwestern portion, and is generally of poor quality.

Stand of species in T. 10 N., R. 22 E.

	Cords.	Feet B. M.
Yellow pine		10,000,000
Alligator juniper	3,025	
Gambel oak	1,850	
Total	4,875	

Forest conditions in T. 10 N., R. 22 E.

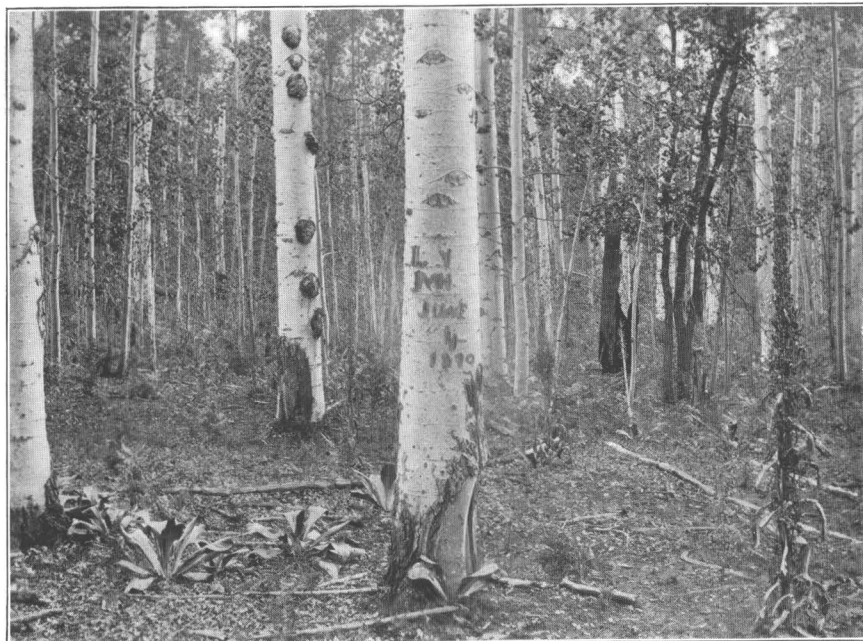
Average total height of yellow pine	feet..	80
Average height, clear	do..	12
Average diameter, breast high	inches..	16
Dead	per cent..	4
Diseased	do..	15
Average age	years..	160
Litter		Light.

TOWNSHIP 8 NORTH, RANGE 23 EAST.

A strip along the northern side of this township is included within the reserve. It slopes gently toward the north and supports a heavy growth of yellow pine, of which 50 per cent is of good quality.

Stand of species in T. 8 N., R. 23 E.

	Cords.	Feet B. M.
Yellow pine		16,250,000
Gambel oak	2,700	



A. GROVE OF ASPEN.



B. LIVING AND DEAD CYPRESS.

Forest conditions in T. 8 N., R. 23 E.

Average total height of yellow pine	feet..	90
Average height, clear	do...	16
Average diameter, breast high	inches..	20
Dead	per cent..	2
Diseased	do...	10
Average age	years..	180
Litter		Light.

TOWNSHIP 9 NORTH, RANGE 23 EAST.

This township has a gentle slope toward the northwest, and is drained by Show-low Creek. There is a good growth of yellow-pine timber of good quality, which can be logged very cheaply to the west.

Stand of species in T. 9 N., R. 23 E.

	Cords.	Feet B. M.
Yellow pine		96,500,000
Gambel oak	5,525	

Forest conditions in T. 9 N., R. 23 E.

Average total height of yellow pine	feet..	125
Average height, clear	do...	24
Average diameter, breast high	inches..	18
Dead	per cent..	1
Diseased	do...	10
Average age	years..	150
Litter		Light.
Reproduction		Excellent.

TOWNSHIP 9 NORTH, RANGE 24 EAST.

The general slope of the surface is toward the north and west. On the eastern side are several buttes. Excepting the north tier of sections, there is a heavy growth of yellow pine, which can be logged very cheaply.

Stand of species in T. 9 N., R. 24 E.

	Cords.	Feet B. M.
Yellow pine		102,500,000
Alligator juniper	1,050	
Gambel oak	6,950	
Total	8,000	

FOREST CONDITIONS IN BLACK MESA RESERVE, ARIZONA.

Forest conditions in T. 9 N., R. 24 E.

Average total height of yellow pine	feet..	90
Average height, clear	do...	16
Average diameter, breast high	inches..	20
Dead	per cent..	2
Diseased	do...	10
Average age	years..	180
Litter		Light.
Reproduction		Excellent.

TOWNSHIP 9 NORTH, RANGE 25 EAST.

Almost the entire surface of this township is rough and mountainous. The best of the yellow-pine timber is to the south.

Stand of species in T. 9 N., R. 25 E.

	Cords.	Feet B. M.
Yellow pine		51, 250, 000
White pine		350, 000
White fir		4, 500, 000
Engelmann spruce		325, 000
Alligator juniper	550	.....
Gambel oak	6, 500	.....
Total	7, 050	56, 425, 000

Forest conditions in T. 9 N., R. 25 E.

Average total height of timber trees	feet..	80
Average height, clear	do...	12
Average diameter, breast high	inches..	16
Dead	per cent..	2
Diseased	do...	10
Average age	years..	155
Litter		Light.

TOWNSHIP 6 NORTH, RANGE 26 EAST.

The northeastern portion of this township is included within the reserve and is very steep, rough, and mountainous, lying on the east slopes of Ord Peak and Mount Baldy, and is at the headwaters of Little Colorado River.

Stand of timber species in T. 6 N., R. 26 E.

	Feet B. M.
White pine	250, 000
Red fir	500, 000
White fir	250, 000
Engelmann spruce	21, 250, 000
Total	22, 250, 000

Forest conditions in T. 6 N., R. 26 E.

Average total height	feet..	90
Average height, clear	do...	15
Average diameter, breast high	inches..	16
Dead	per cent..	10
Diseased	do...	25
Average age	years..	125
Litter		Medium.

TOWNSHIP 8 NORTH, RANGE 26 EAST.

The divide between the drainage of Little Colorado and Gila rivers traverses this township from southeast to northwest, and is the boundary line between the forest reserve and the White Mountain Indian Reservation. The surface is broken and mountainous and supports a scattering growth of yellow pine, red fir, and Engelmann spruce of little value.

Stand of timber species in T. 8 N., R. 26 E.

	Feet B. M.
Yellow pine	3,500,000
Red fir	2,000,000
Engelmann spruce	1,500,000
Total	7,000,000

Forest conditions in T. 8 N., R. 26 E.

Average total height	feet..	75
Average height, clear	do...	7
Average diameter, breast high	inches..	14
Dead	per cent..	3
Diseased	do...	17
Average age	years..	140
Litter		Light.

TOWNSHIP 9 NORTH, RANGE 26 EAST.

Almost the entire surface of this township is steep and broken, with a general slope toward the north. With the exception of the north tier of sections, it supports a fair growth of yellow pine, of which 50 per cent is of good quality.

Stand of species in T. 9 N., R. 26 E.

	Cords.	Feet B. M.
Yellow pine		45,250,000
Red fir		3,750,000
Alligator juniper	1,050	
Gambel oak	3,075	
Total	4,125	49,000,000

FOREST CONDITIONS IN BLACK MESA RESERVE, ARIZONA.

Forest conditions in T. 9 N., R. 26 E.

Average total height of timber trees.....	feet..	85
Average height, clear	do...	12
Average diameter, breast high	inches..	18
Dead	per cent..	2
Diseased	do...	20
Average age.....	years..	160
Litter.....		Light.

TOWNSHIP 1 NORTH, RANGE 27 EAST.

This township is all very rough and mountainous and is drained by Eagle Creek, which is of no value as a logging stream.

Stand of timber species in T. 1 N., R. 27 E.

	Feet B. M.
Yellow pine	1,210,000
White pine.....	61,500,000
White fir.....	58,000
Total.....	62,768,000

Forest conditions in T. 1 N., R. 27 E.

Average total height.....	feet..	100
Average height, clear	do..	16
Average diameter, breast high.....	inches..	16
Dead	per cent..	2
Diseased	do...	8
Average age.....	years..	130
Litter.....		Light.

TOWNSHIP 2 NORTH, RANGE 27 EAST.

This township is very rough and broken and is well watered by Eagle Creek and its tributaries. There is a rather scattering growth of yellow pine along the creeks, which will be very expensive to handle.

Stand of timber species in T. 2 N., R. 27 E.

	Feet B. M.
Yellow pine	12,000,000

Forest conditions in T. 2 N., R. 27 E.

Average total height.....	feet..	125
Average height, clear	do...	20
Average diameter, breast high	inches..	20
Dead	per cent..	2
Diseased	do...	10
Average age	years..	140
Litter		Light.

TOWNSHIP 3 NORTH, RANGE 27 EAST.

The greater portion of this township is on the Blue Mountain plateau, which forms the divide between Salt River and Eagle Creek. It supports a heavy stand of timber, which will be very expensive and difficult to handle.

Stand of timber species in T. 3 N., R. 27 E.

	Feet B. M.
Yellow pine	30,750,000
White pine	8,000,000
Red fir	8,750,000
White fir	8,750,000
Engelmann spruce	72,750,000
Total	129,000,000

Forest conditions in T. 3 N., R. 27 E.

Average total height	feet.. 90
Average height, clear	do... 13
Average diameter, breast high	inches.. 20
Dead	per cent.. 4
Diseased	do... 10
Average age	years.. 130
Litter	Light.

TOWNSHIP 4 NORTH, RANGE 27 EAST.

The east five-twelfths of this township is included within the reserve. The surface is very rough and the timber will be difficult and expensive to handle. About 50 per cent of the yellow pine is of good quality, but the white pine and red fir are poor. There is some alligator juniper in the undergrowth.

Stand of timber species in T. 4 N., R. 27 E.

	Feet B. M.
Yellow pine	69,250,000
White pine	2,100,000
Red fir	2,800,000
Total	74,150,000

Forest conditions in T. 4 N., R. 27 E.

Average total height	feet.. 120
Average height, clear	do... 30
Average diameter, breast-high	inches.. 18
Dead	per cent.. 1
Diseased	do... 10
Average age	years.. 120
Litter	Light.

TOWNSHIP 5 NORTH, RANGE 27 EAST.

The east half of this township is included within the reserve. The surface is steep, rolling, and broken, and supports a heavy growth of yellow pine of good quality. Other timber is small and poor.

Stand of timber species in T. 5 N., R. 27 E.

	Feet B. M.
Yellow pine	78, 750, 000
White pine	625, 000
Red fir	4, 500, 000
Engelmann spruce	250, 000
Total	84, 125, 000

Forest conditions in T. 5 N., R. 27 E.

Average total height	feet.. 120
Average height, clear	do... 24
Average diameter, breast-high	inches.. 18
Dead	per cent.. 2
Diseased	do... 10
Average age	years.. 150

TOWNSHIP 6 NORTH, RANGE 27 EAST.

Sections 1 to 15, inclusive, the north half of sections 16, 17, and 18, sections 22 to 27, inclusive, and sections 34, 35, and 36 are within the boundaries of the reserve. The surface is all broken and mountainous, and the timber is of very poor quality.

Stand of timber species in T. 6 N., R. 27 E.

	Feet B. M.
Yellow pine	12, 000, 000
White pine	1, 250, 000
Red fir	14, 500, 000
White fir	1, 000, 000
Engelmann spruce	19, 250, 000
Total	48, 000, 000

Forest conditions in T. 6 N., R. 27 E.

Average total height	feet.. 70
Average height, clear	do... 11
Average diameter, breast-high	inches.. 20
Dead	per cent.. 2
Diseased	do... 10
Average age	years.. 130
Litter	Light.

TOWNSHIP 7 NORTH, RANGE 27 EAST.

The surface is very broken and mountainous. It supports a scattering growth of yellow pine, red fir, and white fir. About 40 per cent of the yellow pine is of good quality.

Stand of timber species in T. 7 N., R. 27 E.

	Feet B. M.
Yellow pine.....	17,750,000
Red fir.....	3,000,000
White fir.....	1,500,000
Total.....	22,250,000

Forest conditions in T. 7 N., R. 27 E.

Average total height.....	feet..	110
Average height, clear.....	do..	18
Average diameter, breast-high.....	inches..	26
Dead.....	per cent..	2
Diseased.....	do..	18
Average age.....	years..	185
Litter.....		Light.

TOWNSHIP 8 NORTH, RANGE 27 EAST.

The surface is all steep, rolling, and broken, draining toward the northeast, and supports a very scattering growth of yellow pine, with a very few red fir and Engelmann spruce of no value. There is a considerable growth of aspen, alligator juniper, and Gambel oak in the undergrowth.

Stand of species in T. 8 N., R. 27 E.

	Cords.	Feet B. M.
Yellow pine.....		19,250,000
Alligator juniper.....	475	

Forest conditions in T. 8 N., R. 27 E.

Average total height of yellow pine.....	feet..	80
Average height, clear.....	do..	10
Average diameter, breast high.....	inches..	20
Dead.....	per cent..	4
Diseased.....	do..	20
Average age.....	years..	180
Litter.....		Light.

TOWNSHIP 1 NORTH, RANGE 28 EAST.

All of this township lies upon the slopes of Red Peak, which reaches an elevation of 9,250 feet in section 17. The drainage is into Eagle Creek and Blue River. The surface is very broken and mountainous. It supports a fair stand of yellow pine, white pine, and white fir, all of poor quality. There is some alligator juniper and Emory oak in the undergrowth.

FOREST CONDITIONS IN BLACK MESA RESERVE, ARIZONA.

Stand of timber species in T. 1 N., R. 28 E.

	Feet B. M.
Yellow pine	32,250,000
White pine	5,675,000
White fir	2,500,000
Total	40,425,000

Forest conditions in T. 1 N., R. 28 E.

Average total height	feet.. 115
Average height, clear	do... 18
Average diameter, breast high	inches.. 18
Dead	per cent.. 2
Diseased	do... 8
Average age	years.. 140
Litter	Light.

TOWNSHIP 2 NORTH, RANGE 28 EAST.

This township lies on the southwestern flank of Mount Oliphant. It reaches an elevation of 10,000 feet in section 1. The drainage is into Eagle Creek and Blue River. The surface is all rough and broken, which will make logging very expensive. Yellow pine and white pine are very scattering and of poor quality.

Stand of timber species in T. 2 N., R. 28 E.

	Feet B. M.
Yellow pine	32,500,000
White pine	505,000
Total	33,005,000

Forest conditions in T. 2 N., R. 28 E.

Average total height	feet.. 120
Average height, clear	do... 22
Average diameter, breast high	inches.. 22
Dead	per cent.. 1
Diseased	do... 10
Average age	years.. 155
Litter	Light.

TOWNSHIP 3 NORTH, RANGE 28 EAST.

The greater portion of this township lies on the Blue Mountains plateau. The surface is all very rough and broken, and the timber will be difficult and expensive to log. There is a heavy stand of timber, but it is of poor quality.

DESCRIPTIONS OF TOWNSHIPS.

49

Stand of timber species in T. 3 N., R. 28 E.

	Feet B. M.
Yellow pine	25,750,000
White pine	21,250,000
Red fir	18,000,000
White fir	33,250,000
Engelmann spruce	113,750,000
Total	212,000,000

Forest conditions in T. 3 N., R. 28 E.

Average total height	feet.. 85
Average height, clear	do... 12
Average diameter, breast high	inches.. 18
Dead	per cent 2
Diseased	do... 10
Average age	years.. 125
Litter	Light.

TOWNSHIP 4 NORTH, RANGE 28 EAST.

This entire township is drained by Salt River, which is of no value as a logging stream. The yellow pine is of very good quality, and stands heavy on the northern part of the township. Other timber is rough and of poor quality.

Stand of timber species in T. 4 N., R. 28 E.

	Feet B. M.
Yellow pine	98,750,000
White pine	8,825,000
Red fir	12,600,000
White fir	13,000,000
Total	133,175,000

Forest conditions in T. 4 N., R. 28 E.

Average total height	feet.. 110
Average height, clear	do... 24
Average diameter, breast high	inches.. 18
Dead	per cent. 2
Diseased	do... 10
Average age	years.. 125
Litter	Light.

TOWNSHIP 5 NORTH, RANGE 28 EAST.

This township is drained by Salt River, which is of no value as a logging stream. The yellow pine is of very good quality and stands heavy all over the township except on the north. Other species are scattering and of poor quality.

FOREST CONDITIONS IN BLACK MESA RESERVE, ARIZONA.

Stand of timber species in T. 5 N., R. 28 E.

	Feet B. M.
Yellow pine	18,000,000
White pine	1,485,000
Red fir	18,500,000
White fir	250,000
Engelmann spruce	600,000
Total	38,835,000

Forest conditions in T. 5 N., R. 28 E.

Average total height	feet.. 115
Average height, clear	do... 20
Average diameter, breast high	inches.. 22
Dead	percent.. 2
Diseased	do... 10
Average age	years.. 165
Litter	Light.

TOWNSHIP 6 NORTH, RANGE 28 EAST.

This township is very steep, rough, and broken, and is drained by Salt River. The timber is very scattering and of poor quality and will be difficult and expensive to handle.

Stand of timber species in T. 6 N., R. 28 E.

	Feet B. M.
Yellow pine	20,000,000
White pine	1,500,000
Red fir	4,750,000
Engelmann spruce	1,250,000
Total	27,500,000

Forest conditions in T. 6 N., R. 28 E.

Average total height	feet.. 75
Average height, clear	do... 10
Average diameter, breast high	inches.. 18
Dead	per cent.. 5
Diseased	do... 15
Average age	years.. 150
Litter	Light.

TOWNSHIP 7 NORTH, RANGE 28 EAST.

The divide between Little Colorado River and Salt River crosses the southern portion of this township. The surface is rough and broken and supports a scattering growth of timber of poor quality.

DESCRIPTIONS OF TOWNSHIPS.

51

Stand of timber species in T. 7 N., R. 28 E.

	Feet B. M.
Yellow pine	20, 750, 000
Red fir	750, 000
White fir	500, 000
Engelmann spruce	250, 000
Total	22, 250, 000

Forest conditions in T. 7 N., R. 28 E.

Average total height	feet.. 80
Average height, clear	do... 10
Average diameter, breast high	inches.. 18
Dead	per cent.. 5
Diseased	do... 20
Average age	years.. 170
Litter	Light.

TOWNSHIP 1 NORTH, RANGE 29 EAST.

This township lies on the east slope of Rose Peak and is drained by Blue River. The surface is rough and broken and supports a scattering growth of yellow pine, white pine, and white fir, which will be difficult and expensive to handle.

Stand of timber species in T. 1 N., R. 29 E.

	Feet B. M.
Yellow pine	25, 500, 000
White pine	2, 000, 000
White fir	2, 650, 000
Total	30, 150, 000

Forest conditions in T. 1 N., R. 29 E.

Average total height	feet.. 95
Average height, clear	do... 14
Average diameter, breast-high	inches.. 18
Dead	per cent.. 2
Diseased	do... 10
Average age	years.. 140
Litter	Light.

TOWNSHIP 2 NORTH, RANGE 29 EAST.

This township is very mountainous and is traversed by the deep canyons of Blue River, into which it drains. It supports a scattering growth of timber, which will be difficult and expensive to handle. There is some Emory oak and alligator juniper in the undergrowth on the hills, and some cottonwood and sycamore along the river.

FOREST CONDITIONS IN BLACK MESA RESERVE, ARIZONA.

Stand of timber species in T. 2 N., R. 29 E.

	Feet B. M.
Yellow pine	18,750,000
White pine	6,250,000
White fir	9,000,000
Total	34,000,000

Forest conditions in T. 2 N., R. 29 E.

Average total height	feet.. 95
Average height, clear	do... 12
Average diameter, breast-high	inches.. 16
Dead	per cent.. 2
Diseased	do... 15
Average age	years.. 125
Litter	Light.

TOWNSHIP 3 NORTH, RANGE 29 EAST.

This township is drained by tributaries of Blue River and lies on the east side of the Blue Mountain plateau. The timber is scattering and of poor quality, and will be difficult and expensive to handle.

Stand of timber species in T. 3 N., R. 29 E.

	Feet B. M.
Yellow pine	18,000,000
White pine	5,750,000
Red fir	4,000,000
White fir	9,000,000
Engelmann spruce	15,500,000
Total	52,250,000

Forest conditions in T. 3 N., R. 29 E.

Average total height	feet.. 90
Average height, clear	do... 12
Average diameter, breast-high	inches.. 14
Dead	per cent.. 4
Diseased	do... 12
Average age	years.. 120
Litter	Light.

TOWNSHIP 4 NORTH, RANGE 29 EAST.

This township straddles the divide between Salt River and Blue River. Its surface is rolling and broken, and the timber is of very poor quality and will be expensive to handle.

DESCRIPTIONS OF TOWNSHIPS.

53

Stand of timber species in T. 4 N., R. 29 E.

	Feet B. M.
Yellow pine.....	19,000,000
White pine.....	1,375,000
Red fir.....	2,000,000
White fir.....	2,000,000
Engelmann spruce.....	14,000,000
Total.....	38,375,000

Forest conditions in T. 4 N., R. 29 E.

Average total height.....	feet.. 90
Average height, clear.....	do... 12
Average diameter, breast-high.....	inches.. 16
Dead.....	per cent.. 5
Diseased.....	do... 12
Average age.....	years.. 125
Litter.....	Light.

TOWNSHIP 5 NORTH, RANGE 29 EAST.

The surface is steep, rough, and broken and is principally drained by Salt River. It reaches an elevation of 9,500 feet in the southeastern portion, and in the higher areas is partly timberless. The timber is of very poor quality.

Stand of timber species in T. 5 N., R. 29 E.

	Feet B. M.
Yellow pine.....	37,000,000
Red fir.....	3,250,000
White fir.....	3,000,000
Total.....	43,250,000

Forest conditions in T. 5 N., R. 29 E.

Average total height.....	feet.. 90
Average height, clear.....	do... 18
Average diameter, breast-high.....	inches.. 20
Dead.....	per cent.. 2
Diseased.....	do... 10
Average age.....	years.. 140
Litter.....	Light.

TOWNSHIP 6 NORTH, RANGE 29 EAST.

The eastern portion of this township is the summit between Salt River, Blue River, and Nutrioso Creek. The surface is rough and broken, but supports a fair growth of yellow pine, of which about 80 per cent is of good quality.

FOREST CONDITIONS IN BLACK MESA RESERVE, ARIZONA.

Stand of timber species in T. 6 N., R. 29 E.

	Feet B. M.
Yellow pine	40,750,000
White pine	2,000,000
Red fir	7,000,000
Engelmann spruce	500,000
Total	50,250,000

Forest condition in T. 6 N., R. 29 E.

Average total height	feet.. 80
Average height, clear	do... 12
Average diameter, breast-high	inches.. 18
Dead	per cent.. 2
Diseased	do... 12
Average age	years.. 155
Litter	Light.

TOWNSHIP 7 NORTH, RANGE 29 EAST.

The surface is steep and broken, draining northeasterly into Nutrioso Creek. The timber is generally scattering and of poor quality. The eastern portion of the township is open prairie or grazing land.

Stand of species in T. 7 N., R. 29 E.

	Cords.	Feet B. M.
Yellow pine		9,750,000
Red fir		1,500,000
White fir		250,000
Alligator juniper	1,285	.....
Total	1,285	11,500,000

Forest conditions in T. 7 N., R. 29 E.

Average total height of timber trees	feet.. 75
Average height, clear	do... 8
Average diameter, breast-high	inches.. 18
Dead	per cent.. 4
Diseased	do... 18
Average age	years.. 150
Litter	Light.

TOWNSHIP 1 NORTH, RANGE 30 EAST.

The entire township is drained by Blue River, which flows through very steep canyons. The higher areas are almost timberless. There is some Gambel oak and alligator juniper among the undergrowth of the higher areas, and along the river are found willows, alders, cottonwoods, and sycamores.

DESCRIPTIONS OF TOWNSHIPS.

55

Stand of timber species in T. 1 N., R. 30 E.

Yellow pine	Feet B. M. 13,250,000
-------------------	--------------------------

Forest conditions in T. 1 N., R. 30 E.

Average total height	feet.. 100
Average height, clear	do... 18
Average diameter, breast-high	inches.. 16
Dead	per cent.. 3
Diseased	do... 20
Average age	years.. 140
Litter	Light.

TOWNSHIP 2 NORTH, RANGE 30 EAST.

The township is entirely drained by Blue River and is very mountainous. The timber is mostly of poor quality and will be difficult and expensive to handle. The undergrowth includes Emory oak, alligator juniper, cottonwood, and sycamore.

Stand of timber species in T. 2 N., R. 30 E.

Yellow pine	Feet B. M. 41,250,000
-------------------	--------------------------

Forest conditions in T. 2 N., R. 30 E.

Average total height	feet.. 80
Average height, clear	do... 12
Average diameter, breast high	inches.. 16
Dead	per cent.. 4
Diseased	do... 20
Average age	years.. 125
Litter	Light.

TOWNSHIP 3 NORTH, RANGE 30 EAST.

The entire township is drained by Blue River, which flows through deep canyons. The timber is mainly of poor quality. The underbrush includes Emory oak, alligator juniper, cottonwood, and sycamore.

Stand of timber species in T. 3 N., R. 30 E.

Yellow pine	Feet B. M. 25,000,000
-------------------	--------------------------

Forest conditions in T. 3 N., R. 30 E.

Average total height	feet.. 80
Average height, clear	do... 12
Average diameter, breast high	inches.. 16
Dead	per cent.. 2
Diseased	do... 20
Average age	years.. 125
Litter	Light.

TOWNSHIP 4 NORTH, RANGE 30 EAST.

This township is very rough and broken and the handling of the timber will be very difficult and expensive. About 30 per cent of the yellow pine is of good quality; the rest of the timber is rough.

Stand of timber species in T. 4 N., R. 30 E.

	Feet B. M.
Yellow pine	14, 750, 000
White pine	250, 000
Red fir	750, 000
White fir	750, 000
Engelmann spruce	500, 000
Total	17, 000, 000

Forest conditions in T. 4 N., R. 30 E.

Average total height	feet..	75
Average height, clear	do..	12
Average diameter, breast high	inches..	16
Dead	per cent..	5
Diseased	do..	20
Average age	years..	125
Litter	Light.	

TOWNSHIP 5 NORTH, RANGE 30 EAST.

This township is rough and mountainous, except a narrow strip of level land along Alpine Creek. About 30 per cent of the yellow pine is of good quality, but it will be difficult and expensive to handle.

Stand of species in T. 5 N., R. 30 E.

	Cords.	Feet B. M.
Yellow pine		40, 500, 000
Gambel oak	8, 925	

Forest conditions in T. 5 N., R. 30 E.

Average total height of yellow pine	feet..	80
Average height, clear	do..	12
Average diameter, breast high	inches..	16
Dead	per cent..	4
Diseased	do..	20
Average age	years..	160
Litter	Light.	

TOWNSHIP 6 NORTH, RANGE 30 EAST.

This township is on the divide between Nutrioso Creek and Blue River. It is very rough and mountainous, with the exception of a narrow strip of level land in Nutrioso Valley. Excepting a few trees standing along the creek bottoms, the timber is small and of poor quality and will be difficult and expensive to handle.

Stand of species in T. 6 N., R. 30 E.

	Cords.	Feet B. M.
Yellow pine		30,250,000
Red fir		2,250,000
Alligator juniper	1,300	
Gambel oak	7,250	
Total	8,550	32,500,000

Forest conditions in T. 6 N., R. 30 E.

Average total height of timber trees	feet..	75
Average height, clear	do..	10
Average diameter, breast high	inches..	16
Dead	per cent..	5
Diseased	do..	20
Average age	years..	170
Litter	Light.	

TOWNSHIP 7 NORTH, RANGE 30 EAST.

The southeastern portion of this township is rough and mountainous and supports a growth of yellow pine and alligator juniper which is of little value. The town of Nutrioso is located in sections 31 and 32.

Stand of timber species in T. 7 N., R. 30 E.

	Cords.	Feet B. M.
Yellow pine		9,000,000
Alligator juniper	3,700	

Forest conditions in T. 7 N., R. 30 E.

Average total height of yellow pine	feet..	80
Average height, clear	do..	10
Average diameter, breast high	inches..	18
Dead	per cent..	5
Diseased	do..	20
Average age	years..	175
Litter	Light.	

TOWNSHIP 1 NORTH, RANGE 31 EAST.

This fractional township contains but 12 sections, and the only timber is in sections 5 and 6.

Stand of timber species in T. 1 N., R. 31 E.

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

Forest conditions in T. 1 N., R. 31 E.

Average total height.....	feet..	80
Average height, clear.....	do..	15
Average diameter, breast high.....	inches..	16
Dead.....	per cent..	5
Diseased.....	do..	30
Average age.....	years..	125

TOWNSHIP 2 NORTH, RANGE 31 EAST.

This fractional township contains but 12 sections, and supports a scattering growth of yellow pine, of which only 30 per cent is of good quality.

Stand of timber species in T. 2 N., R. 31 E.

	Feet B. M.
Yellow pine.....	14,000,000

Forest conditions in T. 2 N., R. 31 E.

Average total height.....	feet..	80
Average height, clear.....	do..	16
Average diameter, breast high.....	inches..	18
Dead.....	per cent..	5
Diseased.....	do..	20
Average age.....	years..	130

TOWNSHIP 3 NORTH, RANGE 31 EAST.

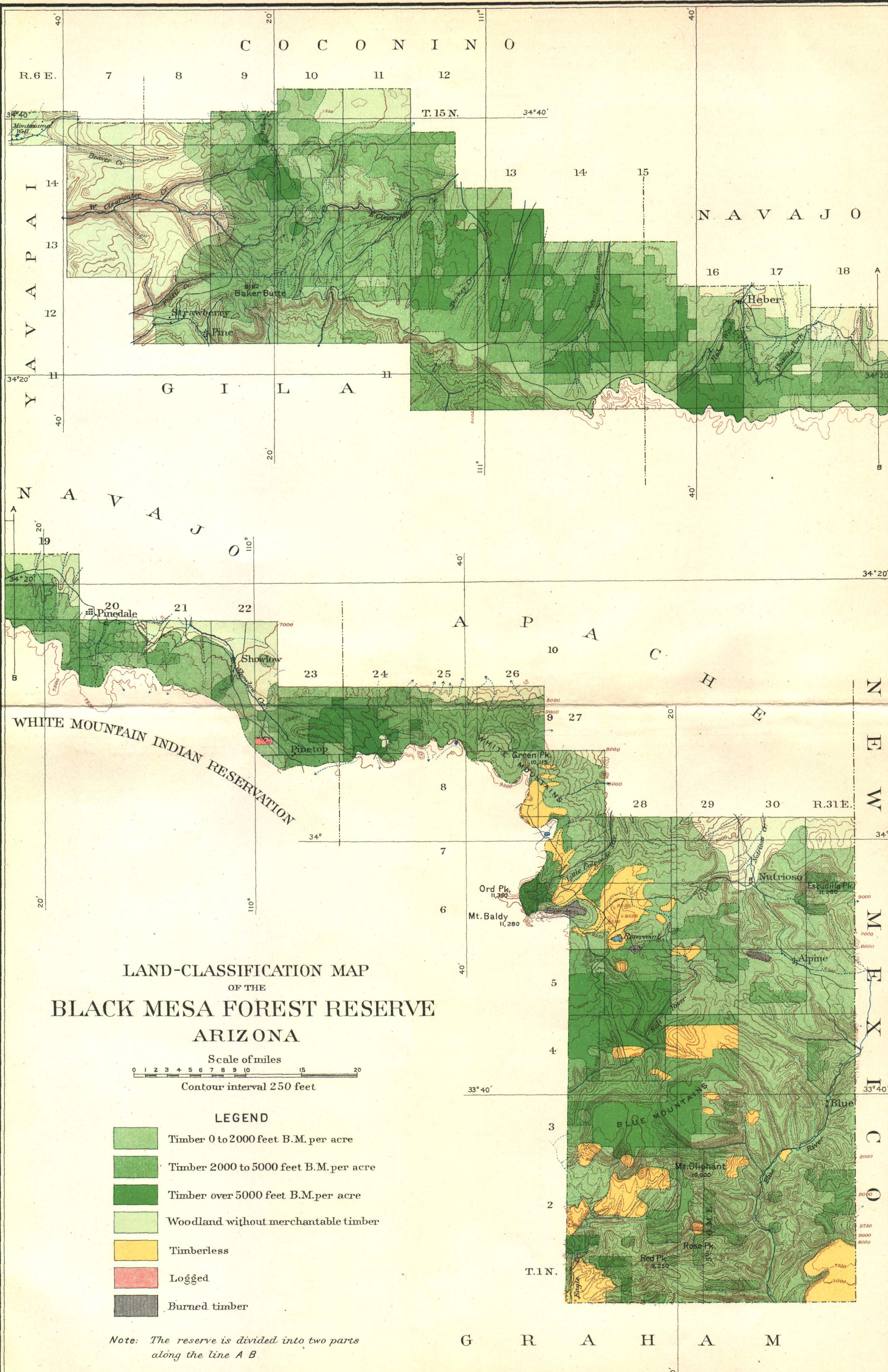
This fractional township contains but 12 sections, and supports a poor growth of yellow pine. The surface is very rough and mountainous.

Stand of timber species in T. 3 N., R. 31 E.

	Feet B. M.
Yellow pine.....	9,500,000

Forest conditions in T. 3 N., R. 31 E.

Average total height.....	feet..	80
Average height, clear.....	do..	15
Average diameter, breast high.....	inches..	16
Dead.....	per cent..	2
Diseased.....	do..	20
Average age.....	years..	125



TOWNSHIP 4 NORTH, RANGE 31 EAST.

This fractional township contains 30 sections and is very steep and mountainous, excepting a narrow strip of land along Blue River. The yellow pine is very small and of poor quality, excepting that along Blue River. A sawmill having a capacity of 1,000 feet per day, is located in section 15. It is operated only in winter. There is some cottonwood and sycamore timber along the valleys.

Stand of species in T. 4 N., R. 31 E.

	Cords.	Feet B. M.
Yellow pine		27,500,000
Gambel oak	11,700	

Forest conditions in T. 4 N., R. 31 E.

Average total height of yellow pine.....	feet..	80
Average height, clear	do...	10
Average diameter, breast high	inches..	18
Dead	per cent..	2
Diseased	do...	20
Average age	years..	180
Litter		Light.

TOWNSHIP 5 NORTH, RANGE 31 EAST.

This fractional township contains 30 sections of steep, rolling land, except some level areas along Alpine Valley. The timber is all small, at least 75 per cent being young growth and saplings.

Stand of species in T. 5 N., R. 31 E.

	Cords.	Feet B. M.
Yellow pine		12,500,000
Gambel oak	9,150	

Forest conditions in T. 5 N., R. 31 E.

Average total height of yellow pine.....	feet..	60
Average height, clear	do...	10
Average diameter, breast high	inches..	12
Dead	per cent..	2
Diseased	do...	15
Average age	years..	100
Litter		Light.

TOWNSHIP 6 NORTH, RANGE 31 EAST.

This fractional township contains 30 sections of rough, mountainous land, supporting a scrubby growth of timber of little value.

Stand of timber species in T. 6 N., R. 31 E.

	Feet B. M.
Yellow pine	4,250,000
Red fir	4,000,000
White fir	2,500,000
Engelmann spruce	11,000,000
Total	21,750,000

Forest conditions in T. 6 N., R. 31 E.

Average total height	feet.. 65
Average height, clear	do... 7
Average diameter, breast high	inches.. 16
Dead	per cent.. 5
Diseased	do... 15
Average age	years.. 130
Litter	Light.

TOWNSHIP 7 NORTH, RANGE 31 EAST.

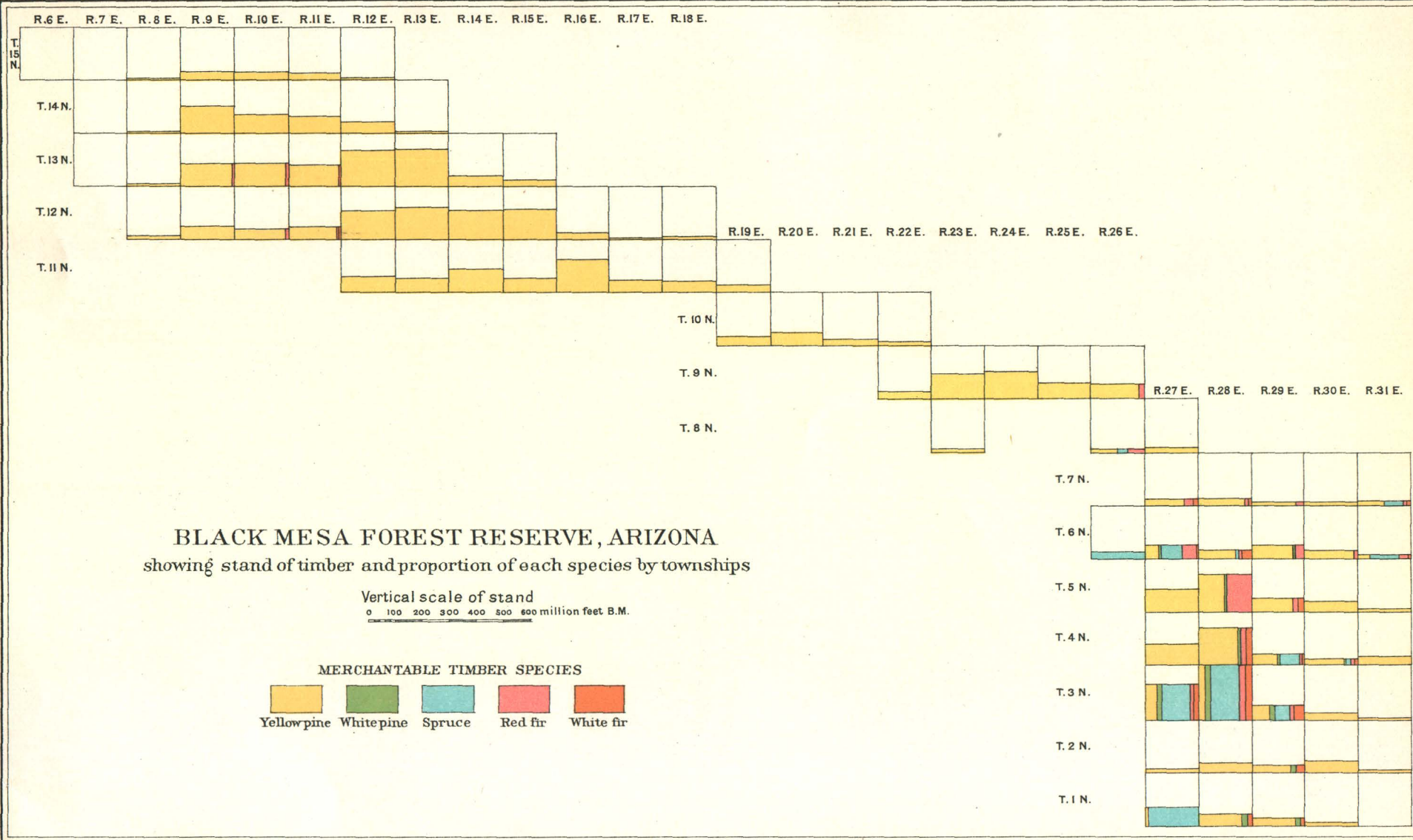
This fractional township contains 30 sections. The southern portion is very rough and mountainous, with more gentle slopes toward the north. All of the timber is in the southern portion, and is very rough and of poor quality.

Stand of timber species in T. 7 N., R. 31 E.

	Feet B. M.
Yellow pine	7,750,000
Red fir	1,250,000
White fir	1,250,000
Engelmann spruce	6,750,000
Total	17,000,000

Forest conditions in T. 7 N., R. 31 E.

Average total height	feet.. 90
Average height, clear	do... 8
Average diameter, breast high	inches.. 20
Dead	per cent.. 5
Diseased	do... 15
Average age	years.. 170
Litter	Light.



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