The Pikes Peak, Plum Creek, and South Platte forest reserves

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PIKES PEAK, PLUM CREEK, AND SOUTH PLATTE FOREST RESERVES

BY

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SITUATION.

These three reserves, known as the Pikes Peak Timber Land Reserve, the Plum Creek Timber Land Reserve, and the South Platte Timber Land Reserve, are all contiguous at some part of their boundaries, and are situated between latitude 38° 45′ and 39° 45′, and between longitude 104° 45′ and 106° 15′ west from Greenwich (Pl. VIII, in pocket). The situation is practically in the very center of the State, Colorado Springs lying just outside the eastern boundary line, while the western limit is several miles east of Leadville. The three reserves are practically contained within the counties of El Paso, Douglas, Jefferson, and Park, nearly half the total area being in the last-named county. Very small areas on the south and west are understood to be within the jurisdiction of Chaffee County and Summit County.

The Pikes Peak Timber Land Reserve contains about 184,320 acres; the area of the Plum Creek Timber Land Reserve is placed at 179,200 acres; while there are 683,520 acres in the South Platte Timber Land Reserve, about one-fourth of which lies in Jefferson County and the remainder in Park County. The total area of the three reserves, therefore, amounts to about 1,047,040 acres.

In general outline the Pikes Peak Reserve is a parallelogram 30 miles in length by 9 miles in width, with some small unreserved areas within these parallel lines and some reserved tracts extending beyond them.

The Plum Creek Reserve is somewhat triangular in outline, the south, east, and north sides being arbitrary straight lines, the west side being the South Platte River.

The South Platte Reserve is extremely irregular in outline, the main body of it lying south of and having for its northern boundary the North Branch of the South Platte River, while South Platte

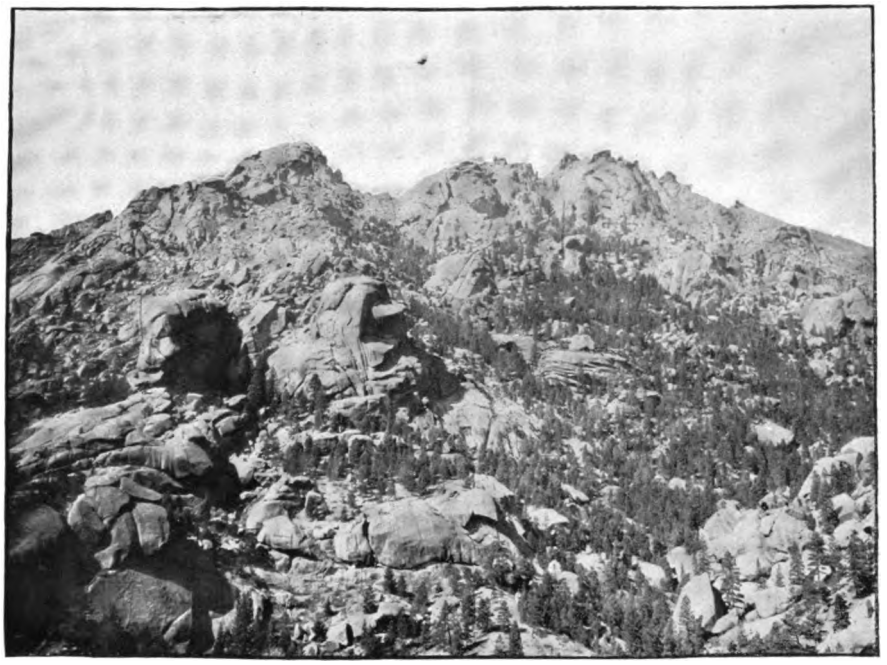
River itself separates the reserve from the Plum Creek Reserve on the east, and a large unreserved tract 16 miles in width lies between its southern portion and the Pikes Peak Reserve. Between the main body of the South Platte Reserve and its extreme western portion lies South Park, an extensive, comparatively level, and open grazing region, 24 miles in width in its widest part and over 50 miles long, which is not included in the reserve. The extreme western portion of the reserve, lying between this unreserved portion and the longitude of Leadville, is the narrowest and most irregular of all, varying in width from 11 miles at its southern end to 1½ miles near Alma.

With the exception of the natural boundaries formed by the rivers mentioned, the limits of the reserves are purely arbitrary, following the straight section or township lines drawn by surveyors. On this account, and as there are no fences or well-defined points to mark the actual boundaries, they are but little known or respected, and the result is that there is locally frequent disagreement as to how far the reserve lines extend, and it is not unusual to find settlers who are not aware that they are located within the area set apart by the Government for the preservation of the timber and the conservation of the water supply.

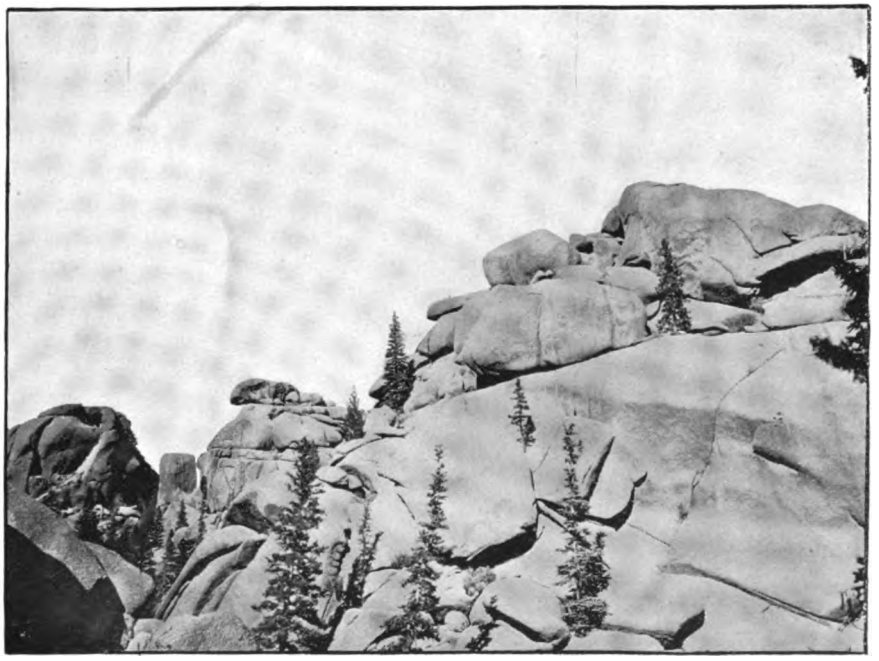
GENERAL SOIL CONDITIONS.

Throughout almost all parts of the three reserves disintegrated granite soils, often resembling finely broken gravel, are everywhere manifest, and the abundant granite rocks and mountains from which the soils have been derived show the general geological character of the country; and it is only on a very limited strip along the lowest eastern edge of the Pikes Peak and the Plum Creek reserves that the tilted sandstone formation, so conspicuous and well known at Manitou, is evident. There are frequent outcroppings of quartz and other rock in different parts of the reserves, and prospecting has shown that mineral-bearing material is likely to be found almost anywhere. On the western arm of the South Platte Reserve limestone and volcanic rock are abundant.

On the higher mountains the broken granite is generally piled in great masses, as on Pikes Peak, or in huge weather-worn blocks, as on some of the Tarryall peaks to the west. In the course of ages the interstices between these rocks have become filled with smaller fragments upon which minute plants grow, thus forming some humus upon which other species grow more vigorously, so that some vegetation, like lichens, grasses, sedges, and other herbaceous plants, is found at the top of the loftiest summits. In natural hollows or cavities and with decreasing altitude and deeper deposit of decayed granite and



A. VERY ROCKY SLOPES EAST OF TARRYALL MOUNTAINS, LOOKING ACROSS LOST PARK CREEK.



B. ENGELMANN SPRUCE AND DOUGLAS SPRUCE ON GRANITE ROCKS ALONG LOST PARK CREEK.

humus the vegetation is richer and more rank, including various species of dwarf shrubs.

On steep slopes the finer material and humus is necessarily accumulated in pockets, and in the ravines and gulches through which streams run, the greatest accumulation of humus is found.

Wherever the soil has been increased by winds blowing débris or sand from other places, or where it is subject to accretion by washing, the decayed granite and humus is commonly found more or less mixed. The decaying roots of trees and other plants in the soil also add in a small degree to the fertility. Throughout the greater part of the reserves, however, there is a general and very noticeable absence of humus or accumulation of decayed vegetable matter of any kind, which is no doubt largely due to the dry conditions favorable for oxidation and to the prevalence of both heavy forest and light ground fires at various times, as well as to the general poverty of the natural living vegetation itself. Probably not 5 per cent of the entire area bears any appreciable amount of humus over the coarse material beneath, and most of such humus as exists is shallow, not more than from 1 to 6 inches in depth.

As a rule the lower hills are rounded and formed of great beds of disintegrated granite resembling small gravel or coarse sand, upon which most of the forest and vegetation grows. Naturally the material accumulated near the base of the hills and in the gulches is of finer composition and contains more vegetable matter than that found above, and this is shown in the finer development of the trees and plants, although increased moisture and shelter are also factors to be considered in connection with improved soil conditions.

The granite rock shows much variation in character in different parts of the reserves. For the most part natural decay and disintegration are very evident; but in some areas the rocks present a hard, polished, and enduring surface, and the wearing away of these areas proceeds more slowly, and great bare masses often rise conspicuously above the surrounding territory. In cracks and crevices of these rocks and bowlders the seeds of trees and shrubs have sometimes lodged, and, germinating, have survived droughts and storms, although often dwarfed and growing very slowly under these trying conditions. These plants serve to hasten the disintegration of such rocks.

Along some of the narrow valleys through which streams run, time has brought in an accumulation of plant-food material, which is the basis of the small farms or ranches which have been established in the most available and suitable sites in the reserves. Although the coarse sandy or gravelly soil on many areas looks unproductive, fair crops of grass and a few other farm products are raised wherever artificial irrigation can be applied. Manures or artificial fertilizers are seldom used except by a very few of the more progressive and industrious farmers.

Rarely, the humus or "muck" is of considerable depth in natural basins, as near Lake Moraine. There are many acres of boggy ground in the high Lost Park region, and much humus occurs south and southwest of Florissant.

CLIMATE AND RAINFALL.

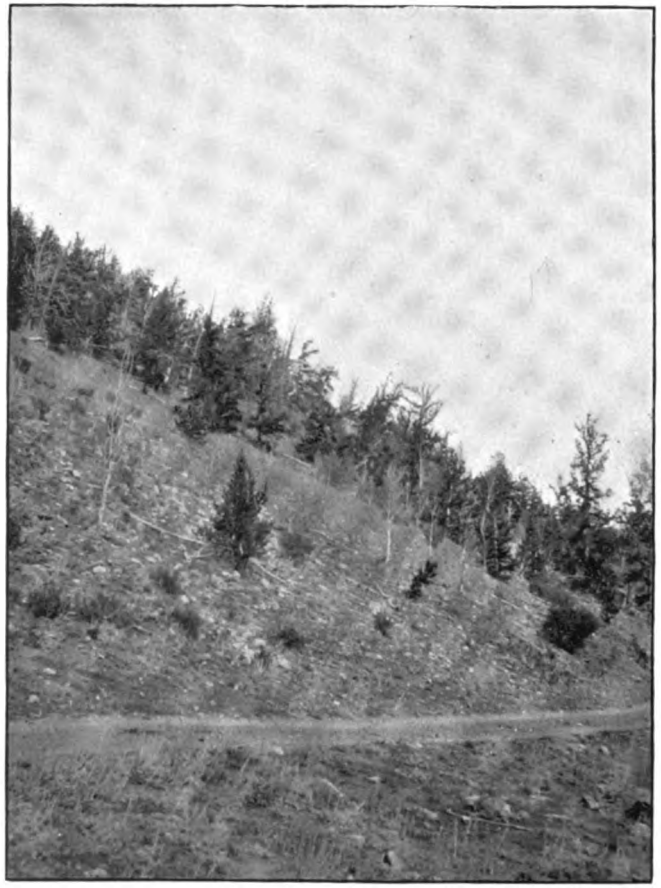
The great elevation of this whole region gives it a comparatively cool summer, with liability of nightly frosts near the timber line. On the so-called agricultural areas, mostly devoted to grazing, snow sometimes falls in midsummer and frosts are not very rare. On this account the variety of crops it is possible to raise within the reserves is very limited, consisting chiefly of hay, oats, barley, rye, and a little wheat in some localities at the lower altitudes. Alfalfa is also grown locally on the lowest levels, where potatoes also can be grown successfully, although it is not economically profitable to attempt the cultivation of this crop at altitudes above 8,500 feet. The growing season is short, as is plainly shown in the slow growth of the trees. In winter the temperature at 8,500 to 9,000 feet altitude sometimes falls to 20° or 30° below zero.

As showing the possibilities in this country, it may be mentioned that on July 19, 1897, there was hard frost, with several inches of snow, throughout the country from Manitou Park (8,000 feet altitude) to South Park, and snow and frost was recorded at Florissant (8,500 feet altitude) on July 1, 1898.

There exist few accurate records of rainfall taken at various points and during a number of years to show the average annual precipitation of this region. The Weather Bureau maintained a station on the summit of Pikes Peak, at over 14,000 feet altitude, during fifteen years, and the average during that time was 28.65 inches, the extremes being 9 and 40 inches. At Colorado Springs, at about 6,000 feet altitude, or 8,000 feet lower than the summit of Pikes Peak, the average during the same years was a little less than 15 inches. As a rule the precipitation decreases rapidly with decrease in altitude. Additional observations were taken during several years in or near South Park. The average annual rainfall of the whole region covered by the reserves may be placed at between 16 and 18 inches.

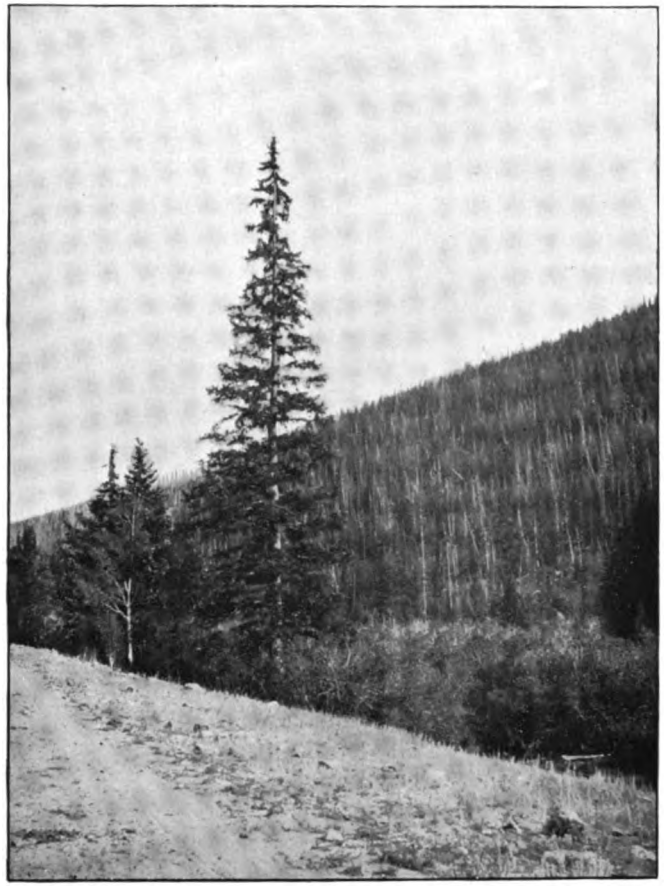
This small rainfall, combined with the dry atmosphere, poor soil, and cool climate, causes nearly all the natural vegetation to be of relatively slow development, and nowhere can there be said to be a strong, rank growth, such as would be found in more fertile, warmer, and more freely-watered regions of nearly the same latitude.

The snowfall is heavy on some of the mountains. Snowslides, however, are very rare, although they occur more frequently on the mountain slopes located outside the western limits of the South Platte Reserve.



A CHARACTERISTIC SOUTH SLOPE ALONG WESTON PASS ROAD.

Growth of scrubby pines.



B CHARACTERISTIC NORTH SLOPE ALONG WESTON PASS ROAD.

Good growth of Engelmann spruce and some lodgepole pine.

There are no data to show that there is any less average annual rainfall than existed fifty years ago.

It is the general testimony of persons who have lived longest in the central part of Colorado that there is now a decided diminution of water in the streams compared with the flow of water twenty-five or thirty years ago. This refers especially to the summer flow, as there is more than the normal amount of water in the early spring. The causes are, locally, variously attributed to excessive pasturage, by which the ground becomes trampled hard and the protecting vegetation along streams destroyed; to the cutting of timber along streams, particularly at high altitudes; and especially to the great areas which have been denuded of forest by fires, allowing the snows to melt more rapidly and the waters to flow off less gradually than they did under conditions existing before the earliest settlement of the country.

FOREST CONDITIONS.

Of all the reserves established by the Federal Government, the three under consideration have probably been the most damaged by fire and been subject to greatest depredations by timber cutters. A comparatively small portion of the total area fails to show traces of forest or surface fires, some of the more recently burned sections presenting a desolate aspect, which under present natural developments is likely to continue for many scores of years. There are a very few thousand acres of merchantable timber where the ax has not been used with evident effect. The best of the remaining timber can not be called large, but it is greedily sought by the lumbermen, who take any kind of sufficient dimensions without much discrimination regarding species. Such forests as exist are generally open and may be traversed by wagon or on horseback, and it is only on comparatively limited areas that any close or dense growth of trees is encountered. In young growths of lodgepole pine only are there what might be called thickets, and occasionally a dense growth of small red fir and its accompanying species is found on some locally favored northern slope.

In a few places at high altitudes there is much dead and fallen timber among the living, piled 2 or 3 feet deep, this deadwood usually representing the accumulation of many scores of years; but this condition is rare in the reserves, although common in forests in other parts of the west.

On the high altitudes, or between 10,000 and 11,500 feet, the forest growth is generally most dense, but much depends upon exposures or slopes. The forest found on slopes facing the south is usually greatly inferior to that growing on the colder, shaded northern slopes, pines usually prevailing on the former and spruce on the latter; but on steep southern slopes the pines are commonly thinly distributed, small in size, and often so much branched as to be nearly worthless for com-

mercial purposes (Pl. IX). Indeed, the southern slopes are sometimes practically bare of timber of any kind, when the opposite northern slopes are well covered.

The generally open character of the forest over a large part of the reserves allows of the growth of grasses and herbaceous plants, which usually occur in tufts or bunches and furnish a limited amount of food for cattle, the grasses naturally being most abundant on the cooler slopes, in gulches, and in the vicinity of streams.

On timber areas burned over at high altitudes the grasses generally spring up in greater abundance, excepting on some of the more arid or dry, warm southern slopes.

The tops and branches of trees cut by lumbermen are rarely accumulated in great masses in the open forest, the tops of each tree cut usually being isolated, because suitable sawmill timber is so scattered. They do, however, furnish material to increase the destructiveness of fires. The finer and softer parts of this refuse material soon decays and about it a few unusually vigorous grasses are generally found.

FIRES.

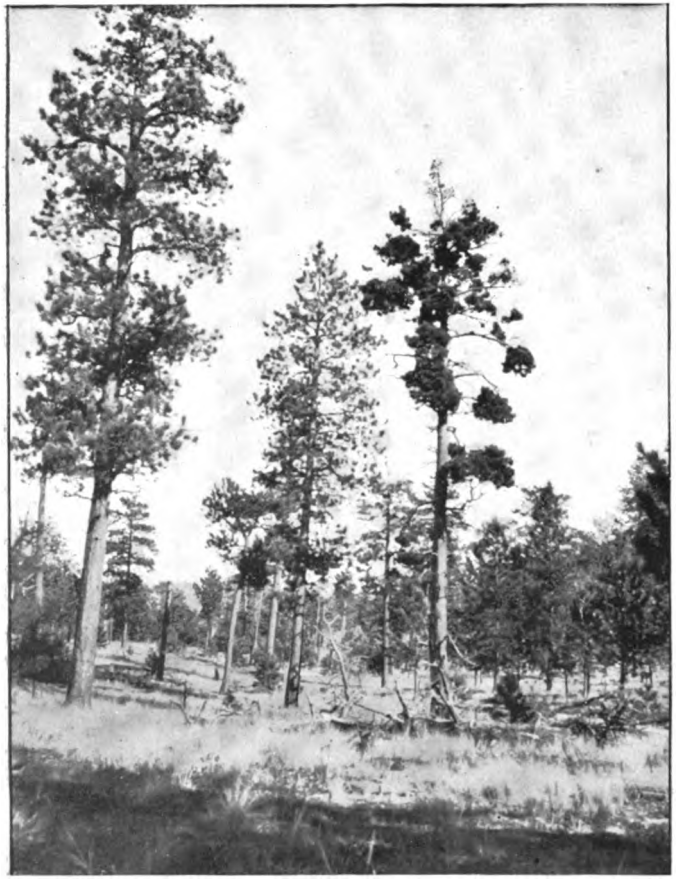
Probably at least 75 per cent of the total area of the reserves clearly shows damage by fire, much of it within the last half century or since the advent of white settlers in the region; and a great deal of ground shows traces of fires, which must have occurred prior to that time, and the forest has partially recovered the areas then burned over (Pl. X, in pocket).

LUMBERING.

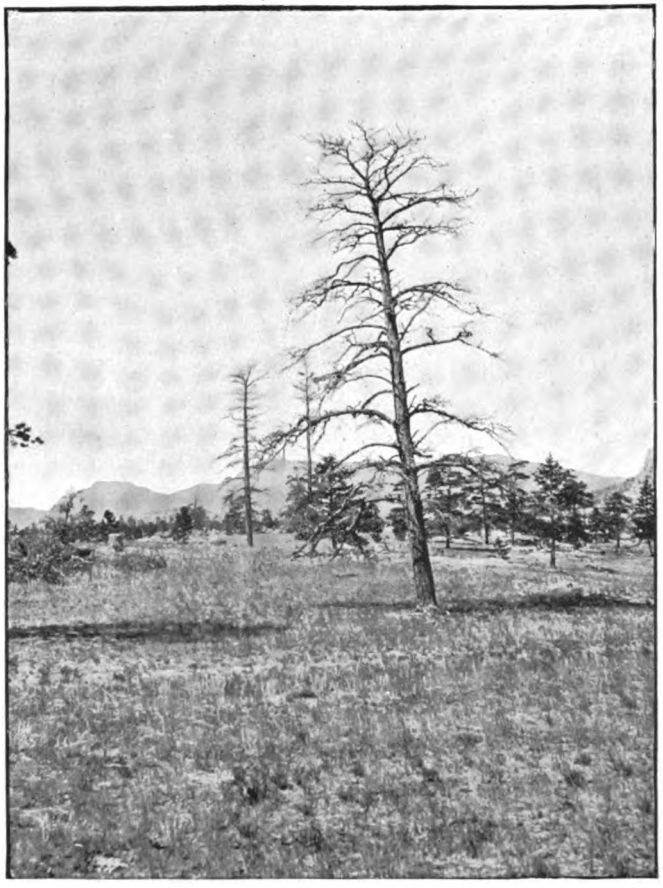
Lumbering is carried on at all seasons of the year, although it is generally stated that cutting in autumn and winter is preferable. The trees furnishing the lumber are almost exclusively yellow pine, red fir, and Engelmann spruce, while some lodgepole pine and blue spruce are also used when found large enough in the localities in which they grow.

The trees are usually felled by sawing nearly through and wedging the side on which the cut is made, so that the tree falls in the opposite direction. Trees and logs above a foot in diameter are usually taken, although some of the smaller sawmills accept logs not less than 8 inches in diameter at the small end. The logs are cut in various lengths, usually 12, 14, or 16 feet, the branches and tops being trimmed off and generally allowed to remain and decay on the ground.

The logs are usually drawn to the loading skids by single horses trained to the work, and are hauled to the mill in wagons. The active mills are exclusively portable steam sawmills, with a capacity varying from about 5,000 to 25,000 feet of lumber a day. The fires for the



A. MISTLETOE INJURING YELLOW PINE IN SOUTN PLATTE RESERVE.



B. YELLOW PINE SAID TO HAVE BEEN KILLED BY DRY WEATHER, SOUTH PLATTE RESERVE.

boilers are fed by refuse lumber left in cutting. The saws used are thick, and about 25 per cent of the sawn timber is lost in sawdust when the lumber is sawn into boards an inch thick, the saw taking a quarter of an inch with each cut.

All of the hauling of logs to the mill and of the lumber to market or shipping station is done with lumber wagons and 2- or 4-horse teams. It is now commonly necessary to haul the lumber considerable distances, requiring a day or longer to make a round trip to and from a shipping station.

No timber or lumber is now floated down any of the streams, although formerly a small amount appears to have been carried in this way. Lumber roads or trails have been made to the best timbered areas in all parts of the reserves, so that there is no great difficulty in getting to almost any part. The length of the haul to market has been the chief factor in preserving such good timber as still remains uncut.

DISEASES AND ACCIDENTS TO TIMBER TREES.

As a general rule the forest trees appear to be in a healthy condition and seem to be subject to few diseases caused by insects or fungi, the cool climate and dry atmosphere, no doubt, being adverse to these pests, which are often so destructive in other parts of the country more favorable to their development. Even dead timber, often standing dry for twenty or thirty years, is little damaged, although borers generally attack the base of such trees. Occasionally tips of twigs of red fir or yellow pine were found affected by destroying insects, and the cones were sometimes destroyed by insects burrowing into them. Larvæ of a species of *Clisiocampa* sometimes defoliate the quaking aspen over a wide range of territory, and when this defoliation is repeated during several successive seasons the trees usually die, to be succeeded by new stems from the roots. While the aspen is of comparatively little commercial importance in this region, it is, when large enough, used for the manufacture of excelsior, or for paper pulp, and the defoliation of the plants prevents them from attaining merchantable size.

The most serious damage to the development of the yellow pine, lodgepole pine, and Douglas spruce noted was caused by three small species of mistletoe belonging to the genus *Arceuthobium* (*Razoumofskya*, Hoffm). This parasite was found to check and distort the growth of a great many trees in some localities, and in some cases it eventually caused their death. Affected trees are often dwarfed and have their branches shortened or distorted by it, and those bearing the parasite are usually readily detected. Trees of various ages and sizes are afflicted, from those only a few years old and a foot or two high up to those 150 years or more of age and 40 or 50 feet or more in height. As the parasite occasionally occurs on at least 50 per cent of

the young trees, it may be readily seen that the normal development of timber is seriously interfered with. Fortunately these parasites are not very generally distributed throughout all places where their hosts grow.

In some parts of this mountainous country a great many trees are annually struck by lightning, which sometimes causes death, sometimes kills only the top or some of the limbs, or leaves signs of its work by a split in the trunk, injuring its value for lumber.

Ground or surface fires or timber fires have often left the trunks scarred or have destroyed the bark on one side, causing a defect which injures the tree for lumber.

Snowslides of sufficient magnitude to damage timber are rare, although they sometimes occur on the high mountains west of the South Platte Reserve. At low altitudes heavy snowstorms occasionally break down large numbers of young trees, or the tops of older ones, both conifers and aspen. Besides the damage to timber, the dry débris thus formed increases danger from fire.

Occasionally local windstorms or hurricanes occur with sufficient force to blow down large areas of green timber, either by uprooting the trees or by breaking off the trunks.

It was also the general belief, in the region south of Tarryall Creek, that the death of many yellow pines was caused by some unusually dry seasons which have prevailed in recent years.

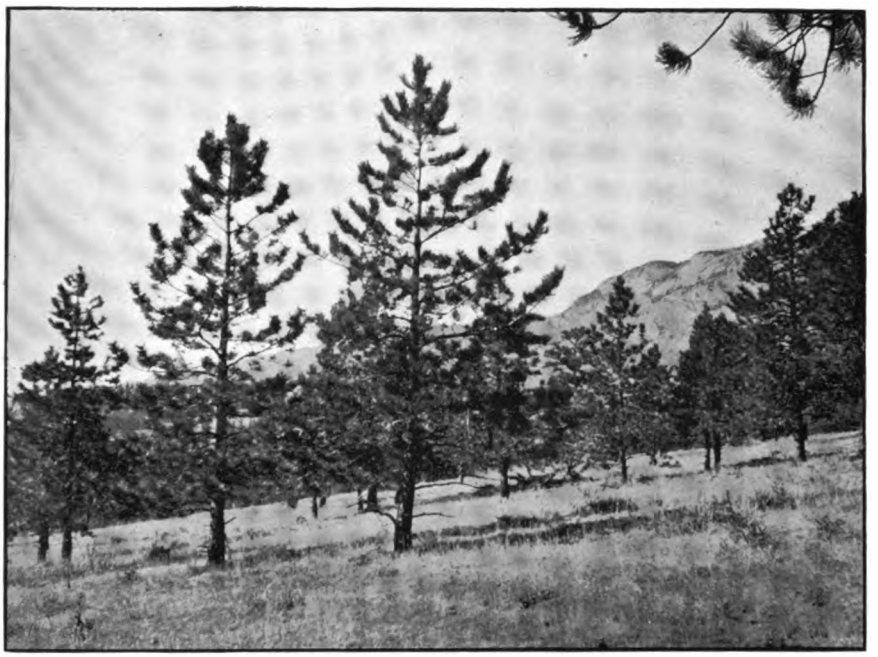
FOREST TREES IN THE RESERVES.

That this region once had a climate and forest flora differing considerably from that which at present exists is shown by the fossil remains of trees and other plants to be found at various places, and particularly easily accessible at Florissant, near the southeastern boundary line of the main body of the South Platte Reserve.

In the soft shale rock are found fossil leaves, fruit, and twigs of trees closely allied to the living species of redwoods or sequoias of California, to oaks, hornbeams, alders, walnuts, chestnuts, elms, ashes, sumachs, hollies, and other trees and shrubs. Fossilized stumps of prehistoric trees, apparently sequoias, still exist, although many have been destroyed or have been removed by collectors. About a mile south of Florissant one of these stumps is standing, with a frame work about it, and saws still in it, as evidence of the unsuccessful efforts of collectors to cut and remove it. The hardness of the fossilized wood rendered the cost of cutting so great that, after the expenditure of much money, the work of removal was abandoned. This stump was partly exposed by removing the accumulation of soil about it, and at present it is between 8 and 10 feet in height and about 50 feet in circumference at the ground. It is a standing witness to the fact that many thousands of years ago the meteorological and other conditions here allowed of

A. YELLOW PINE APPARENTLY KILLED BY MISTLETOE, PLUM CREEK RESERVE.

B. ENGELMANN SPRUCE BLOWN DOWN BY WINDSTORM, LOST PARK, SOUTH PLATTE RESERVE.



A. CHARACTERISTIC GROWTH OF SMALL YELLOW PINE ON MANY PARTS OF SOUTH PLATTE RESERVE.

B. FOSSIL STUMP NEAR FLORISSANT, COLORADO.

Nearly 50 feet in circumference at ground; about 8 feet high.

the growth of much larger trees and a greater variety than is now possible. In comparison with this ancient growth, the forest growth here to-day is small and insignificant, and compared with some of the present living forests of the Pacific coast in Washington, Oregon, or California the timber of these reserves would be regarded as little better than scrub or third-rate growth.

Within the actual limits of the three reserves, covering an area of nearly 2,000 square miles, the number of different species of trees now occupying the ground is much more restricted than is commonly supposed (Pl. IX). Within these boundaries there may be counted five species of pine, two spruces, two firs, Douglas spruce, two species of cedar (*Juniperus*), one species of oak, and four species of poplars—seventeen species in all. Of these the cedars are small, local, and scattered; the oak scarcly more than a shrub, specimens 20 feet high or 10 inches in diameter being rare; three of the poplars are very local and are usually found sparsely along creeks near the reserve borders, and have no commercial importance, while the fourth, though widely distributed, does not often grow to a size sufficient to make it of much present economic value.

PINUS PONDEROSA Laws. (Yellow pine, bull pine.)[1]

Of the pines within the reserves the most abundant, most widely distributed, and locally most valuable species is *Pinus ponderosa*, most commonly known as black-jack pine, but also passing under the local names of yellow pine, bull pine, black pine, etc. So far as observed, it here attains a larger size than any other tree, not excepting the red fir, which most closely approaches it in dimensions. The largest yellow-pine stumps or trees seen did not exceed 4 feet in diameter, and the tallest trees were not more than from 110 to 125 feet in height. These extreme proportions are exceptional, however, and the greater part of existing merchantable timber of this species ranges between 1 and 2 feet in diameter of trunk and 50 and 75 feet in height. As the timber is more or less open, the stems of the trees are usually well furnished with branches, so that the clear trunk is usually short, often furnishing but one free saw log 12 or 14 feet long, although the limbs are generally removed and two or even three saw logs are thus obtained. Trees of the larger sizes often have clear trunks for 50 feet, and as many as five or six saw logs, each 12 or 14 feet in length, are secured.

The relative proportions of size and age of such trees vary somewhat with the conditions under which they grow. Trees growing in coarse granite soil, on ground having a slight slope to the south and

[1] This yellow pine in the region under consideration is considered by some botanists as distinct from the type, and is known as *Pinus ponderosa scopulorum* Engelm.

lying at an altitude of about 8,500 feet, showed the following ages and dimensions, which represent a fair average.

A tree 100 feet high measured 38 inches in diameter at 5 feet from the ground. Trunk very branchy, furnishing only one saw log 12 feet long free from branches or knots, but altogether would furnish five logs of similar length, the topmost of which would measure a foot in diameter at the small end. Annual rings showed this tree to be about 270 years old.

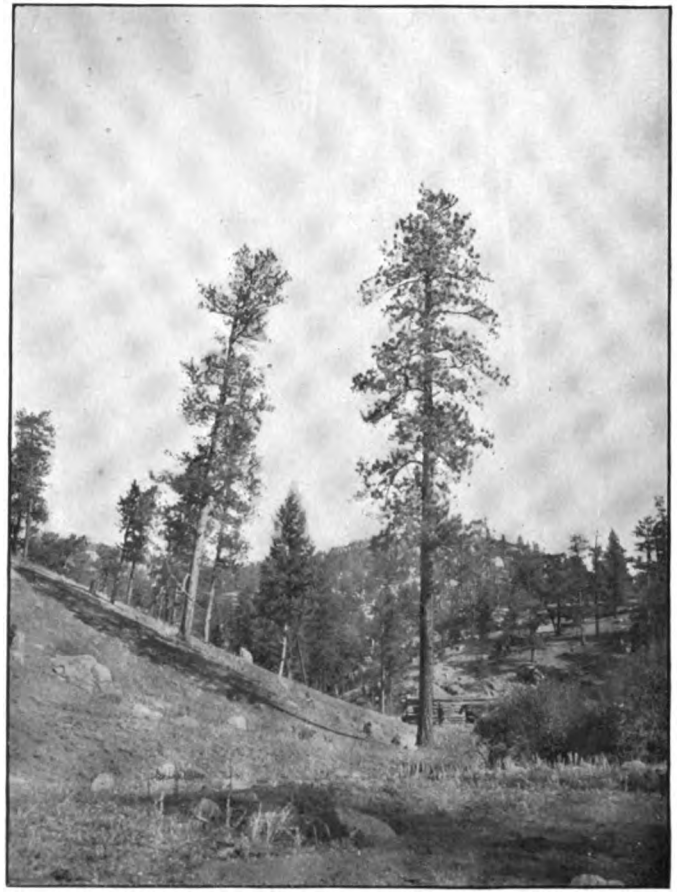
Another, 70 feet high, measured 15 inches in diameter at 5 feet from the ground and 12 inches in diameter at 40 feet from the ground. First 25 feet free from limbs excepting a few small, dead branches. Annual rings showed about 200 years of age.

Another of the same height and base diameter as the last was 8 inches in diameter at 40 feet from the ground and more branchy on its upper parts, and showed annual rings approximating about 160 years of age.

These measurements, taken from a considerable number, represent a fair average of the better class of trees where the timber is heaviest. Great quantities of trees are cut for sawmills, however, which do not produce more than one log of from 12 to 16 feet in length and from 12 to 16 inches in diameter, the remainder tapering too rapidly and bearing too many limbs to be considered of value. The activity of sawmills has removed nearly all trees above a foot in diameter in most of the territory under consideration except in a few of the least accessible localities farthest removed from a ready market. Where the timber has been cut over it is unusual to find any perfect large specimens fit for the sawmill remaining. Where large trees are left on such land it is usually because they have some defect, as having been struck by lightning, partially decayed, or having divided trunks.

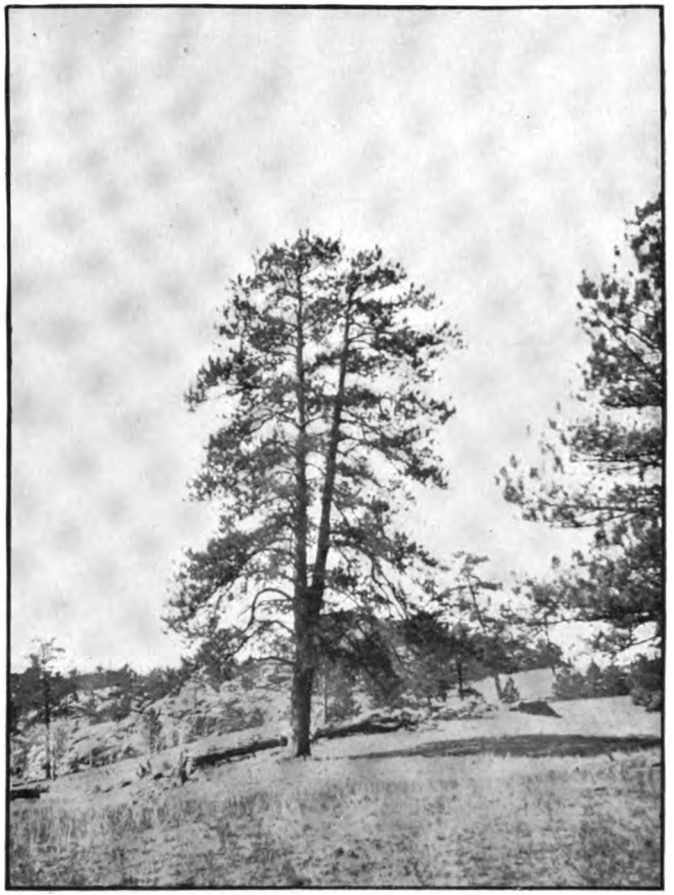
What to the eye of the botanist appears to be, and is considered, as one species is in this case divided by the lumberman into what he calls yellow pine and black pine, the former being most valued, having a wood lighter in weight and with less sapwood, while the latter is claimed to be of poor quality, to have much sapwood, and to be much heavier when green. Few lumbermen claim that they can always distinguish the two when standing, although it is asserted that the less valuable tree can be separated by the darker, rougher, thicker bark and greater abundance of large living branches. Somewhat similar distinctions are insisted upon by lumbermen of the white pine of the Eastern States. While our present understanding of them does not allow that they are specifically distinct, there is no doubt that the quality of the wood is affected by the age of the tree, rate of growth, soil, and other conditions.

The yellow pine is found from the lowest altitude in the reserves, which is under 6,000 feet, up to above 10,000 feet, where it is generally



A YELLOW PINE, SOUTH PLATTE RESERVE.

About 100 feet high; 30 inches in diameter. Exceptionally large for this region.



B YELLOW PINE WITH DIVIDED TRUNK, SOUTH PLATTE RESERVE.

About 70 feet high; 3 feet in diameter at 4 feet from ground.

supplanted by other species. In some sections it occurs almost alone, but as a rule the Douglas spruce is more or less plentifully associated with it, and occasionally it occurs mixed with the other pines and spruces. On the higher altitudes it does not appear so localized as on the lower, where it predominates on slopes facing the south, while the Douglas spruce is more plentiful on those facing the north. This is a marked feature in most of the canyons and gulches, which chiefly extend in an easterly and westerly direction.

The yellow pine is the prevalent tree over nearly all of the Plum Creek Reserve, and of the South Platte Reserve east of Craig Creek, the Tarryall Mountains, and Puma Hills. It does not occur in the Lost Park or Craig Park country, lying north of the Tarryall Mountains, although part of this ground lies nearly a thousand feet below the maximum altitude which the species reaches in other parts; and it is only occasionally found within and near the borders of the long, narrow arm of the reserve lying west of South Park, on the hills and buttes of which it occurs plentifully, and usually associated with Douglas spruce, blue spruce, and two other pines. It is a hardy and much-enduring tree, and will gain a foothold and grow on coarse, dry soils and sunny slopes on which other species do not seem able to become established or maintain their existence.

The yellow pine is chiefly sawed into lumber for various purposes, especially for rough building, mine timbers, etc. It is also cut for railroad ties, is used as fuel, and is an important tree in the development of the country in which it grows.

The lumber is coarse grained and is not durable when subjected to moisture. Its market value varies somewhat in price, according to quality, local demands, etc., but at the present time it usually sells for $11 or $12 per 1,000 feet, board measure, delivered at railroad stations.

PINUS MURRAYANA Engelm. (Lodgepole pine, white pine, spruce pine.)

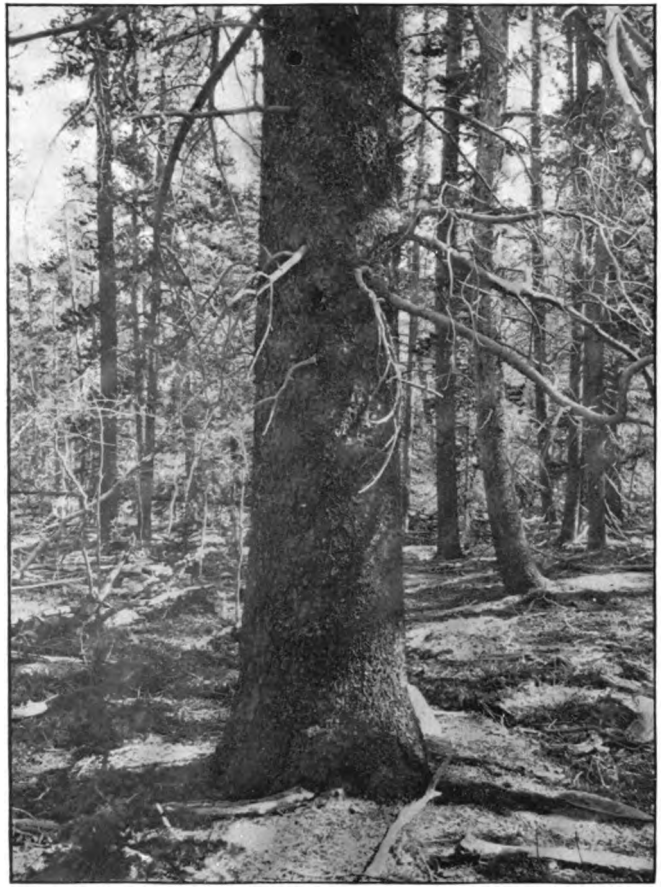
The pine of second importance in the reserves is the lodgepole pine, locally little known under that name, however, and more generally called white pine, occasionally spruce pine or tamarack pine, and at Alma passing as yellow pine. It is a smaller tree than the yellow pine (*Pinus ponderosa*), and specimens are not often found exceeding 2 feet in diameter of trunk or above 100 feet in height. It is sometimes found mixed with other pines or spruces, but its most characteristic growth is found in those areas where it occurs alone or greatly predominates over other species. It is apparently a tree of slow growth, especially when crowded, and will endure for many years without showing any very material increment of the wood. One out of a number of specimens, measured under fair average conditions of

mixed open woods, growing on nearly level disintegrated granite soil southwest of Fairplay and at an altitude of about 9,000 feet, showed the following dimensions: Height, 65 feet; diameter, 4 feet from the ground, 17 inches; saw log furnished, 30 feet, the small end being 11½ inches in diameter, the remainder being very branchy and rejected. The annual rings showed about one hundred and sixty years of growth, the first fifty years showing much the greatest annual increment, the last fifty years with very thin annual rings and all sapwood. This fairly represents all those examined under similar conditions.

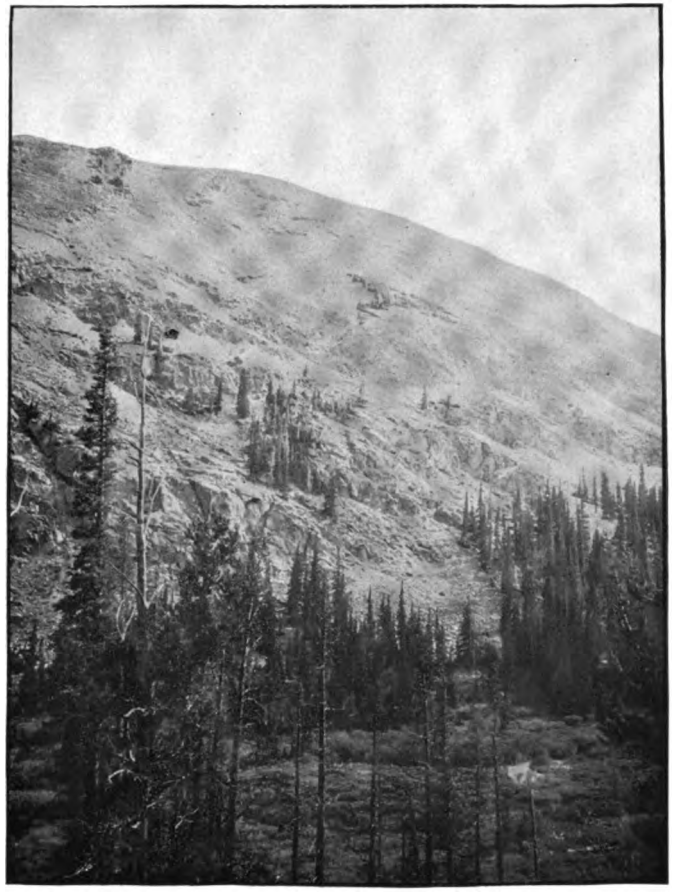
In the Lost Park region, north of the Tarryall Mountains, at an altitude of about 10,000 feet, two saw logs cut on a cold slope facing north measured, respectively, 12½ and 15 inches in diameter at the butt and showed 260 and 310 rings of annual growth. These trees were growing with Engelmann spruce on granite soil with slight humus. They represent about the best of their species fit for the sawmill. The height of such trees here usually varies from 60 to 75 feet, according as they may be growing with abundance of room, so as to produce many branches, or crowded by other individuals.

In other places, where the lodgepole pine occurs practically alone, a great number of individuals often spring up on a small area, forming a close and not easily penetrable growth while young, becoming more open with age and size by the death and decay of the weaker and smaller individuals. On such areas the annual growth is very slow, but the young trees show a remarkable power of shade endurance when overtopped by more sturdy or older individuals.

Many such areas were examined, and an idea of the general conditions may be given in a single example, in which four or five trees were crowded into a square foot, these trees varying from 4 to 8 feet high, 1 to 2 inches in diameter of stem, and with from 15 to 30 annual rings. Sometimes the stand of young trees is smaller and more dense, sometimes larger and proportionally more open, by the natural elimination of many weaker individuals. Nowhere are there any considerable areas of pure timber of this species large enough for cutting into lumber by sawmills. Most of the existing lodgepole-pine areas consist of slender, pole-like growths of varying sizes, but not often exceeding 6 or 8 inches in diameter or 50 feet in height. Wherever found of sufficient size, however, it is cut into rough lumber and generally sold mixed with yellow pine or spruce. Trees too small for the mill are often cut for mine timbers. A few years ago great quantities of all sizes were cut on territory lying to the north and west of the Kenosha Twin Cone Mountains, and converted into charcoal for smelting purposes. This industry is now abandoned in the region about the reserves, so that at present the lodgepole pine is of very limited commercial value and local use.



A. TRUNK OF LODGEPOLE PINE, 21 INCHES IN DIAMETER, SOUTH PLATTE RESERVE.



B. ENGELMANN SPRUCE AT TIMBER LINE, SHEEP MOUNTAIN NORTH SLOPE HORSESHOE GULCH, SOUTH PLATTE RESERVE.

The range of this tree is much more restricted than that of the yellow pine. It appears to be uncommon and very local in the Pikes Peak Reserve, having been observed in any numbers only at its northern end. In the Plum Creek Reserve it is found in small numbers about Devils Head Mountain, but occurs in abundance, either nearly alone or mixed with other trees, from that point south and southwest to the Pikes Peak Reserve. Its distribution in the South Platte Reserve is peculiar and irregular. It is found more or less scattered through the Puma Hills, in the southern portion, sometimes occurring in small separate groves. It is found on the slopes of Freeman Peak, Green Mountain, and Stormy Peak, and is more or less scattered through the forest of the hills in the Lost Park and Craig Park region, lying north of the Tarryall Mountains. It is plentiful on the north slopes of the Platte River Mountains, and is, or was, the predominant species found on the slopes north and west of the Kenosha Twin Cone Mountains. It is distributed more or less plentifully through all the long, narrow, western arm of the South Platte Reserve.

When occurring in mixed growth its most common associate is Engelmann spruce, generally known here as white spruce. It is found most abundantly on the higher plateaus and on northerly slopes, and at altitudes ranging between 8,000 and 10,500 feet, descending below 8,000 feet and, exceptionally, reaching up to about 11,000 feet, but never extending to the highest timber line.

PINUS ARISTATA Engelm. (Range pine, bastard pine.)

This species does not appear to have any generally known popular name in the reserves, but in part is called range pine, pitch pine, or, as in the region about Tarryall Mountains, passes under piñon pine, a name more properly belonging to *Pinus edulis*, which occurs within the reserves only on a small area near Manitou. The names of foxtail pine and hickory pine, in some places applied to this tree, seemed to be rarely if ever used in this region. Pitch pine was the name applied to the tree about Alma, where it is common.

The range pine is never a large tree, rarely exceeding 40 or 50 feet in height, although the trunk is often stout in proportion to the height, frequently measuring 2 or 3 feet in diameter. It is usually of low, branching habit of growth, with many large limbs and rapidly tapering stems, which are often forked, so that it is not common to get more than one saw log of from 12 to 16 feet in length from a tree.

Much of this timber bears branches almost to the ground, or the clear trunks of a great majority of the trees are so short that not even an ordinary saw log can be obtained, so that this species is not often found among the logs which are to be cut by sawmills into ordinary lumber. It is frequently used for mine timbers, however, and for fuel.

In its distribution the range pine is found mostly on ridges, rocky ledges, and south slopes from about 8,000 feet altitude to timber line, which in these reserves averages about 11,500 feet, but in exceptionally favorable situations may extend, in twisted and dwarfed specimens, to 12,000 feet altitude. It is often the chief tree on the upper parts of southern slopes of many mountains, the upper northern slopes being chiefly occupied by Engelmann spruce. This division of the territory by the trees is often a marked feature in the canyons and gulches which lie in an easterly and westerly direction.

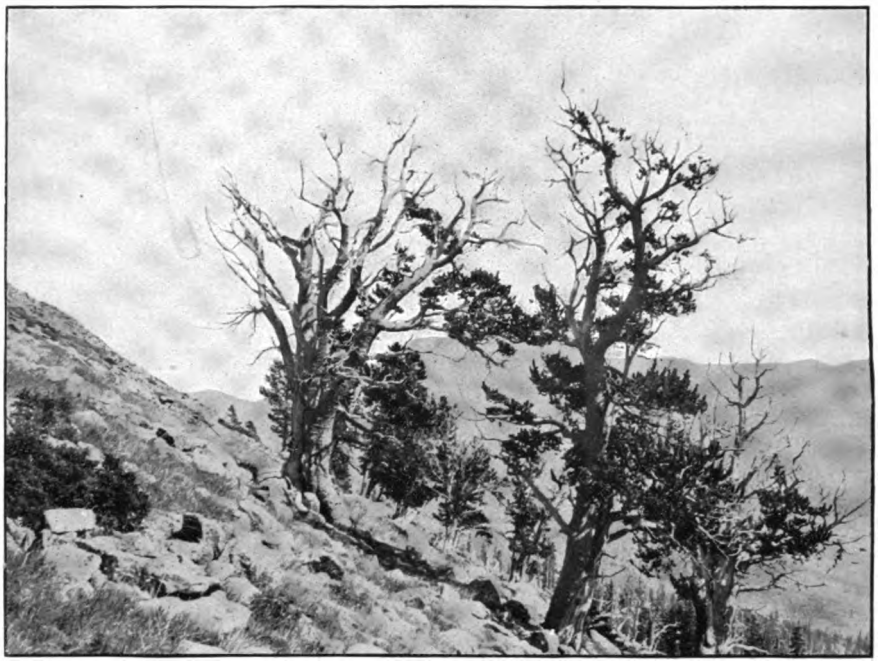
The range pine is common on the slopes of Pikes Peak, where it was originally discovered, and on the higher ridges in that region; it appears local and uncommon in the Plum Creek Reserve, it is plentiful through a large portion of the South Platte Reserve, particularly on the south slopes of unburned parts of the Tarryall Mountains and the mountains in the Lost Park region, continuing all through the branch of the reserve lying west of South Park. As a low, bushy tree it is scattered on the rocks and ridges of the open, uneven, or broken country lying within the reserve boundaries on the eastern side of South Park, as about Bordenville.

As would naturally be expected from the dry, poor, or rocky situations on which it most commonly grows, this pine is of very slow growth. Few opportunities were had to make measurements, but an idea of average relative size and age may be had from dimensions of a typical individual, under average conditions, which measured about 40 feet in height, 17 inches in diameter at 5 feet from the ground, and showed annual rings approximating 290 years of age. Individuals of larger diameter of trunk, and growing nearer timber line were undoubtedly of considerably greater age.

Pinus flexilis James. (White pine, limber pine.)

This is the least common of any of the pines found in the reserves; it is less known or distinguished from other species by people living in the region, and it has least economic importance. Nowhere does it appear to be recognized by any general familiar name, although it is occasionally referred to as white pine; was also pointed out as sugar pine; and is said to pass under the name of bull pine. As a rule, however, it seems to be confounded with the range pine, with which it most commonly grows and to which it bears some general superficial resemblance.

In stature it is somewhat similar to the range pine; it has much the same kind of short, rapidly tapering trunk, often divided, and generally bearing many large limbs. The trunk is more free from lower branches and attains a larger diameter, however, than the range pine, and it more often makes good sawmill logs, although on account of the general scarcity of the tree its wood is not often seen in lumber piles.



A. RANGE PINE (PINUS ARISTATA) AT TIMBER LINE. PIKES PEAK. SOUTH SLOPE.

B. LODGEPOLE PINE IN SOUTH PLATTE RESERVE.

A little timber has been cut here—all under 10 inches in diameter.

While the white pine is nowhere abundant, it is quite generally scattered through most parts of the reserves, occuring from about the lowest levels, or between 6,000 and 7,000 feet, up to timber line, or about 11,500 feet, although it appeared to attain the latter altitude only occasionally, and was not seen to reach the extreme limits of stunted specimens of the range pine. It grows with the latter and with Engelmann spruce at timber line on the south and east slopes of Pikes Peak, and occurs here and there through most of that reserve, and appears to have been more than usually plentiful on that portion of it north of Ute Pass which was burned over about twenty years ago. It is scarce in the Plum Creek Reserve; and in the South Platte Reserve it is very irregular, but appears to occur most often through its extreme western arm.

Whenever of sufficient size and development of clear trunk, the white pine is sawed into lumber or used for mine timbers, but on account of its comparative rarity it is of very slight economic value in this region.

PINUS EDULIS Engelm. (Piñon, piñon pine, nut pine.)

This, the true piñon, or piñon pine, only occurs within the reserve limits in the vicinity of Williams Canyon, north of Manitou, under 8,000 feet altitude, where it is commonly mixed with *Juniperus monosperma* and *Juniperus scopulorum*. It is here a low, bushy tree, rarely more than 15 feet high, not often exceeding 12 or 15 inches in diameter, and with a very short or no clear trunk. It is locally valued for fuel, and in the Arkansas Valley, south and west of the reserves, it was formerly much cut and used in the manufacture of charcoal for smelting purposes.

PSEUDOTSUGA TAXIFOLIA (Lam.) Britton. (Red fir, Douglas spruce, red spruce.)

The tree generally known to botanists and dendrologists as Douglas spruce is in the reserves almost universally known as red spruce, sometimes red pine, and certain trees which contain a large proportion of sapwood are sometimes called bastard spruce by lumbermen. It is the red or yellow fir of the Pacific coast.

This tree has almost exactly the same range in the reserves as the yellow pine (*Pinus ponderosa*) with which it is usually found associated, sometimes one preponderating, sometimes the other, according to the peculiar local conditions and exposures. It grows well at the lower altitudes in the reserves, or at about 6,000 feet altitude, and the highest altitude at which it was noted was between 10,500 and 11,000 feet, on the south slopes of the Tarryall Mountains, near Mountaindale. The altitude reached here seems to be exceptional, however, for as a rule the upper limits of this species appeared to be about 10,000 feet, or occasionally 10,500 feet. Growing mainly under similar conditions

the red fir appears to reach about the same dimensions, in this part of the country, as the yellow pine.

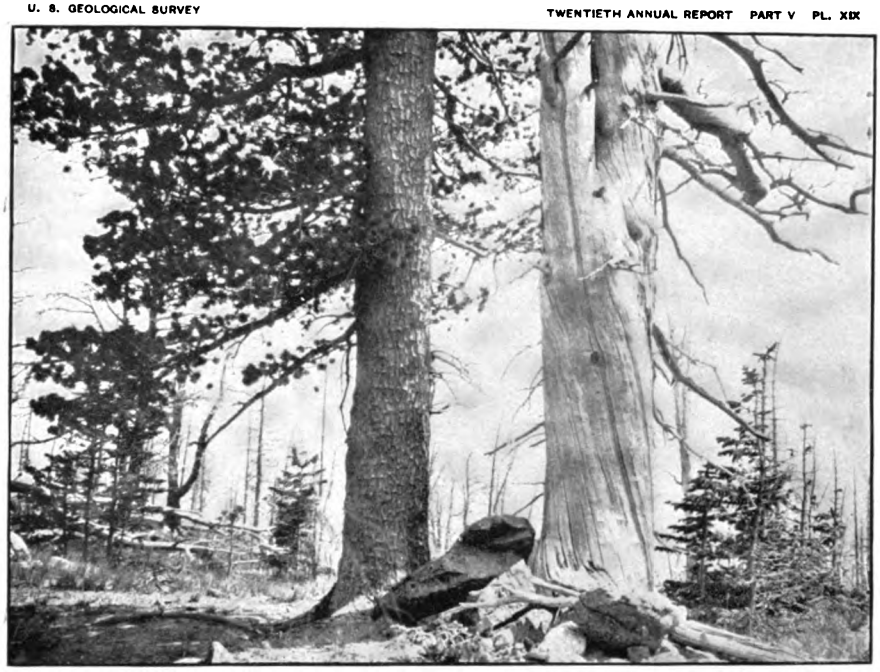
Trees with trunks 4 feet in diameter at the stump and 110 or 120 feet in height, with a clear trunk of 50 or 60 feet, are very rare and apparently never were common, even before the coming of sawmills. A trunk diameter of 2 feet at 3 or 4 feet from the ground and a total height of 100 or 110 feet, giving, perhaps, 60 feet of saw log, the upper 20 feet or more of which bears branches, the small end about or little less than a foot in diameter, is considered fine timber of this species in this region. Trees of this extra size are very exceptional, however, and are found in few localities and on limited areas, either alone or so intermixed with poorer material or other species that the amount of lumber per acre on any given square mile or quarter section is not great, probably never exceeding an average of 2,000 feet to the acre. Wherever easily and profitably accessible, nearly all trees of suitable sizes have been cut for the sawmill or for railroad ties.

Most of the Douglas spruce which remains on the reserves consists of rather small, much-branched trees with not more than 12 or 15 feet of clear trunk, or those in which some defect unfits them for profitable lumber purposes, or they are under 8 inches in diameter and therefore not useful either for sawmill lumber or for making of railroad ties.

On the lower altitudes and along canyons and gulches the red fir is found mixed with blue spruce as well as yellow pine, and in its upper limits it is often scattered among Engelmann spruce and lodgepole pine. It occurs throughout the Pikes Peak Reserve up to about 10,000 feet altitude, and is commonly mixed with other species over all the Plum Creek Reserve, particularly in gulches and on northern slopes.

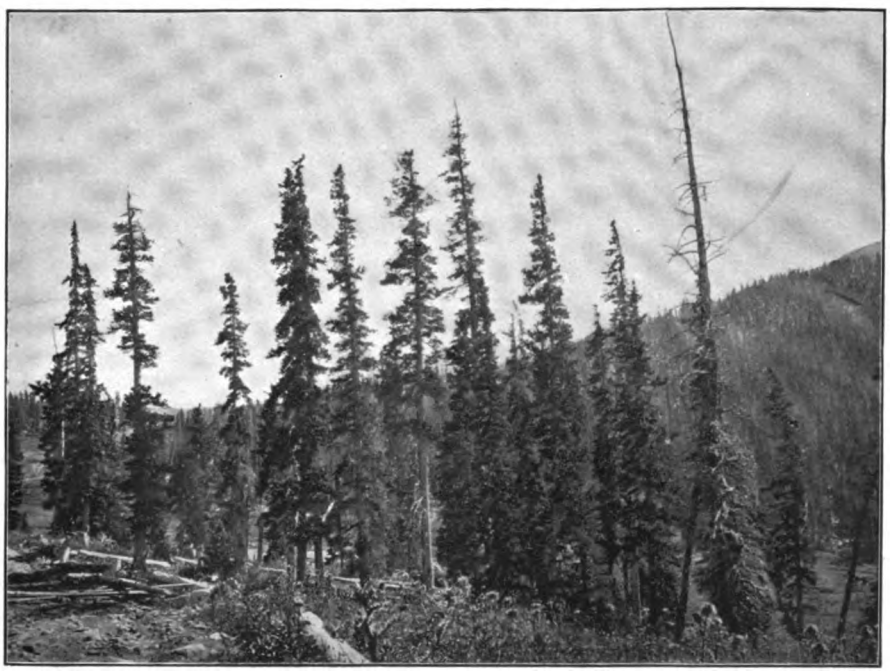
The Douglas spruce is distributed through the main body of the South Platte Reserve, but, like the yellow pine, it seems strangely absent from the Lost Park region lying north of the Tarryall Mountains and east of South Park, although the lower part of this region has an altitude decidedly lower than the species generally reaches; and on the long narrow extreme western arm of this reserve it is found only at irregular intervals near the edge of the eastern slope adjoining South Park, upon the low hills and buttes of which it occurs, generally small in size, and mixed with yellow pine and blue spruce.

The best trees yet uncut by lumbermen are found at altitudes of from 7,000 to 8,500 feet, on the ground drained by Wigwam Creek and Lost Park or Goose Creek, extending 4 or 5 miles back from their junctions with South Platte River; and on the nearly opposite slopes of this river in the southwest corner of the Plum Creek Reserve, southwest of Thunder Butte. In these places, however, the forest covering is thin and there is a preponderance of other kinds of trees, or of those too small for any present use.



A. WHITE PINE (PINUS FLEXILIS), EASTERN SLOPE OF PIKES PEAK.

Living tree, 18 inches; dead tree, 24 inches in diameter.



B. ENGELMANN SPRUCE ON BRECKENRIDGE PASS, WEST SLOPE.

Largest trees 80 or 90 feet high; trunks 3 feet in diameter. Above 11,000 feet altitude.

As a rule the Douglas spruce seems to maintain about the same relative rate of growth and increase in size as the yellow pine when growing together and under similar conditions.

On north slopes and decayed granite soil, in the favorable localities just mentioned, a number of red firs were measured and their ages ascertained. A tree growing without having been much crowded measured 58 feet in height, was 17 inches in diameter at 3 feet from the ground, and the small end of the second saw log, cut at 26 feet from the large end of the first log, was 12 inches in diameter. The remaining 32 feet of length bore many large green branches and was rejected by the lumberman. The annual rings showed this tree to be about 175 years old.

Another having a total height of 75 feet was 18½ inches in diameter at 3 feet from the ground, 12 inches in diameter at small end of log 30 feet in length, the remaining 45 feet being rejected on account of branches. Annual rings showed about 180 years of growth.

Douglas or red spruce is considered more desirable for lumber and railroad ties than yellow pine, but although the railroad ties made from Douglas spruce generally command 10 cents each more than those made from pine, the sawmills, when cutting the logs into boards and other building lumber, rarely separate the spruce and pine, but all are mixed and sold at the same price per thousand feet. This is undoubtedly in part due to the fact that the lumber is largely used locally, or in mining camps, for the construction of rough, hastily-erected, and cheap buildings, the lowest-priced lumber being sought; and also because the Douglas spruce fit for the sawmill is so scattered and mixed with pine that any slight difference in price it might command would not pay for sorting and separating at the mills.

It is the principal tree used in constructing bridges over creeks and streams, being more durable in contact with water than most other timbers locally available.

PICEA ENGELMANNI Engelm. (Engelmann spruce, white spruce.)

The Engelmann spruce is almost universally called white spruce throughout the reserves. It is the most abundant tree on all the uppermost forest ranges, and to-day would probably furnish more ready sawmill timber than any other species within the territory under consideration. It often grows as almost pure spruce woods, but commonly some lodgepole pine, range pine (*P. aristata*), or alpine fir (*Abies lasiocarpa*) is found mixed with it.

Often extending down cool northern mountain slopes and following cold canyons and gulches in small numbers to 6,000 or 7,000 feet altitude it is most abundant, and seems most at home. It reaches its best development at an elevation between 10,000 and 11,500 feet, covering the tops of mountains under timber line and forming a belt around

the highest, often furnishing fair sawmill timber up to from 11,500 to 11,700 feet, and extending in more or less dwarfed or stunted form, according to the exposures, to the highest limit reached by trees in the reserves. As a rule this appears to be between 11,700 and 11,800 feet, but in some situations straggling groups or individuals are found at about 12,000 feet altitude.

While the range pine (*Pinus aristata*) often chiefly occupies rocky southern slopes opposite the northern slopes, which are covered by Engelmann spruce, the latter species also appears to occupy most intermediate locations, and often crowds the pine from the extreme upper limits.

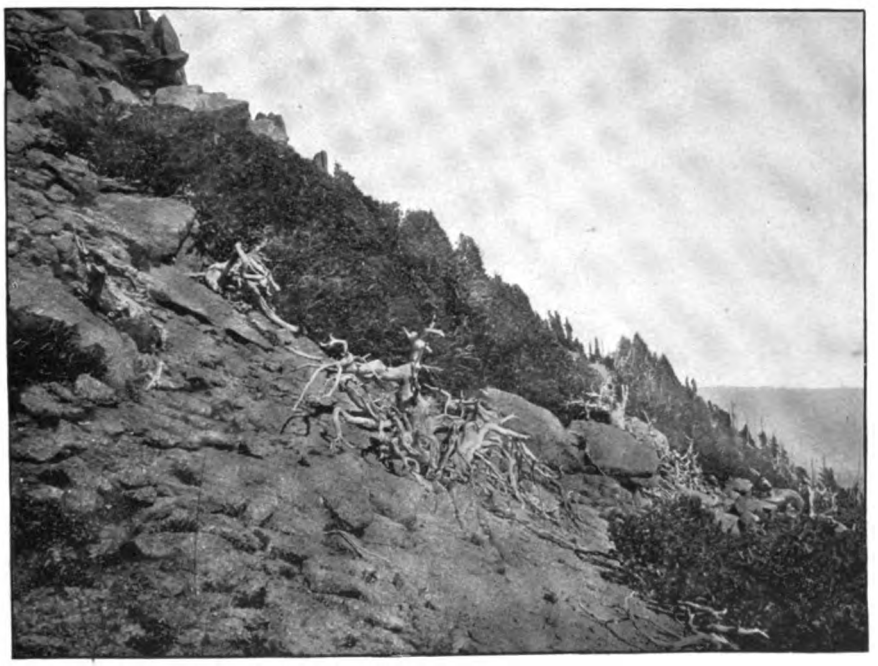
In its best condition, as found in these reserves, the Engelmann spruce is a tree with regularly-tapering stem, sometimes 110 to 120 feet high, and with a trunk over 3 feet in diameter at 3 or 4 feet from the ground. Commonly it ranges between 70 and 80 feet in height and 8 or 10 inches to 2 feet in diameter, although specimens 3 feet in diameter and much shorter in proportion are found near timber line. Branches, living and dead, are generally borne from near the ground to the top, so that there is practically no clear trunk, or only a few feet of it, this condition prevailing even where the trees are growing comparatively close together. The branches are slender and generally not more than 6 or 7 feet long and markedly depressed, so that besides offering comparatively little resistance to winds, to which the trees are much exposed, the drooping branches carry very little of the snow which falls upon them.

As might be expected on the poor granite soils on which the Engelmann spruce generally grows, and the cool high altitudes at which it reaches its best development, where frosts are common and snows not very rare throughout the summer, the growth of the trees is slow, and a great many years are required to produce the best of the sawmill timber now found. Many trees and logs were measured and the ages ascertained from specimens growing in different sections, and the results showed a fairly uniform rate of growth and increment.

In the Lost Park region, on a northern slope, in coarse granite soil, and at about 10,000 feet altitude, one of the best trees seen cut for lumber measured 110 feet in height (the top being dead), was 28 inches in diameter at 3 feet from the ground and had clear annual rings showing about 275 years of growth. This tree gave five good saw logs of a total length of 72 feet, the first three each 16 feet and the last two 12 feet in length, and measuring respectively 24, 21, 19, 16¼, and 12½ inches in diameter, at the small end, giving upward of 1,200 feet of lumber. At the top of the last log, 72 feet from the butt end or 75 feet from the ground, annual rings showed 140 years of growth, so that the remaining 35 feet of height had developed in about 135 years.

A. ENGELMANN SPRUCE TRUNK, OVER 3 FEET IN DIAMETER, BRECKENRIDGE PASS WEST SLOPE.

Altitude above 11,000 feet.



B. ENGELMANN SPRUCE AT TIMBER LINE, NORTH SIDE OF PIKES PEAK.

Altitude nearly 12,000 feet.

Another tree, with its top broken and decayed, showed 325 clear annual rings of growth and gave three saw logs; the first 12 feet long, 35½ inches in diameter at large end and 28 inches at small end; the second 16 feet long and 25 inches in diameter at small end; and the third also 16 feet long and 22 inches in diameter at small end. Up to about 200 years the annual rings were of fairly uniform thickness, but largest in the second half of the first century. After 200 years the rings become distinctly thinner with the age of the tree. Trees of the dimensions of these two are exceptional, the average being much smaller.

Another specimen, cut near the last, measured 12½ inches in diameter at the stump and 68 feet in total height, and annual rings showed it to be about 225 years of age. Thirty feet of saw log was taken from it, the small end measuring 8½ inches in diameter, the remaining 35 feet being rejected as too small and bearing too many branches for profitable lumber.

Near Boreas, on Breckenridge Pass on the northern slope, at an elevation of 11,500 feet, the larger trees did not measure more than from 60 to 70 feet in height, although at 3 feet from the ground some of the trunks measured over 2 feet in diameter and showed as much as 340 annual rings of growth.

All of these trees were growing on a coarse rocky or granite soil, where no traces of former forest fires were to be found, and where there was an accumulation of several inches of humus. The trees on Breckenridge Pass probably receive more moisture from westerly winds than those in Lost Park.

Most of the timber land in the reserves which does not show any trace of damage by fire is situated at the higher altitudes where this spruce occurs, but the areas which have had such immunity are generally not large.

The Englemann spruce is sawed into much the same class of lumber, and is mainly used for the same purposes and commands about the same prices as the yellow pine and Douglas spruce, although it does not appear to be much cut for railroad ties. It was formerly used in making charcoal, and recently has been cut for the manufacture of paper pulp. Being, as a rule, the least accessible of all the good timber trees, it has been the last to be attacked by lumbermen, and consequently there is more of it of a size fit for lumber standing on a given area than of any other species. It is found throughout most of the Pikes Peak Reserve and is particularly abundant on the higher mountains and slopes around Pikes Peak, especially to the south and west, and, although the principal tree, it does not occur of large size over any considerable areas unbroken by fire, the ax, or by predominance of other kinds of trees which occur on exposures peculiarly suited to them. It is still plentiful near Lake Moraine and the Seven Lakes on the south, and in the so-called Black Forest, occupying a

narrow belt to the north and west. It is uncommon in the northern part of the reserve; and so little of it is to be found in the Plum Creek Reserve that it is there of no economic importance.

In the eastern part of the South Platte Reserve it is rarely seen within 4 or 5 miles of the South Platte River. It is found on the Puma Hills in the southern part, and the Tarryall Mountains in the central part, and is most abundant to the north of the latter, over the region covered by the Kenosha and Platte mountains, with the intervening Lost Park and Craig Park. Here it is the prevailing tree, although it is often mixed with lodgepole pine, the so-called range pine (*Pinus aristata*), and occasionally with alpine fir (*Abies lasiocarpa*).

In this area it forms the only considerable body of original timber remaining within the limits of any of the reserves, although even here it has not been exempt from the ravages of fire, and the lumberman has been at work in the heart of it. This spruce is also found through the long western arm of the reserve, west of South Park, although unfortunately the best and most valuable forested areas are chiefly outside the western boundaries of the reservation.

PICEA PARRYANA (André) Parry (PICEA PUNGENS, Engelm.). (Colorado blue spruce.)

This tree is found passing under various local names, among them blue spruce, silver spruce, white spruce, fan-leaf spruce, and water spruce. Two or three names are sometimes applied to different individuals when growing side by side, according as they may vary in color of foliage, peculiarities of branching, etc.

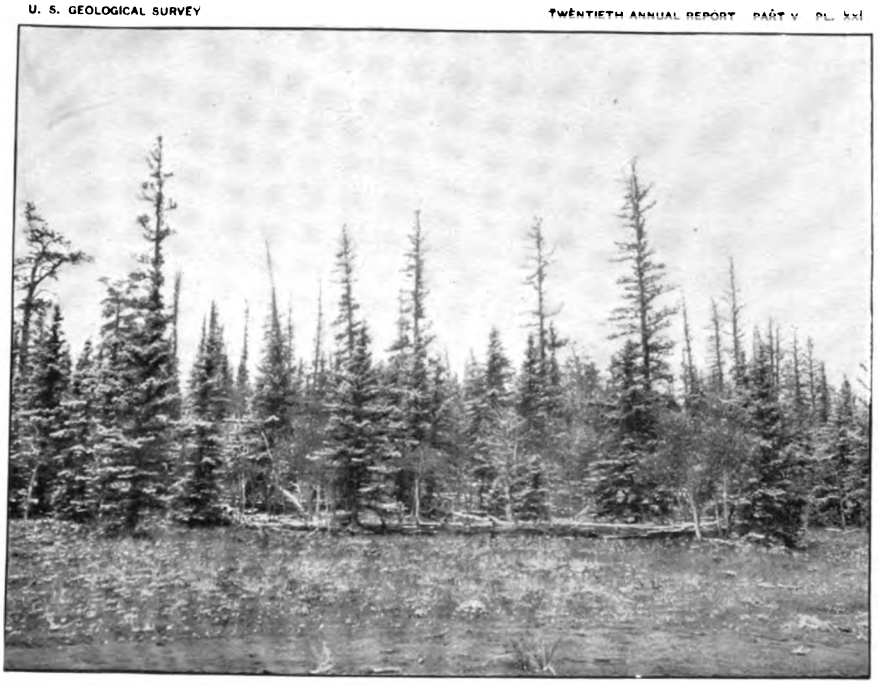
In its best condition, as found in these reserves, the blue spruce may attain a height of 110 or 120 feet and a diameter of trunk of about 3 feet near the base. It is a more horizontally branched, broader spreading, more symmetrical tree than the Engelmann spruce and grows much more rapidly, especially in the first few decades of its development.

An example of the rate of growth may be given from a specimen on the banks of Tarryall Creek, near Farnham's ranch, at about 9,000 feet altitude, which measured 90 feet in height and 31 inches in diameter at 4 feet from the ground, and which the annual rings of growth showed to be between 180 and 200 years old.

On exposed situations, when the species grows old, the branches often have a straggling, stunted aspect, which gives the trees anything but the beautiful, symmetrical appearance which they have in youth, in sheltered places, or in cultivation.

As a rule there is little of clear trunk even where the trees are comparatively crowded among other species.

The blue spruce is peculiarly uneven in its distribution, is confined to the lower altitudes, and is usually found along rivers and creeks or



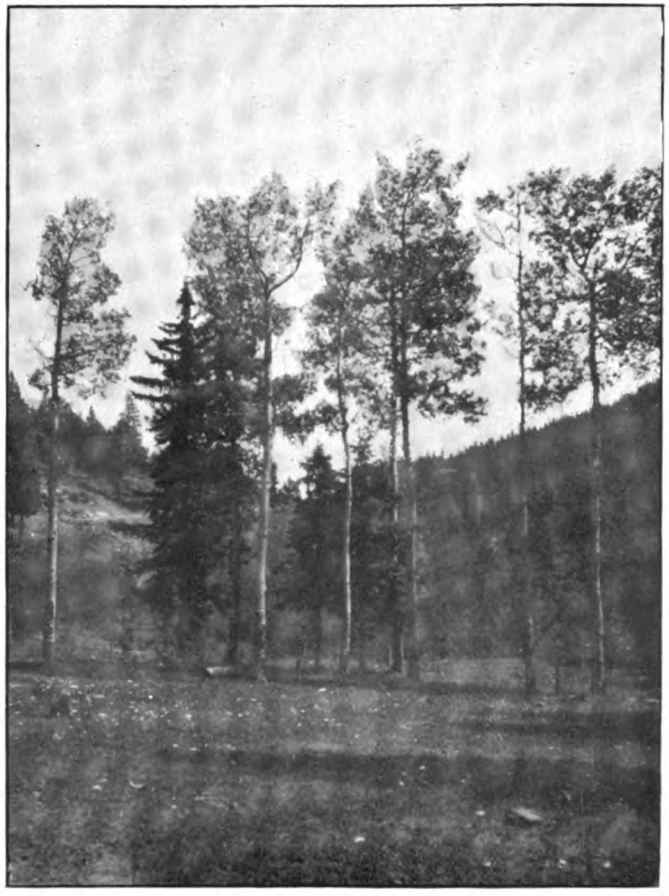
A. BLUE SPRUCE (PICEA PARRYANA), NEAR BUFFALO SPRINGS, SOUTH PARK.

B. CHARACTERISTIC GROWTH OF ASPEN IN PIKES PEAK RESERVE, WHERE FOREST HAS BEEN DESTROYED AND GROUND BURNT OVER MORE THAN ONCE.

Prostrate trees burnt fifteen or twenty years before.

A BLUE SPRUCE (PICEA PARRYANA) AT CASSELLS, SOUTH PLATTE RESERVE

Three feet in diameter at 4 feet from ground; 90 to 100 feet high.



B BLUE SPRUCE AND ASPEN (POPULUS TREMULOIDES), PLUM CREEK RESERVE.

Aspen 10 inches in diameter, about 50 feet high.

where more than the average amount of moisture is obtained from the soil, although it occurs also on the north slopes of some low hills and ridges. It commonly occurs over the same territory occupied by the yellow pine and Douglas spruce, which usually grow on the slopes, while the blue spruce more closely follows the water courses. As a rule, it seems to range between 6,000 feet and 9,000 feet in altitude, but sometimes reaches fully 1,000 feet above the latter elevation.

It never occurs as pure forest, and is nowhere sufficiently abundant to be of commercial value, generally being scattered among other species.

It is found scattered along the creeks and gulches of the lower parts of the Pikes Peak Reserve, crossing it through Ute Pass, and occuring here and there over the lower unburned parts to the north. It is to be met scattered along creeks through the Plum Creek Reserve, and all around the main body of the South Platte Reserve, being more than usually plentiful in the southern portion, ascending Lost Park Creek almost to Lost Park itself, and crossing the reserve diagonally by way of Tarryall Creek from the South Platte River to South Park. It occurs at intervals along the eastern margin of the narrow western arm of the reserve, especially near its southern end, where, in spots, it most nearly appears as the prevailing growth. It is commonly scattered over the hilly portion of South Park lying between the two parts of the reserve.

Its altitudinal distribution is peculiar and variable according to locality and other conditions. As examples it may be mentioned that in the canyons east of Pikes Peak 8,500 to 9,500 feet seems to be the upper limit; along the North Branch of the South Platte it disappears a little above Webster, at about 9,000 feet altitude, and its place is taken by the Engelmann spruce; it exceeds this altitude when following the course of Tarryall Creek to South Park; is found at an elevation of fully 9,800 feet to the west of the town of Como; while to the south, within a mile or two of Platte Station or Rich's ranch, it is found reaching up to quite 10,000 feet altitude before it is entirely supplanted by Engelmann spruce and other trees.

The wood of the blue spruce is generally coarse and otherwise of poor quality. Nevertheless, in this region, where rough timbers are chiefly in demand, wherever found of sufficient size, it is, with the yellow pine and Douglas spruce, usually sawed into boards and other classes of lumber and sold mixed with the better kinds.

Young plants showing the most blue or glaucous foliage are sometimes collected and shipped to nurserymen to be grown for ornamental purposes. Plants growing side by side show much variation in foliage, many having an ordinary green coloring, while others are very strikingly glaucous or blue.

ABIES CONCOLOR (Gord.) Parry. (Colorado white fir, balsam fir, blue fir.)

This tree may be regarded as rare and very local in the reserves. It was not observed anywhere to reach an altitude greater than about 8,500 feet; and its best developement was attained along water courses or on adjacent cold north slopes, where it was sometimes found 70 or 80 feet in height and with a trunk 2 feet or more in diameter.

When not crowded it is usually a beautifully symmetrical tree, conical in outline, with regular horizontal branches. It is most often to be seen along creeks and gulches on the eastern slopes of the Pikes Peak and Plum Creek reserves; and is apparently a very rare tree in the South Platte Reserve, not being found at all in the main body or extreme western portion of it.

It is not of any special economic importance in this region, although, whenever large enough, it may be cut, with other species, for the sawmill.

ABIES LASIOCARPA (Hook.) Nutt. (ABIES SUBALPINA, Engelm.). (Alpine fir, balsam.)

While the preceding species is only found at the lower levels, the alpine fir reaches up to the average timber line; also extending well down the mountain sides on cold northern slopes, but apparently not meeting or mingling with *Abies concolor*.

It is also rare and local, and nowhere occurs in sufficient numbers to be taken into commercial account. It is usually found scattered among Engelmann spruce, and is also sometimes found associated with lodgepole pine. But it is by no means always found wherever these trees occur.

It is most often to be seen in the mountainous region between the Tarryall Mountains and the North Branch of the South Platte River, and on the high range of the narrow western arm of the South Platte Reserve.

It is usually a smaller tree, with decidedly shorter branches than *Abies concolor*. It is occasionally 70 or 80 feet high, with a trunk 2 feet in diameter, the height of the tree diminishing as timber line is approached, as is the case with Englemann spruce.

At Boreas, on Breckenridge Pass, at fully 11,500 feet altitude, an average tree of this fir measured 53 feet in total height, was 15½ inches in diameter at 3 feet from the ground, and 12 inches in diameter at 20 feet from the larger end of the log.

It showed 185 annual rings of age, the first 100 rings of nearly uniform size, the remainder appreciably smaller with the advancing age of the tree.

When large enough the alpine fir is sometimes cut with the spruce for lumber or paper pulp.

JUNIPERUS SCOPULORUM Sargent. (Cedar.)

This tree sometimes passes in the same locality under the names of juniper, cedar or red cedar, and white cedar, the latter name being applied to trees with unusally glaucous foliage.

It is local and never abundant in the reserves, usually growing scattered on the most rocky ledges or soils, and apparently chiefly limited to altitudes under 9,000 feet, or less than the general range of the yellow pine.

It is rarely found 25 feet in height, and the trunk is usually very much branched to the base or has a divided stem. It is of very slow growth and very tenacious of life. Many individuals are in part dead, probably mainly by reason of unusually dry seasons, the trees being situated on the driest and most exposed situations.

This cedar is found on rocky, dry hills and rocks in parts of the lower levels of all of the reserves, but is nowhere sufficiently abundant to make it of much commercial importance. It is much prized and used locally, however, its durability under nearly all conditions being fully recognized and appreciated.

JUNIPERUS MONOSPERMA (ENGELM.) Sargent. (One-seed juniper, cedar, red cedar.)

This juniper or cedar is generally at once distinguished from the preceding species by having more rigid twigs and darker green foliage, never showing the glaucous coloring characteristic of *Juniperus scopulorum*. It is found near Manitou with *J. scopulorum* and piñon pine (*Pinus edulis*), and rarely at several other points near the reserve boundaries, but it does not grow to the same altitudes on the hills as *J. scopulorum*, being practically confined to very nearly the same limits as the piñon pine.

The one-seed juniper appears to grow to about the same size as the other, and is used for similar purposes; but it is so rare in the territory under consideration as to be practically not deserving more than mere mention.

POPULUS TREMULOIDES, Michx. (Quaking asp, trembling aspen.)

This is the only deciduous tree which occurs plentifully over any considerable area of the reserves. It is found in almost all parts, from the low levels near the reserve borders up to 10,500 or 11,000 feet altitude, and even higher in favored localities and in small specimens. It may be seen at these higher altitudes on the slopes about Pikes Peak, and also in other places.

It commonly occurs most abundantly over areas that have been swept by forest fires, and if the ground gives evidence of having been burned over more than once the growth of "quaking asp" is usually proportionately more dense. It is also found to a limited extent in open woods which show no trace of fire since white men came into the country. It reaches its best development along streams or in places where there are springs or more than the usual amount of moisture, but, in smaller size, it grows on ordinary levels, slopes, or mountain sides, being, as a rule, less abundant on very warm southern slopes than in other situations.

Under most conditions in which it is found it is rarely more than 25 or 30 feet high, with a stem 5 or 6 inches in diameter, and commonly it is so small and poorly grown as to be practically worthless under present conditions and demands. In a few favored situations it sometimes attains a height of 60 or 70 feet, with a long clean trunk over a foot in diameter at 4 or 5 feet from the ground. Such trees, however, are exceptional.

Wherever large enough the quaking asp has lately been cut for shipment to Denver for the manufacture of excelsior and also of paper, but the quantity obtainable for this purpose is so limited as to be totally exhausted with the shipment of a few carloads.

The vast areas of smaller timber furnish at present only firewood and fencing. For the latter purpose it has been found that fence rails made of quaking aspen, stripped of the bark, will last for many years, rails in use for twenty years being yet perfectly durable. In the moist atmosphere of the Eastern States these would probably be decayed and useless at the end of two or three seasons. It is not found so enduring for fence posts, however, and for this purpose it is usual to employ either cedar, Douglas spruce, or yellow pine.

The remarkable power of the quaking aspen to spring up and partially cover the ground soon after a forest fire is largely due to the fact that many plants exist in a more or less suppressed condition through these open woods. The roots are very widespreading and mostly near the surface of the soil, and when the ground is burned over adventitious buds produce stems at irregular intervals along these roots, so that from a single original plant there may spring up a colony of stems extending for many feet around it.

POPULUS ANGUSTIFOLIA James. (Cottonwood, narrow-leaved cottonwood.)

This tree is only found along rivers and creeks, sometimes ascending these streams to between 9,000 and 10,000 feet altitude. It is nowhere abundant, occurring only as scattered individuals or groups, and on account of its scarcity it is of little economic value in and about

the reserves, excepting that it is planted for shade. It may be considered as the largest deciduous tree found in this region, but the best specimens seen hardly exceeded 2 feet in diameter of trunk and 50 feet in height.

POPULUS BALSAMIFERA Linn. (Balm of Gilead poplar, cottonwood.)

This tree is found along streams in and about the reserves up to 10,000 feet or greater elevation, but it is nowhere common or of any extensive use. It sometimes attains about the same size as the narrow-leaved cottonwood, to which it often bears a close general resemblance.

POPULUS DELTOIDES Marsh. (P. MONILIFERA Ait.)

The broad-leaved cottonwood, so common along creeks and rivers on the plains, did not appear to be actually indigenous within the limits of the reserves, although it occurs in the vicinity of them and is planted for shade and other useful purposes.

Populus acuminata Rydberg, was seen only about Colorado Springs and Manitou, where a few individuals may be found. In all specimens seen they showed features which suggested a hybrid between the broad-leaved and the narrow-leaved cottonwoods.

PIKES PEAK FOREST RESERVE.

BOUNDARIES.

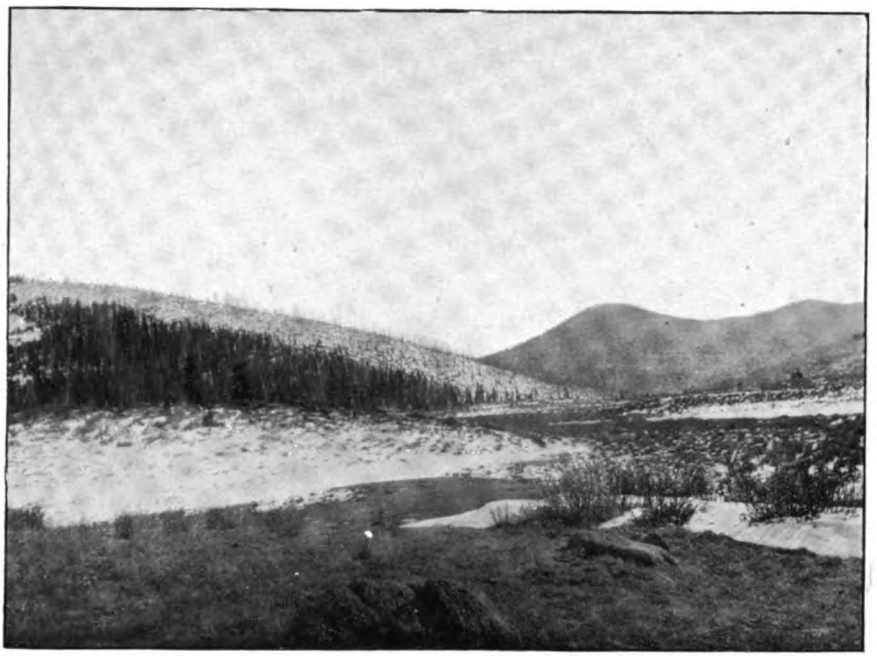
The boundaries of this reserve, as established by Executive order of March 18, 1892, supplementary to that of February 11, 1892, are as follows:

Beginning at the northeast corner of section four (4), township eleven (11) south, range sixty-seven (67), west of the sixth (6th) principal meridian; thence westerly along the second (2nd) correction line south, between townships ten (10) and eleven (11) south, to the northwest corner of section six (6), township eleven (11) south, range sixty-eight (68) west; thence southerly along the range line between ranges sixty-eight (68) and sixty-nine (69) west, to the southwest corner of section eighteen (18), township thirteen (13) south, range sixty-eight (68) west; thence westerly along the section line between sections thirteen (13) and twenty-four (24), fourteen (14) and twenty-three (23), fifteen (15) and twenty-two (22), sixteen (16) and twenty-one (21), seventeen (17) and twenty (20), and eighteen (18) and nineteen (19), to the northwest corner of section nineteen (19), township thirteen (13) south, range sixty-nine (69) west; thence southerly along the range line between ranges sixty-nine (69) and seventy (70) west, to the southwest corner of section thirty-one (31) of said township; thence easterly along the township line between townships thirteen (13) and fourteen (14) south, to the quarter section corner on said township line between section thirty-five (35), township (13) south, range sixty-nine (69) west, and section two (2), township fourteen (14) south, range sixty-nine (69) west; thence southerly through the middle of sections two (2), eleven (11), and fourteen (14), township fourteen (14) south, range sixty-nine (69) west, to the quarter section corner on the section line between sections fourteen (14) and twenty-three (23) of said township and range; thence easterly along said

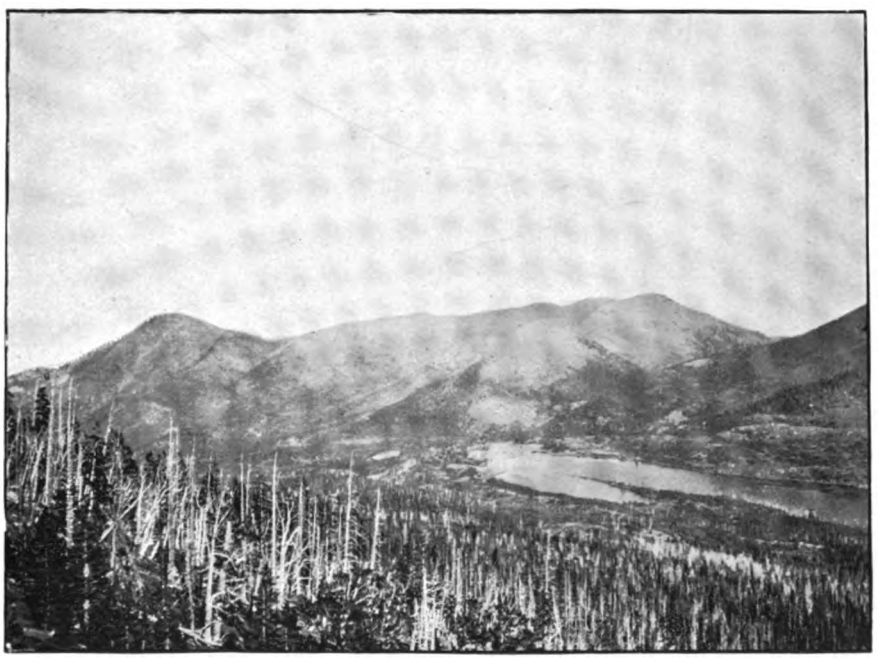
section line to the northeast corner of section twenty-three (23) of said township and range; thence southerly along the section line to the quarter section corner on said line between sections twenty-three (23) and twenty-four (24) of said township and range; thence easterly through the middle of section twenty-four (24) to the quarter section corner on the range line between section nineteen (19), township fourteen (14) south, range sixty-eight (68) west, and section twenty-four (24), township fourteen (14) south, range sixty-nine (69) west; thence southerly along said range line to the southwest corner of section thirty-one (31), township fifteen (15) south, range sixty-eight (68) west; thence easterly along the third (3rd) correction line south between townships fifteen (15) and sixteen (16) south to the southeast corner of section thirty-four (34), township fifteen (15) south, range sixty-seven (67) west; thence northerly along the section line between sections thirty-four (34) and thirty-five (35), twenty-six (26) and twenty-seven (27) to the point for the quarter section corner on the section line between sections twenty-two (22) and twenty-three (23), township fifteen (15) south, range sixty-seven (67) west; thence westerly to a point for the legal center of section twenty-one (21) of said township and range; thence southerly to the southwest corner of the southeast quarter of section twenty-eight (28) of said township and range; thence westerly along the section line between sections twenty-eight (28) and thirty-three (33), twenty-nine (29) and thirty-two (32), thirty (30) and thirty-one (31) to the northwest corner of section thirty-one (31) of said range and township; thence northerly on the range line between ranges sixty-seven (67) and sixty-eight (68) west to the southwest corner of section six (6) of said township and range; thence easterly along the section line to the southeast corner of section six (6) of said township and range; thence southerly along the section line to the southwest corner of section eight (8) of said township and range; thence easterly along the section line to the southeast corner of section ten (10) of said township and range; thence northerly along the section line between sections ten (10) and eleven (11), two (2) and three (3), township fifteen (15) south, range sixty-seven (67) west, to the northeast corner of section three (3) of said township and range; thence westerly along the township line between townships fourteen (14) and fifteen (15) south to the northwest corner of section three (3), township fifteen (15) south, range sixty-seven (67) west; thence northerly along the section line between sections thirty-three (33) and thirty-four (34), twenty-seven (27) and twenty-eight (28), twenty-one (21) and twenty-two (22) to the northeast corner of section twenty-one (21), township fourteen (14) south, range sixty-seven (67) west; thence westerly along the section line between sections sixteen (16) and twenty-one (21), seventeen (17) and twenty (20), eighteen (18) and nineteen (19) to the northwest corner of section nineteen (19) of said township and range; thence northerly along the range line between ranges sixty-seven (67) and sixty-eight (68) west to the northeast corner of section one (1), township fourteen (14) south, range sixty-eight (68) west; thence easterly along the township line between townships thirteen (13) and fourteen (14) south to the southeast corner of section thirty-three (33), township thirteen (13) south, range sixty-seven (67) west; thence northerly along the section line between sections thirty-three (33) and thirty-four (34), twenty-seven (27) and twenty-eight (28), twenty-one (21) and twenty-two (22), fifteen (15) and sixteen (16), nine (9) and ten (10), and three (3) and four (4) of townships thirteen (13), twelve (12) and eleven (11) south, range sixty-seven (67) west to the place of beginning.

TOPOGRAPHY AND DRAINAGE.

Of the 184,320 acres contained within the Pikes Peak Reserve, that having the lowest altitude consists of a small corner near Manitou with an elevation of between 6,000 and 7,000 feet above sea level. Almost the whole of the Pikes Peak Reserve is composed of rugged



A. VIEW AT SEVEN LAKES, PIKES PEAK RESERVE LOOKING SOUTH.



B VIEW LOOKING EAST TO LAKE MORAINE, SHEEP MOUNTAIN, AND CAMERON CONE FROM SLOPES OF PIKES PEAK.

hills and mountains which attain an extreme elevation in Pikes Peak itself, the height of which is 14,108 feet. To the south and southeast of Pikes Peak are numerous mountains and ridges between 11,000 and 13,000 feet in elevation; a very small portion is below 8,500 feet, and probably the average altitude exceeds 10,000 feet. To the north of Pikes Peak the land falls much more abruptly, and most of the territory lying in the reserve between the Peak and the Plum Creek Reserve ranges between 8,000 and 9,500 feet in altitude, the highest points not exceeding 10,000 feet.

The soil is generally a coarse, broken, or decayed granite, among which are distributed many ledges, rocks, or bowlders. There is little humus or loam, and whatever there may be is generally accumulated in hollows, along creeks, or in small areas of forest which show no trace of fire. In the Lake Moraine vicinity there is a good deal of deep muck, the accumulation of many centuries.

Several small creeks have their sources in the Pikes Peak Reserve, most of them falling to the east or west into larger streams, which in turn empty into the South Platte River on the north or the Arkansas River on the south, most of the water falling into the latter stream. The most important of these creeks is Fountain Creek, which rises in the western part, where it is known as Catamount Creek, and, passing across the center of the reserve, is joined by Monument Creek near Colorado Springs and falls into the Arkansas River at Pueblo. It is fed by a number of small tributaries, among them Ruxton Creek, which carries the waters flowing from the east of Pikes Peak and joins Fountain Creek near Manitou. The waters of Ruxton Creek are used both for power purposes and water supply for the towns below.

The southern end of the reserve is chiefly drained by Beaver Creek and its tributaries, and Cheyenne Creek and its branches carry off the water from a comparatively small area in the southeastern part.

There are no large bodies of water on the reserve. The largest, known as Lake Moraine, is less than 100 acres in area, and is now, in fact, an enlarged artificial reservoir, forming part of the Ruxton Creek water system.

The small bodies of water known as the Seven Lakes are above, and are separated from Lake Moraine by a high divide, and have Beaver Creek, which flows southward, for their outlet. These lakes are situated at an altitude of about 10,500 feet, are of various depths, and altogether, when full, may cover a hundred or more acres in area.

A tunnel, known as the Strickler tunnel, is in process of construction, with the object of drawing some of the waters near the head of Beaver Creek into Lake Moraine in order to increase and perpetuate the water supply for Colorado Springs and other places below. In its fall of several thousand feet the water will be utilized to furnish power for various purposes.

Palmer Lake, a small artificial reservoir in the northeastern corner of the reserve, is situated outside the mountain region, so that it is of no special importance in relation to the reserve proper.

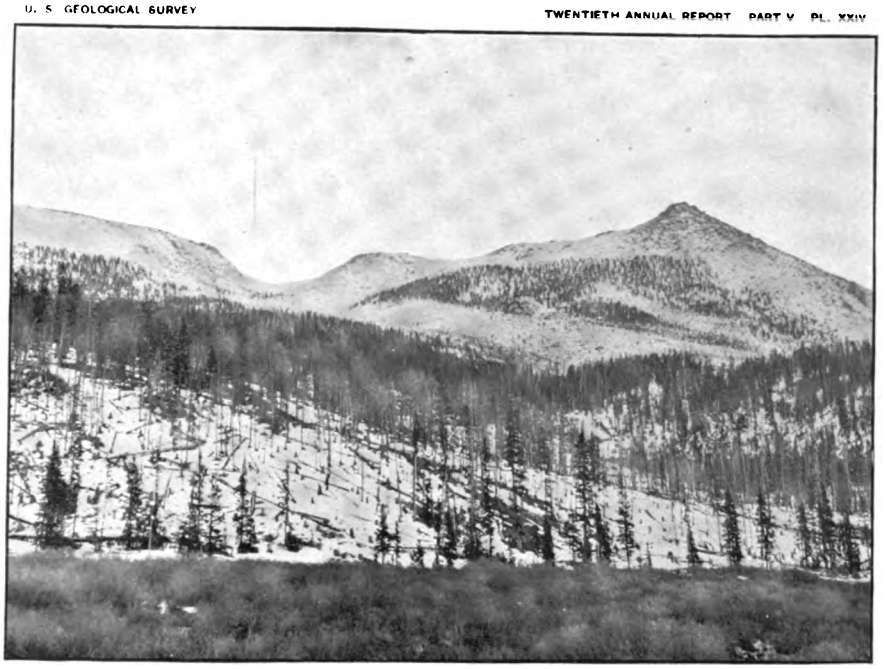
Considering the ranching, manufactures, and especially the large transient and permanent health-seeking population at Colorado Springs, Manitou, and other places along the eastern slope of this reserve, the importance of preserving a pure and undiminished water supply can not be overestimated; and, as this purest water comes from the higher mountains in the vicinity of and including Pikes Peak, every means should be taken to preserve it from damage of any sort.

Among the chief sources of the streams are the great snowdrifts above timber line, which accumulate in winter in deep gulches or hollows, and, slowly melting in summer, still exist on the north or shaded sides of the mountains when they are replenished by the snows of the succeeding autumn and winter.

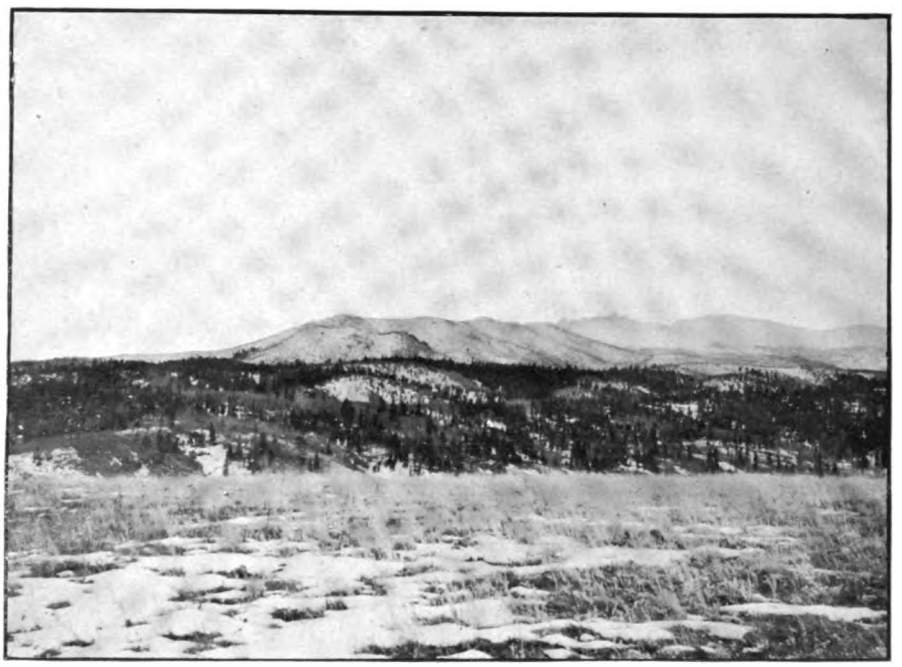
TIMBER.

It is well known in mountainous regions that a constant and equable distribution of the water in summer is greatly helped by a good forest covering of the upper slopes and valleys, the effect being to cause a more gradual melting of snow where shaded and checking the water from precipitately rushing to streams below, as is generally the case on denuded ground. Unfortunately there are no very large continuous forest areas on this reserve, fire and the ax having removed the best portion of the timber, so that there is little of the primeval forest remaining or which does not show molestation by man. The best of the remaining timber is found in a narrow belt near Glen Cove, northwest of Pikes Peak, in the so-called Black Forest, to the west of Glen Cove, and perhaps 3 or 4 square miles in irregular patches and very variable density, lying south of Pikes Peak and mostly to the west of Lake Moraine and the Seven Lakes. Here and there, as near the Halfway House and a few other favored points near the line of the Manitou and Pikes Peak Railway, groves of a few acres of fine trees may be found, but these are exceptional. As a rule the best remaining timber is on the least accessible, although not inaccessible, slopes.

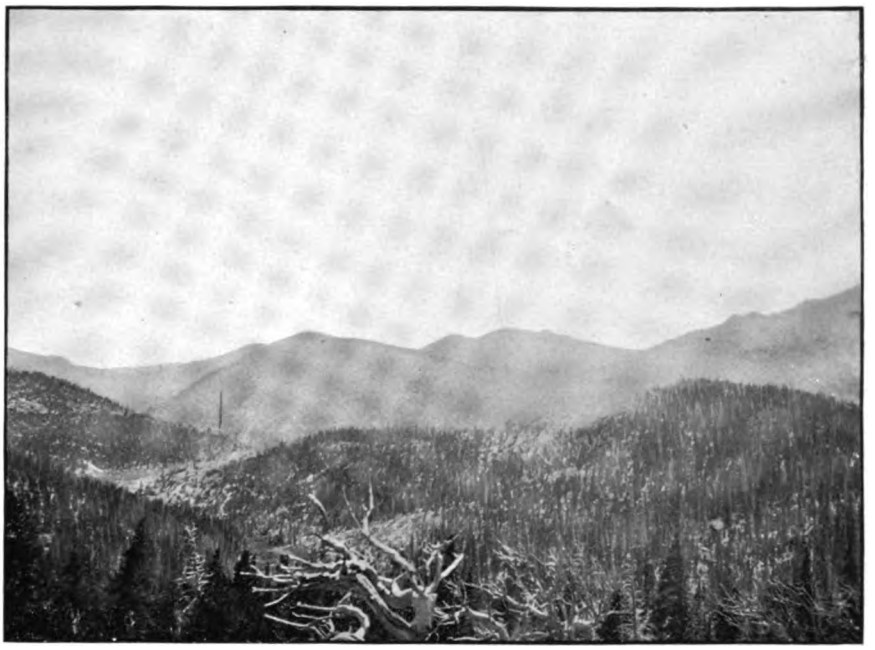
A considerable portion of the Black Forest district, situated between Glen Cove and Midland Station, lies outside the reserve boundaries. It has nearly all been cut over and the best of the timber taken out, although much still remains of sufficient size for immediate use. The activity of sawmills is indicated by numerous abandoned sawmill sites (or sawmill "settings," as they are called locally) which are found along the creeks. In June, 1896, fires destroyed a considerable portion of the living timber, and there was strong suspicion that the flames were started by lumbermen in order that their operations might come within



A BLACK FOREST, LOOKING SOUTH TO SENTINEL POINT, WEST OF PIKES PEAK; MUCH CUT OVER AND BURNT



B RASPBERRY MOUNTAIN (CATAMOUNT HILL) AND PIKES PEAK, LOOKING EAST ON HAYDEN DIVIDE ROAD ABOUT 1 MILE SOUTH OF DIVIDE STATION



A VIEW LOOKING SOUTH-SOUTHEAST FROM SLOPES OF PIKES PEAK TO HILLS SOUTH OF LAKE MORAINE.

B ENGELMANN SPRUCE IN PIKES PEAK RESERVE.

Burnt probably over fifty years ago enough old trees escaping to seed the ground the old trees since cut

the provision allowing dead timber to be removed from the Government reserves.

The timber near Lake Moraine has mostly been cut over and the best taken for lumber or other purposes. About the Seven Lakes and along Beaver Creek the greater part of the original forest has been destroyed by fire, many of the dead trees still standing, in spite of their destruction more than a quarter of a century ago. These trees, as well as the areas about Glen Cove and those composing the Black Forest, are mostly Engelmann spruce, among which are some range pine (*Pinus aristata*) and white pine (*Pinus flexilis*), which are most plentiful on south slopes, while the higher altitudes with a northerly slope are most exclusively occupied by Engelmann spruce. The tree ordinarily sought here for lumber is the latter species. While occasionally 80 or 90 feet high, with a trunk 2½ feet in diameter, the average available timber trees would not measure above 60 or 70 feet in height and 12 to 15 inches in diameter, and on many portions there is practically no timber left of a size suitable for the sawmill, although much could be utilized for paper pulp.

On account of the extreme variability of the timber on these areas, caused by cutting, by burnings at various times, and by very diverse quality according to exposure or elevation, so that no section or even quarter section of living timber ground can be found giving a fairly uniform growth, it is impossible to give a close estimate of the amount of lumber remaining here without more time for examination and measurements than was available in the present exploration. There are many acres which would cut over 5,000 feet of lumber to the acre if trees less than 10 or 12 inches in diameter were included, but not many acres of such timber could be found together.

With the exception of a few scattered small areas, which are hardly more than groves, there are practically no forests deserving of the name on all the remaining portion of the reserve. In the southern portion, as along North and South Cheyenne creeks, and especially along the line of the wagon road between Colorado Springs and Cripple Creek, there are some patches of light timber; but most of the territory here has been burned over and no important new growth has yet developed, or it bears a very scattered growth of very small or medium-sized trees. Some of the ground on south slopes and in valleys is absolutely bare of trees of any kind.

The species found here are Engelmann spruce, Douglas spruce, yellow pine (*Pinus ponderosa*), some range pine (*P. aristata*), and white pine (*P. flexilis*).

In all the remaining part of the reserve, lying to the north of the Manitou and Pikes Peak Railway, and comprising about 120,000 acres, or two-thirds of its entire area, there is no timber worthy of the name. Between the Pikes Peak Railway and Fountain

Creek, or the line of the Colorado Midland Railway, the principal conspicuous growth is small aspen or "quaking asp," among which are scattered individuals or small groves of conifers, chiefly yellow pine, white pine, and Douglas spruce. Some of these trees are of good size, being the survivors that escaped the earlier great fires, and they bear the seed which is gradually, although very slowly, reforesting this ground, which was mostly burned over between two and three score years ago. The new trees are of various ages, ranging from seedlings to trees above 30 years old. They are usually growing with the aspen, but they are rarely in sufficient numbers together to ultimately produce good timber. This rising generation of trees must arrive at seed-bearing age before, in the course of nature, the ground will become properly and sufficiently stocked.

On the slopes and hills about Fountain Creek, for several miles northwest of Manitou, there is still left a generally open, irregular growth of small-sized or medium-sized yellow pine and Douglas spruce. There is little, however, to furnish ready material for sawmill lumber.

Excepting a comparatively small area, nearly all of the territory lying to the north of Fountain Creek, or more than one-third of the total area of the reserve, may be classed as practically destitute of living timber of any kind except small aspen. This ground, after being cut over, is said to have been burned about the year 1880, only a few small belts, groups, or individuals of the timber then standing escaping the flames. This timber was not large, and the surviving remnants to-day would make mediocre sawmill lumber. They stand like oases in a desert, and the seeds which they produce are the chief hope of natural reforestation of this burned district. Nevertheless, there are yet hundreds of contiguous acres upon which not a single young conifer has yet started to take the place of those destroyed. Near the living trees which escaped burning there is generally a good, although not dense, growth of young trees coming, the individuals becoming more and more isolated and rare with increased distance from the old seed-bearing trees.

The trees killed by the fire are mostly quite sound, and are either standing or fallen to the ground, and are used locally for fuel and other purposes. Over most of this tract the white pine (*Pinus flexilis*) appears to have been plentiful, but yellow pine and Douglas spruce were the prevailing trees, some Engelmann spruce and blue spruce being mixed with them. A narrow strip along the extreme northern end of the reserve, and bordering on the Plum Creek Reserve, escaped the general conflagration of the time, and here are growing small or medium sized trees of the species mentioned, with a considerable percentage of lodgepole pine among them. The best of the timber has been cut out, but what remains is well worth care and protection, and in future should furnish a continual small local supply of building timber.

A. NORTHERN PART OF PIKES PEAK RESERVE, BURNT ABOUT 1880.

B. ASPEN AND SCATTERED PINUS FLEXILIS ON GROUND IN PIKES PEAK RESERVE.

Burnt probably about fifty years ago.

FIRES.

No great forest fires have occurred within the Pikes Peak Reserve in recent years. The most serious of the later fires burned over considerable valuable timber lying to the west of Pikes Peak, partly within and partly outside the reserve. This area is said to have been burned in June, 1896, and the owners of sawmills were accounted responsible.

The early fires which devastated a great part of the forest land are said to have taken place when the country was first explored, about half a century ago; and it is claimed that they were started by Indians, who thus attempted to drive out the game before them when they were compelled to leave this region for more distant reserves.

The more recent fires have generally been confined to small areas, and the damage has not been very great in comparison with the earlier fires, which swept the ground and destroyed the primeval growth.

Sparks from locomotives of the Colorado Midland Railway and the Manitou and Pikes Peak Railway have caused numerous small fires, but, in recent years at least, these corporations seem to have taken reasonable precautions to prevent them. Campers, prospectors, and other persons making fires, and careless about guarding or extinguishing them, have sometimes been responsible for considerable damage. Only one fire was recorded during the past season. It occurred in early October among some timber south of Pikes Peak, burned slowly for several days, and was finally extinguished by a snowstorm. The origin of this fire or the extent of the damage could not be ascertained, as there was not time to make a personal inspection of the ground.

Small grass fires are sometimes started from sparks from locomotives, but they are usually quickly suppressed before they get beyond control.

It is probably safe to say that 75 or 80 per cent of the total area shows marks of damage by fire. Some of this burning occurred before the coming of white men, and these tracts have a considerable growth of trees or timber. Most of the forest has been burned since the country was first explored, the great fires about Pikes Peak occurring about fifty years ago, or about 1848, according to the best information obtainable. Aspen and some shrubs are abundant, but conifers are coming in very slowly except in the vicinity of groves or individuals, which escaped the general conflagration.

Dr. W. A. Bell, of Colorado Springs, states that the large burned tract in the northern part of the reserve, north of Fountain Creek, was destroyed by fire about 1880. The few trees and groves which escaped are seeding the ground about them, but it will be centuries before another coniferous forest exists here if natural conditions prevail. The fire burned the humus so thoroughly that the bare disin-

tegrated granite is everywhere apparent. Aspen has come in, and a few shrubs, but grasses and grazing herbs are not abundant, except along some of the small streams.

SETTLEMENTS.

Excepting at Palmer Lake, situated in the northeastern corner there are no large settlements or aggregations of dwellings located within this reserve. There are few ranches or mining camps, and a relatively small proportion of the entire area comes under the provisions of patented or homestead lands.

A large proportion of the lands in private ownership are located near the line of the Colorado Midland Railway, between Manitou and Woodland Park, the latter small settlement being just on the reserve boundary.

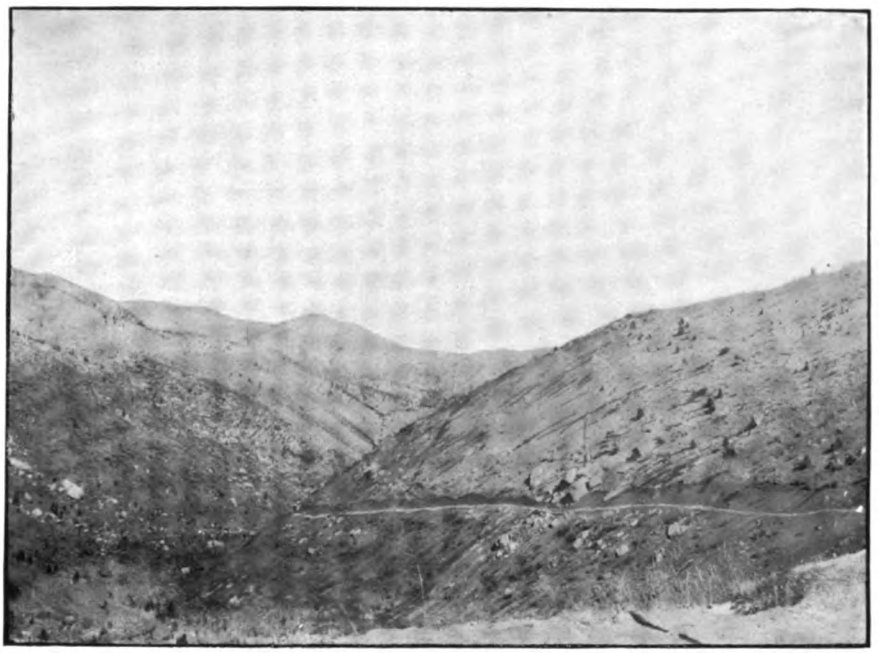
Cascade and Green Mountain Falls are the principal stations along this route, the total permanent population being but a few score persons, although in summer it is greatly augmented by tourists and people seeking rest and recreation in the mountains. Ute Park is another small summer resort situated between the two stations mentioned, and there are a number of small ranches distributed along the creek and its tributaries up to Woodland Park, where several dwellings are located within the reserve limits. Although Palmer Lake lies within the reserve, the fact is not generally known among the inhabitants. It is located on the line of the Denver and Rio Grande and of the Atchison, Topeka and Santa Fe railroads, and has a population of between 100 and 150 persons, this number being very greatly increased during the warm season by summer residents, lodgers, and campers.

Glen Cove, on the wagon road on the north side of Pikes Peak, is merely a lodging and way-station house for tourists and is vacated in winter. Along the line of the Manitou and Pikes Peak Railway there are a number of cottages and boarding establishments, occupied in summer, but usually vacant in winter, and near Lake Moraine and above it are the stations and lodgings of those employed in the development of the waterworks.

Along Bear Creek and North Cheyenne Creek are two or three small so-called ranches, and several are on the Cheyenne Mountain wagon road between Colorado Springs and Cripple Creek, the largest and most important being located at Beaver Creek and consisting of four or five occupied buildings, forming a halfway station between the two important towns on the road.

Throughout the reserve there are scattered a few solitary cabins of prospectors or miners, but at present there are no mining camps.

During summer there are many camping parties throughout the reserve, either merely traveling through it or remaining in one location for several weeks together.



A. BEAR CREEK CANYON, PIKES PEAK RESERVE.

Timber burnt about fifty years ago and deadwood largely removed for fuel.

B VIEW ON LINE OF MANITOU AND PIKES PEAK RAILWAY

Aspen burnt about five years ago, new growth of aspen coming

AGRICULTURE AND GRAZING.

There is little practical agriculture possible in this reserve and little is attempted. A few of the hardier grains and vegetables may be raised in limited areas of low altitude where irrigation is possible, as at Palmer Lake, along Fountain Creek, and similar situations.

Along the creeks the ground available and suitable is confined to very narrow strips, rarely more than a few rods wide excepting in a few places where it broadens into so-called parks. It is chiefly devoted to the raising of hay or forage for cattle in winter.

The chief business of the ranches consists in the grazing of cattle, of which there are a considerable number, variously estimated at from two to five thousand head, ranging over most parts of the reserve where pasturage is to be obtained. Fewer cattle range in the northern portion than in the southern part of the reserve. The largest herds belong to a company whose cattle chiefly range in the Beaver Creek region.

A large proportion of the cattle found in the reserve do not belong to persons located upon it, but are branded and driven in from settlements in the surrounding country, being taken out at the approach of winter. On this account it is not easily practicable to get a close estimate of the average number of cattle pastured on the Government land.

The pasturage is undoubtedly greatly inferior to that which formerly existed, and in past years much of the ground has been made to support a larger number of cattle than was warranted by the conditions. There are some areas where grazing should be restricted or abandoned. This is especially true of some of the high slopes or meadow-like intervales at the head of some of the streams to the south of Pikes Peak. Even moderate pasturage here has a tendency toward injuriously affecting the purity of the water supply for domestic purposes upon which the towns below are dependent. Excessive pasturage near the streams has greatly reduced or destroyed the grasses and other herbage and shrubs which should hold the soil and modify the flow of surface waters.

MINING AND LUMBERING.

There are no active, profitable mines located within the reserve limits, but considerable prospecting is carried on in almost all parts by individuals perennially hopeful of finding rich ore. Gold and silver are found, and it seems very probable that important discoveries may yet be made, such as have been made within 2 or 3 miles of the southwestern boundary. It was reported that small mills for the treatment of low-grade ore or gravel were to be erected 2 or 3 miles to the north of Green Mountain Falls, and should these

prove successful it is likely that an important industry may be developed in the treatment of a low grade of mineral-bearing rock or gravel, of which there seems to be an abundant supply.

No sawmills are now at work in the reserve. As most of the valuable timber has been either cut or burned, there is little left to induce extensive lumbering operations. On the Cheyenne Mountain road to Cripple Creek a few trees were being cut for telegraph or trolley poles, and in places a few railroad ties were taken. A small portable sawmill was located at Woodland Park, just at the reserve boundaries, and undoubtedly much timber which supplied it was taken from Government land, although, of course, it was claimed that it had been cut on patented land within the reserve limits.

In October, 1898, this mill was moved to another location farther from the reserve boundary. Another sawmill, located at Midland Station, must necessarily draw a large part of its supplies from public lands, perhaps also from the reserve, the boundary of which is within a mile of the mill.

The most extensive recent cutting has taken place within three or four years on the portion of the reserve bearing the heaviest timber, sometimes called the Black Forest, and located to the west of Pikes Peak and Glen Cove.

The numerous sawmill sites or "settings," indicating the moving of the mill from time to time in order to get nearer the trees cut, and the heaps of sawdust and refuse attest the activity and extent of the lumbering carried on here. The locations of the mill and the cuttings were situated in part on reserve land and in part on ground outside of it, but belonging to the Government. The destruction of timber by the ax was finally supplemented by the action of fire, which burned over a large area of that which remained. This fire was believed to be of incendiary origin, in order that the forest might come under the head of dead timber, which is allowed to be taken freely from the reserves. After the cutting and fires had deprived the tract of its best value, Government officials interfered and the sawmill operations were stopped.

In spite of the havoc already accomplished, there is still some good living Engelmann spruce and a small proportion of Douglas spruce here well worth guarding from further damage.

The fires, which occurred in June, 1896, have left a great deal of standing dead, but sound, timber, which is now being utilized for mine timbers. The trees are cut in the forest into various convenient lengths and hauled to the Midland Station of the Midland Terminal Railway, where they are loaded upon flat cars and shipped to Cripple Creek and other mining camps. The logs are shipped without squaring or dressing, or even the removal of bark. Delivered at the cars, logs 16 feet long are paid for at the rate of 2½ to 3 cents per inch of

diameter, measured at the small end, and logs from 4 inches in diameter and upward are taken.

At Woodland Park some aspen or quaking asp (*Populus tremuloides*) was collected and shipped to Denver to be manufactured into excelsior. No sticks less than 4 or 5 inches in diameter were shipped. They were usually cut into lengths of 8 or 12 feet, and stripped of bark, and commanded about $4 per cord, delivered at the shipping station. This kind and quality of lumber is very limited in quantity in this region, and the few cords accumulated represented gleanings from both Government and patented ground in the vicinity. A considerable quantity was also collected and shipped at Divide, a station about midway between Woodland Park and Florissant and 2 or 3 miles north of the westernmost part of the reserve. Aspen of fair size grew more plentifully in this vicinity than in most other places seen.

SUGGESTIONS.

As may be readily seen from the foregoing observations and the accompanying photographs, which are selected to show fair average conditions, there is but a small portion of the area of this reserve sufficiently covered with trees to deserve the name of timber land; and from such timber land as exists the best has been already taken out for sawmill lumber and other purposes. Such timber is confined to the southern portion, the northern half being practically timberless. South and west of Pikes Peak a few million feet of lumber could yet be found and taken out without material injury to the present forest covering, but care should be taken in removing old trees, as seedlings or young growths are not abundant. A great many of the trees killed by fire are still sound and in good condition and will be of value both for mining timbers and for fuel, and for the latter purpose will furnish a local supply for many years to come.

On large areas which were completely burned over, and where no conifers escaped destruction, it is probable that, left to natural conditions, two or three centuries must elapse before the ground again bears a scanty covering of medium-sized trees such as formerly grew upon it. Meanwhile aspen and various shrubs will occupy the ground in part. In places where a few trees or groves escaped, or in the neighborhood of unburned areas, the ground is likely to be much sooner filled with a new growth.

The northern part of the reserve may be regarded as of little or no present value as a timber reserve or for agriculture, and on account of the poverty of the soil the grazing is poor and meager. Moderate pasturage here, however, will not seriously affect the returning forest conditions, which will naturally be very slow.

That these conditions could be supplemented and aided artificially and economically by dissemination of seed would seem probable. Cer-

tain it is that this territory is fit for little else than the growth of such trees as will exist upon it.

If practicable, it might be well to modify the boundaries of the reserve so that Palmer Lake should not be included within them. It is also important that the actual boundaries should be more clearly marked, and the persons living near them be better informed in regard to them. This is particularly desirable along the boundaries where there is timber, especially in the Black Forest region, in the western part of the reserve, where inquiries were made, and ignorance was professed in regard to the boundaries by persons who were removing dry timber from what was probably Government land.

Without injury to any private rights, at least 15 or 20 square miles lying to the west and southwest of Pikes Peak could be added to the reserve with great advantage. This would include Sentinel Point and other territory above timber line, and the springs or sources of various small streams flowing westward or southward.

The irregular boundary line in the southeastern part of the reserve is inconvenient and without any apparent geographical or topographical significance.

PLUM CREEK TIMBER LAND RESERVE.

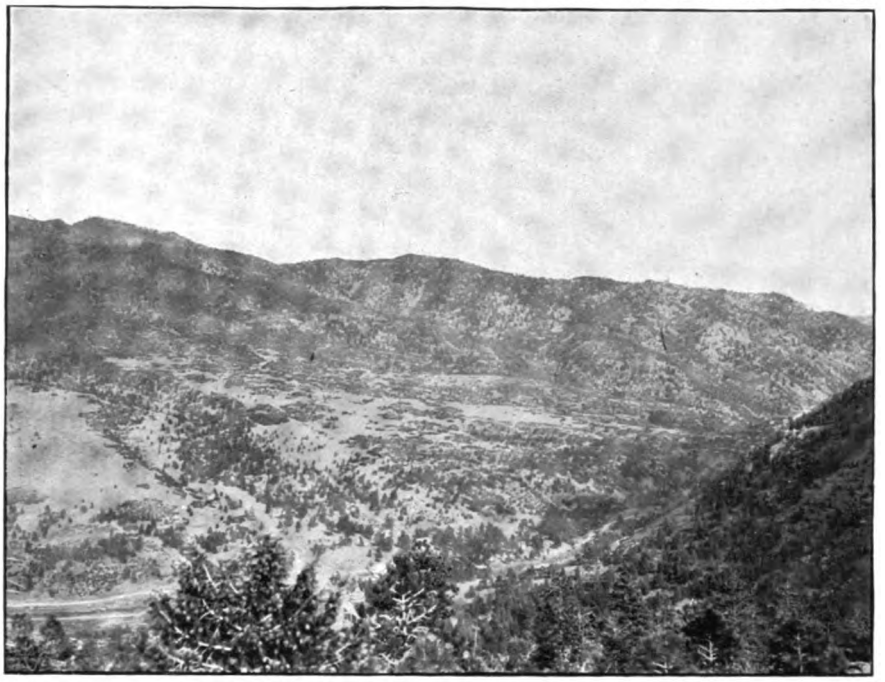
BOUNDARIES.

The boundaries of this reserve, as established by Executive order of June 23, 1892, are as follows:

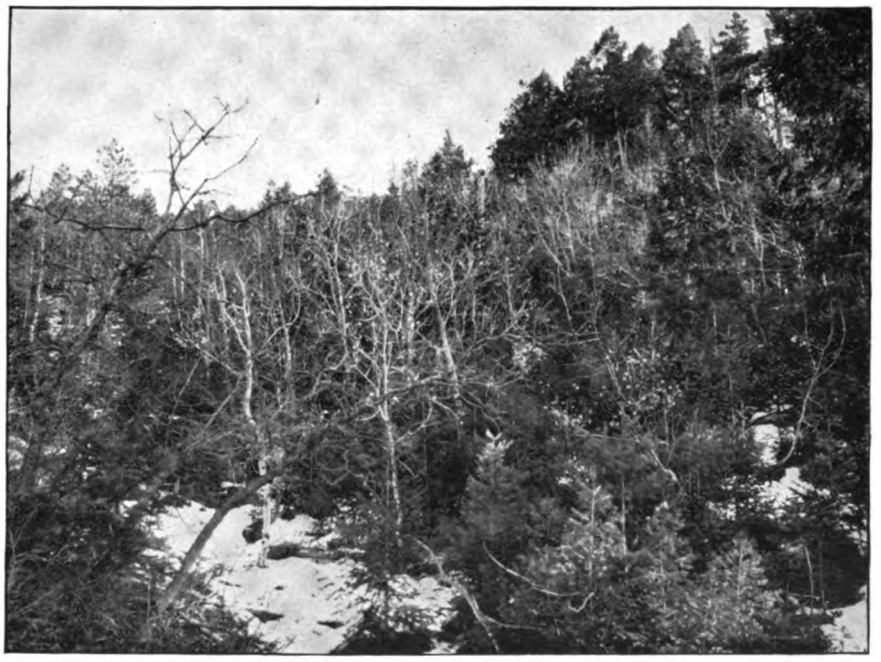
Township ten (10) south, of ranges sixty-eight (68), sixty-nine (69), and seventy (70) west; township nine (9) south, of ranges sixty-eight (68) and sixty-nine (69) west; township eight (8) south, of range sixty-nine (69) west; and so much of township ten (10) south, of range seventy-one (71) west; township nine (9) south, of range seventy (70) west; township eight (8) south, of range seventy (70) west, and township seven (7) south, of range sixty-nine (69) west, as lie to the eastward of the South Platte River.

TOPOGRAPHY AND DRAINAGE.

This reserve is situated directly to the north of the Pikes Peak Reserve, which adjoins it for 6 miles along its southern boundary. It is located entirely within Douglas County, and the area is given as 179,200 acres. The average altitude is much lower than that of any of the three reserves examined, the highest point reaching to less than 9,800 feet, in Thunder Butte, near West Creek, in the southwestern portion; the lowest falling below 5,600 feet in the extreme northeast corner. The reserve as a whole might be likened to a high, hilly plateau, having a diminishing slope northward, and cut by many gulches or canyons having a general easterly or westerly direction. The greater part of the area lies at an altitude between 7,000 and 8,000 feet. Irregular ridges, extending from north to south through the central



A. VIEW LOOKING OVER CASCADE TO NORTH SLOPES OF HILLS ALONG UTE PASS, PIKES PEAK RESERVE.



B. EXCEPTIONALLY GOOD STAND OF YOUNG DOUGLAS SPRUCE ON NORTH SLOPE IN PLUM CREEK RESERVE AMONG ASPEN AND SCRUB OAK

Altitude 7,500 feet.

part of the reserve throw the waters in an easterly direction into Plum Creek, which falls into the South Platte River below the reserve boundaries, or in a westerly direction into small streams, which also flow into the South Platte along the reserve boundary.

The most important stream flowing through this reserve is West Creek, with its important tributary known as Trout Creek. These really have their sources and some of their most important feeders outside the reserve limits, in the high comparatively level and partly open country lying to the west of the northern part of the Pikes Peak Reserve. They pass through and drain the southwestern portion of the reserve, coming together and forming what is locally called Horse Creek, which runs 4 or 5 miles before entering the South Platte River. The eastern slope of the reserve is drained by several small branches of Plum Creek, the most important of which are West Plum Creek and Jackson Creek, which falls into it.

There are practically no lakes or ponds or important natural reservoirs in the Plum Creek Reserve, but there are several small private storage reservoirs and numerous situations where such could be economically constructed, as they are especially necessary to ranches along the eastern slope.

The amount of water flowing from this reserve is not large, and it is liable to great variation. On account of its relatively low altitude and the absence of dense forest covering, the snows disappear early in the season, so that during summer the smaller creeks sometimes become dry or have a very much diminished flow.

On the west side the extended area of the watershed of West Creek and its tributaries enables this stream to maintain a fair flow of water throughout the year, although much diminished in summer, when many of the smaller tributary creeks and springs become dry.

While passing through the reserve very little of the water is changed from its course for irrigation purposes, although much is used on the lands below.

TIMBER.

The trees of chief economic value in this reserve are yellow pine (*Pinus ponderosa*) and Douglas spruce (*Pseudotsuga taxifolia*), and with these are associated a small amount of blue spruce, Engelmann spruce, *Pinus aristata* and *Pinus flexilis;* while in the southeastern portion, south of Devils Head or Platte Mountain, there is an abundance of lodgepole pine (*Pinus murrayana*). North of Devils Head Mountain a large proportion of the hills or ridges are practically destitute of timber, at best only a few scattered trees being found upon them, although along the intervening gulches or creeks there is or has been a fair growth of small-sized or medium-sized timber trees. These nearly treeless hills generally do not show many indications of ever having

borne any heavy forest. They support several species of shrubs, which partly cover the coarse granitic soil.

In the southern portion, which largely has an altitude of from 500 to 1,000 feet greater than the territory to the north of Devils Head Mountain, the country has much more of the appearance of a forest, although the trees are nowhere large or would produce over 2,000 feet of good sawed lumber to the acre on any average measured section of land.

The local demand for lumber and the facility with which it could here be taken out has caused nearly the whole of this reserve to be very thoroughly gone over by lumbermen, and the best has been removed. In some places a second or third culling out of the best trees has taken place. Notwithstanding the activity of sawmills, however, there are still a good many million feet of coarse lumber procurable from yellow pine and Douglas spruce in the southern and southwestern part of the reserve. This fact is well known to the sawmill men, and three or four portable steam sawmills are at work upon what timber remains. Trees 3 feet in diameter of trunk are very rare and most of the logs cut range between 12 and 20 inches in diameter at the stump. With the trees fit for cutting profitably into lumber there is a very large proportion of material of various ages and sizes which will not be servicable for many years to come and which should receive greater consideration and protection than is usually accorded by wood choppers when taking out the trees which they consider worth cutting.

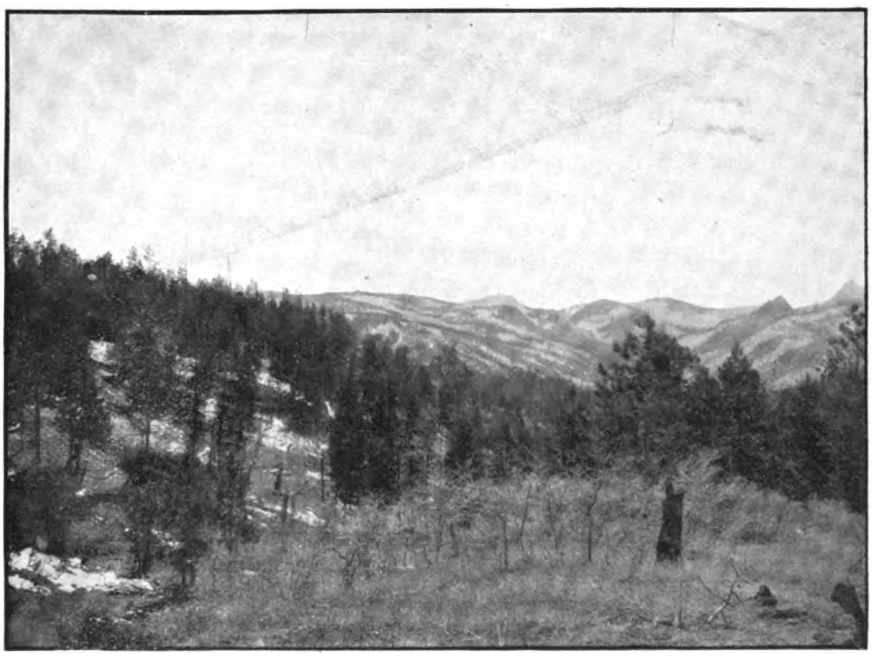
As in most other parts of this region, it is common to find the slopes facing the south almost bare or producing a very scattered growth of yellow pine, while the opposite northern slopes are much more closely timbered with Douglas spruce and yellow pine, although that which remains is chiefly of small size.

On account of great variation in the conditions and quality of the standing timber, the extensive culling out of the best over all parts, and the numerous practically bare tracts or those which have been burned over, it is extremely difficult to give any close approximate estimate of the quantity of ready available sawmill or railroad-tie timber still standing upon the reserve. From as careful observations and estimates as could be hurriedly made, however, it is probable that, by taking trees above 8 or 10 inches in diameter, at least 50 million or 60 million feet of rough sawmill lumber could still be gleaned from the wooded parts of the reserve.

The clear trunk furnished by the ready sawmill timber is very short, probably not over 25 or 30 feet, but a considerable portion of the limb-bearing parts of the trunks are used. Douglas spruce 100 feet high, with 50 feet of clear trunk, and 20 inches in diameter at the stump, is still found in sheltered locations in canyons, but such good

A LOOKING WEST, ABOUT 2 MILES ABOVE FOOT OF HILLS ON JACKSON CREEK ROAD, PLUM CREEK RESERVE.

Timber long ago cut off or burnt.



B AREA EAST OF DEVILS HEAD MOUNTAIN, PLUM CREEK RESERVE.

Yellow pine and Douglas spruce; few trees large enough for sawmill; much burnt or showing effects of former fires.

A. SOUTHWEST PART OF PLUM CREEK RESERVE.

Exceptionally favorable condition of timber; not yet entered by lumbermen. Yellow pine and Douglas spruce.

B. VIEW ALONG FOURMILE CREEK, WEST OF THUNDER BUTTE, PLUM CREEK RESERVE.

Remnants of yellow pine and Douglas spruce left by lumbermen.

trees are rare. Some lodgepole pine is fit for use, but most of it is undersized.

In some of the gulches quaking aspen occasionally attains a height of 50 or 60 feet or more with the trunk a foot in diameter, but timber of this species and size is too rare to be of much commercial importance.

FIRES.

Throughout this reserve there are in different parts large areas which have in past years been visited by forest fires, and over much of the territory there are evidences of ground fires which have destroyed the humus, leaving only the bare granite sand. The forest fires have not swept any such extensive continuous areas as in the Pikes Peak Reserve; though they have burned over considerable tracts, they have left intervening groups or belts of living timber, especially in the northern and eastern parts. On some of the burned ground a new growth of conifers is gradually coming in and has already attained good size and density; in others the ground is practically bare, excepting for aspen and various shrubs. Chief among these latter are scrub oak (*Quercus gambelii*), *Ribes cereum*, *Cercocarpus parvifolius*, *Holodiscus discolor*, *Rubus deliciosus*, *Prunus pennsylvanica*, *Ceanothus fendleri*, *Jamesia americana*, and *Arctostaphylos uva-ursi*.

The best timber remaining is in the southern and southwestern part of the reserve and along the South Platte River, and fortunately these parts have not been seriously devastated by fire.

Small burned areas which were set on fire by sparks from sawmill engines are occasionally seen. Several cases of fires started by lightning were reported. No railroad crosses the reserve, but the Colorado and Southern Railway, commonly called the South Park Line, follows the course of the South Platte River along the northern boundary.

North of Devils Head Mountain there are large areas of nearly bare hills which have been swept by fire, although they do not appear to have ever had a dense growth upon them. Upon these hills are a few scattered yellow pines, but little else which can be called arborescent, as the aspen on these dry exposures apparently never grows large. Recovery from the burns must be exceedingly slow, especially on southern slopes. On northern slopes seeds appear to germinate more freely and seedlings more easily get a foothold. South and southwest of Devils Head Mountain the young lodgepole pine is of various sizes, according to the age of the burns, and it sometimes forms almost impenetrable thickets.

The lodgepole pine, on account of its dense growth and resinous character, burns more freely than the other species, and, apparently, small strips are sometimes burned, the fires eventually dying out, so that it is not uncommon to find different areas with trees of two or

three distinct ages or periods growing upon a tract of a few hundred acres.

In the more open woodland evidences of surface or ground fires are common, and on these areas there are few or no seedling trees, and older trees sometimes show blackened bark, or destruction of the bark on one side, as evidence of damaging fires which did not reach up among the limbs of the trees, nor were hot enough to destroy the entire bark at the base, and so cause death.

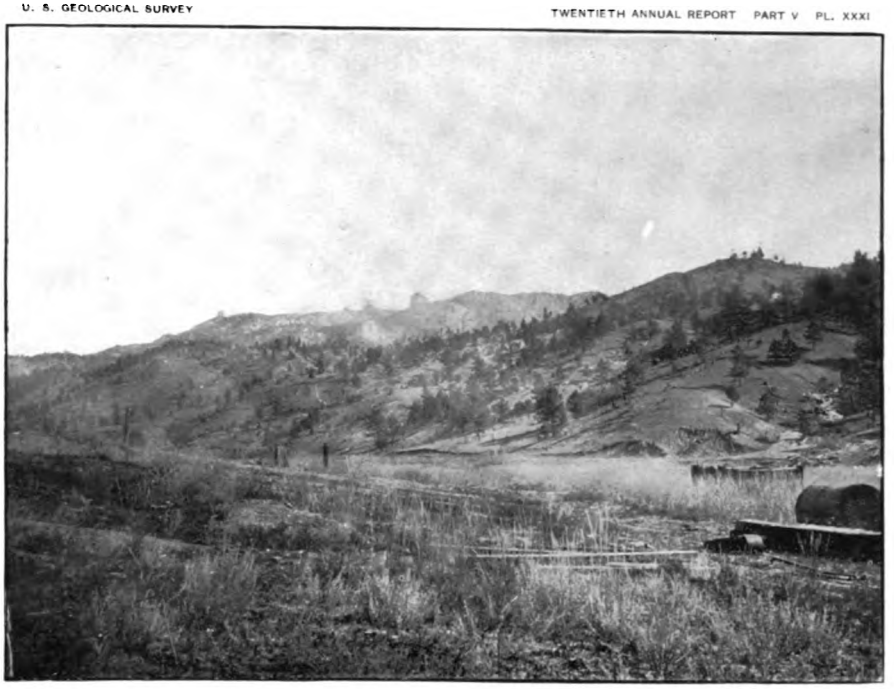
SETTLEMENTS.

A larger proportion of the total area of this reserve is in private ownership, under patent and homestead laws, than in any of the three reserves examined. At least one-third of the territory is claimed under the provisions of these laws. The largest proportion of these lands is situated in those parts having the lowest altitude and most level surface, as at the northern end, and also the middle eastern side, including Perry Park, where there is a solid contiguous block of about 20 square miles of patented land included within the reserve lines. A considerable portion of the patented land is not used or occupied by the owners.

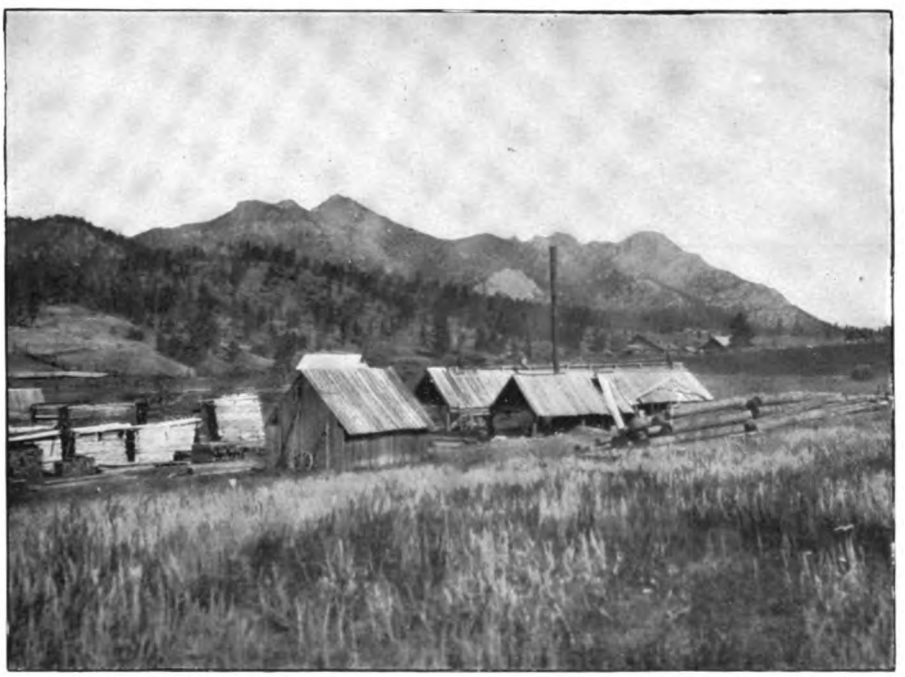
The western side of the Plum Creek Reserve has been the scene of intense mining excitements within the past four or five years, resulting in the establishment of half a dozen small settlements or "town sites." The boom having passed, on account of disappointing expectations as to the richness of the discoveries, the so-called towns are partially deserted for other fields, so that many of the hastily constructed buildings are now without tenants.

The largest of these mining camps is Pemberton, sometimes called West Creek, located on West Creek 9 or 10 miles above its junction with the South Platte River and near the southern boundary of the reserve. Probably two-thirds of the hundred or more habitable buildings were vacant in the summer of 1898, but the population here is liable to considerable fluctuation, from time to time, according to the activity of sawmills in the vicinity or the development of mines or mining prospects.

Other small settlements are Given, about 2 miles above the mouth of West Creek; Daffodil or Trumbull, near the junction of West Creek and the South Platte River; Dunaway and Nighthawk, at intervals of 3 or 4 miles down the South Platte River. These last three places are in part located across the river in the South Platte Reserve, in Jefferson County. They are each composed of merely a few occupied buildings of very cheap construction, and are liable to have their populations depleted or increased any day, according to the rise of mining excitements in other places or developments in the immediate vicinity. At present they derive most of their life from prospectors,



A. VIEW AT DUNAWAY, LOOKING NORTHEAST ACROSS SOUTH PLATTE RIVER.



B. VIEW ABOVE PEMBERTON (WEST CREEK), PLUM CREEK RESERVE, LOOKING NORTHWEST OVER SAWMILL TO THUNDER BUTTE.

or from those employed in the lumber business, as much lumber is hauled by team through these places on the way down the valley of the South Platte River to South Platte Station on the South Park Line, whence it is shipped by rail to Denver and other points.

Besides these "town sites," other settlements, mostly abandoned or with but a single occupied dwelling, and prospectors' cabins or ranches are scattered through the reserves, chiefly along the more important creeks. The largest and best ranches are located in the comparatively low region toward the northern end and about Perry Park on the eastern side of the reserve, where there are five or six considerable ranches chiefly devoted to the raising of cattle. Perry Park itself was originally designed as a summer resort by its owners, but at present contains only two or three occupied dwellings, and the hotel is not in use. As the situation is a very picturesque, interesting, and attractive one, it is probable that at some future time a considerable population will be centered here.

At Daffodil, on the South Platte, are so-called mineral springs, which are visited by a varying number of people during the summer, who occupy inexpensive cabins or cottages put up for their accommodation.

The only expensive buildings on the reserve, or those costing more than a few hundred dollars, are located outside of the hills, about Perry Park.

AGRICULTURE AND GRAZING.

Timber, and possibly mining, must ever remain the chief considerations of commercial value in this reserve. Incidentally, grazing for several thousand cattle may be furnished, but much development of pure agriculture is out of the question. At the lowest altitudes, at the northern end of the reserve and the extreme eastern side, as represented by the vicinity of Perry Park, lying southwest of Dawson Butte, it is possible to raise the hardier cereals and forage crops, potatoes, and other hardy vegetables. Attempts have been made to raise some of the hardier fruits, but as yet with uncertain success. The areas suited to such crops are, however, limited to a comparatively few acres of irrigable land. Oats, rye, potatoes, and other hardy crops are also grown on the narrow strips of fertile or irrigable land bordering the creeks in some places and along the South Platte River. There is a ready local demand for anything that can be raised, and, in fact, most of the food supplies used in the reserve have to be brought in from outside. Grain and fodder are the chief interests cultivated, and are used on the ranches for the cattle and horses in winter.

The so-called ranches vary much in size and value. Some are deserted, some merely prospectors' cabins, others comprise perhaps an acre or two of arable land and three or four head of stock, while

the largest may have 300 head of cattle grazing both on patented and reserve Government lands. Two of the largest of these ranches, estimated to graze about 300 head of cattle each, are located in the northern and western slopes of the reserve, and another large one is in the extreme south, near Manitou Park. The size of herds is no indication of proportionate territorial ownership. In summer the cattle on these ranches are usually allowed to roam at large over any part of the reserve and are brought into sheltered places at the approach of severe winter weather.

There may be 50 or 60 persons having ranches upon the reserves, who, in the aggregate, probably have between 1,500 and 2,000 cattle and horses. This, however, does not represent the total number of cattle grazed on the reserve in summer, because a great many are annually sent into the reserve from ranches outside of the boundaries, sometimes at a considerable distance from them. By thus grazing on the public lands the ranchmen are enabled to keep a much greater herd than would be possible on their own comparatively small ranches. On their patented areas they commonly allow the native grass to grow for winter grazing or harvest it, and also raise other forage where irrigation is possible.

As the forested lands are rarely densely covered, some grasses, furnishing scattered and limited grazing, are found almost everywhere; but it is naturally along the creeks that the best and only important pasturage is found. As it is here that cattle find necessary water, and as it is customary to furnish them with salt in such localities in order to keep them together as much as possible, it naturally follows that these regions are most closely grazed. That the grazing is often excessive and too localized is apparent to anyone following many of the streams, particularly the tributaries of Trout Creek and West Creek, in the southwestern part. The consequence is that the pasturage has deteriorated greatly, the ground produces much less food for animals than it did a few years ago, and the conditions are yearly becoming worse. The best forage grasses, having no chance to reproduce themselves by seed, and being constantly cropped almost to the very roots, and crushed or displaced by hoofs, must inevitably become greatly weakened or die out. Moreover, the shrubs and herbaceous vegetation bordering the streams are constantly cropped, trampled upon, and eventually destroyed. These served to protect the banks of the creeks, and prevent them from washing, and also served to check and hold the flow of water in times of unusually heavy precipitation.

The slender streams themselves are trampled and the waters are so polluted as to be unfit for human use, if, indeed, the streams are not practically dry, as they are very apt to be during the late summer season, owing to the unnatural conditions which prevail. Moreover, the excessive number of cattle in some localities is more or less damaging

A PERRY PARK, LOOKING SOUTHEAST FROM HIGH ROCK.

Reservoir and C. A. Roberts's house on left.

B DAKAN (PERRY PARK), LOOKING NORTH; DAWSON BUTTE ON RIGHT

Dark patches are chiefly scrub oak.

to young forest growth, as even young conifers like Douglas spruce are occasionally browsed upon, and many seedlings are destroyed by trampling.

Unless the grazing is restricted and regulated the pasturage must certainly grow even poorer than it is now. Under proper regulations and limitations a considerable number of cattle might be pastured on the reserve without serious injury, but it would in the end be of greater benefit to the State and Government to prohibit grazing altogether than to allow it to be overdone.

Sheep grazing does not appear to be carried on in or about the reserve.

MINING.

No well-established paying mines are yet in operation, although it is claimed that numerous promising "prospects" have been discovered and only lack capital for their proper development.

Two or three small mills are in course of construction in the Trout Creek Valley north of the southern boundary of the reserve. These are intended to treat by cyanide process low-grade ore-bearing rock or the gravel or sand so abundant in this region and which is said to contain a sufficient percentage of gold to make the workings profitable. Should this prove to be the case, it is likely that it will mean a considerable and permanent addition to the population of this locality. Prospectors are busily engaged in developing shafts or tunnels, constantly having before them the hope that they may make discoveries which will lead to the building up of a second Cripple Creek. That gold exists here there is ample evidence, and it is chiefly a question of the abundance of mineral-bearing rock and of the employment of capital necessary to get it out economically. Persons having ranches or cattle in the reserve, or in other kinds of business, besides professional miners and prospectors, give some time to prospecting when not otherwise employed.

While the principal mining or prospecting has been developed in the West Creek and Trout Creek regions and along the South Platte River, there are men in other parts of the reserve who are prosecuting the search for the precious metals. On the eastern side of the reserve, in Spring Creek Canyon near Perry Park, a tunnel 170 feet in length was found, from which it was stated that pay ore had been taken which assayed about $35 in gold and 300 ounces in silver to the ton. The statements of prospectors are not always to be implicitly relied upon, however, as they are likely to be biased by their hopes.

In the Perry Park territory, on the eastern edge of the reserve, a small mill has been started for the manufacture of plaster and similar products from gypsum and other rock suitable for such purposes, which is plentiful in this locality. The product is shipped by railroad

to Denver, Colorado Springs, or wherever a market can be found. The work is yet largely experimental, but may develop into a considerable business.

LUMBERING.

A good deal of lumbering is still carried on in this reserve, no doubt largely illegally, although usually claimed to be under the provisions of existing laws. At the time the reserve was examined six portable steam sawmills were in operation upon it, altogether capable of turning out between 60,000 and 70,000 feet of lumber a day when running full time. The largest of these mills was located on Fourmile Creek, west of Thunder Butte, and was stated to be able to produce from 15,000 to 18,000 feet a day. This mill had exhausted the adjacent supplies and was preparing for removal to another location within a few miles. It was claimed that the mill was located on private holdings of land and that the cuttings were from a purchased school section.

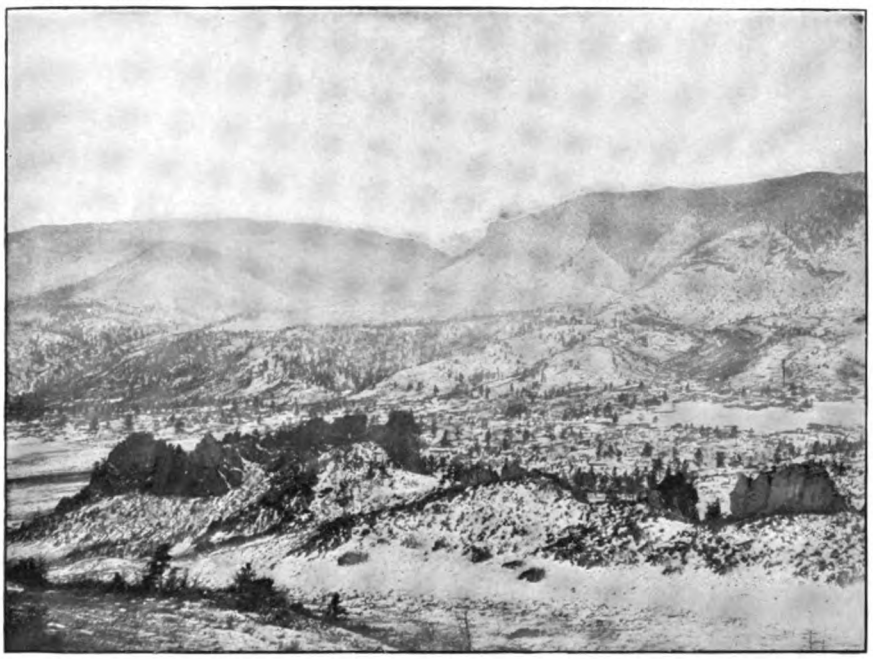
Another mill is situated about a mile south of Pemberton. Its reported capacity was 12,000 or 13,000 feet of lumber a day, and it had been located on the same site for over a year and a half, a longer time than the average period for an active mill to remain in the same place.

A large mill with a capacity of about 15,000 feet of lumber a day had been at work near the mouth of West Creek but was in process of removal to a location outside of the reserve, where a more abundant timber supply was obtainable.

A mill capable of cutting 8,000 or 10,000 feet a day had been recently relocated at the head of Jackson Creek, to the west of Devils Head Mountain, cutting from what was claimed to be homestead and school-section land. It had previously been located farther down Jackson Creek. About 3 miles east of Nighthawk, on the road to Sedalia, a small sawmill was at work, and another was located on the eastern slope south of Perry Park.

Along rivers and creeks throughout the reserve, piles of sawdust and sawmill refuse are frequently met, each one indicating the base of active operations of some lumberman for a time. These piles are commonly left to sink gradually into decay, but at Given the great accumulation of sawdust left by a recently removed mill was burning and probably continued to burn for several weeks.

The lumber cut and sold by these mills is practically all yellow pine and Douglas spruce, the pine constituting decidedly the larger proportion. It is used locally for buildings, mines, and other uses, and commonly sells for $8 or $9 per 1,000 feet at the sawmill. The lumber sold for use in the reserve, however, constitutes but a very small fraction of the total amount cut, most of it being shipped to markets far outside the reservation limits. This involves long hauls by team



A. PERRY PARK, LOOKING SOUTH-SOUTHEAST FROM HIGH ROCK.

B. PERRY PARK, LOOKING EAST FROM HIGH ROCK.

to distant railroad stations. The chief shipping point for lumber from this reserve is South Platte, on the South Park Line. Florissant, on the Colorado Midland Railway, also receives some of it, and lumber from the Jackson Creek region is hauled to Sedalia for sale and shipment.

At South Platte it was estimated that from 25,000 to 50,000 feet of lumber was loaded on cars and shipped daily, the points to which it was consigned being Denver and other commercial or demand centers. The lumber here is usually hauled by teams of four horses drawing two wagons together, and carrying 3,000 or 4,000 feet of lumber. Delivered at the railroad station it is worth $11 or $12 per 1,000 feet, pine and spruce generally being sold together and not sorted. Sometimes Douglas spruce is kept separate and cut into planks for bridges.

The lumber roads are in fair condition, especially along the South Platte River, where the present wagon road was once graded for a railroad, but upon which the rails were never laid.

Nearly all parts of the reserve are comparatively easy of access, and roads are sought or cut as the encroachments and demands of the sawmill necessitate in order to obtain fresh supplies of logs. Some of the ground has been cut over a second time, and even a third time, the first cuttings having taken only the larger trees, the last taking whatever can be found of sufficient size to yield a cash profit. Sticks not more than 8 inches in diameter are sometimes used by the smaller mills.

Whenever possible it is the custom to locate the sawmill on patented or homestead land, the timber thereon, and perhaps also the timber upon a school section, being purchased. But the tree cutter knows no boundaries, and the best timber is taken wherever found so long as there is no interference by Federal authorities.

The excuse is made by lumbermen and inhabitants that the cutting and shipping of lumber is necessary to give employment to people settled in the reserve, who may be prospecting part of their time, and who practically depend upon what they may earn at lumbering for subsistence. But at the present rate of cutting the ready lumber will soon be exhausted, although such considerations give little trouble to the men who think only of themselves and their immediate welfare—a class too common in the region of mining camps.

Should important mining industries ever be developed here all the timber in the region around would be needed for local use, but if it is allowed to be shipped to other parts of the State at the present rate the time may come when lumber will be brought in from outside, at a much higher cost to the miner.

Among other schemes for illegally getting timber from Government land, both in and outside the reserve, is the practice of staking out

a mining claim on some heavily timbered spot, cutting and selling the timber, and then abandoning the claim without attempting to get final deed or patent for it. As a mining claim includes about 10 acres, it is apparent that by frequent repetition of this scheme upon the very localized areas of good timber much of the best would very speedily be removed.

Besides the sawmills found at work within the reserve, several are or were located on unreserved Government land to the south, procuring their timber largely from ground upon which they had secured no right to trespass. There were rumors of the coming of other mills to this section, in which much good timber is still to be found, better in fact than now exists within the boundaries of the reserve. It is altogether probable that other mills will locate within the reserve unless prevented by legal action. As it is generally considered more economical to move the mill from place to place as the local supply of timber is exhausted, instead of hauling the logs to the mill from any considerable distance, most of the active mills occupy a given site for only a few months.

Great quantities of railroad ties have in the past been cut in the reserve and sold to the various railroads having stations within hauling distance. The cutting of ties is still carried on, although only locally and in comparatively small numbers. The work has been done under certain rights and privileges claimed by the railroads, by cutting upon homestead and patented lands, upon mining claims, or the timber has been boldly taken from Government land wherever trees of suitable size were found. Most of the cutting, however, has been done under cover of concessions claimed to have been granted to the railroads, but about the legality of which there appeared locally to be doubt and dispute. Douglas (locally called red) spruce is the species almost exclusively used. Standard ties are cut 8 feet long and dressed or hewn on two opposite sides to 7 inches in diameter, the other two sides being allowed the full diameter of the tree stripped of bark. All sticks must be large enough to square 7 inches when dressed, but no limit is placed upon the maximum size or diameter of the tie in the broadest or undressed direction. This usually regulates itself, as very large trees involve too much hewing and are too heavy and buiky for hauling most economically, inasmuch as the railroads pay no more for extra large ties than for those coming just within acceptable minimum dimensions. Such standard railroad ties are worth 35 cents each, delivered at a railroad station.

From some of the best of the Douglas spruce to be found, which are trees about 20 inches in diameter at the stump and 100 feet in height, 8 good ties may be cut, making a total length of 64 feet. Such trees are rare, and are found in only a few favored canyons; and, as a rule, not more than three or four ties are procured from each tree.

The cutting is done by outsiders, who come in for the sole purpose of getting out ties, or by persons owning ranches or land in the reserve, or by prospectors who, in many cases, having spent all their capital in sinking shafts or tunneling, cut ties as almost their only means of obtaining subsistence to prosecute their mining work in their particular locality. The cutting of ties is often very wasteful of good Douglas spruce, which could be made to yield fine sawmill timber.

Dry yellow pine or Douglas spruce which has died or been killed by fire is sometimes collected, hauled to railroad stations, and shipped for fuel. Such wood delivered at South Platte Station was paid for at the rate of about $2.75 per cord. It involved a haul of 6 or 8 miles.

SUGGESTIONS.

This reserve must be considered as essentially a timber reserve, rather than one likely to furnish very important water supplies. The timber should be much more rigidly protected from inroads by thieves and damage by fire. On thinly-wooded areas no trees should be allowed to be cut, even although mature, because they are essential as seed producers and give shelter and shade to the ground while the seed is germinating and young trees are getting established.

Such treatment would apply to nearly all the territory to the north of a line drawn east and west of Devils Head Mountain and much other to the south. South of Devils Head Mountain is located nearly all the timber which has an immediate marketable value and which could be cut without great damage to the forest covering. Much of this, however, is second-rate or third-rate in size and could advantageously be allowed to remain for many years. When cut, it should be under the general supervision of someone who would see that the young growth remaining was not needlessly injured.

All the lumber grown on the reserve may yet be necessary for consumption within or near it, and, as a means of conservation, a rule prohibiting the shipping of lumber to distant points might be beneficial. The exclusion of sawmills altogether from the reserve for a term of years would certainly be no injury to the forest crop and would eventually be a gain to bona fide residents. At present the lumber is chiefly taken by outside lumber companies which, after taking out what they are allowed to or can conveniently find, move out to other places, leaving the country deprived of its best crop, for which little or no return has been given. One or two licensed sawmills conscientiously managed could be worked with profit and would yield some return to the Government, but the wholesale indiscriminate destruction, carried on as in the past, should be stopped.

Pasturage, too, should be regulated and restricted, and it is believed that a tax, however small or nominal, on all cattle allowed to range

on Government land or found thereon, would have a beneficial effect. As all cattle are branded, the collection of such a tax or the registering of licenses should be practicable.

The boundaries of the reserve include some nearly treeless and purely agricultural or grazing lands along the eastern side, which are almost entirely held in private ownership. For this reason it may be considered best to eliminate a strip which includes Perry Park, and is 6 or 7 miles in length by about 3 in width. This portion of the reserve is traversed by about 5 miles of the direct public road between Palmer Lake, Sedalia, and Denver. Perry Park itself is a very interesting and attractive locality, chiefly on account of the peculiar tilted sandstone rocks and cliffs which are the distinguishing features of its surface and which in some respects are not excelled by the similar formations of the Garden of the Gods, near Manitou.

The laws regarding the cutting of railroad ties and sale of them to railroads, also the rights of railroads to timber from the reserves, should be better known among the people. The laws regarding lumbering are also imperfectly understood.

If copies of rules and regulations and some plan of description of the reserve boundaries could be served upon property owners in the reserve, and posted in public places in the country about it, there would be less excuse for trespass than now exists.

Where there are no guideposts or natural features to indicate boundaries notices posted along roads or trails crossing them should also serve for the same purpose.

The considerable area of land in private ownership is likely to be a constant source of trouble in maintaining the integrity of the reserve for timber production.

Of the three reserves examined the Plum Creek Reserve is the least important for the general welfare of the community, and at least the northern half could be eliminated without appreciably affecting the present or future water or timber supplies.

THE SOUTH PLATTE FOREST RESERVE.

BOUNDARIES.

The boundaries of the reserve as established by Executive order of December 9, 1892, are as follows:

Beginning at the confluence of the North Fork of the South Platte River with the South Platte River; thence up the middle of the channel of the North Fork of the South Platte River to the range line between township seven (7) south, ranges seventy-four (74) and seventy-five (75) west of the sixth (6th) principal meridian; thence northerly on said range line to the northeast corner of township seven (7) south, range seventy-five (75) west; thence westerly on the township line between townships six (6) and seven (7) south to the northwest corner of township seven (7) south, range seventy-six (76) west; thence southerly on the range line between

ranges seventy-six (76) and seventy-seven (77) west to the northeast corner of section thirteen (13), township seven (7) south, range seventy-seven (77) west; thence westerly on the section line between sections twelve (12) and thirteen (13) to the northwest corner of section thirteen (13) of said township and range; thence southerly on the section line between sections thirteen (13) and fourteen (14), twenty-three (23) and twenty-four (24), and twenty-five (25) and twenty-six (26) to the northeast corner of section thirty-five (35) of said township and range; thence westerly on the section line between sections twenty-six (26) and thirty-five (35), and twenty-seven (27) and thirty-four (34) to the northwest corner of section thirty-four (34) of said township and range; thence southerly on the section line between sections thirty-three (33) and thirty-four (34) of said township and range, and sections three (3) and four (4), nine (9) and ten (10) and fifteen (15) and sixteen (16), township eight (8) south, range seventy-seven (77) west to the northeast corner of section twenty-one (21) of said last-named township and range; thence westerly on the section line between sections sixteen (16) and twenty-one (21), seventeen (17) and twenty (20), and eighteen (18) and nineteen (19) to the northwest corner of section nineteen (19) of said township and range; thence southerly on the range line between ranges seventy-seven (77) and seventy-eight (78) west to the northeast corner of section thirteen (13), township nine (9) south, range seventy-eight (78) west; thence westerly on the section line between sections twelve (12) and thirteen (13) and eleven (11) and fourteen (14) to the northwest corner of section fourteen (14) of said township and range; thence southerly on the section line between sections fourteen (14) and fifteen (15) to the southwest corner of said section fourteen (14); thence westerly on the section line between sections fifteen (15) and twenty-two (22) and sixteen (16) and twenty-one (21) to the northwest corner of section twenty-one (21) of said township and range; thence southerly on the section line between sections twenty (20) and twenty-one (21) and twenty-eight (28) and twenty-nine (29), to the southwest corner of section twenty-eight (28) of said township and range; thence easterly on the section line between sections twenty-eight (28) and thirty-three (33), to the southeast corner of said section twenty-eight (28); thence southerly on the section line between sections thirty-three (33) and thirty-four (34) of said township and range, and sections three (3) and four (4), nine (9) and ten (10), and fifteen (15) and sixteen (16), township ten (10) south, range seventy-eight (78) west, to the northeast corner of section twenty-one (21) of said last-named township and range; thence westerly on the section line between sections sixteen (16) and twenty-one (21), seventeen (17) and twenty (20), and eighteen (18) and nineteen (19), to the northwest corner of section nineteen (19) of said township and range; thence southerly on the range line between ranges seventy-eight (78) and seventy-nine (79) west, to the southwest corner of township ten (10) south, range seventy-eight (78) west; thence westerly on the second (2nd) correction line south to the northwest corner of section one (1), township eleven (11) south, range seventy-nine (79) west; thence southerly on the section line between sections one (1) and two (2), eleven (11) and twelve (12), thirteen (13) and fourteen (14), twenty-three (23) and twenty-four (24), twenty-five (25) and twenty-six (26), and thirty-five (35) and thirty-six (36) of said township and range, and sections one (1) and two (2), eleven (11) and twelve (12), and thirteen (13) and fourteen (14), township twelve (12) south, range seventy-nine (79) west, to the southwest corner of section thirteen (13) of said last-named township and range; thence easterly on the section line between sections thirteen (13) and twenty-four (24) of said township and range, and sections eighteen (18) and nineteen (19), seventeen (17) and twenty (20), sixteen (16) and twenty-one (21), and fifteen (15) and twenty-two (22), township twelve (12) south, range seventy-eight (78) west, to the quarter section corner between said sections fifteen (15) and twenty-two (22); thence southerly

through the middle of sections twenty-two (22), twenty-seven (27), and thirty-four (34) to the quarter section corner on the south boundary of section thirty-four (34) of said township and range; thence easterly on the township line between townships twelve (12) and thirteen (13) south, range seventy-eight (78) west, to the northwest corner of township thirteen (13) south, range seventy-seven (77) west; thence southerly on the range line between ranges seventy-seven (77) and seventy-eight (78) west to the southwest corner of section six (6), township thirteen (13) south, range seventy-seven (77) west; thence easterly on the section line between sections six (6) and seven (7), five (5) and eight (8), and four (4) and nine (9) to the southeast corner of section four (4) of said township and range; thence northerly on the section line between sections three (3) and four (4) of said township and range and sections thirty-three (33) and thirty-four (34), township twelve (12) south, range seventy-seven (77) west, to the northeast corner of section thirty-three (33) of said last-named township and range; thence easterly on the section line between sections twenty-seven (27) and thirty-four (34), to the southeast corner of section twenty-seven (27) of said township and range; thence northerly on the section line between sections twenty-six (26) and twenty-seven (27), twenty-two (22) and twenty-three (23), fourteen (14) and fifteen (15), ten (10) and eleven (11), and two (2) and three (3) of said township and range, and sections thirty-four (34) and thirty-five (35), township eleven (11) south, range seventy-seven (77) west, to the northeast corner of section thirty-four (34) of said township and range; thence westerly on the section line between sections twenty-seven (27) and thirty-four (34), to the northwest corner of said section thirty-four (34); thence northerly on the section line between sections twenty-seven (27) and twenty-eight (28), to the northeast corner of section twenty-eight (28) of said township and range; thence westerly on the section line between sections twenty-one (21) and twenty-eight (28), twenty (20) and twenty-nine (29), and nineteen (19) and thirty (30), to the northwest corner of section thirty (30) of said township and range; thence northerly on the range line between ranges seventy-seven (77) and seventy-eight (78) west, to the northeast corner of township eleven (11) south, range seventy-eight (78) west; thence easterly on the second (2d) correction line south, to the southeast corner of township ten (10) south, range seventy-eight (78) west; thence northerly on the range line between ranges seventy-seven (77) and seventy-eight (78) west, to the southwest corner of section eighteen (18), township nine (9) south, range seventy-seven (77) west; thence easterly on the section line between sections eighteen (18) and nineteen (19), seventeen (17) and twenty (20), sixteen (16) and twenty-one (21), and fifteen (15) and twenty-two (22), to the southeast corner of section fifteen (15) of said township and range; thence northerly on the section line between sections fourteen (14) and fifteen (15), and ten (10) and eleven (11), to the southwest corner of section two (2) of said township and range; thence easterly on the section line between sections two (2) and eleven (11), and one (1) and twelve (12), to the southeast corner of section one (1) of said township and range; thence northerly on the range line between ranges seventy-six (76) and seventy-seven (77) west, to the southwest corner of township eight (8) south, range seventy-six (76) west; thence easterly on the township line between townships eight (8) and nine (9) south, range seventy-six (76) west, to the southeast corner of section thirty-one (31), township eight (8) south, range seventy-six (76) west; thence northerly on the section line between sections thirty-one (31) and thirty-two (32), to the southwest corner of section twenty-nine (29) of said township and range; thence easterly on the section line between sections twenty-nine (29) and thirty-two (32), to the southeast corner of said section twenty-nine (29); thence northerly on the section line between sections twenty-eight (28) and twenty-nine (29) and twenty (20) and twenty-one (21), to the southwest corner of section sixteen (16) of said township and range; thence easterly on the section line between sections sixteen (16) and twenty-one (21), to the southeast corner of said section sixteen (16); thence north-

erly on the section line between sections fifteen (15) and sixteen (16), nine (9) and ten (10), and three (3) and four (4) of said township and range, and sections thirty-three (33) and thirty-four (34), township seven (7) south, range seventy-six (76) west, to the southwest corner of section twenty-seven (27) of said township and range; thence easterly on the section line between sections twenty-seven (27) and thirty-four (34), twenty-six (26) and thirty-five (35), and twenty-five (25) and thirty-six (36) of said township and range, and sections thirty (30) and thirty-one (31), twenty-nine (29) and thirty-two (32), twenty-eight (28) and thirty-three (33), and twenty-seven (27) and thirty-four (34), township seven (7) south, range seventy-five (75) west, to the northwest corner of section thirty-five (35) of said township and range; thence southerly on the section line between sections thirty-four and thirty-five (35) of said township and range, and sections two (2) and three (3), ten (10) and eleven (11), fourteen (14) and fifteen (15), twenty-two (22) and twenty-three (23), twenty-six (26) and twenty-seven (27), and thirty-four (34) and thirty-five (35), township eight (8) south, range seventy-five (75) west, to the southwest corner of section thirty-five (35) of said township and range; thence easterly on the township line between townships eight (8) and nine (9) south, range seventy-five (75) west, to the northwest corner of township nine (9) south, range seventy-four (74) west; thence southerly on the range line between ranges seventy-four (74) and seventy-five (75) west to the southwest corner of township ten (10) south, range seventy-four (74) west; thence easterly on the second (2nd) correction line south to the northwest corner of township eleven (11) south, range seventy-three (73) west; thence southerly on the range line between ranges seventy-three (73) and seventy-four (74) west to the northeast corner of section thirteen (13), township twelve (12) south, range seventy-four (74) west; thence westerly on the section line between sections twelve (12) and thirteen (13), and eleven (11) and fourteen (14) of said township and range, to the quarter-section corner between said sections eleven (11) and fourteen (14); thence southerly through the middle of sections fourteen (14), twenty-three (23), and twenty-six (26) to the center of section twenty-six (26) of said township and range; thence easterly through the middle of sections twenty-six (26) and twenty-five (25) to the quarter section corner on the range line between section twenty-five (25), township twelve (12) south, range seventy-four (74) west, and section thirty (30), township twelve (12) south, range seventy-three (73) west; thence southerly on said range line to the southwest corner of township twelve (12) south, range seventy-three (73) west; thence easterly on the township line between townships twelve (12) and thirteen (13) south, to the southeast corner of township twelve (12) south, range seventy-three (73) west; thence southerly on the range line between ranges seventy-two (72) and seventy-three (73) west, to the northeast corner of section twenty-four (24), township thirteen (13) south, range seventy-three (73) west; thence westerly on the section line between sections thirteen (13) and twenty-four (24), fourteen (14) and twenty-three (23), fifteen (15) and twenty-two (22), sixteen (16) and twenty-one (21), seventeen (17) and twenty (20), and eighteen (18) and nineteen (19), to the northwest corner of section nineteen (19) of said township and range; thence southerly on the range line between ranges seventy-three (73) and seventy-four (74) west, to the quarter section corner on the west boundary of section eighteen (18), township fourteen (14) south, range seventy-three (73) west; thence easterly through the middle of sections eighteen (18), seventeen (17), sixteen (16), fifteen (15), fourteen (14), and thirteen (13), township fourteen (14) south, range seventy-three (73) west, and sections eighteen (18) and seventeen (17), township fourteen (14) south, range seventy-two (72) west, to the quarter section corner between sections seventeen (17) and sixteen (16) of said last-named township and range; thence northerly on the section line between sections sixteen (16) and seventeen (17), and eight (8) and nine (9), to the northeast corner of section eight (8) of said township and range; thence easterly on the section line between

sections four (4) and nine (9), three (3) and ten (10), two (2) and eleven (11), and one (1) and twelve (12), to the southeast corner of section one (1) of said township and range; thence northerly on the range line between ranges seventy-one (71) and seventy-two (72) west, to the southwest corner of township thirteen (13) south, range seventy-one (71) west; thence easterly on the township line between townships thirteen (13) and fourteen (14) south, to the southeast corner of section thirty-three (33), township thirteen (13) south, range seventy-one (71) west; thence northerly on the section line between sections thirty-three (33) and thirty-four (34), twenty-seven (27) and twenty-eight (28), twenty-one (21) and twenty-two (22), fifteen (15) and sixteen (16), nine (9) and ten (10), and three (3) and four (4) of said township and range, and between sections thirty-three (33) and thirty-four (34), twenty-seven (27) and twenty-eight (28), twenty-one (21) and twenty-two (22), fifteen (15) and sixteen (16), nine (9) and ten (10), and three (3) and four (4), township twelve (12) south, range seventy-one (71) west, and between sections thirty-three (33) and thirty-four (34), twenty-seven (27) and twenty-eight (28), twenty-one (21) and twenty-two (22), fifteen (15) and sixteen (16), nine (9) and ten (10), and three (3) and (4), township eleven (11) south, range seventy-one (71) west, to the northeast corner of section four (4) of said last-named township and range; thence easterly on the second (2nd) correction line south, to the southeast corner of section thirty-three (33), township ten (10) south, range seventy-one (71) west; thence northerly on the section line between sections thirty-three (33) and thirty-four (34) of said township and range, to the middle of the channel of the South Platte River; thence down the middle of the channel of the said river to its confluence with the North Fork of the South Platte River, the place of beginning.

TOPOGRAPHY AND DRAINAGE.

The South Platte Reserve includes 683,520 acres, an area nearly twice that of the combined extent of the Pikes Peak and Plum Creek reserves. The main body of it lies directly west of the Plum Creek Reserve and South Platte River, a small portion extending south of the latter stream. A long, narrow strip or arm extends from the northwest corner of the main part of the reserve along the eastern base of the Park Range of mountains, forming a western boundary to the district known as South Park.

Most of this reserve lies at a much greater average altitude than the Plum Creek Reserve, and the extremes of altitude are much greater. The lowest point is in the northeast corner, at the junction of the North Branch of the South Platte with the South Platte River, where the altitude is a little above 6,000 feet for some distance along the shores of these streams. From this point the area within the reserve rises abruptly and rapidly in irregular ridges, hills, and mountains, divided by innumerable ravines, gulches, or canyons. In the main body of the reserve, which lies between South Platte River and the unreserved area known as South Park, there are a number of mountains and ranges which rise well above timber line, reaching an altitude of 12,400 or 12,500 feet. These nearly surround the regions known as Lost Park and Craig Park or Mountain Meadows, which have a minimum elevation of about 9,000 feet and form most important feeders to the streams which flow out of them.

South of Tarryall Creek the average altitude is much less than to the north, and there are no mountains reaching the timber-line limit. The larger portion of the important territory of the reserve lies between 8,000 and 10,000 feet altitude.

West of the main body of the South Platte Reserve is the agricultural or grazing country known as South Park, the free limits of which are not generally locally known and which, topographically, can not be distinguished from considerable areas included within the reserve. It is in part composed of a nearly level, treeless plain, having an altitude mostly between 8,500 and 9,500 feet or higher, and in part of irregular, thinly-timbered hills or ridges with open treeless areas or "parks" between them. It serves for the pasturage of many thousands of cattle and sheep, the grass being good and much hay being raised where irrigation from the Platte River and Tarryall Creek is possible, these streams crossing it in a southeasterly direction.

North and west of South Park lies the western branch or arm of the South Platte Reserve, a narrow strip over 40 miles long and varying in width from 1½ to 11 miles, with an average width of perhaps 4 or 5 miles. It is mainly composed of high, broad hills or mountains, and practically forms the lower eastern slope of what is known as the Park Range. Some of these mountains included in the reserve rise above timber line, but most of them bear trees to the summits.

The highest peaks and the highest parts of the Park Range of mountains lie to the west, outside the limits of the reserve, and conspicuously above timber line. In the ravines and gulches near the summits of some of these there are huge drifts of snow which do not disappear during the summer, and it is from these perpetual snow banks that many of the streams start which cross the narrow western arm of the reservation, and which form the South Platte River and Tarryall Creek, these streams draining the entire eastern slope of the Park Range, and also the South Park.

The main body or eastern portion of South Platte Reserve is chiefly drained by the South Platte River itself and the very numerous streams which fall into it, the most important of which is Tarryall Creek, while the tributary known as Goose Creek or Lost Park Creek carries the waters from an extensive area most valuable as a water reservoir. This area is also partly drained by Craig Creek, the waters of which, and also of Buffalo Creek, flow into the north branch of the South Platte River, which drains a small watershed sloping to the north.

While South Platte River and Tarryall Creek drain most of the reserve, their true sources are many miles to the west, in the higher Park Range, just outside the limits of its western arm of the reserve. The South Platte is a comparatively small stream, rarely more than a few rods in width, and easily forded at many points, but it is very important to the region through which it flows.

The largest and practically the only large natural body of water in the reserve is known as Jefferson Lake, located at an altitude between 10,500 and 11,000 feet, at the head of Jefferson Creek, one of the branches of Tarryall Creek. This lake is more than half a mile across in its widest part, and soundings are said to have shown a depth of 850 feet. A few feet of its waters are now artificially drawn off to supply the necessities of a number of ranchmen along Jefferson Creek, in South Park, below. It is a very valuable natural reservoir, chiefly fed from perpetual snow banks, lying west of and outside the reserve lines.

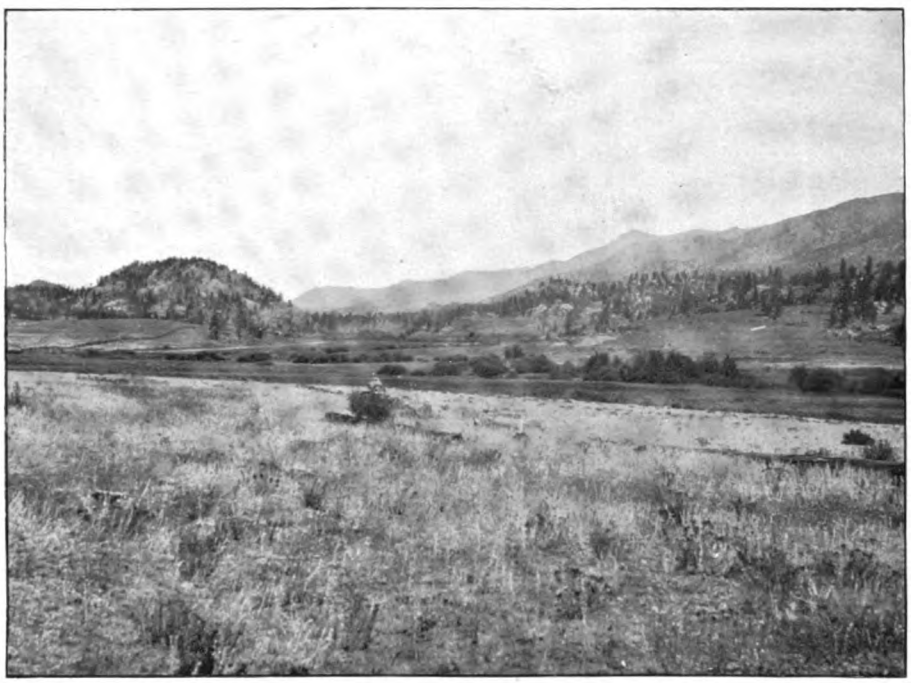
Lake George is merely an artificial reservoir formed by damming the South Platte River, and Wellington Lake was made by building a dam near the head of Buffalo Creek. The altitude of each of these reservoirs is about 8,000 feet.

There are various reservoirs projected or in course of construction in this reserve, the most important being on the South Platte River, on Goose Creek (also known as Lost Park Creek), and on Tarryall Creek. Near the outlet of the latter active preparations were being made during the summer of 1898 for the construction of a reservoir which would have a maximum depth of over 100 feet of water and cover over 2,000 acres. The conservation of these waters is primarily intended for the supply of the city of Denver, about 50 miles away.

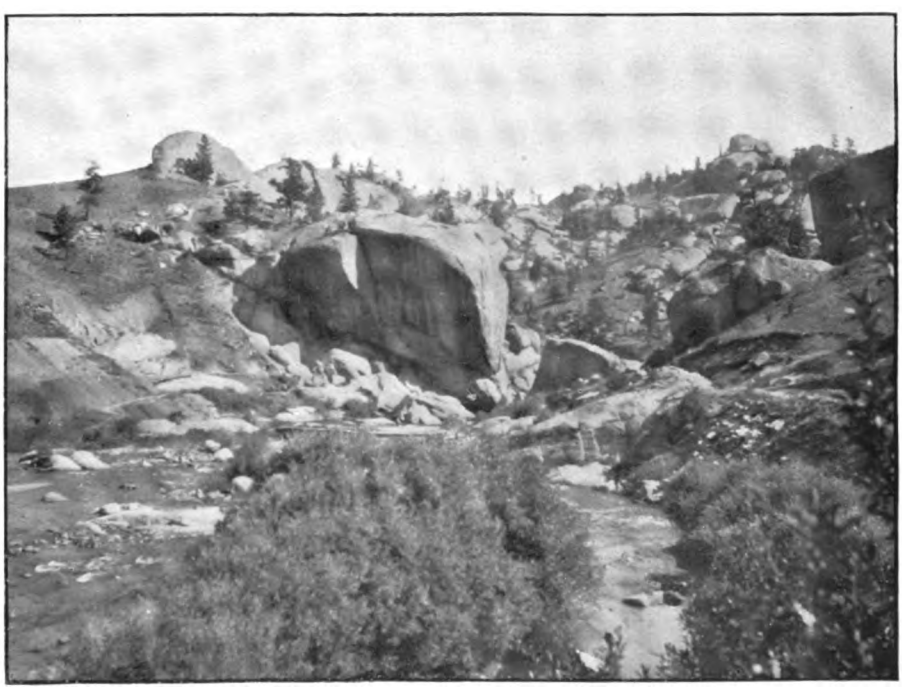
Throughout the reserve, especially in the higher altitudes, there are innumerable springs, most of which maintain a good flow of the finest water in the driest seasons. In the Lost Park and Craig Park district there are large areas of treeless, boggy, or peaty ground which are practically reservoirs holding and gradually giving out large and perpetual supplies of pure and very cold water to the streams which run through them. These boggy areas are commonly covered with low shrubby willows from 2 to 8 feet high, and mixed with them are various grasses, sedges, and mosses which, with the accumulated humus of centuries, hold and but slowly release the water which stands beneath or among them. These areas might properly be likened to slowly-flowing reservoirs or lakes which are concealed by the subalpine vegetation growing over them. As a feeder of streams, this region, giving its waters to Lost Park Creek and Craig Creek, is the most valuable of any found within any of the three reserves examined, and no effort should be spared to preserve or improve the present conditions existing there.

On account of its limited area and topographical position, much of the extreme western section of the reserve contributes comparatively little water to the streams, most of it coming from farther to the west, from the eastern slope of the high Park Range, several of the summits of which exceed Pikes Peak in altitude.

A number of small natural ponds or artificial storage reservoirs



A SITE OF PROPOSED RESERVOIR ON SOUTH PLATTE RIVER, ABOVE MOUTH OF TARRYALL CREEK.



B SITE OF PROPOSED DAM ON SOUTH PLATTE RIVER, 2 OR 3 MILES ABOVE SOUTH PLATTE STATION.

A. BOGGY GROUND OR NATURAL RESERVOIRS AT HEAD OF CRAIG CREEK.

B. CRAIG CREEK AND PARK (MOUNTAIN MEADOWS), FROM NORTHERN END OF KENOSHA MOUNTAINS.

occur at various points along this range. The broader southern end of this part of the reserve is the most valuable as a stream-feeder, as it includes the apex of the watershed and the beginnings of the creeks.

TIMBER.

The South Platte Reserve contains a varied assortment of forest conditions, and, like most parts of the country accessible to markets or railroads, the surface has been very largely deprived of its most valuable timber by the rapacity of sawmill men and of railroad-tie hunters; many thousands of acres also having been cleared by manufacturers of charcoal for smelting purposes.

What remains of unmolested primeval forest is chiefly located farthest away from local markets or shipping stations, or is situated in limited areas on slopes not easily accessible. The timber in which the operations of lumbermen have not yet been very destructive comprises but a few thousand acres, mostly located north of the Tarryall Mountains, about the head waters of Lost Park Creek, Wigwam Creek, and Craig Creek, in and about the vaguely defined region generally known as Lost Park, having an altitude of from above 9,000 to 11,500 feet or more.

The valuable timber here is almost all Engelmann spruce, but some good lodgepole pine, range pine (*Pinus aristata*), and *Pinus flexilis* also occur, although rarely used.

The spruce attains a larger size than the other trees in this region. The largest specimens seen and measured showed a total height of 110 or 115 feet and a diameter of 3 feet at the stump. This size is exceptional, however, and the mature timber obtained would probably not average more than 15 inches in diameter at the stump and 70 to 80 feet in height, furnishing 35 or 40 feet of saw logs.

The large trees or those immediately available for the sawmill are interspersed with many too small for present profitable use, but selected acres may be found which would yield 10,000 feet of lumber to the acre by taking trees above 10 inches in diameter at the stump. But when a square mile is taken as a unit the average is greatly reduced on account of lightly timbered areas, burned strips, and the treeless ground or "parks" along the creeks and on the tops of the higher ridges and mountains.

Throughout the remainder of the reserve the best of the timber has already been removed or is in process of removal. A little fair timber occurs at various places along the western arm of the reserve, west of South Park, about Jefferson Lake, on the slopes of Mount Silverheels, and at other points, although the best and most valuable parts of the forest actually lie to the westward, among the mountains, well outside the present boundaries of the reserve. On these outside slopes some very good timber still remains, although in no very

extended areas without interruption by poor, burned, cut-over, or open tracts intervening. In this region also the prevailing useful tree is Engelmann spruce, although there is much lodgepole pine mixed with it in some places, or this pine may occupy the ground in some localities almost to the complete exclusion of other species.

Fully three-fourths of the total territory upon which trees grow is occupied by yellow pine and Douglas spruce, among which a small proportion of blue spruce is found along or near creeks, while some lodgepole pine, range pine (*Pinus aristata*), and *Pinus flexilis* occur on the hills. The yellow pine and Douglas spruce prevail over all the eastern half of the reserve and the portion lying south of the Tarryall Mountains. As this ground has nearly all been cut over at various times during the past thirty years, some of it having been twice or even three times searched for suitable sawmill trees, there are few trees of large size remaining. Some of the best trees of these species seen were found north of Lost Park Creek, a few miles from its mouth or junction with the South Platte River, where trees which would furnish from 500 to 1,000 feet of lumber each were scattered over a few hundred acres which had escaped fire and had not been entered by lumbermen, although some had been cut for local ranches. These exceptionally fine trees were surrounded by much timber of undersize or poor quality, and indications seemed to show that forest fire had many years ago burned out smaller trees, leaving a scattered growth of larger ones.

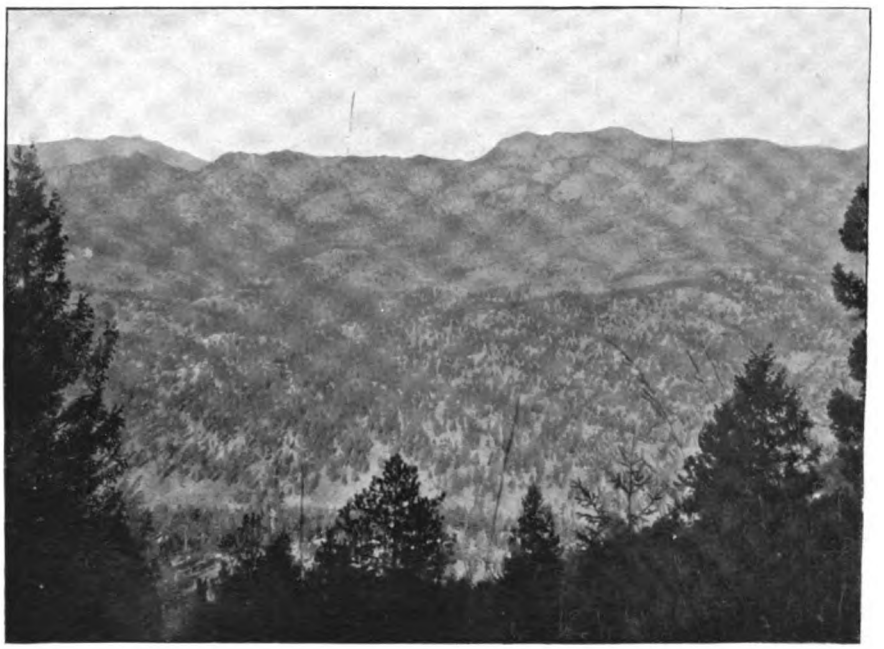
Upon a good deal of the area the yellow pine is more plentiful than the Douglas spruce, and it commonly occurs in very open or scattered growth and well furnished with branches, so that there is but a short, clear trunk. Some trees are ready to be culled out for the sawmill now according to the present standard accepted by the lumbermen, this standard being modified so as to include smaller material as the trees become scarcer and the ground is repeatedly gleaned. A large proportion, however, is too small for any present purpose. In some parts the soil is so rocky, poor, or dry that it is unlikely that the trees upon it will ever reach a large size.

In the southern part of the reserve, west of Florissant, a considerable percentage of blue spruce occurs with the other trees found there, and it is also plentiful in some parts of the reserve bordering South Park.

The lodgepole pine occurs in great abundance on the north and west slopes of the Platte River Mountains, in places through the Park Range, and on some parts of the slopes of Stormy Peak, Freeman Peak, etc. It often occurs almost pure, but it is also frequently mixed with Engelmann spruce, as in the Lost Park region, among the Puma Hills, and along the Park Range. Trees 2 feet in diameter of trunk and 100 feet in height are considered rare throughout this region and although the species is plentiful, or even extremely abun-

A VALLEY OF TARRYALL CREEK.

View southeast from trail from Mountaindale to Bison Peak, at about 11,000 feet altitude.



B VIEW LOOKING WEST FROM ROCK AT GRAHAM'S RANCH, 5 OR 6 MILES ABOVE MOUTH OF LOST PARK CREEK.

dant in certain sections, there is very little of it large enough to be manufactured into the ordinary kinds of sawmill lumber, as now accepted by the lumbermen. If preserved from damage in future the existing lodgepole pine should eventually yield a considerable amount of medium-sized merchantable timber. This pine seems to be especially susceptible to damage from forest fires, which apparently sweep through a forest of these trees more readily than through growths of any of the other species in this reserve. This is, no doubt, largely due to the resinous character of the tree, to its thin bark and slender twigs, and especially to its dense or close growth when young, several living plants sometimes standing to the square foot until they are several feet high. Standing thus relatively close, the flames easily pass from tree to tree as among dry grass in a meadow.

The lodgepole pine reproduces itself more easily and generally forms a better stand of young trees than any other species. In the case of the yellow pine and the spruces the stand of seedling or young trees is commonly insufficient to produce what would be considered good, clear timber in other regions. Locally, however, as in some gulches and on north slopes, good, fair stands of young trees are found, although they do not cover any very extended continuous areas.

The range pine (*Pinus aristata*) occurs abundantly on many ridges or ranges, particularly on south slopes, but the trunks are generally so short, divided, or covered with large branches, that this tree is seldom cut to be sawed into ordinary lumber, although it is sometimes used for mine timbers.

Pinus flexilis, the limber pine, or white pine, or sugar pine, as it is sometimes called, is not abundant enough anywhere to obtain commercial consideration, although it becomes a much better timber tree than *Pinus aristata*.

Probably at least one-fifth of the total area of this reserve is practically destitute of trees of any kind, excepting in parts where a few widely-scattered pines and small aspens grow in situations where they will not attain arborescent proportions. This treeless area includes bare mountain tops, valleys, or parks between the mountains and along streams, grazing lands included within the present reserve lines, and areas so completely burned that they are not likely to be recovered for a century or two. These irregular treeless areas, the frequent burned tracts, those covered with practically useless kinds of timber (as range pine), the depredations of lumbermen, and the varied character of the so-called wooded ground, make it extremely difficult or almost impossible to get any clear idea of the approximate amount of timber remaining on the reserve. Where lumbermen have already been at work once or twice, they may yet find a good many saw logs of medium or small size, and doubtless several small movable steam sawmills would continue to find employment for several years to come

before the available supplies were totally exhausted. Such close cutting, however, would be injurious to true forest interests, because, in open growth of yellow pine and Douglas spruce, the mature trees, or those simply large enough for the mill, should be allowed to remain until the ground has a sufficient number of seedlings upon it for proper restocking of the land. The destruction of necessary seed-bearing trees is often a serious loss in this country, where, in the struggle for existence, so much of the seed is taken by birds and rodents for food, and the conditions of germination are so unfavorable that a smaller percentage of plants results from any given quantity of seed than is the case in other regions, where the conditions are more favorable.

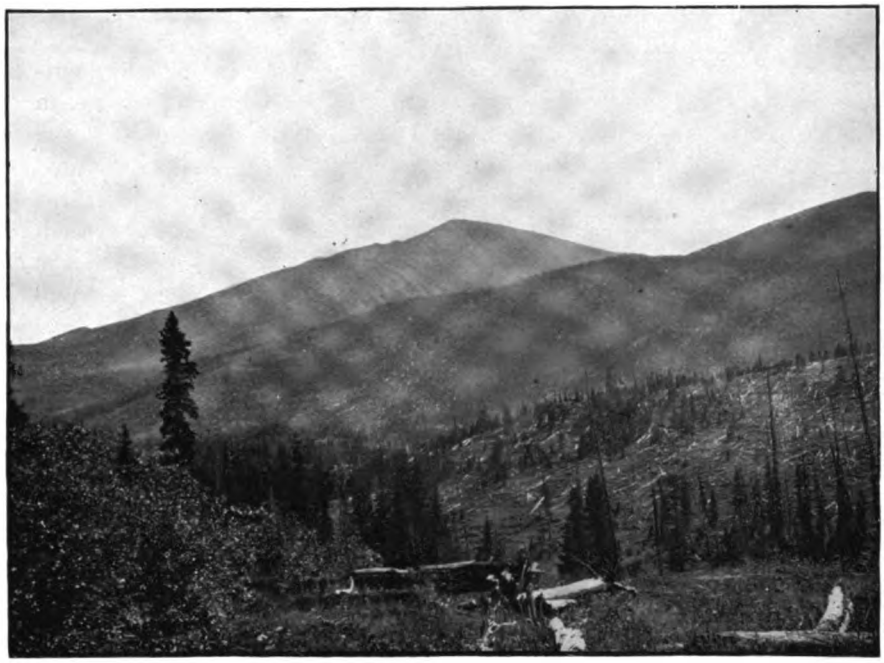
In the region north of the Tarryall Mountains, including what is known as Lost Park and the Kenosha Range and Platte River Mountains, it is probable that 50 million feet of lumber could be taken without serious injury to the forest covering if the work were properly conducted, with due regard to the preservation of the immature growth and the prevention of forest fires. This forest is the best on the reserve and is chiefly composed of Engelmann spruce, which also occurs in considerable quantity on the western arm of the reserve.

The remainder of the ready timber is chiefly yellow pine and Douglas spruce, and altogether the supplies of all properly grown sawmill lumber in the reserve may be placed at 150 million to 200 million feet, although such an estimate is largely guesswork, necessitated by the strangely unequal conditions met with everywhere; and yet it would be impossible to estimate more nearly without a careful measuring and study of each section of ground containing merchantable timber. Doubtless more than the above amount could be immediately cut if the reduced standard of the size of trees taken by the smaller sawmills should be accepted; but a too close and early cutting is often hurtful to the forest and the adjacent country, and is certainly not always the most economical timber management.

FIRES.

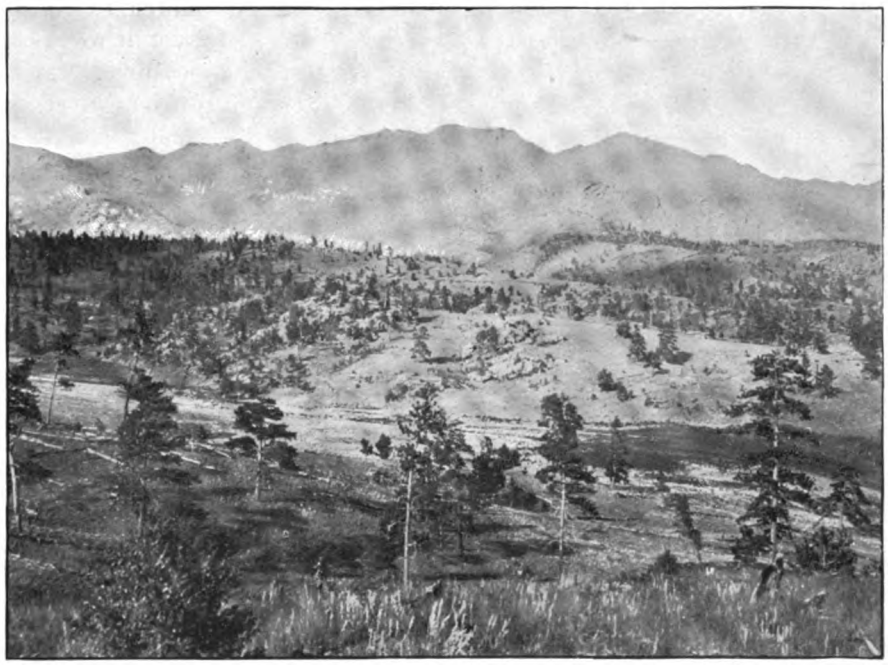
Probably between 60 and 70 per cent of the total forested area of this reserve has damage by fire very clearly marked, and on a larger area there are evidences of ground fires or of forest fires which occurred so long ago that traces of them have become nearly obliterated and a natural forest growth has almost recovered the ground.

The damage by fire is confined to no particular section of the reserve, but spots, streaks, or extended areas of burned ground are frequent on most parts, especially on those longest settled or near routes most traveled, such as long passes through the mountains. The burned tracts are often comparatively small and frequent; but there



A. EAST SIDE OF BRECKENRIDGE PASS, LOOKING SOUTH TOWARD MOUNT SILVERHEELS.

Engelmann spruce and lodgepole pine; mostly burnt.



B. VIEW AT MOUNTAINDALE.

Looking north across Tarryall Creek to mountains; burnt in 1868 or 1869.

are three or four areas upon which the burnings have been very extensive.

The most widespread of these conflagrations occurred in 1868 or 1869 and burned over the larger portion of the Tarryall Mountains, which extend northwest and southeast through the central part of the reserve. The burning here was very complete over many thousands of acres, where barely a conifer has yet started to reforest the ground, and the only living woody vegetation consists of small quaking aspen and scattered shrubs of various species,

Sometimes groups or belts of trees escaped, or a whole mountain side was passed unharmed by the flames, and it is from seeds of these living pines and spruces that a new natural forest must be derived.

This fire covered a stretch of mountains over 20 miles in length and 6 or 8 miles wide at the widest parts, although sometimes quite narrow and generally very irregular. It was said to have originated from the burning of a heap of brush by one of the early settlers; but other information placed the responsibility for the fire upon the Indians, who probably are charged with more than their share of such occurrences.

The forest of this burned region consisted chiefly of yellow pine (*Pinus ponderosa*), range pine (*Pinus aristata*), limber or white pine (*Pinus flexilis*), Douglas spruce, and Engelmann spruce.

Lesser fires have more recently occurred in the woods north of the Tarryall Range, many within a few years or since the advent of sawmills.

Large tracts have also been burned on the western arm of the reserve, especially along the slopes east of Weston Pass, and other routes into or over the range.

A great deal of ground shows traces of fire, which must have occurred from thirty to one hundred or more years ago, and upon this is a more or less dense growth of small timber of various ages and sizes, according to the length of time since the fire and the time elapsing before fresh seed stocked the ground. As many of these fires appear to have been comparatively small and local, or to have left living individuals or many intervening strips of living trees which soon produced seed for the burned areas, the ground has become fairly well re-covered, much sooner than is possible when many thousands of acres are burned over and no living trees escape. Almost the only exception to this general rule is found in the case of the lodgepole pine, which, if burned under certain conditions, leaves seed enough unharmed to restock the ground with the same species.

No very extensive fires have occurred on this reserve during the past four or five years, and only one, covering considerable area, was noted during the season when this examination was made. This

occured on Breckenridge Pass, on the Colorado and Southern Railway, generally known as the South Park Line, which crosses the reserve at this point. The fire was supposed to have originated from sparks from a locomotive, and it burned one of the snowsheds belonging to the railroad, besides several hundred acres of woodland, in some of which no trace of former fires was evident, although the best of the timber had long since been cut out. This fire burned to timber line or to an altitude of over 11,500 feet, the trees here being chiefly Engelmann spruce, and it reached down to considerable tracts of lodgepole pine. A number of other small fires were burning at this time (October 8) among the timber on both the slopes east and west of the pass. Some of these were presumably started by sparks from locomotives, others perhaps from other causes. They were burning slowly and soon afterwards were extinguished by snowstorms. The railway employees were making no effort to extinguish the fires on the woodland, but the snowsheds were guarded. Near Kenosha Pass, also, grass fires and incipient timber fires were seen, which were started from sparks thrown out by locomotives of the same railway.

SETTLEMENTS.

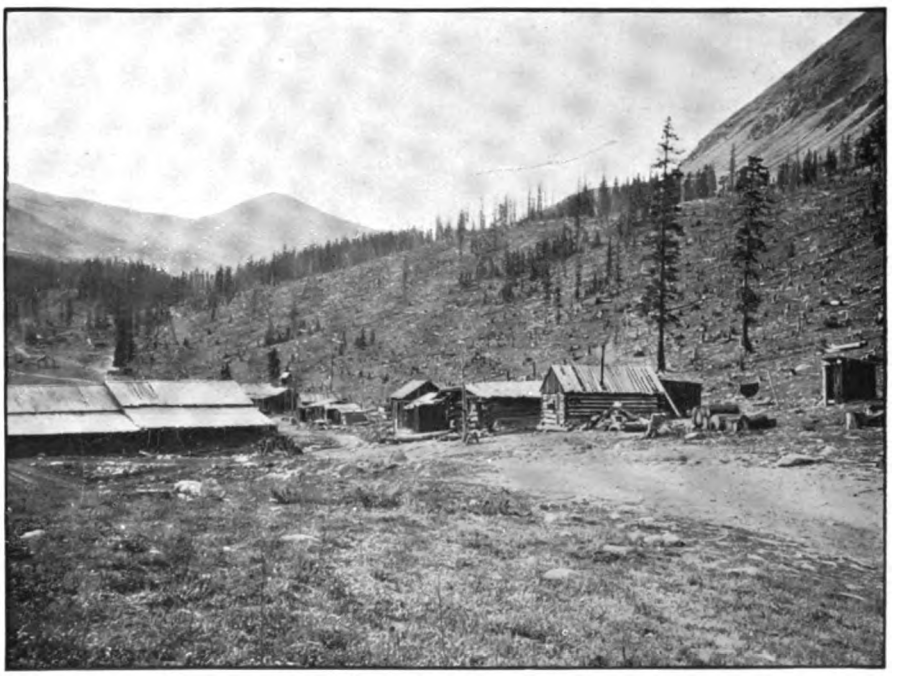
This reserve is crossed by two lines of railroad. The Colorado Midland Railway crosses the southern portion west of Florissant, following the course of the South Platte River into South Park. The Colorado and Southern Railway, otherwise known as the South Park Line, follows the North Branch of the South Platte River along the entire northern boundary of the main body of this reserve. It leaves this boundary and passes into South Park by crossing the reserve at Kenosha Pass, and the main line again crosses the reserve over Breckenridge Pass, between Como and Breckenridge. Two spurs or branch lines have been built to mines or mining camps located near or outside of the western boundary. One of these runs from Fairplay through Mosquito Gulch to the lower London mine, near the foot of Mosquito Peak. The other branch also starts from Fairplay and follows Horseshoe Gulch to the mining camp of Leavick, formerly known as Horseshoe, located near the eastern base of Horseshoe Mountain at about 10,800 feet altitude.

The amount of land held in private ownership is smaller in proportion to the total area than on either of the other reserves examined. It is chiefly situated in the northeastern and southern parts, and in open grazing areas lying east of South Park.

The largest settlement included within the limits of this reserve is Alma, which is located at the narrowest part of its western arm, at an altitude of above 10,000 feet. It is situated on the Mosquito Pass wagon route, between South Park and Leadville, and has a population estimated at 400 or 500, which is likely to increase or decrease

A. VIEW AT KENOSHA PASS, LOOKING SOUTHEAST.

Small aspen, scattered lodgepole pine, and Engelmann spruce.



B. LEAVICK, LOOKING NORTHWEST TO MOUNT SHERIDAN.

considerably, according to the activity of the mining industries in the adjacent country. Alma is an important supply station for the miners and prospectors in the mountains to the north and west. A smelter is located here, but this was idle during the past summer. Another smelter, also idle, is located near London Junction, which is the railroad station for Alma. Park City, about a mile and a-half west of Alma, has several occupied cabins, but appears to be just outside the reserve limits.

East Leadville, about 6 miles south of Alma, is now nearly abandoned for the active mining camp of Leavick, on the western border of the reserve. The population of Leavick was roughly estimated at perhaps 100 persons, but is likely to vary greatly according to the activity of the mines, amount of timber cutting being carried on, and other industries.

Throughout this region miners' or prospectors' cabins are not rare, but not so numerous as they are on the more mountainous range west of the reserve limits.

In the southern part of this western division of the reserve there are several small ranches, the best known being that called Platte Station, on the route over Weston Pass, at nearly 10,000 feet altitude. Near the summit of this pass there is also a small mining camp.

At the summit of Breckenridge Pass, at Boreas Station, are a number of buildings, chiefly occupied by employees of the railway.

In the main body of the reserve east of South Park the most important settlements are situated along the North Branch of the South Platte River and near Tarryall Creek. Most of the settlements along the former stream are located on its north side and are therefore outside the reserve limits. The largest on the south side is Buffalo, at the mouth of Buffalo Creek, the population of which is estimated at about 150, being very much increased in summer by residents whose cottages are vacant in winter. This land is in control of a regularly organized company known as the Buffalo Creek Park Company.

At Wellington Lake, 7 or 8 miles up Buffalo Creek, there is also established a small colony of summer residents. Cassells, on the North Branch, near Chase, is another summer resort with accommodations for 50 or more persons. South Platte and Estabrook are small stations from which is shipped considerable timber cut on the reserve.

South of Tarryall Creek are several small mining camps. The largest of these is Puma City, which a couple of years ago had a "boom" and a population of several hundred prospectors, but which was reduced to two or three score when seen in the autumn of 1898. Gold City and Jasper are other small prospecting camps.

In the southeastern corner of the reserve and along Wigwam Creek,

Lost Park Creek, Tarryall Creek, and the principal creeks of the southern portion are a considerable number of small ranches, with cattle raising as the chief business, but where lumbering and prospecting also usually receive some attention.

Bordenville, on Tarryall Creek, consists simply of two or three ranches, with buildings located comparatively near each other, and at the post-office of Mountaindale, on the same stream, there is a single dwelling with accompanying farm buildings. Weekly mails are received here for other settlers or prospectors who are widely scattered in the region around.

At the post-office known as Rocky, in the southern part, similar conditions prevail, there being no aggregation of inhabited buildings to form a village, but simply a mail center for the scattered population of the country.

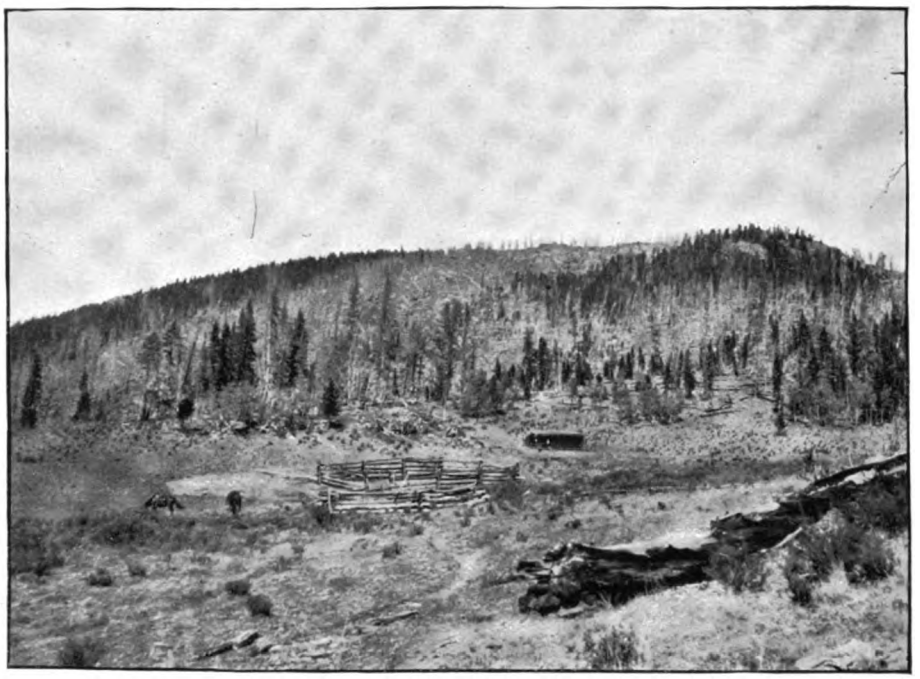
Along the Colorado Midland Railway are five or six small stations within the reserve, rarely composed of more than the dwellings of railroad employees and an occasional ranch. Some attempt has been made to make Lake George a summer resort, but apparently with slight success.

AGRICULTURE AND GRAZING.

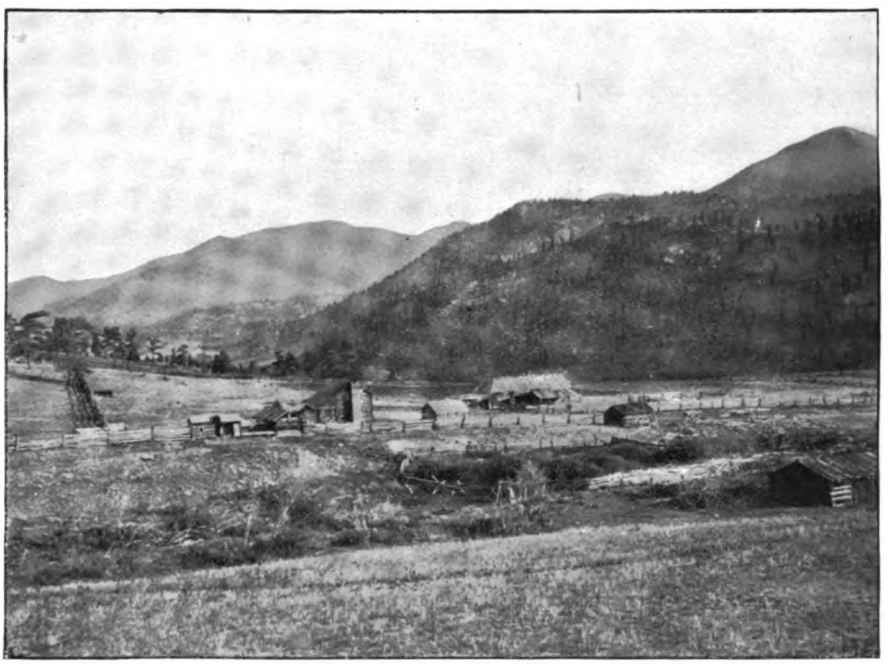
The high altitude of the greater part of this reserve makes the practice of ordinary agriculture impossible. Along some of the creeks, however, especially on the eastern slope at the lower altitudes, some hardy grains are raised and a few potatoes, but the total amount is inconsiderable, and is of no importance in outside markets, although potatoes are taken to Cripple Creek or similar local markets. Potatoes are an uncertain crop, as they are liable to be damaged by late frosts. Hay and grain are the staples cultivated, and what is grown is mostly fed to stock upon the ranches. Stock raising is therefore really the only important agricultural interest, and this would be very limited if stock owners were compelled to graze their cattle on their own lands instead of allowing them to range upon Government territory, as is the general practice.

The patches of cultivated ground are usually so small and irregular that it is difficult to obtain a true idea of the total amount actually tilled, but after a careful estimate it is probably safe to say that the total area of the ground under cultivation in the reserve is less than 3,000 acres, although more may be irrigated and cut over for native hay, but is not cultivated.

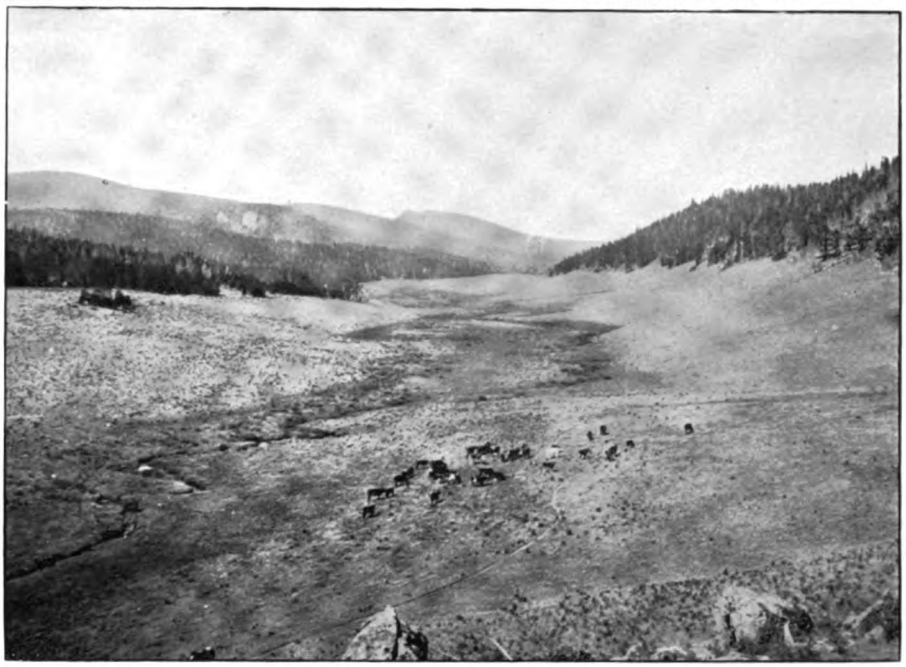
On account of high altitude, narrowness of fertile valleys, and limited water supply it is probable that there will be no very great increase of the profitable tillable area, and the country here must be considered as essentially a grazing one. The large areas of land, covered with a very



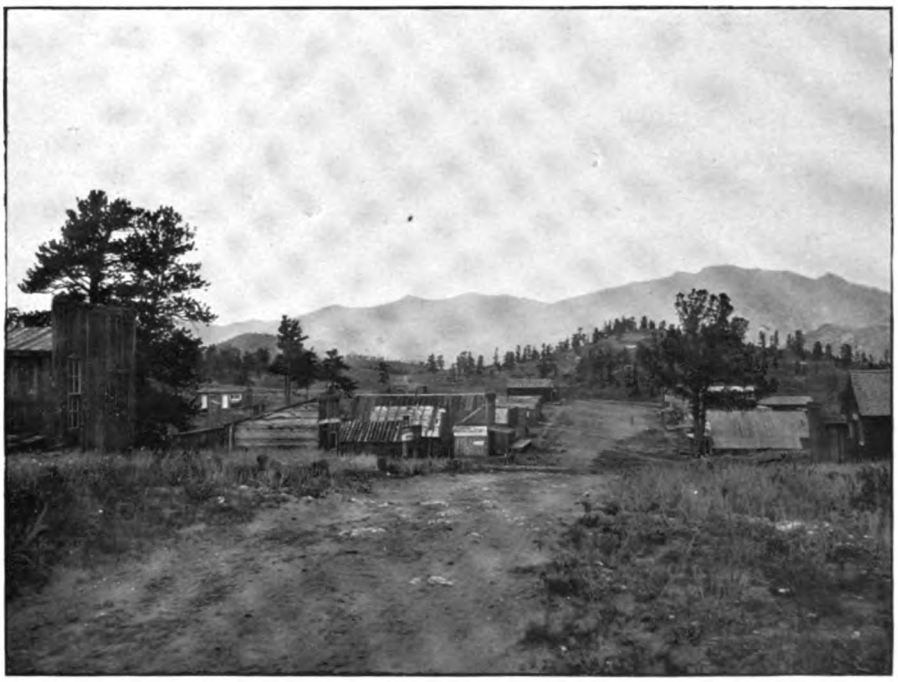
A. HERDSMEN'S CABIN IN LOST PARK; TIMBER BURNT IN 1893.



B. MOUNTAINDALE, LOOKING NORTHWEST ACROSS TARRYALL CREEK.



A. VIEW LOOKING UP LOST PARK CREEK.



B PUMA CITY (TARRYALL POST-OFFICE), LOOKING NORTH THROUGH MAIN STREET

scant growth of timber, produce a scattered growth of grasses and herbage sufficient to furnish food for a limited number of animals.

East of Craig Creek and the Tarryall Mountains it is estimated that from 4,000 to 5,000 cattle have been grazed by the ranchmen during some seasons, but during the past year the number was probably not more than one-half as great because of sales on account of a good cattle market. On all the remaining portions of the reserve it is probable that a maximum of about 5,000 cattle have been kept, the number being subject to great fluctuations in different seasons.

The bona fide residents or settlers of the reserve are not alone in pasturing cattle on public lands, as large numbers of cattle are annually driven in from outside, often the property of persons in no way connected with agricultural pursuits. It was found, for instance, that persons living in Fairplay, on the western side of South Park, made a practice of sending cattle into the Tarryall Mountain region, on the east of the park; and others living at Woodland Park, on the borders of the Pikes Peak Reserve, had herds over 30 miles away in the heart of the South Platte Reserve, to the west. Many of the ranchmen in South Park distribute some of their cattle on the reserve during the summer. Many of these cattle are annually sent into the so-called Lost Park, a region showing more of the original condition of the country and less molestation by human agencies than any other in the reserves. The number annually pastured here is said to vary in different seasons, from several hundred to two or three thousand. When visited in September, 1898, it was estimated that there were then not more than 400 or 500 in that particular region. Cattle belonging to different owners commonly run together, but as they are branded they are easily separated in the autumn "round-up," when they are sent to market or removed to lower altitudes or shelter for wintering. Cattle have been brought hundreds of miles to this region to be temporarily kept until in prime condition for final shipment, or for advantageous markets.

It will thus be seen that it is very difficult to make any close estimate of the number of cattle which the reserve annually supports.

Many sheep are kept on South Park or are brought there to be finally fattened before marketing. During the summer some thousands of them are pastured above timber line on Mount Bross, Mosquito Mountain, and other mountains lying west of the reserve, across which they are driven in order to reach the grazing ground. Little of this sheep pasturage lies within the present boundaries of the reserve. The sheep are usually in charge of herders who temporarily live in cabins near the timber line.

The pasturing of sheep as here practiced is an injury to the sources of the small streams and incidentally to the struggling young trees

near timber line. The vegetation of the high mountain slopes becomes badly trampled and cut up by hoofs, as well as reduced by excessive grazing; and in the hollows or ravines, where the streams originate or take definite form, the protective covering of low shrubs, which are chiefly willows, become very much injured or totally destroyed by trampling and browsing, leaving the ground bare and exposed, and liable to be washed away by any heavy rain.

In regard to the pasturage afforded for cattle on those parts of the reserve principally used for grazing purposes, it seems to be the unanimous opinion of the earlier settlers that there has been a very decided reduction of the grazing value of the land as compared with its condition when first used for this purpose. The chief reason is obvious to these ranchmen, who admit that there has been over-pasturage, too many cattle on the same ground year after year trampling it, especially near water, so as to expose the roots of the grasses, keeping the latter as closely cropped as though devoured by grasshoppers, and preventing any possibility of production of seed for regeneration. Unusually dry seasons have also helped to reduce the grazing power of the land, droughts being so serious that it is claimed to have caused the death of mature yellow pines.

The estimated area given as now necessary to support each animal, steer, or cow on these lands varied from 15 to 40 or more acres, which may give some idea of the scanty forage afforded on a good deal of the territory under consideration.

MINING.

Throughout a large part of the South Platte Reserve more or less prospecting has been done, much is still prosecuted, and recently several small new mining camps have been established. The largest of these is Puma City (Tarryall post-office) south of Tarryall Creek, 10 or 12 miles from its outlet into the South Platte. When visited during the past summer the "boom" in this camp had passed, and a large proportion of the buildings were vacant. It was claimed, however, that good ore had been found and only capital was wanted to develop gold mines and make Puma City a thriving place. Since the past summer (1898) rich strikes and a new rush of gold-seekers to this place has been reported, but whether or not there is really cause for excitement has not been settled.

Smaller camps are Gold City and Jasper, both also south of Tarryall Creek, but nearer the South Platte River than Puma City. More or less prospecting is done by most of the ranchmen living on or about the reserves, as well as by persons who give all their time to it. As yet little has been done in the northern part of the main body of the reserve, in the region lying north of the Tarryall Mountains, although

A. GOLD CITY, ABOUT 7 MILES NORTHWEST OF FLORISSANT, LOOKING WEST.

B. ABANDONED SAWMILL SITE ON JEFFERSON CREEK.

the northeastern portion, between Craig Creek and the South Platte, has been more carefully examined.

On the extreme western arm or branch of the reserve lying west of South Park there is considerable activity in mining, both for gold and silver. The reserve limits are here so narrow in part that most of the actual mining ground lies to the west of the present boundaries.

Mount Bross, Mount Lincoln, Mount Buckskin, Mosquito Mountain, Horseshoe Mountain, and other peaks, which geographically should be included within the reserve, are all situated outside of it. On all of these active prospecting and some profitable mining is conducted.

The comparatively old town of Alma lies just within the reserve lines and is an important outfitting post for miners in the adjacent mountains, and flourishes or loses its importance with the rise or fall of mining development in the country about it.

The mining camp of Park City, a few miles west of Alma, also lies just on the reserve borders. It has been partially abandoned for more promising localities.

Some other old but small camps, such as East Leadville and Sacramento, situated within the reserve limits, have been nearly abandoned for more promising localities mostly lying outside the reservation boundaries. East Leadville has been supplanted by the camp known as Leavick or Horseshoe, situated farther up Horseshoe Gulch, at the edge of the reserve and near the base of Horseshoe Mountain, where there is active and profitable gold and silver mining. Farther south, within the reserve limits, on Weston Pass, there is some mining, although it is necessary to haul the ore many miles to mills for treatment.

Few of the operated mines possess proper mills or smelters of their own or in close vicinity, and usually the ore is shipped to some distance, as to Leadville, Colorado Springs, Buena Vista, and other places, to be treated in large establishments. A smelter at Alma and another within 2 or 3 miles of that place have not been working recently.

From most parts of the reserve the ore is either hauled by wagon to the nearest railroad or smelter, or it is brought out over trails on the backs of burros or donkeys, locally known as "jackies." By the aid of these patient and enduring animals the miner without much capital is able to bring ore over narrow trails from places which would be otherwise inaccessible without the expenditure of considerable money in the making of roads or the erection of costly machinery.

At the London mine, at about 12,000 feet altitude, on Mosquito Pass, and at the mines at the head of Horseshoe Gulch, both outside the present limits of the reserve, the ore is brought from high slopes, difficult of access, to the mill or cars in buckets suspended on endless wire rope or cables, no other power than the natural gravity of the laden buckets being required.

In some places wagon roads for hauling ore have been constructed at considerable cost to the promoters.

There is very little placer mining prosecuted within the reserve limits, the most extensive workings being those near Alma and on Tarryall Creek, above Como. During several months in some years these placers can not be worked on account of lack of water. Recently those near Alma have been idle on account of litigation, a too common hindrance to the development of mines and other industries in this part of the country.

There seems to be no doubt as to the permanent richness of the mines in the mountain range to the west of South Park, and the industry is likely to increase.

Profitable mining in the main body of the reserve east of South Park has not yet been proved a permanent and paying business, but there are indications that really good mines may yet be opened there.

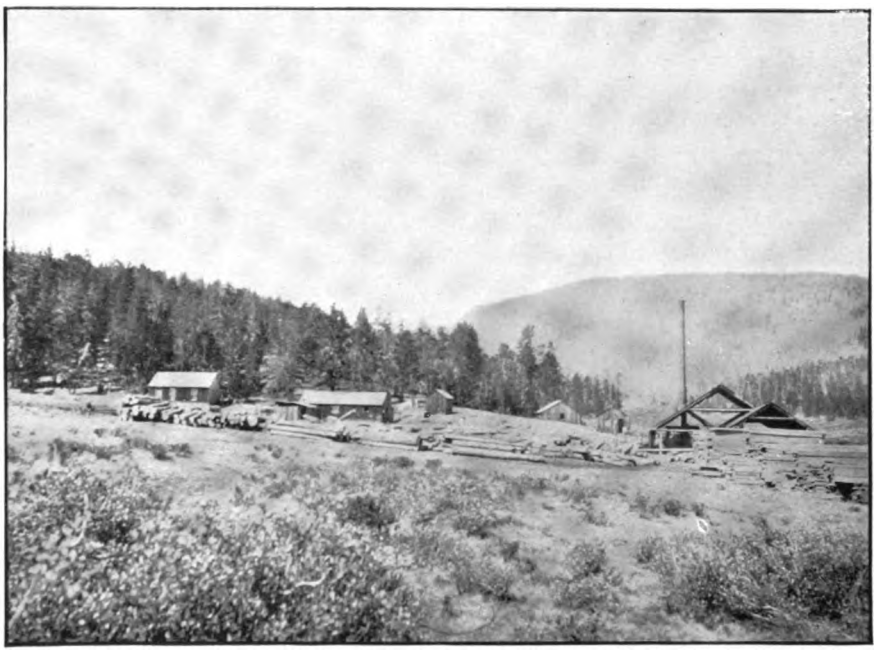
LUMBERING.

Ever since this part of the country was first settled by ranchmen, about forty years ago, the business of cutting lumber from the territory now included within the boundaries of the reserve has been unremittingly prosecuted, although during the earlier years most of the timber cut was for strictly local use. With the advent of railroads and the development of mining the shipping of lumber became important, and numerous sawmills have been almost steadily at work taking timber from private or public lands, legally and illegally. Beginning with the supplies available nearest to market or shipping station, portable sawmills have been moved gradually to the farthest and least accessible of the timbered parts of the mountains, until now they have reached Lost Park, where is located the last of any considerable area of timber land which has not had the best picked from it or been totally destroyed by fire.

The timber nearest the South Platte River and for several miles back from this stream was naturally the first to be taken, and much of this easily accessible ground has been gone over a second time in the search for sawmill logs or for the few railroad ties which might be found.

Abandoned sawmill sites, with their heaps of decaying sawdust and lumber refuse, are plentiful along the courses of the numerous small streams, but at present there are fewer sawmills in active operation than were to be found on this reserve several years ago. This is in part due to exhaustion of supplies in certain localities, and in part to the energy of forest rangers appointed by the Department of the Interior during the past summer.

During the past autumn there were only four or five mills at work



A. SAWMILL AND CAMP IN LOST PARK.

B ENGELMANN SPRUCE UNTOUCHED BY AX OR FIRE; NEAR SAWMILL IN LOST PARK, NORTH SLOPE.

Altitude above 10,500 feet; trees 3 to 15 inches in diameter of trunk.

in the entire reserve. The largest and most important of these was found located in Lost Park, in the midst of the last considerable body of unburned and uncut forest to be found in all this region. When running at full capacity this mill could cut about 25,000 feet of lumber per day. It had been gradually moved from location to location as the good timber was cut out, a very fair lumber road being constructed and extended as necessities arose in order to facilitate the hauling of the product to the shipping station at Estabrook.

It was moved to the present site in the spring of 1893, but was then run for a few months only, when it was closed and not reopened until the spring of 1898. Like many of the larger mills in operation in this part of the country, this one was outfitted by a large lumber company which has extensive lumber yards at Denver, Colorado Springs, and other points. It was claimed by the mill operators that they had title to two sections of land, upon which they were working.

This mill is located beside a small stream in one of the open "parks," at an altitude of about 10,000 feet. The hills and ridges surrounding it are covered with timber of variable quality, according to exposure, and composed mainly of Engelmann spruce, here known as white spruce, which is almost the only tree used for lumber, although some lodgepole pine is cut and mixed with it. The Engelmann spruce reaches its best development on cool slopes having a northerly aspect; on southerly slopes it is poorer and is often supplanted by *Pinus aristata*, which rarely makes good saw logs. The best spruce timber here is not very large, trees 3 feet in diameter at the stump being uncommon, as has already been stated. Most of the logs obtained and sawed are between 12 and 15 inches in diameter at the small end, the trees probably averaging 35 to 40 feet in length of log used after stripping off the branches, as there is commonly a very short clear trunk, or practically none.

The trees are felled by sawing nearly through and wedging the sawed side, so that the tree falls in the opposite direction. The branches are stripped off just so much of the trunk as is considered desirable, usually up to about a foot in diameter at the small end. The timber is cut usually into lengths of 12, 14, or 16 feet, the heavier logs usually into the shorter lengths. Two men generally work together in felling the trees and cutting the logs, although sometimes they are assisted by a "trimmer," whose chief work is to remove the branches from the logs.

Single horses with whippletree and chain are usually employed in hauling the logs to the skids, at the side of a wagon road, where they are loaded upon wagons and taken to the mill. These skidding horses often suffer much injury to their feet and legs, especially where there is much débris from tree tops and branches, and on

steep slopes they are liable to be injured by the logs which they are hauling.

The refuse tree tops and branches are left to decay where they fall, furnishing dry fuel, which would cause very destructive burning if fire should get started.

Seedlings and young trees are ruthlessly sacrificed wherever they appear the least in the way of operations, but on most of the ground now being cut over a fair number of medium-sized trees remain to shade and seed the ground and protect the new growth, although many of these trees now left or rejected are liable to fall when visited a second time by the lumberman after gleaning the best from a first cutting, or are sure to be taken when the manufacturer of wood pulp can not get material nearer a shipping station.

Like most of the movable mills in this part of the country, the sawmill in Lost Park is of cheap, rough construction, simply an open-framed building roofed over. One-fourth of the timber is lost in sawdust by the thick circular saw, which consumes a quarter of an inch in thickness with every board cut.

The sawed lumber costs about $3 per 1,000 feet to haul to Estabrook, the nearest shipping station, 14 or 15 miles distant, where it is worth $11 or $12 per 1,000 feet.

Choppers were here paid $1 per 1,000 feet (Scribner's measure) for cutting logs ready for the mill. The lumbermen roughly calculated that 14 or 15 logs of the mixed lengths cut (12, 14, and 16 feet) were required to produce 1,000 feet of lumber.

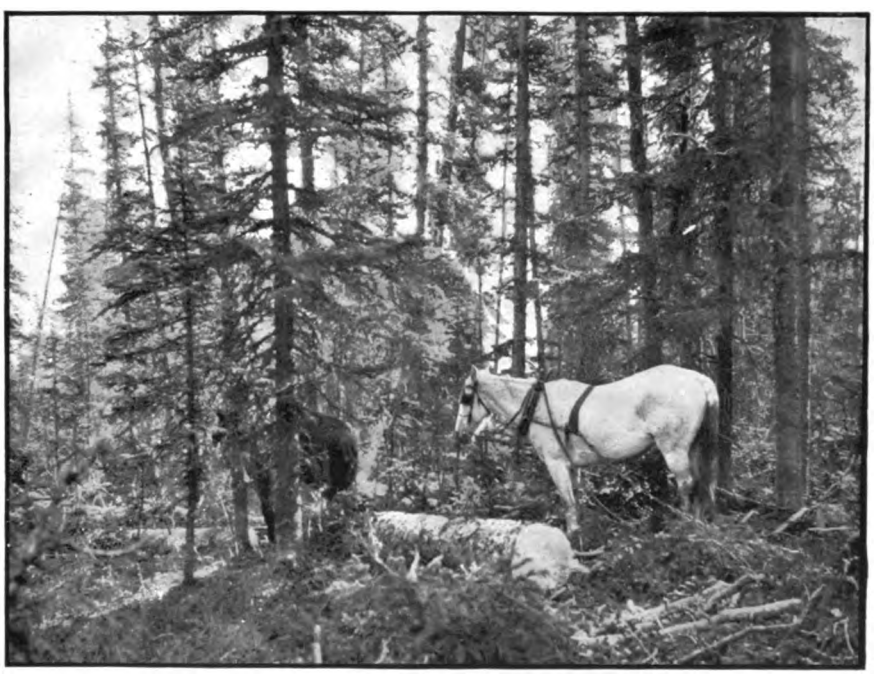
Strong efforts were being made to have the operations of this mill stopped, and at last accounts they were at least temporarily successful.

A sawmill was at work beside a small creek flowing from the Platte River Mountains into the North Branch of the South Platte, near Chase. Another small mill was located near Grant, farther up the river, but on the north or unreserved side of the stream. In October the mill was closed and the proprietor was placed under arrest.

Another mill, with a daily producing capacity of about 10,000 feet of lumber, was at work several miles south of Puma City, About 450,000 feet of lumber was cut from ground within a radius of 2 or 3 miles from the sawmill. At the end of October this mill was moved to another location near Signal Butte, outside the eastern boundary of the reserve. The lumber cut in all this comparatively low country (8,000 to 9,000 feet altitude) is yellow pine and Douglas spruce, and occasionally a blue spruce.

It is here considered worth while locating and operating a portable steam sawmill if 500,000 feet of lumber can be obtained within a radius of 2 or 3 miles, so that the average amount of lumber obtained, around some locations of the mills, is sometimes under 100 feet to the acre. A mill may move to new locations several times in the course of a

A. CHOPPERS FOR SAWMILL IN LOST PARK CUTTING ENGELMANN SPRUCE.



B HORSES "SKIDDING" SAW LOGS IN LOST PARK.

A. TIMBER IN LOST PARK.

Three saw logs, Engelmann spruce, together containing over 1,000 feet lumber; largest log 25 inches in diameter at small end. Exceptionally large timber for this region.

B. VIEW IN LOST PARK.

Logs among refuse, cut and ready for "skidding" out to lumber road.

year, and during the last twenty-five years much of the ground has had two or three visitations from lumbermen. The distance for hauling logs depends somewhat upon the character of roads and the practice of mill managers, some preferring frequent moving of the mill to a long haul of the logs.

One or two small mills were at work near the reserve boundaries south of Florissant.

No active sawmills were found in the western arm of the reserve west of South Park, but three or four were located close to the boundaries. One of these was on the western slope of Breckenridge Pass, another east of Hoosier Pass, near the base of Mount Silverheels, and one close to the eastern boundary of the reserve on the road through Horseshoe Gulch to Leavick. The timber cut by these mills was chiefly Engelmann spruce and lodgepole pine.

At Mountaindale was seen the only water-power sawmill in any of the reserves. Its power was obtained from Tarryall Creek and its output was small, as it is operated only occasionally in order to supply some local demands.

A great many railroad ties have been cut and removed from this reserve, and the cutting of ties is still carried on, although the business is much diminished in comparison with former years. Apparently few ties are cut by regular lumbermen or by persons having tie making for their sole occupation, such cutting as is now carried on being done chiefly by ranchmen, squatters, or prospectors. The work is generally incidental to some other undertaking, and it is almost impossible to obtain any very definite idea of the somewhat limited number of ties now annually cut within the reserves. Douglas spruce is practically the only species cut for this purpose, and to be acceptable to the railroads it is considered essential that it should be cut in autumn or winter, although it was during August and September that the two or three cases of actual tie cutting were observed.

The cutting of Engelmann spruce for manufacture into paper is a comparatively recent industry in this region, but is one likely to grow very rapidly and to the great damage of the spruce forest unless restrictive measures are enforced. No cutting for pulp was actually seen within the reserve lines, although some was reported; but in two places, close to the boundary, timber cut for this purpose was in process of removal from Government land. One of the locations was in Halls Valley, 2 or 3 miles north of the most northerly part of the reserve. The wood is cut into short lengths on the hills and sent down timber chutes to the valley below, whence it is hauled to Webster, a small station on the Colorado and Southern Railway, and there loaded on box cars and shipped to Denver.

Another shipping point was Leavick, near the head of Horseshoe Gulch, so close to the western boundary of the reserve that it was a

disputed matter whether or not the work came within the reserve lines. Sticks of any size down to 4 inches in diameter are taken here. The logs are hauled by horses down the slopes to a small steam sawmill, which is used for cutting them into pieces 2 feet long, after which they are loaded on box cars for shipment. A machine for stripping off the bark before shipment was on the ground, but had not been set up or operated.

In the northern part of the reserve, north and west of the Kenosha Twin Cone Mountains, during several years previous to 1893, a large gang of men were employed cutting timber for manufacture into charcoal for smelting purposes. Many thousands of acres were cut over, and practically all of the lodgepole pine and Engelmann spruce were taken to the charcoal kilns, the pine being the principal tree of this section. Twenty-five or thirty kilns were operated, part of them being located at Webster, others near Kenosha.

The timber was taken from public lands and the depredations were stopped only by the establishment of the reserve in 1893. The kilns are now abandoned, some of them broken and fallen to decay, others still in a fair state of preservation.

A great deal of apparently needless destruction attended this cutting. Hundreds of thousands of small lodgepole-pine trees were cut and left on the ground, so as to not only destroy a crop already partly grown, but to invite worse damage by fire. In some places a portion of the small trees was left standing, in others they are gradually coming in to re-cover the ground.

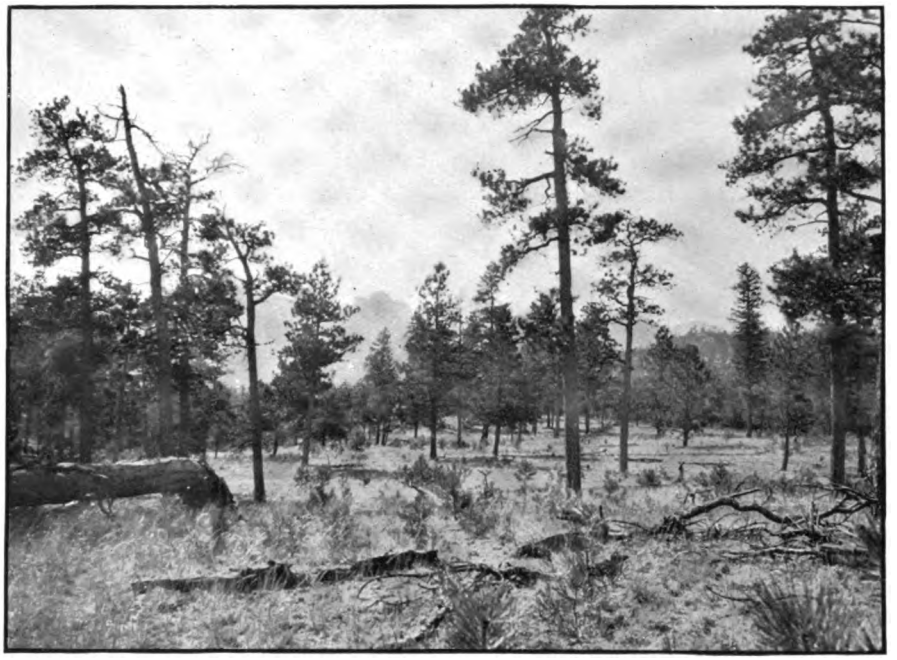
Destructive to forest as the cutter for wood pulp may be, he is outclassed by the manufacturer of charcoal from wood.

Some timber is cut and used locally in mines and a small amount of dead and dry material is collected and sold.

SUGGESTIONS AS TO BOUNDARIES.

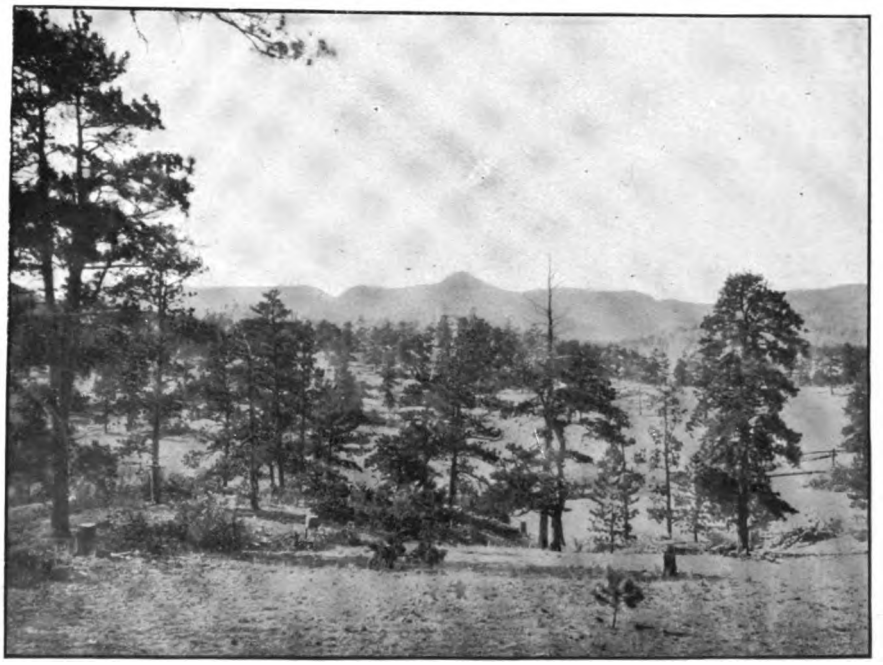
As they are at present drawn the boundaries of parts of the reserve are far from satisfactory, especially considering the objects of conservation of timber and water supplies. The irregular artificial boundary lines of certain parts are little known or respected, although natural boundary lines, like the South Platte River, are too obvious to admit of any excuse for trespassing.

On account of the irregularity and narrowness of much of the western arm of the reserve, west of South Park, the timber of almost any part is easily removed by persons outside of the reservation while the reserve lines are in dispute. For the purpose of water conservation the reserve is of comparatively little value. It is unfortunate that the entire eastern watershed of the Park Range of mountains is not included within the reserve, and indeed it would have been advanta-



A. VIEW NORTH OF LOST PARK CREEK, 4 OR 5 MILES FROM ITS MOUTH.

Characteristic growth of yellow pine and Douglas spruce on considerable areas never visited by lumbermen, but subjected to surface fires at various times.

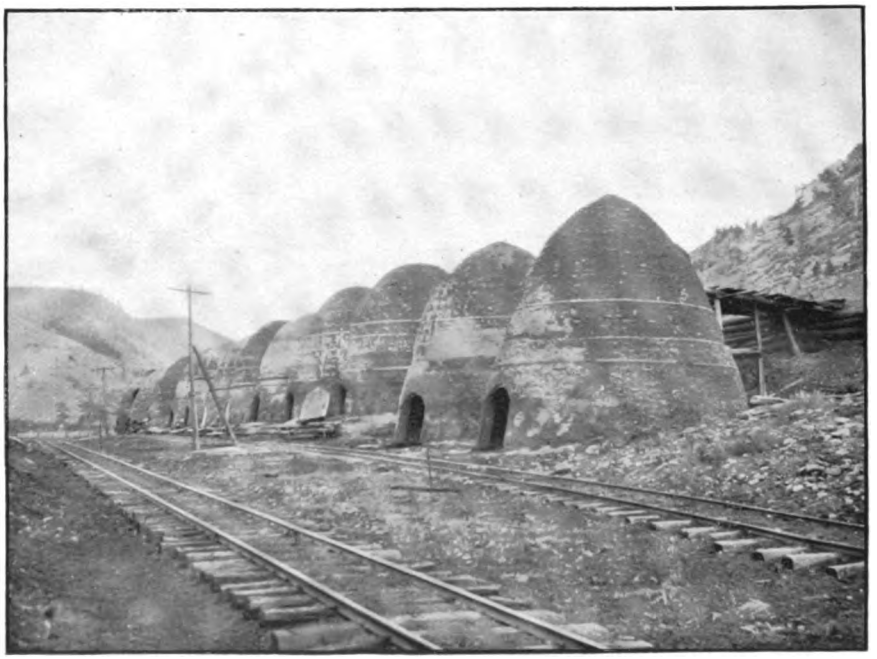


B. VIEW AT PUMA CITY, LOOKING WEST.

Yellow pine and remnants after cutting.

A. CHARCOAL KILNS AT WEBSTER, FRONT VIEW.

Openings are for filling with wood



B. CHARCOAL KILNS AT WEBSTER, BACK VIEW.

Openings are for taking out charcoal.

geous if much of the western slope had been taken in, as here are important feeders of the Arkansas River, and also of the Blue River, which flows into the Grand. It is true that the perpetual snow banks on the sides of these high unreserved peaks are likely to furnish a certain amount of water during the summer, independent of forest conditions on the lower slopes, but the preservation of the forest would be certain to add to the flow of water and to distribute it more evenly in the early part of the summer, when the snows of the lower slopes are melting.

The main body of the reserve would be better and more simply inclosed by making the South Platte River the boundary along the entire eastern and southern sides, leaving out the territory on the south side of the stream. This ground is not mountainous, and is not of much value as a source of water supply. It is true that it has furnished and may furnish some timber, but in this respect, and also for its small streams, it is not so valuable as a large portion of the unreserved territory lying north of Florissant and Hayden Park, bounded on the east, north, and west, respectively, by the Pikes Peak, Plum Creek, and South Platte reserves. Much of this area, especially on the western side, might well have been included within reservation lines in order to preserve valuable timber upon it and to protect the small tributaries of West Creek and the South Platte River.

There is much territory of an open and almost useless character lying east of the Puma Hills and south of Tarryall Creek, but as it could not very well be separated and may in time become better timbered, it is probably best to continue it as an integral part of the reserve, unless, indeed, it should ever be found advisable to eliminate from the reserve altogether all of the region lying south of Tarryall Creek, this region being of much less value for water conservation than the higher mountain region north of the creek.

West of the Puma Hills and the Tarryall Mountains and east of South Park there are included within the reserve limits considerable areas of open, level, or but slightly timbered and rolling land, which is much used for grazing purposes. As this land is of little use for the purposes for which the reserves were established, it would seem the best policy to relocate the boundaries so that such areas would not come within the rules governing the reservation.

TREES AND SHRUBS OBSERVED IN THE PIKES PEAK, PLUM CREEK, AND SOUTH PLATTE RESERVES, AUGUST, SEPTEMBER, AND OCTOBER, 1898.

The following list of trees and shrubs is undoubtedly incomplete, but there are probably very few more species to be found within the limits under consideration. The list will serve to show the paucity of the ligneous flora of the region examined, embracing over 2,000

square miles in area and varying in altitude from under 6,000 to over 14,000 feet. The list is given alphabetically according to genera.

Abies concolor (Gord.) Parry. (Silver fir, white fir.)

Not abundant. Along streams or canyons up to 8,000 or 9,000 feet.

Abies lasiocarpa (Hook.) Nutt. (*A. subalpina* Engelm.) (Alpine fir or balsam spruce.)

Grows with Engelmann spruce up to timber line. Plentiful in few localities.

Acer glabrum Torr. (Maple.)

Common along creeks and on many mountain slopes, from 6,000 to 10,000 feet altitude. A large shrub, never arborescent, not growing above 20 feet high.

Acer negundo Linn. (See *Negundo aceroides.*)

Alnus tenuifolia Nutt. (Alder.)

A large shrub or small tree, near streams.

Amelanchier alnifolia Nutt. (Juneberry.)

Occasional; from 6,000 to 10,000 feet altitude.

Ampelopsis quinquefolia Michx.

Local, near streams; 6,000 to 7,000 feet altitude.

Arceuthobium. (See *Razoumofskya.*)

Arctostaphylos uva-ursi Spreng. (Bearberry.)

Common on mountain slopes, on coarse granite soils, and prevents washing.

Artemisia tridentata Nutt. (Sagebrush.)

In western part of the South Platte Reserve, with other *Artemisia.*

Berberis repens Lindl.

Common in some localities and on south slopes up to 9,000 feet altitude. Springs up freely from the roots after a fire has passed over the ground.

Betula occidentalis Hook. (Birch, black birch.)

Along streams, up to 10,500 feet altitude or more. A tall shrub, with numerous stems. Never truly arborescent, although sometimes 15 or 20 feet high.

Betula glandulosa Michx.

Along streams and in wet places at high altitudes. A small shrub.

Bigelovia.

There are several species of small shrubby *Bigelovia* in this region.

Ceanothus fendleri Gray.

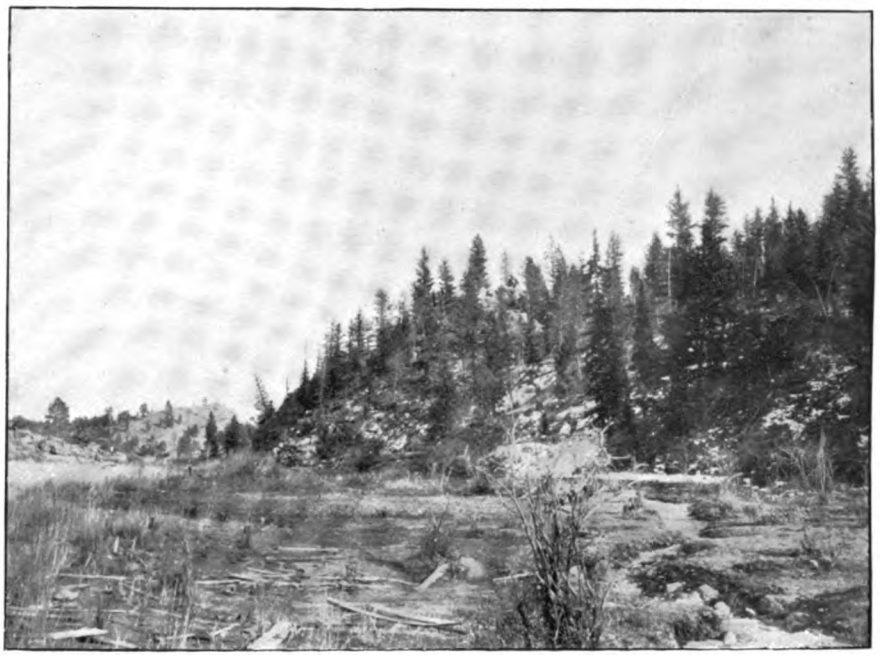
Observed in Pikes Peak and Plum Creek reserves up to 9,000 feet altitude.

Ceanothus ovatus Desf.

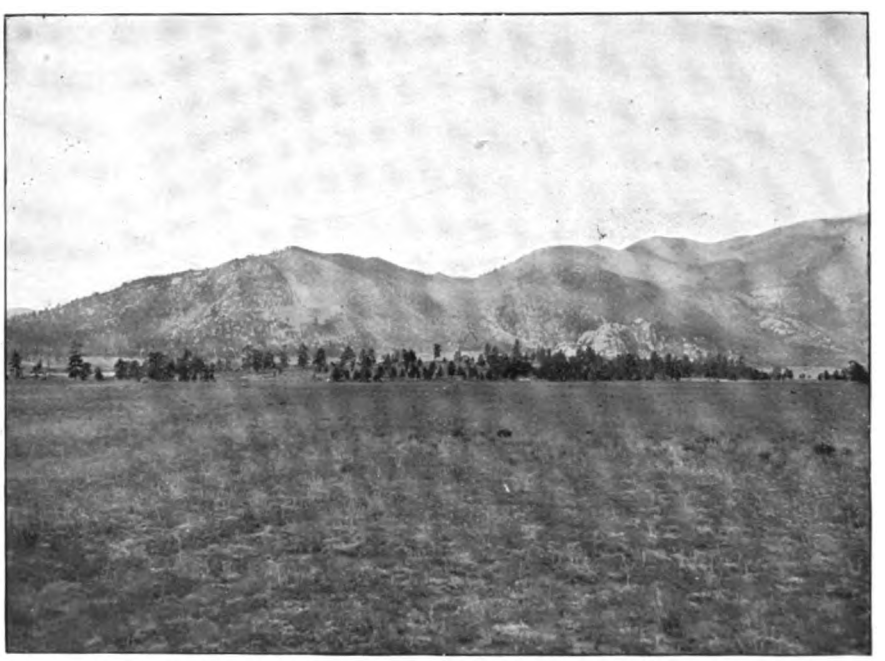
About same range as *C. fendleri.*

Ceanothus velutinus Dougl.

Eastern side of Plum Creek Reserve, 7,000 to 7,500 feet altitude.



A. VIEW ON FISH CREEK, 5 OR 6 MILES SOUTHWEST OF FLORISSANT, LOOKING EAST.



B. VIEW LOOKING WEST TO PUMA HILLS, ALONG ROUTE BETWEEN PUMA CITY AND LAKE GEORGE.

Timber on hills much burnt.

Celtis occidentalis Linn. (Hackberry.)

Rare, only seen on lower eastern slope of Plum Creek Reserve. Small, scrubby.

Cercocarpus parvifolius Nutt. (Mountain mahogany, Buffalo bush.)

Often locally abundant on coarse, granite soils, at altitudes from 6,000 to 9,000 feet. Usually an upright bush 7 or 8 feet high, but never arborescent. When burned, new shoots spring from the stumps.

Clematis ligusticifolia Nutt.

Frequent along creeks under 8,000 feet altitude.

Clematis verticillaris De C.

Occasional, up to 10,500 feet altitude.

Cornus stolonifera Michx. (Red-stemmed cornel or dogwood.)

Occasional, along streams.

Corylus rostrata Ait. (Hazelnut.)

Occasional, on lower slopes of mountains.

Cratægus rivularis Nutt. (Hawthorn.)

This species was found near Grant, on the North Branch of the South Platte River, and along the South Platte near the junction with West Creek. It is apparently rare and local in these reserves.

Cratægus sp.

A thorn bearing some resemblance to but apparently distinct from *C. macracantha* was noticed in the South Platte Reserve on Buffalo Creek, 2 or 3 miles from its mouth. It was hardly arborescent, although there were large, vigorous-stemmed plants, 8 or 10 feet high, accompanied by many suckers. Late spring frosts had destroyed blossoms so that no fruit was produced this season.

Dryas octopetala L.

Low creeping shrub, above timber line, 11,500 to 12,500 feet altitude.

Gaultheria myrsinites Hook. (Wintergreen.)

Plentiful in some localities.

Holodiscus discolor Maxim.

Common on coarse poor soils and rocks up to 10,000 feet altitude or more.

Jamesia americana Torr. and Gray.

Common on rocks and coarse granite soil up to 9,000 or 10,000 feet altitude.

Juniperus nana Willd. (Common juniper.)

Occasional; never abundant. A low spreading shrub.

Juniperus monosperma (Engelm.) Sarg. (Cedar, red cedar.)

Observed only along eastern edge of Pikes Peak and Plum Creek reserves, under 7,000 feet altitude.

Juniperus scopulorum Sarg. (Red cedar; locally also called white cedar.)

More generally distributed through the reserves and growing at a much higher altitude than *J. monosperma*, reaching at least 9,500 or 10,000 feet.

Lepargyraea canadensis (L.) Greene (*Shepherdia canadensis*, Nutt.). (Buffalo berry.)

Local up to 10,500 feet altitude or more.

Lonicera involucrata Banks.

Occasional, especially near streams, reaching to 10,500 feet altitude or more.

Negundo aceroides Moench (*Acer negundo* Linn). (Box elder, ash-leaved maple.)

Seen only along South Platte River in northeast part of Plum Creek Reserve, below 6,000 feet altitude.

Pachystima myrsinites Raf.

Observed only on west slope from Breckenridge Pass, and not actually within reserve limits.

Physocarpus torreyi Maxim.

Common on disintegrated granite soils well up mountain slopes.

Picea engelmanni Engelm. (Engelmann spruce, white spruce.)

The prevailing tree at high altitudes to timber line.

Picea parryana (André) Parry (*P. pungens* Engelm.). (Blue spruce.)

Along creeks and gulches along the lower parts of the mountains and on some of the "parks," up to 10,000 feet altitude.

Pinus edulis Engelm. (Piñon, piñon pine, nut pine.)

Occurs only within the Pikes Peak Reserve north of Manitou.

Pinus flexilis James. (Limber pine, white pine, "sugar" pine.)

Generally scattered through the reserves and reaching to timber line. Rarely abundant at any place.

Pinus aristata Engelm. (Range pine, also miscalled "piñon pine.")

Abundant on south slopes of mountains and reaching to timber line. Also scattered to the base of the mountains and on hills or "buttes."

Pinus ponderosa scopulorum Engelm. (Yellow pine, bull pine.)

The prevailing timber tree up to 10,000 feet altitude. Showing a great deal of variation and hardly considered distinguishable from the typical *P. ponderosa* Lawson, although the variety *scopulorum* is considered distinct by some botanists and is the tree found in this region.

Pinus murrayana Engelm. (Lodgepole pine, white pine.)

Abundant in many regions, either growing with Engelmann spruce and other trees or forming close pure forest of this species alone.

Populus acuminata Rydb. (Cottonwood.)

Only a few trees seen, near Manitou and Colorado Springs.

Populus angustifolia James. (Narrow-leaved cottonwood.)

The most common cottonwood or poplar along streams in this region.

Populus balsamifera Linn. (Balm of Gilead, balsam poplar, cottonwood.)

Frequent along streams; found at altitudes of 10,500 feet or higher.

Populus deltoides Marsh (*P. monilifera* Ait.). (Cottonwood, broad-leaved cottonwood.)

The tree most commonly planted for shade at places along the eastern base of the mountains below 7,000 feet altitude. Not found in the mountains.

Populus tremuloides Michx. (Quaking aspen or quaking asp, aspen.)

Abundant almost everywhere, especially after forest fires. Usually small, but in moist, sheltered canyons or gulches sometimes attaining 60 feet in height and a trunk diameter of a foot or more. Occasionally reaches to 11,000 feet altitude.

Potentilla fruticosa Linn.

This is probably the most generally distributed shrub in the reserves. Observed at different altitudes from 6,000 to 12,500 feet and possibly higher. Often very abundant on open "parks" used for grazing.

Prunus americana Marsh. (Wild plum.)

Local, along creeks on eastern side of Plum Creek Reserve, under 7,000 feet altitude. A shrub or small tree 10 to 12 feet high. The fruit is valued for culinary purposes.

Prunus pennsylvanica Linn. (Bird cherry.)

Common in many places from 6,000 to 10,000 or higher altitude. Always very small, never arborescent. Springs up freely from roots after fire. Possibly a distinct variety or species from the eastern type.

Prunus virginiana Linn. (Chokecherry.)

Frequent, especially along creeks, sometimes on rocky mountain slopes. Usually 6,000 to 8,500 feet altitude.

Pseudotsuga taxifolia (Lam.) Britton (*P. douglasii* Carr). (Douglas spruce, red spruce.)

Abundant, with yellow pine up to 10,000 feet or higher altitude.)

Pyrus sambucifolia Cham. & Schlect. (Mountain ash.)

Rather rare and local.

Quercus gambelii Nutt. (Oak, scrub oak.)

Usually growing to 7 or 8 feet in height, forming thickets. Rarely tree-like or 20 feet high.

Razoumofskya americana (Nutt.) Kuntze (*Arceuthobium americanum* Nutt.).

Parasitic on lodgepole pine; plentiful in some localities and causing considerable injury to the growing trees.

Razoumofskya douglasii (Engelm.) Kuntze (*Arceuthobium douglasii* Engelm.).

Parasitic on Douglas spruce; local.

Razoumofskya robusta (Engelm.) Kuntze (*Arceuthobium robustum* Engelm.).

Parasitic on yellow pine (*P. ponderosa*). Abundant in many localities and sometimes causing much injury.

Rhus glabra Linn. (Smooth sumac.)

Occasional, at low altitudes. Springs up again after fire.

Rhus toxicodendron Linn. (Poison sumac, poison "ivy.")

Occasional; dwarf, never climbing; found only at low altitudes.

Rhus trilobata Nutt.

A common spreading bush in many places from 6,000 to 8,000 feet altitude.

Ribes aureum Pursh. (Missouri currant, buffalo currant.)

Uncommon and local, along streams at lower levels.

Ribes cereum Dougl.

Common on rocks and poor granite soils, on mountain slopes up to above 10,000 feet altitude.

Ribes lacustre Poir. var. **parvulum** Gray.

Frequent, especially at high altitudes, reaching to 12,000 feet or more.

Ribes leptanthum Gray.

Occasional.

Ribes oxyacanthoides Linn. (Gooseberry.)

Along streams up to 9,000 feet altitude or more. Fruit edible; valued for culinary purposes.

Robinia neomexicana Gray.

Naturalized at Manitou from another part of the State. Not within the reserve boundary.

Rosa arkansana Porter.

Rosa engelmanni Watson.

Rosa woodsii Lindl.

The roses showed great variability, and other species may occur. Typical *R. engelmanni* occurs on the Cheyenne Mountain wagon road, between Colorado Springs and Cripple Creek.

Rubus deliciosus James. (Flowering raspberry.)

Common, usually with *Physocarpus*, *Holodiscus*, etc.

Rubus strigosus Michx. (Red raspberry.)

Common in localities, but not so abundant as is generally supposed. Plentiful in a few burned districts and along some roadsides. Always dwarf, rarely more than 18 inches high.

Rubus americanus (Pers.) Britton (*R. triflorus* Richardson).

Uncommon; in moist places.

Salix bebbiana Sarg. (*S. rostrata*, Richardson.)

Occasional.

Salix cordata Muhl.

Frequent along streams.

Salix desertorum Richardson, var.?

Abundant along cold mountain streams or on wet mountain meadows or "parks" reaching 12,000 feet altitude.

Salix flavescens Nutt.

Salix irrorata Anders.

A handsome willow found along streams up to 10,500 feet altitude or more. Grows 8 to 10 feet high.

Salix lasiandra Benth.

Much resembling *Salix lucida* of the east.

Salix longifolia Muhl.

Noticed only along streams below 8,000 feet altitude.

Salix monticola Bebb.

Occasional.

Salix novæ-Angliæ Anders.

Common along streams at high altitudes.

Salix phylicifolia (*S. chlorophylla*, Anders.).

Near streams at high altitudes.

Salix reticulata Linn.

A creeping, very small willow, growing on exposed slopes above timber line.

Sambucus racemosa Linn. (Red-berried elder.)

Occasional on mountain slopes up to 10,500 feet or more. Usually dwarf, and less woody stems than eastern form.

Symphoricarpos occidentalis Hook.

Occasionally abundant, especially near streams.

Symphoricarpos pauciflorus (Robbins) Britton. (Snowberry.)

Plentiful in a few localities.

Symphoricarpos oreophilus Gray.

Occasional.

Vaccinium myrtillus Linn, var. **microphyllum**. (Whortleberry.)

Abundant in some localities, but not generally distributed. Dwarf, rarely more than 3 or 4 inches high.

Vitis vulpina Linn. (V. *riparia*, Michx.) (Wild grape.)

Very local along creeks on eastern borders of Plum Creek Reserve at about 6,000 feet altitude.