DEVELOPING NATIONAL FOREST RECREATIONAL RESOURCES WITH A PRELIMINARY RESORT AND FOREST PLAN FOR A SPECIFIC AREA IN THE SANTA CATALINA MOUNTAINS ARIZONA

THESIS FOR DEGREE OF M. FOR

CLIFFORD WORDEN Mc KIBBIN

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Introductory.

Recreational Resources.

The recreational resources of our forests are assets often not readily recognized but present, developed or latent in every forest area. Unlike timber, wood, forage or water resources they are intangible yet as permanent as the forest itself and just as capable of exploitation, development and of being made to serve a wonderful use to mankind. Timber of the forest is worked into homes, forage resources help furnish our meat supply, water stored by the forest gives with its regulated outward flow a power to do the nation's work and an element to make her valleys productive, yet the resources of recreation are even greater in their service to humans for their function is the up-building of the human body itself, restoring health and repairing man's physical being to make it fit for its share of the work of world progress. Hand in hand with this re-building of physical powers there comes to the nature lover, "to him who in the love of nature holds communion with her visible forms", that finer touch of nature's inspiring influence that strengthens man's spirit and truly re-creates his being.

This health giving influence of the forest is difficult to define, even difficult to describe. One who

has drawn deep of the ozone of the pines, who has made his camp under the forest's sheltering branches and has known the restful sleep following a long day in nature's out-of-doors, knows, better than can be told, that power of the forest for administering 'nature's remedy'. Back in early times the forest was man's home. It sheltered him and gave him food and by living and doing things in nature's way physical perfection was attained. During the ages since, even through the rapid development of modern times, man's desire, an instinct really, to get into the woods and live close to nature has remained and nature has retained the power of building physical vigor in those that will return, so that whatever may be man's quest in the forest -- whether it be the hunt, mountain climbing, fishing, or just sight-seeing travel -- the fact that he goes back to the forest home of nature is the essential. This keeping of nature's home, with all those possessions of the forest that lure men to its realms go to make up recreational resources. A sheltered place for a camp or cabin or a more pretentious lodge, sparkling waters, and fish that temptingly rise for a fly, a splendid antlered deer, mountains inviting the climber, canyons, valleys, waterfalls, parks, all bidding men to the enjoyment they offer, these attributes of the forest that tempt and lure and finally satisfy through a re-creation constitute a forest's recreational resources.

Historical.

Going back to the early history of forestry which had its real beginnings in the countries of Europe, the first forests are found to have been set aside and kept and used for recreation alone. In Germany as the development of property conditions placed kings, dukes and barons in a position to assert their rights as landed proprietors, they first sought, after their incomes were assured, to provide for their recreation and sport. At that time the main use of the forest was for the hunt. Wood was plentiful, an ample supply for all who used it, and there was no necessity for a thought as to the source of this supply. Accordingly, as owners of private property, kings and barons soon developed their right to prevent others from hunting upon their lands since this was their chief use. In the eighth century kings forbade trespass under penalty of a heavy fine, the king's ban or fine of 60 shillings being imposed upon trespassers, so that the exclusive right to the hunt or chase became recognized as a part of the property. It is right here in this connection in truth that our word forest was derived. Hitherto the word Forst had been used to designate only the king's property, but now at the end of the eighth century any lands reserved and used exclusively for the king's hunting no matter whether they were woodlands or not were termed 'forst'.

The right to create ban forests or to reserve the hunt and fishing for king's use alone was soon extended to barons and the clergy as those classes were given land so that, as property rights developed among individuals the ban forests were indefinitely extended. Here the king or lord and his friends and retinue sought the deer, the wild boar, the wolf, and other animals that in the chasing and killing would furnish excitement and sport. The entire chase became the source of great and prolonged social festivities. It was made the occasion of great gatherings of nobles who enjoyed the hospitality of one of their number, took part in the hunt upon his domain, and feasted and drank and celebrated in honor of those most successful in bringing in the trophies.

Special officers were placed in charge of the hunting grounds, in reality officers of the hunt, but who, in guarding the rights of the king and enforcing the restrictions of the chase, were the first to bring forth the idea of forest protection, restriction in forest use, and restriction in clearings. These officers or guards were called forestarn. the chief a forestmaster.

Thus as hunting grounds and for recreation only was the first use made of forest areas. Not until the demands of an increasing population and a more extensive colonization brought forth the need for mast pasturage lands and greater wood supplies were forests used or protected for other purposes. Indeed it was not until the beginning of the 19th. century that the watershed protective function of forests was

discovered.

Present Day Conditions on the National Forests.

In our own country however the history of National Forest administration shows the order of demand and use of our western Forests to be exactly reversed. At the time of the creation of the National Forests and, subsequently, economic conditions have been such as to place demands for timber supply, grazing ranges, and watershed protection far ahead of recreation or resort uses, so that development along these lines has remained until the very last. When the Forest Service was first organized to administer and carry on the business of the National Forests a great many vexing problems confronted them. Millions of acres of wild western mountain lands, sparsely settled, inaccessible, and with very meager communication and transportation facilities had been set aside as National Forests and were to be placed under a system of management that would make them of most use to the greatest number of people. It is obvious that in placing such a vast and broadly scattered area under forest regulation the problems of organization and administration were fundamental and insistant and demanded that energy be spent on present needs rather than on plans for future development or on schemes for opening up new and untouched resources. Problems of organization of field forces, facilities for carrying on the work in the field, such as houses for Forest officers, telephone lines, trails, roads, etc., fire protection plans,

silvicultural policies, grazing regulations, land classification all demanded immediate attention, a solution today, a far seeing policy to be formulated and carried out at once.

But with few exceptions all these various lines of administrative activities may now be said to be well established, fixed in their operation, and the work of their construction and organization completed. Such conditions are indeed fortunate for within the past two years a practically new demand for a use of the National Forests has arisen. This demand is for recreational use and has been brought forth by two powerful agents, the European war and the almost universal use of the automobile as a means of travel. The slogan of "See America first" became a command when the great war closed the doors of Europe to American travel and from that time the number of travellers and sight-seers making use of the Rocky Mountain region has increased incredibly. Augmenting this westward flow of tourists comes the extensive use of the automobile and the ever growing popularity of motor touring. The automobile has so broadened the scope of travel that new and better roads are everywhere called for and new country must be made accessible, particularly if it have possibilities for recreation. A secondary result of the great war has been the bringing of general prosperity to this country which has stimulated touring and travelling, western travelling

specifically for where else may sight-seers turn. The California expositions of last year added a further incentive to western sight-seeing and Rocky Mountain resorting.

To meet this demand for recreational uses measures are being taken by both the Federal government and the Forest Service. The government is assisting through legislation intended to permit greater development and more extensive use of recreational resources. To the Forest Service of course falls the duty of providing facilities for intensive recreational use by the people and of working out detailed plans for development and administration of recreation and resort grounds.

PLAN FOR DEVELOPMENT OF SOLDIER CAMP RESORT AREA.

1. General Description.

(a) Location.

The Santa Catalina range of mountains is in the southcentral part of Arizona in the extreme north of Pima County and forms the northernmost as well as the most heavily timbered of the five divisions of the Coronado National Forest. The Soldier Camp Area lies along the summit of these mountains about midway of the main range in approximately Sec. 6, T. 12 S., R. 16 E., Gila and Salt River Base and Meridian. The area embraces the upper Bear Wallow Canyon which for a distance runs parallel with the range and on the north side of the higher ridges at this point. Bear Wallow is one of the tributaries of Sabino Creek, which is the largest and most important stream in these mountains and drains a large part of their south slopes. Gaining headway in the upper mountain heights, the canyon tends westward, the main range dividing into two ridges to form its sides. After coursing through the Soldier Camp Area, the canyon bears off southward cutting off and disbursing the southern ridge as it descends the mountain leaving its canyon side on the north to continue and become the backbone of the range westward.

Within the area the rather steep canyon sides are cut by numerous side canyons that tend to widen out the canyon

bottom and reduce the slopes. Flanking the upper stream the slopes are steep but are slightly moderated as it proceeds westward until the flattened saddle at Soldier Camp proper is reached. A short distance below Soldier Camp huge outcrops of granite precipitate the canyon sides and make of the canyon itself a steep rocky gorge.

Elevations within the area range from 7500 feet to 7900 feet in the upper canyon, the average elevation of the lands capable of intensive resort development being about 7750 feet above sea level. A U. S. Geological Survey bench mark, marked 7705, is located directly in front of and some 200 feet distant from the Soldier Camp Ranger Station.

(b) Climate.

While no absolute records have been kept on the area in the past, the maximum temperature as noted from time to time by numerous resorters is about 75°. It is very rare that this temperature is exceeded, an average minimum during June, July and August being about 70°. Winter temperatures are not known but no doubt an average winter maximum would be about 5°, although zero temperatures and below are no doubt common.

The warmest period is from June first until late August, while winter weather prevails from the middle of November till late March. Typical of the region embracing the southwestern United States, the relative humidity is very

small and the extreme dryness of the atmosphere is carried even through the heights of the pine-clad mountains.

Absolute data on precipitation is not available either but based on comparison of vegetation and records over the state, an average fall of 30 inches over the area is no doubt a very conservative estimate. The climate in this respect is similar to the west coastal region, two well defined seasons of precipitation prevailing. The summer rainy season begins usually about mid-July and extends into early September, while winter snows come early in November and continue until late March and even early April along the summit of the mountains The summer rains resemble those of the tropics in that they are torrential in character, hard showers of from one to four hours duration occurring almost daily during the summer rainy period. These down-pours are almost always accompanied by lightning and in the high mountains, the electric storms are especially severe, and form the chief cause of forest fires in this region. The period of winter precipitation is not so well defined in its extent or regularity. The winter precipitation is of course all in the form of snow, which falls in considerable depth over the area and lies in deep drifts in the canyons and protected north exposures until the latter part of April or in many years until the middle of May.

To show the relative amounts of precipitation during the different seasons of the year, we may safely take the

records gathered in the general southern Arizona region surrounding. While all of the weather stations are much lower in elevation, the records will serve as an indicator of the seasons and will give precipitations relatively, although the rainfall does not vary entirely with elevation because of the influence of slope and topography. For this purpose precipitation data collected at Tucson, Arizona, Pima County, elevation 2425, covering period of 45 years, Benson, Arizona, Cochise County, elevation 3523, covering period of 32 years, shows the seasonal fall as follows:

Winter, Dec. to March inclusive,	27.6%
Arid for summer, April to June " .	6%
Summer rain, July to Sept. 15 " ,	50.2%
Arid after summer, Sept. 15 to Nov. " ,	16.2%

(c) Economic Conditions.

On account of its geographic and physiographic location, the climate of southern Arizona is very hot and dry. By southern Arizona is meant approximately the lower one third of the state. It forms the southernmost territory of what used to be described as the great American desert. The rainfall is very light, averaging but 10 inches annually for a greater part of the area and the relative humidity is very low most all of the year. Summer temperatures prevail from May 1 until October 1 and during all of that time a mean maximum of 96° may be taken as an average for the entire desert section.

Temperatures of 110° to 115° are not at all uncommon in July and August and in several of the desert towns 118° to 120° are registered regularly each year. The winter climate is correspondingly mild and very delightful, in fact so much so that the region is used extensively as a winter resort.

The industries of the region are mining and stock raising both of which are becoming very extensive in the scope of their operations.

Agricultural and horticultural pursuits are limited because of low rainfall and soil conditions and confined wholly to the narrow valleys where agricultural soils occur and where irrigation may be practiced.

The region as a whole is essentially a grazing range type and no doubt will always be used most extensively for the raising of range stock. Its mountains, foot hills and long mesas gently sloping to the stream beds support seasonal growths of grasses, weeds, browse and desert vegetation which, although scanty, furnish subsistence to thousands of cattle, horses, sheep and goats.

Within the past two years, the mining industry has been greatly stimulated due to the European war and unsettled conditions in Mexico and the increased prices in metals, particularly copper, have opened up and caused to be operated a large number of old mines hitherto abandoned as well as many newly developed claims. The stock raising industry has also received an impetus from the European war, although prices

for range stock have been steadily increasing for a number of years and prospects seem especially bright for the stability and permanency of the cattle business in this region.

Besides these established industries which employ and provide for considerable numbers of people, southern Arizona has long been famous as a health resort. On account of the extremely dry atmosphere and the large percentage of sun-shiny days throughout the year, the climate is especially favorable to recovery from tuberculosis in almost any form in which the stage is not too far advanced. The medical profession throughout the country recognizes the excellence of this climate for this disease and each year large numbers of health seekers are sent here from all parts of the country. While the mildness of the winter climate also attracts large numbers of tourists and travellers during the winter months, those seeking relief from tuberculosis ordinarily remain for a number of years, many permanently.

Having in mind the industries and the peculiar climatic conditions which bring and hold a stable population in this region and furthermore recalling the desert temperatures which prevail from May until September, almost one half of the year, the very extreme needs of this region for a summer resort and recreation ground are obvious.

City of Tucson:

While conditions such as have been described are uniform throughout southern Arizona, and the needs for a

mountain retreat where the protracted summer heat may be escaped are about equal over the general region, the city of Tucson (pronounced Tū-sŏn) which is located in the very heart of the desert area and is its metropolis and trade center, may be taken as representative and as a specific example in which a description in detail of certain economic factors may be given. Furthermore the city of Tucson is nearest to the Soldier Camp Resort area and Tucson people hold the region as a vitally important asset to their city and are chiefly interested in its immediate development.

A city of some 20,000 inhabitants, Tucson lies in the Santa Cruz Valley at an elevation ranging between 2300 and 2400 feet above the sea. It is entered by the main transcontinental line of the Southern Pacific and also by the El Paso and Southwestern Railroads, the latter a branch of the Rock Island lines which are slowly being extended through to the west coast at San Diego, California. From Tucson the Southern Pacific Company operates a branch line southward to Nogales, Arizona, and Sonora, and the west coast of Mexico at Guymas. The city is also a railroad division point and has large car shops and other divisional equipment. It is the trade center of a rich mining region and cattle raising industry and, besides controlling much of the business of southern Arizona, it is the seat of several philanthropic and educational institutions, among which should be mentioned the

State University with a present enrollment of 425 students, the Indian Training School (Papago Reservation) and the Desert Laboratory of the Carnegie Institute.

Altogether Tucson is to be considered an up to date and growing city and on account of the resources behind it and its numerous institutions it is destined to permanency and a greater growth and development.

However of its size and its business interests, the summer heat of Tucson is almost intolerable in its intensity and duration. Beginning in late May and extending well into October some days whose maximum temperature averages 96° and often reaches 110° in July and August. This extreme summer heat is one of the chief drawbacks to Tucson as a city for permanent residense. It is also the factor that establishes a high value for the nearby mountain resort as an asset to the city itself. Both these points are recognized by Tucsonians.

In the past it has been the practice of all that could afford it to vacate the city during the summer, many going to California coast resorts. Many men who, on account of business demands, can not go themselves are in the custom of sending their families for from one to three months of the hottest weather. This migration to the California coast and to other resorts during the summer months leaves the city spent both in numbers and wealth and stunts business activities accordingly. The extreme need of a nearby summer resort, one that is close, easily accessible and will keep Tucson money and business

at home is very keenly felt through the pocketbook of the Tucson business man. And it is obvious that the need is not by any means an entirely financial one. To many the escaping of at least a part of the torrid summer is necessary to health.

(d) Accessibility.

The demand for an accessible summer resort in the Santa Catalina Mountains has been felt for a long time. The range is very rough and rugged and its lower slopes present unusual difficulties to the ordinary traveller, making the trip to its upper timbered and less rugged reaches one that is physically impossible to all those not accustomed to strenuous mountain trips. Although but 18 miles distant, air line, at the present time the Soldier Camp Area is reached from Tucson by fair valley road, 12 miles to the mouth of Sabino Canyon, thence over a good trail 20 miles, a total of 32 miles, in which distance a climb of some 5000 feet is made, along almost sheer canyon walls, and steep boulder strewn mountain sides. The present trail was constructed by the Forest Service in 1912 and is very good both as to grade and tread. However, to make the mountain top accessible to all and especially those not in the best of health who really have the greatest physical need for the recreation facilities offered by the pine covered heights, a good road, preferably an automobile road is required. Such a road has been contemplated for several years by Tucsonians and numerous efforts for state and federal aid

have been made from time to time. Finally the question was brought to a crystalization in October 1915 when the county of Pima, in which Tucson is situated, in a general road bond election voted $100,000 bonds for the construction of the mountain road. Just previous to the drawing up of the ballot, a party consisting of the chief engineer of the Tucson Division of the Southern Pacific Company, the Forest Supervisor and several other interested Tucsonians thoroughly acquainted with the mountains, made a hurried reconnaissance of all of the routes that had been suggested and finally recommended a route up from the south side of the mountains, taking, in the main, the route of the present trail, and as is shown in Map 2. Engineer Mathews of the Southern Pacific Company, who acted as chief of the party, estimated the cost at $100,000 and this amount was fixed for the election ballot. The Forest Service donated to the county the location survey which was begun in December 1915. The field work was completed in May 1916, but the cost data for which the county authorities are waiting before going ahead with actual construction is not yet available. There seems to be some doubt among experts that an automobile road which shall come up to requirements as to width and all safety precautionary construction can be built for the $100,000 voted, but it is the general opinion that the money should be spent and the road made to go as far toward the top as possible after which, through outside aid or an additional bond issue, it will be completed.

The idea prevails that, once Tucson people (for probably not more than 3 per cent of them have ever been in the pines and firs of the upper slopes) know the beauties and the recreational possibilities of the mountain top, as they would even if the road can be completed only to the lower edge of the pines, it will be possible to secure any amount necessary to complete the entire project.

The proposed road, while it goes only to the Soldier Camp area, will make available all of the upper slopes of the Santa Catalinas for resort purposes, and there are from 8 to 10 other areas capable of equal resort elaboration. When the projected road may be completed and ready for use is at this time a matter of conjecture only, but it cannot possibly be completed even to the pine zone before 1918. By 1920 however it is felt certain that the recognized needs of all of southern Arizona will have pushed the project through to completion.

It is obvious that any extensive development of the mountain along recreation and resort lines is dependent upon a good road or at least upon some means of making the region much more accessible than it is at present.

2. Forest Description.

(a) Types and Species.

Two very distinct forest types occur on the area, the yellow pine type and the fir type.

Pine Type: The pine type made up of pure stands of western yellow pine (P. ponderosa and P. Arizonica) occurs on benches and south exposures. Much young Mexican white pine is mixed in this type on higher portions of the tract along ridges and in sites of slightly more shade than the average for the type. For the most part the stand is very open and the forest floor clear and dry except for occasional clumps of dense reproduction in the seedling and sapling stages, and a low brushy coppice-like growth of white leaf oak (Q. hypolenca) occurring in scattered groups on very sunny sites. This increases rapidly in occurrence with the descent in elevation and on south exposures at 7700' and lower, it covers a considerable area of the forest floor. The pine type in the Soldier Camp Area lies entirely on the north side of the canyon, stopping abruptly at the stream bed in the bottom and at the crest of the ridge above. The two species, P. ponderosa and P. Arizonica, occur together through the type no distinction being noticeable as to their distribution on various sites. Nor is the difference between the species at all noticeable except on a close examination of the leaf clusters, the bark,

leaves and general form of the two species being identical. A very occasional individual of white oak(Q.Gambelli) is found on the moister sites. This is almost always found in coppice form.

Fir Type: The fir type is composed of Douglas (Pseudotsuga taxifolia) and white fir (Abies concolor) about evenly divided as to species. As the pine type occurs only on the north side of the canyon, southerly exposed, the fir type clings tenaciously to the northerly exposed and moist, deeply shaded south side. The stream bed of the canyon forms almost a hard and fast type boundary for this particular area. Through much of the type white fir makes over half of the stand, probably 60 per cent of it. An occasional yellow pine is found in the type though as a rule there is not sufficient light for them. Mexican white pine is scattered in the opener sites. Numerous hard woods seek the moist shaded slopes of this type, their demand for moisture leading them to associate with their moisture-loving coniferous brothers. These hard woods are maple, A. grandidentatum, aspen, P. tremuloides, locust, R. Neo-Mexicana, oak, Q. Gambelli, alder, A. oblongifolia, and such shrubs as dogwood, willow, etc. The fir type extends well up toward the top of the ridge on the south where heat, light and moisture conditions again give the pine type the upper hand.

(b) Form and Growth, Pine Type.

The pine type soils are rocky clay, well drained and of disintegrated granite and gneiss formation. They are shallow as a rule and being southerly exposed soon dry out through the upper strata. The pine therefore, except for the small saddle area at Soldier Camp Station, makes only a very mediocre growth. The stand is better toward the head of the canyon, due possibly to less evaporation and a slightly greater moisture content in the soil. In the saddle at Soldier Camp Station, a deep clay loam apparently well watered, and shaded by the high steep canyon side on the south, produces a very vigorous growth in a thick stand of 'blackjacks'. In this connection it must be mentioned that woodsmen distinguish two forms of the western yellow pine which are termed blackjack and yellow pine respectively. These two names are given from the fact that, in its younger stages and up to from 100 to 140 years, the bark of the tree is of a blackish color, while as it proceeds to maturity the black outside scales are exfoliated exposing those beneath which are of a light cinnamon red. While the blackjack marks the younger stage of the tree, very often where they have made a rapid growth many blackjacks will be found of greater size than others in the yellow pine stage. I have often seen yellow pine in poor sites as small as 6" and 8" D.B.H. while blackjacks from 18" to 22" D.B.H. are quite common.

The better stands of yellow pine will average 8 M. ft. b.m. per acre, the poorest on sites of shallow soil exposed to severe evaporation average but 3 to 4 M. per acre. Over the entire pine type, the stand is approximately 4 M. ft. b.m. per acre. Mature individuals average about 75 feet high and 24 inches in diameter. On poor sites the open nature of the stand tends toward the production of low, limby trees of poor quality from a lumberman's standpoint. A clear length of about 18 feet is probably an average for the stand although there are many individuals with clear lengths of 25 and 30 feet.

No volume or growth data were taken on the area but the stand here will average up favorably with other stands of western yellow pine in the Southwest. The primary use of this region is for other than timber production so that growth and volume data are not essential.

The occasional individuals of Gambell's oak are as a rule mature trees from 6 to 8 inches D.B.H., low and spreading in an orchard-like form. Numerous examples of coppice growth are found where several stems from 3 to 6 inches in diameter have started from a single stem.

Fir Type: In the fir type, soil moisture is much more abundant and the dense stands resulting, shade the forest floor and provide a thick layer of needles, twigs and duff which prevents evaporation and greatly reduces direct run off. From this upper humus layer, the soil is much enriched and is able to support the dense stands of both coniferous and hard wood

species.

While there is considerable mature and over-mature fir, the greater part of the type is young growth. Douglas and white fir make about an equal growth here; many reach a height of 100 feet and a diameter of from 3 to 5 feet. An average diameter is about 30 inches for each species. The growth is especially dense and vigorous on the moister sites resulting in crowded stands and long, clean, evenly tapered boles. Mature individuals are scattered through dense stands of saplings and poles. These large firs are a source of admiration and wonder to all of the Tucson people who have seen them, there being but few who can believe that such timber exists within 18 miles, air line, from their desert bound city. This was brought out decidedly when moving pictures, taken in the big timber, were shown in Tucson theatres during the campaign for the Santa Catalina road bond election. As the pictures appeared on the screen invariably a murmur of astonishment would go through the audience and exclamations of wonder could be heard on every side.

Mexican white pine occurs only occasionally on less shaded sites and mature trees sometimes reach a diameter of 20 inches and height of 60 to 70 feet. An average tree, however, is from 8 to 10 inches D.B.H. and not over 40 feet in height. This species is apparently naturally inclined to low limby growth even when crowded for light. The occasional yellow pine individuals that find footing where light is available make an excellent growth and being crowded stretch

up and form long clean cylindrical boles, a superior tree to those in pure pine type stands.

Aspen creeps in in small openings and makes a quick growth. Where it has been possible to gain a foothold of any size, the stand is very dense. When interspersed among coniferous growth and at all crowded, aspen develops remarkably, often attaining a size of 14 inches d.b.h. by 60 feet high with a long straight trunk clean for much over half its length. As a rule however it is much smaller in diameter and with a low rounded crown. Gambel oak occurs in this type similarly with the pine type, it being low and spreading, often a coppice form of several stems each banding outward away from the central trunk or stump that gave rise to it.

Maple is found in the draws and bottoms where plenty of water is to be had. It rarely reaches a size of over 6 inches d.b.h. and its low, spreading and often bent head is scarcely ever above 20 feet in height.

The locust is very occasional in its appearance but, when growing in dense forest and crowded, it reaches its optimum size. Here it may be seen in tree form 15 to 20 feet high and 5 to 7 inches in diameter.

Willows and the red barked dogwood occur along the canyon bottoms.

This type presents an especially beautiful forest scene in the autumn when the somber green of the conifers is illuminated with the golden yellow of the aspen and the orange and red colorings of maples, oaks and dogwood. Such a varied

mixture of coniferous and hard wood species is not at all common in the general southwestern region of the United States, where the stands are chiefly of pine and fir with aspen or oak alone as the sole hard wood representative. This in itself lends an added feature of attractiveness.

(c) Reproduction

Reproduction is only fair throughout the pine type. It consists chiefly of scattered clumps of saplings and seedlings, the former often forming dense thickets. Seedlings from 3 to 4 years are fairly well distributed. Pole stands are light, some of them having been heavily thinned for building purposes. The fact that a portion of this type has been pastured may also bear upon the poor reproduction, for over the Santa Catalinas as a whole, pine reproduction is splendid.

In the fir type reproduction is excellent. Very thick stands of saplings and poles occuring over the entire area. Seedlings are also well supplied. Many sapling clumps of fir of both white and Douglas are so thick that it is often difficult to walk through them. The numerous pole stands have also been thinned for building purposes, but without apparently diminishing the supply.

(d) Commercial Importance.

The forest on the Soldier Camp Area is unimportant from the standpoint of outside commerce. The mountains are so inaccessible and the timber in such comparatively small amounts over the entire range that its exploitation from a

lumbering standpoint is scarcely practicable. The original outlay that would be necessary in preparation for operations here would not be justified by the amount of timber available for cutting. The timber itself is good however and similar in quality and characteristics to yellow pine and firs being cut in this general southwestern region.

Although unimportant from the standpoint of the world of commerce, the timber has a very important use in connection with the proposed development of the region as a resort, when the pine and firs can be used to excellent advantage for local building. As houselogs for cabin construction, the yellow pine and Douglas fir are especially suitable. White fir is also well suited to this use but is not so lasting and when used precautions should be taken against decay. Sawed material of these species as well as slabs, shakes, shingles, and practically every product that might be turned out by a small portable mill here can be utilized and very suitably in summer resort building work. Douglas fir is more durable in contact with the ground than yellow pine or white fir, the latter being the least of the three. Yellow pine and Douglas fir are used considerably for mine timbers in this region and may also find ready use here as such.

(e) Watershed Value.

In lower Sabino Canyon Area several miles directly south of the resort, a natural damsite exists where a number of individuals have proposed to do the necessary construction to develop and furnish both a power and a water supply to the city of Tucson and vicinity. Negotiations were first started in 1909 when a company known as the Great Western Power Co. formed by two Tucson men obtained a permit to carry on engineering investigations and a small amount of construction work. Shortly after this a disagreement among certain members of the Company resulted in the formation of two more companies for the development of the same project. These made application to the Forest Service for the use of the tract, and when the Federal Power and Water Company, who held the permit failed in meeting the requirements in construction work, their permit was revoked on May 5, 1913. Three new applicants were then considered but, since the city of Tucson made known that they wished to develop the project as a municipal one, they were given first consideration. Upon its developing that the city of Tucson would not be able to finance the project, the New State Development Company, composed of Tucson people, was granted a Forest Service Preliminary Power Permit in May 1915. They are given a year in which to undertake development work, but thus far have done nothing. In case their permit is forfeited, it will be turned over to one of the two waiting applicants, who are very anxious to be allowed

to proceed with the project.

As outlined, the project proposes the construction of a dam at what is known as the "dam site" just below the "basin" in Sabino Canyon. This dam will create a reservoir of considerable area in the "basin" and the development of hydro. electric power would be made besides the furnishing of a pure mountain water supply to the city of Tucson. The present supply pumped from wells is costly and of very poor quality.

The waiting applicants have made known that they consider the undertaking would furnish a very small and slow return on the amount of the investment, estimated at close to $1,000,000;; still they seem anxious to go ahead with the project. From their tone and the opinions of a number of engineers acquainted with the premises, it seems probable that this project will eventually be carried through successfully.

Bear Wallow Canyon is one of the tributaries to Sabino Creek, joining it about 4 miles from its source on the north side of Mt. Lemon, the highest point in the Santa Catalina Mts. Sabino Creek is a permanent living stream for some 5 or 6 miles of its upper length, after which it is intermittant in its flow during the summer season. The entire drainage area of the stream, which includes much of the south slope of the Santa Catalina Mts., is approximately 29 square miles, of which the Bear Wallow Canyon makes up

a little over 1-1/4 square miles. It is of much greater importance to the entire watershed however than this area proportion would indicate because it is one of the living heads of the stream, and all of its watershed area is of high mountain lands completely timber covered and capable of great run off control.

It is in view of the proposed power development and the furnishing of a water supply to the city of Tucson that the Sabino Watershed assumes such importance. With the water supply project put through, the area is charged with an added responsibility for not only must a continuous outward flow be maintained by the protective cover for the development of power, but furthermore this supply must be kept clean and pure and uncontaminated for the use of a city's people. At the present time the watershed is important to the valleys below which depend entirely upon the regulated flow of the mountain streams for direct irrigation and for ground water which is pumped extensively throughout the valleys.

(f) Grazing.

The area is not used for grazing purposes, except by a few saddle and work animals of summer campers. There is no stock under permit here nor is there liable to be. In years past, numbers of cattle were driven into the upper Catalinas, but they soon became wild and difficult to handle on account of the roughness of the country. They were gradually shot and driven out until practically none are left

and the upper ranges have for the past five years been absolutely abandoned by cattlemen in the vicinity.

On account of its economic value as a watershed in connection with the proposed water and power development project, the drainage area of Sabino Canyon is not open to sheep and goat grazing - however there is no demand whatever for this class of range on account of insufficient adjoining winter range.

3. Resort Plan

(a) Past and Present Use.

A limited use of the Santa Catalinas for summer camping has been made for the past 30 years by residents of Tucson and vicinity. Even before that time, soldiers stationed at Old Fort Lowell on the Rillito Wash at the southern foot of the mountains made numerous trips into them on practice marches as well as to get out timber for building work about the Fort. The Old Soldier Trail and Soldiers' Camp on the summit were thus named. The first trails were very rough and difficult to travel and only the more adventurous spirits were willing to undergo the difficulties and hardships of the climb, but once the top was reached all felt amply repaid for their exertions and were so enthusiastic about the natural beauties and attractiveness of the region that the number of campers has steadily increased each year. Recently improved trails have also encouraged travel until in 1915 some 250 persons made excursions into the upper slopes.

In former years, game was very plentiful throughout the range and many sportsmen were attracted in the fall for the hunting offered. Deer abounded in all parts of the mountains and are still quite plentiful considering the large numbers of hunters who go into the hills each season with the express purpose of bringing home a buck. Twenty years ago, wild turkeys were also very plentiful, but were entirely

exterminated shortly after that time. It is said that they were killed out by Indians and fires, although it is probable that soldiers and hunters had their share in the destruction. This mountain range is admirably adapted to wild turkeys, there being plenty of winter food for them in the oaks, junipers and manzanita thickets of the lower slopes, and the upper coniferous zone offers excellent opportunity for nesting and bringing off their young. Wild turkeys are very plentiful in the larger mountain ranges in eastern Arizona and New Mexico where climatic and vegetational features are similar to those here and turkeys could be brought back here and would multiply with protection. Bears are seen occasionally now although they are very scarce as compared to ten years ago. A few mountain lions are left and three or four are caught nearly every year by local trappers. Wild cats are also found here in numbers. Quail and grouse do not habit the mountains, although the little plumed valley quail abounds in the low lands surrounding the range.

The native mountain brook trout makes an excellent fishing stream of Sabino Creek although originally the stream was without fish. The first trout fry were secured from the Leadville, Colorado, hatchery and placed in the stream in 1908 by a public spirited mountain lover, Ed. L. Vail, of Tucson. These fish have done very well and for the past three years have furnished excellent fishing sport. The stream of Sabino Creek rushes down through a steep rocky rough canyon that makes the fishing difficult and adds zest to the sport.

At the present time there are eight summer residences, log cabins or substantial tent houses in the Soldier Camp Area. With the exception of the old Crissman cabin, the sites on which these residences are located together with three other unimproved sites are held under special use permit from the Forest Service. The holders are merchants and professional men of Tucson. The first summer residence, the Cochran cabin, was built in 1906; the second, a substantial tent house, was built by S. J. Kitt in 1910; two other cabins were constructed in the fall of 1914, and two cabins and a tent house were put up in the summer of 1915. It is understood that the three unused sites will be improved within the next year. The old Crissman cabin was built about 1905, but in recent years has not been kept up, but is used occasionally during wet weather by transient campers.

Most of the summer homes are occupied from the middle of June until the middle of September by the owners or their friends. In several instances, the length of the stay in the mountains by these people with permanent residences is fixed by length of the children's summer vacation from school. All but two of the cabin occupants have children of school age and they go into the mountains as soon as school is out in June and remain until it re-opens in September. It may be said here that the attractiveness of this resort area is not confined in its appeal to grown-ups alone. Children delight in romping and playing among the trees and climbing the mountains in their games and flower gathering and are especially bene-

fited by a summer so spent. They are improved physically by their life out of doors and learn first hand of the things of nature. They re-enter school work rugged and invigorated and with minds refreshed. The value of the place as a children's summer play ground is recognized by all who have taken children into the mountains and parents are especially enthusiastic on that subject. Besides those occupying permanent summer residences, approximately 100 people made use of the camping facilities offered and spent from one to four weeks in tents on various parts of the Soldier Camp Area.

As has already been indicated, the entire top of the mountain range is capable of resort use, but, on account of obvious topographical and water requirements, the areas on which extensive resort building and housing accommodations may be had are limited. Roughly, there are seven such tracts besides the one at Bear Wallow on which resort communities may be built up. These groups of potential sites are shown on Map 2. Four permanent camps, three of which are residences, are occupied in other parts of the mountains and many outlying camping spots are used by parties in tents for short periods, but the Bear Wallow Area being central and with telephone and transportation facilities easiest available, has been most popular and most used. The summer headquarters of the Forest officer of the Santa Catalina district are in the Soldier Camp Ranger Station, an attractive log cabin very centrally located and to which all trails lead.

The Station is connected with Tucson and other points in the Santa Catalinas by Forest Service telephone line. It is because of the popularity of this area and the attractions which it offers in the way of accessibility and telephonic communication that an early demand for intensive resort development is anticipated here, and for that reason the Soldier Camp Area rather than any of the other numerous potential recreational areas is being chosen for this study and plan.

During the past season, two men made a business of transporting parties into the mountains. One had some 10 saddle animals and made regular trips from Lowell Station to Soldier Camp Station, while the other, with burro trains, did a heavy freight and packing business from May until November.

(b) Anticipated Demand.

It is obvious that the demand for the recreational use of these mountains rests almost entirely upon their being made easily accessible; in other words, upon the construction of an automobile road that shall at least reach up into the timber zone. From the need that exists throughout southern Arizona for the resort facilities offered by the Santa Catalina Mountains, a means of making their heights accessible is sure to come, eventually if not at present. The numbers in favor of the road and actively pushing its construction and the fact that a bond issue to finance its building has been passed by a popular vote lend strong assurances that the road will soon come. With this probability of the regions being opened to the use of all who will wish it, future plans are being made on that

assumption.

While it is true that there are two other mountain ranges in southern Arizona, high and timber covered, that are capable of great recreational use, they are farther distant from the centers of population and routes of travel and do not possess the favorable economic environment of the Santa Catalinas. These are the Graham Mountains and the Chiricahua Mountains, the former a part of the Crook National Forest, the latter making up the greater part of the Chiricahua National Forest. Both these ranges lie in the southeastern part of the state. Because the mountain ranges themselves are not readily reached and their upper slopes offer similarly difficult obstacles to road building, it does not seem that their recreational possibilities will be developed as early as those of the Santa Catalinas.

The following are population figures for southern Arizona cities and towns whose people will no doubt make some use of the Catalina resort region. These figures were obtained from the Tucson Chamber of Commerce and were compiled from various sources including school census, railroad and mining companies' data, etc. It is believed that, in the main, they are thoroughly reliable, although it is entirely possible that in one or two cases they are slightly high.

Tucson-	22,500	Nogales-	5,000
Phoenix-	23,000	Yuma-	4,000
Warren District including Lowell, Warren & Bisbee-	23,000	Mesa-	3,000
Douglas-	12,000	Tempe-	2,000
		Tombstone-	800
		Benson-	800

The relation of the Santa Catalinas to these centers of population is shown by Map 1. Of course the greatest use will be made by the city of Tucson, but with the attraction offered by a good mountain summer resort, well managed and equipped and within easy reach over good state highways such as connect Tucson with Phoenix, Nogales and Douglas, many patrons from Phoenix, Mesa, Tempe, Nogales, and the mining towns of Tombstone, Warren District and Douglas may be expected. People from Benson and Yuma may reach the Catalinas by a fair road or even by railroad to Tucson.

With the above in mind, a very safe estimate of the numbers who will wish to go into the Santa Catalinas may be placed at 5000 people, four-fifths of which number will no doubt be citizens of Tucson or vicinity. This estimate is believed to be entirely conservative and is set for a period beginning roughly about 1922 or from three to four years after the completion of the road. These figures on anticipated demand are approximated only for the sake of making a beginning in the development of plans for the accommodation of the recreational users of this forest area. With the beginning made and a tentative plan at hand, it will be an easy matter to adjust it as actual development takes place, and, keeping pace with the resort demands, make changes as they are called for.

Based upon similar uses made of mountain recreational and scenic resorts in other parts of the west, the accommoda-

tional needs of the anticipated number of 5000 may be estimated roughly as follows. Of the total number about 40 per cent will be accommodated in private summer residences, and will represent a stable summer population making use of their cottages from early in June until October. The other 3000 may be dealt with as transients who will come into the mountains for short periods of from 2 to 3 days up to a month and whose average length of stay in the mountains will be about two weeks. Probably 40 per cent of the transient class will be boys and young men or people of the poorer classes who will bring their own camping equipment and live in tents. The rest of the transients, 30 per cent of the total number coming into the mountains, will no doubt be automobilists, travellers, tourists and people more well to do, who will wish hotel or tent house accommodations for short periods only.

Considering the number of relatives and guests usually sharing such summer hospitality, each permanent summer residence may be calculated to care for an average of five persons during the season. With this number fixed, the summer cottage sites necessary to care for the demand will be about 400, which, under existing conditions of topography and water supply, means that <u>every possible cottage building site</u> in the mountains <u>must be developed</u> and <u>made available</u> for use. When careful and complete development has been made, it is believed that this demand may be met, although at the present time, a rough estimate places the number of potential sites at 350. Thus, to meet the demand will require the utmost care in the survey and apportionment of lots and a thorough inventory of the potentialities of the entire

mountain top. The fundamental question in the whole scheme of resort development here is that of a water supply. This question may be met successfully without doubt, yet only with a comprehensive knowledge of the entire mountain height and its possibilities.

At this time it is impossible to go more deeply into the resort plan for the entire Santa Catalina range because data are not now available, nor is it the purpose of this study. The necessity of a comprehensive survey looking toward complete recreational development of the entire mountain top is very urgent however and its early undertaking is strongly recommended.

(c) Survey of Sites.

It is the purpose of this study to treat only of the development of one specific region in the Santa Catalinas, one group of potentialities which may be built up into a resort community. As stated, because of its importance, its popularity, and the demand for development here, already beginning the Soldier Camp Area has been selected. The relation of this tract to others capable of similar development is shown by Map 2.

Bearing in mind the above paragraphs on the anticipated demand, it is obvious that intensive development is necessary in every division capable of recreational use and that every possible potential site for any sort of resort purpose must be made available. And while in some instances it might be possible to go ahead with actual lot survey as the first step, in this particular case, on account of the intensive nature

of the proposed development and the necessity for carefully laid plans well coordinated, an accurate map of the region seems the first essential. The scale used in the maps accompanying is 200 feet to the inch and is none too large. The original map was made with plane table and stadia using land survey and U. S. G. S. points for horizontal and vertical controls. Contours were placed at 10 foot intervals. The entire area has been covered by the U. S. Geological Survey in their Tucson Quadrangle but their scale of $\frac{1}{125000}$ with contour interval of 100 feet is of course unsuited to the present needs but is very helpful in checking. As the mapping proceeded, an attempt was made to locate and note all areas capable of any form of resort use, roughly amounting to a resort reconnaissance. With this map in hand, the general lines of resort and recreational development may be drawn and the varying needs provided for something as in Map 4. A party may then go into the field and make final lot subdivisions and designate areas for special kinds of resort and recreational usage. It must be borne in mind however that the plans drawn in Map 4 are not by any means to be considered final as to exact lot line location and other details. This plan is simply a definite proposal as to the manner of resort development and the number and extent of the needs to be accommodated rather than a hard and fast location drawing and must be regarded as such. It is an idea to work toward but conditions on the ground must often dictate as to the exact

location details. Furthermore, varying and unforeseen demands may disprove the advisability of certain proposed sites and their uses. This must be borne in mind in the location work.

(d) Residence Sites.

Ordinarily these need not be more than one acre in area, often less, depending upon local needs and topographic and forest conditions. The size of the lots should be such as to use all the available parts to the very best advantage, not crowding the residences unnecessarily, nor spreading them lavishly so as to materially reduce the number of buildings to be accommodated. From one half to one acre will be an average under conditions on the Soldier Camp Area.

Formerly several residence sites here have been permitted up to 2 acres in area, but they are in reality larger than conditions warrant. On this account and further because the existing uses have been permitted without any attempt at regularity or at following out any prescribed plan with consequental blanks left between lots, a resurvey conforming to the definite plan outlined is recommended.

In contemplating the individual residence lot survey, there are three prime considerations; first the suitable location for the construction of a residence, second that each individual lot may be easily accessible preferably without without the necessity of crossing any other lot, and third that the outhouses and sanitation measures necessary for each lot

be provided for in the locating survey.

The first consideration does not necessarily mean that each lot shall be entirely flat, but that there will be some level or partly level land upon which a house can be built without too much excavation. In the Soldier Camp Area all the desirable sites are on the sloping canyon sides and on nearly all lots here more or less excavating will be necessary.

As will be seen in Map 3, all the potential residence sites have been located on the north canyon side in the pine type. Practically no sites have been indicated in the fir type on the south canyon side, northerly exposed. The reason is that the south side, being covered with a dense stand of timber, is naturally heavily shaded and very damp and the sun shine scanty. For that reason, it is doubted if residence sites will ever be in demand there, so that plans have not been made for them.

(e) Hotel Sites.

At the present time but one hotel site is suggested on the area. It is a gently sloping bench in the mixed pine and fir type and the site is commanding in view. It is very close to the terminus of the proposed road although since the final road survey has not beem completed, this location is not definite. Nor is it known just how large an establishment this site might accommodate.

(f) Public Camp Ground.

The public camping ground has been located in conformity with its past use. This area is in the upper canyon bottom which widens out into a shaded flat covered with a grove of fir, maple, and oak. It has been used for camping purposes for several years and will accommodate from 4 to 8 camping parties very nicely. The grove furnishes protection and the surface is flat making good locations for tents almost anywhere.

(g) Public Improvements.

1. Roads. Roads and trails are of course as necessary to the complete utilization of the areas as a city's streets. A road up Bear Wallow canyon as shown on the improvement plan will make the entire block of lots easily accessible and will not be very costly. A good trail follows the canyon bottom at the present time and in many places a road will be but an amplification of the trail. This road will of course connect with the proposed ascending road and with a proposed road on westward to other potential resort communities. Trails will of course develop as the lots are improved and intercommunication begins. It is not felt necessary to make provision for these as yet since their location is a matter of doubt and will depend upon the growth of recreational uses. A twelve foot road is believed to be amply sufficient for the traffic involved and a rough estimate of the cost of the road work would be $1500. In its construction, care should be taken to enhance rather than mar the natural beauty of the canyon bottom.

2. Water Supply. The question of water supply is not a difficult one for the Soldier Camp Area, yet considering conditions, it is rather expensive. At the present time, the Bear Wallow stream flows regularly for all of its length in the wet seasons, but during the dry early summer months is intermittant as far down as the Soldier Camp Station. From that point on, it is regular in its flow at all seasons. The present resort water supply is carried by hand from the stream. The source of the stream is fed by two excellent permanent springs as shown on the map. A water supply close at hand is essential to the development of a large number of the sites, shown in the canyon sides, in fact the availability of these sites is alone dependent upon the water. Development is further necessary to insure an absolutely pure supply to all the sites. It is proposed by means of a reservoir and gravity pipe line to bring water to these sites or very close to them so that it will not be necessary to carry water any great distance. A reservoir of several thousand gallons capacity is proposed to be located about 200 feet below the springs and from this, the pipe line will lead along the canyon side following the contours with a gradual grade until the saddle at Soldier Camp is reached where it will ascend about 50 feet and continue along the contour westward, and may be calculated to furnish other sites farther west. A 2 inch pipe from the springs to the reservoir and from the reservoir on to supply the sites is planned on. The privilege of tapping this supply would be extended to each site occupant.

Some of the residence sites could have water brought to them directly in such a way that it would be possible to pipe the house completely if desired, while others not so fortunately situated might have it brought close to the house when a very short up-hill carry would be necessary. A public hydrant and supply line would be furnished the public camp ground and corral. It is believed that a two inch pipe will amply supply all the sites on the Soldier Camp Area and many on the adjoining areas to the west. The cost of the water supply system described furnishing water to the Soldier Camp area is placed roughly at $2000 although an equally large or larger potential block of lots west of Soldier Camp may be supplied from the same line at considerably less cost per site.

3. Sewage Disposal. To my mind, this item is one of the most important of any in the development of any resort and especially one laying claim to health promotion. The average resort community, because of its location, is without the city or town facilities for sewage disposal. An ample sewage system is out of the question because of the extension necessary to reach all sites which brings up a cost that is not justified by the period of yearly use. Living a more or less out of doors resort life and with all house keeping facilities more or less crude, members of such a summer colony are prone to become careless about sewage disposal and proper sanitation. While it is true that in this out of door mountain existence ones physical condition is ordinarily greatly improved

a higher opsonic index is developed and the body as a whole is better able to withstand disease attacks, nevertheless with sanitation facilities poorer than in the cities, chances for contamination and disease attacks are much more numerous and facilities for proper treatment are often difficult to be had. For this reason every precaution against disease and unsanitary conditions of any sort must be taken.

Wherever possible septic tanks are recommended for sewage disposal, but as the installation of a septic tank, although comparatively cheap, may present other difficulties in obtaining suitable topography for location and connections, the sanitary privy must be relied upon. The septic tank should always be given first consideration however and used wherever possible. It may be that a cooperatively owned and operated septic tank can be used for two or more occupants in some cases. A sanitary privy is to be insisted upon in every instance where a septic tank is not possible however and its location on each lot should be provided for. Except under extreme circumstance the outhouse should be at least 100 feet from the dwelling and preferbly 150 feet although this will not always be possible. Outhouses should be located by Forest officers and great care exercised. The sanitary closet known as the L.R.S. type is recommended for use as it is most suited to needs here. With this type, provisions for collection of sewage about once a month will have to be made. Around the mountain northeast of Soldier Camp Station about 1/4 mile is a small bench admirably suited as a location for an incinerator, and being on the

opposite side of the ridge from the resort, it could not possibly become offensive. From the Soldier Camp Area sewage collections may be transported by pack animals for incineration and no doubt collections of garbage and refuse should be handled in connection, and the entire business permitted to a private individual or a collection company who would make a charge to each lot holder served. The proper sanitary precautions must be taken at each outhouse and methods for the systematic use of disinfectants, etc. must be devised and insisted upon by the Forest officer. Two outhouses will be necessary for the public camp ground.

The disposal of garbage and refuse will become a problem in time to be worked out and developed as the number of users increase. The scheme of requiring every cottage owner to provide and use a standard garbage can of heavy galvanized material with a tight cover and making provision for the emptying of these cans once or twice each week is an excellent one and will no doubt prove of best use here. At the present time great care is necessary and close supervision required to keep the used area in a clean and sanitary condition, and keep the water supply from contamination. This was done last year or at least it was attempted, by establishing a 'clean up' day for the entire region and asking all campers and cottagers to take part and clear and clean up their premises. Besides this, gentle reminders were dropped to those in cottages from time to time and a visit was made to each party of tent campers as they arrived and the entire matter

of camp sanitation discussed and gone over on the ground with them. Continual efforts in this line are necessary.

In view of the proposed power and water project in the lower part of this watershed, extreme precautionary measures are required throughout the resort grounds.

4. Telephone System. The Forest Service telephone line from Tucson to the Soldier Camp Station and other points in the Santa Catalinas is in constant use during the resort season. Many men send their families into the mountains and there is often a daily conversation between these men and the members of their families besides orders for supplies, and business calls between the colony and Tucson. The phone was used during the past summer to such an extent that, in order to provide for official Forest Service business and fire call reports, it was necessary to place a restriction on the use of the line, limiting each conversation to three minutes and opening the phone to public use only during certain hours of the day. The instrument is now inside the Ranger Station house and should remain there, even though the public use is considerable, in order that not one iota of complete control shall ever be lost to Forest officers. As the number of permanent residences increase and the resort grows in size, a demand for a commercial toll line and a local exchange at Soldier Camp will be met no doubt by the Mountain States Company. When this time comes, the Forest Service line will be greatly relieved and its telephone business facilitated.

5. Public Corral and Pasture. Although much of the traffic into the mountains will be by automobile, there will always be a demand and a use for horses and burros, and provision for the care of such animals must be made. Above the proposed location for water development, and so as not to interfere with any cottage sites, it is planned to locate a public use pasture and corrals. The greatest use of pack and riding animals will be made by those coming with their own outfits and making use of the public camp ground, and it is therefore advantageous to have the pasture and corrals close to the public camp ground. Care must be taken in the location of the corrals on account of the roughness of the country, the need for placing water from the main into the pasture, preferably with a trough in one of the corrals, and the further necessity that these corrals do not subject the water supply to contamination or even appear to do so. While it is an objectionable feature -- placing the pasture and corrals at the head of the canyon, it is about the only location for them on account of the available pasturage -- there being none whatever on the north slopes or under the heavier timber stands. Furthermore, in this location, these public improvements are further distant from the more intensively used areas. A pasture of 80 acres is believed to be amply sufficient and of a size to permit of animals being readily found. The cost of the public use pasture is estimated at $150.

6. Motor Car Parking Pavilion. While the necessity of provision for the parking of motor cars may seem to be an undue refinement at this stage, nevertheless the importance of such a public use provision in a country as rough and sloping as that in the Soldier Camp Area must be emphasized. It is obvious that, with steep slopes and narrow resort roads as must be the practise here, cars may not safely be parked along the road side, and it is believed to be best to construct and establish a public parking place although as development goes forward a commercial garage will no doubt to some extent supplement the public parking place use. This parking place should be central and could well be located as shown on the improvement map. It should consist of a cleared level area 12 feet wide by 80 feet long just off the road. An attractive rustic pavilion of timbers and slabs, with all sides open and a low roof could be erected over the site as a protection to cars parked. This could be constructed for $75.

7. Tennis Courts, Play Grounds, etc. Obviously mountain climbing and mountain sight-seeing must not be depended upon to furnish all the recreation and sport features in such a resort, and other means of satisfying the need for sport and for exercise must be supplied. On account of the topography and timber growth, tennis is practically the only game that can be provided for and a tennis court now exists in front of the Soldier Camp Station on the only level or prin-

cipally level piece of ground of the required size available. This court is screened and in its present condition affords considerable pleasure but could be made into an excellent court by a little leveling and grading. No doubt this may be taken care of by an association of interested resorters. However, there is a demand for this sort of sport and the facilities for it should be developed. There is no opportunity here for golf links or other game grounds.

At the side of the tennis court and directly in front of the Soldier Camp Station is a gently sloping area about 250 by 150 feet covered with a black jack grove, well shaded and excellently suited to use as a children's play ground on account of its central location. This should be fitted up as a play ground with swings, rustic seats, and possibly as conditions may warrant complete school play ground apparatus, flying rings, bars, trapezes, etc. The resort area being such a splendid place for children, their use of the place should be encouraged and every effort made to facilitate active sports and exercises to supplement their excursions and play in the mountains and woods surrounding. Children demand a variety of sports and games, especially in the mountains where facilities for much of the play to which they are accustomed at home are limited. They soon tire of woods excursions alone. Between the play ground and the tennis court is a thick group of tall black jack poles forming a small amphitheater, in the center of which it has been customary for the summer colony to gather evenings to enjoy a camp fire, music, and a general sociable. All these features

located so near the Ranger Station house make of the ranger's headquarters a social center. This is, of course, an excellent condition and one which will make it possible for the right Forest officers to keep this particular resort area in excellent shape from park, forest, and sanitation standpoints, and will permit of its being a power in spreading good forestry and a favorable Forest Service sentiment among all who make use of the region.

(h) Fishing.

With an extensive use of the Santa Catalina Mountains the trout fishing offered by Sabino Creek must be well regulated. The state law relative to seasons, creel limits, etc. must be rigidly enforced and frequent restocking provided for if the sport is to be maintained. Sabino Creek being the only stream of any size in the mountains, it offers practically the only fishing, although its upper side branches have fish in them for a short distance. In this stream the fishing grounds are limited to from 4 to 6 miles of its length. With fishing possibilities so limited, it is obvious that every care must be taken to preserve them and a very rigid enforcement of the state game laws relative to fishing.

(i) Game Preserve.

Because of the natural beauty and attractiveness which wild game such as deer, wild turkeys, quail, grouse, pheasants, etc. will lend to such a recreational area by their presence, a game preserve or sanctuary is advocated to include the entire summit of the Santa Catalina Mountains. To permit

hunting to such numbers as may be expected to come into the mountains, even under restriction, would soon bring about the entire extermination of the remnant of game that exists, and so many hunters in so small an area would greatly endanger human life and property. The present day sporting rifle with its high power and long range would be exceedingly detrimental to the safety of all persons in the mountains, whether hunters, resorters, or travellers and should not be permitted there.

With the Santa Catalinas as a game preserve where the killing of any kind of game is unpermitted, the attractiveness of the mountains as a park and resort will not only be increased, but as this game increases, it may be expected to overflow and restock the adjacent mountain ranges, particularly the Rincon Mountains to the southeast, where in a few years the hunting would be excellent. The uses of these two mountain ranges would then be segregated, and advantageously, the one as a park and recreational resort, the other as a hunting grounds strictly.

Under the Hornaday Plan for the establishment of game preserves in National Forests, this scheme could be accomplished very nicely and it is to be hoped that that plan may be embodied in favorable legislation after which the top of the Santa Catalinas may be set aside as a game sanctuary by the Secretary of Agriculture. As these mountains are not used at all by stockmen for grazing purposes, no opposition to the application of the Hornaday Plan can be foreseen. In fact, nearly all

Tucson people interested are in favor of having a game preserve or sanctuary made in the Catalinas and a petition to that effect was circulated several years ago but without direct result at that time.

(j) Stores, Garage, Postoffice, etc.

These utilities have not been provided for here because it is felt that a much more favorable location is to be found for them farther west in the canyon of the main Sabino Creek near the Webber tract.

(k) Resort Administration.

It is felt that the resort administration of the Soldier Camp Area should be entirely separate from the forest administration of the area although both must be in very close accord and cooperation.

One man should have complete charge of the resort and recreational use. It would be his duty to see that development work and resort building was done in accordance with definite plans and requirements for such work and that all would be in harmony with the general development scheme. He would have direct supervision over the use of all public utilities such as the water supply system, proper sewage disposal, community as well as individual lot sanitation measures, and the keeping of all resort grounds clean and neat. He would further supervise the use of the public camp ground, pasture, corrals, as well as looking after the entire resort grounds. Preferably, he should be an assistant to the Forest officer in charge of the district,

and the designation of "ground's superintendent" would be appropriate and characterize his line of duties.

BUSINESS ASPECTS OF PROPOSED DEVELOPMENT.

The leasing of resort building sites will of course be handled as provided for in the Term Lease Occupancy Act of March 4, 1915. No attempt is being made to place a rental value upon each lot at this stage because of a lack of definite information upon the character of each individual lot and the demand. These rates must be worked out at the time of the final survey. The desirability of each lot however will depend upon its building site size and location within the lot, accessibility, water supply and sewage disposal facilities, size, location with reference to the rest of the block, topography and view commanded, and the timber stand, particularly if it include large trees.

Existing special use leases are on terms of $10 per year, but, with water furnished and close supervision and care given the resort and the demand as great as anticipated, a rental of from $15 to $30 per lot seems commensurate, with an average for the block of $20.00 which no doubt is very conservative. Calculating upon a basis of 30 lots in the Soldier Camp block at an average rental of $20, the yearly income from the area becomes $600. This number of lots is of course dependent upon the development of a water supply and other resort utilities treated in the foregoing. The estimated cost of the improvements is as follows:

Road	$1500.00
Water supply	$2000.00
Incinerator for sewage disposal	$ 100.00
Public corral and pasture	$ 150.00
Motor car parking pavilion	$ 75.00
Children's play ground	$ 75.00
	$3900.00

With a yearly income of $600 from the tract, an expenditure for the proposed improvements is entirely justified.

4. Forest Plan.

(a) Forest administration.

The Soldier Camp area lies in and is administered as a part of the Santa Catalina unit, or district, of the Coronado National Forest, the headquarters of which are in Tucson, Arizona. This district is under the supervision of a Forest Ranger, who during the winter months is stationed at Oracle, Arizona, a small settlement at the northern extremity of the mountains. From April until November, he makes his headquarters at the Soldier Camp Ranger Station. Considering the needs of the district, this can scarcely be improved upon. As the resort use is developed, his duties will, of course, increase, and it is possible that an assistant will be necessary even with the assignment of a "grounds superintendent" to look after the strictly resort needs. The forest officer would administer forest business only of course; supervise marking, cutting, timber sale transactions and everything having to do with silviculture. He would also handle all the regular Forest business for the district, including grazing, fire protection, improvement work, trail and road maintenance, etc. The position of grounds superintendent would be appropriately placed under his supervision, but the work so arranged as to

relieve him of as much of the responsibility of the resort supervision as possible.

Telephone connections from Soldier Camp Station are had with Tucson and with the Rincon District headquarters, as well as several parts of the Santa Catalinas, and the administrative work is facilitated to that extent. With the road contemplated, the Soldier Camp Station could well become the year long forest officer's headquarters, since it is most centrally located, and with the road would be very convenient of access.

With resort development, an assistant will no doubt be necessary at the Lowell Station on the south side of the Santa Catalinas, where the proposed road enters the National Forest. In case the tract is included as a game preserve, a man located here is especially desirable to assist in the enforcement of regulations against hunting; and the services of a game warden will also become necessary on the mountain top, to enforce the game preserve regulations and look after the care and breeding of the game animals and birds.

(b) Protection.

1. Fire: From the forest standpoint, the prime essential is protection from fire. The Soldier Camp Resort area making up such a small part of the Santa Catalina for-

est district, or unit, its protection from fire will be treated in plans for the entire unit, rather than individually, because the entire range is a logical fire protective unit and should be thus handled.

The fire season here is during the dry fore summer months of May, June and early July, although occasionally when summer rains have been very light, a fall season threatens from mid September until November. This is unusual, however. During the fire season, the most dangerous period is at the beginning of the summer rains, when lightning storms are very numerous, and sufficient rain has not fallen to soak up the forest cover and reduce the fire hazard. When summer rains are light, this danger exists during the entire season of storms, the hazard being decreased, of course, as rains fall and soak up the ground.

Causes.

While campers and travelers add their share to the number of fires started each year, the greater proportion are started by lightning. On the Santa Catalina District during 1915, 5 out of 8 fires occurring were started by lightning. The other three were started by campers and hunters. This is a fairly representative ratio of causes in this region, although in 1914 all of the 10 fires occurring in the Santa Catalinas were reported to have been

started by lightning. Statistics covering the past three years' fires on the Coronado National Forest, whose 4 other districts are largely similar to the Santa Catalina, show the following causes:

	Light-ning	Incen-diary	Campers	Un-known	Miscel-laneous	Total
1913	10	0	1	8	0	19
1914	19	8*	0	6	0	33
1915	5	0	2	3	3	13
Total	34	8	3	17	3	65
Percentage	52	12	5	26	5	100

* Set by one person.

The miscellaneous causes were from branding fires, bee hunters, etc.

The tall scragly spires of dead or spike topped yellow pines seem to act as forest lightning rods, and invariably when these dead trees are struck, the friction of the lightning passing down their lengths ignites the pitch exuding from the "fat" or resinous wood portions of the trunk. The fire thus started in the standing tree works its way up and down the trunk, the dry dead wood burning readily. On account of the openness of the average yellow pine stand, crown fires seldom occur from this cause, because dead trees are practically the only ones ignited by lightning, and their crown extension is so narrow as to

rarely menace adjacent crowns. Another reason is that the trunk of the tree being the source of the fire, the branches are often burned off where they join the trunk, so that fire rarely creeps out to their extremities before they are burned through and fall to the ground. These falling branches, embers, and pieces of smouldering bark ignite the needles, grass and inflammable material at the base of the tree, and are the source of surface fires.

Past Fires.

All the fires occurring here since 1910 are shown on Map 5.

Of these, the largest and most severe occurred in 1910 and covered some 16,000 acres, and required the services of some 200 men, gathered from Tucson and other sources, to extinguish it.

Plan for Protection.

On account of the mountainous character of the country and the fact that such a large percentage of fires are started from lightning, the lookout scheme of detection is readily applicable and most effective. Two primary look-out points, one a tower on the heights of Mt. Lemmon, the other a tower in the course of construction on Mt. Bigelow, are the highest points in the range and, located some 5 miles distant from each other in the main range, serve

exceptionally well as triangulation points. These points are connected with telephone to the Soldier Camp Station, Tucson, and to stations in the Rincon District adjoining on the south. A fire location map fitted with protractors, threads, etc., is kept at the Soldier Camp Station, as well as at the Supervisor's office in Tucson. The map at the Soldier Camp Station, as well as the tool and food supply box, not only serve their regular purpose in the scheme of fire protection, but are of infinite value in fire prevention publicity work, being objects of great interest to the large numbers of resorters making use of the Soldier Camp area. In time this will become a source of excellent educational work in behalf of forest fire prevention. With the development of a resort here, excellent opportunities will be offered for very effective work in this line. All travelers, campers and resorters are more or less interested in forest fire protection and efforts to stimulate their interest should be made by displaying apparatus and equipment explaining the fire protection scheme and the efficient and effective carrying out of the fire plan provisions, when fires are reported.

The following is the fire plan being used during the present season for the Santa Catalina district. This plan contemplates protection of the area at the present time

and, with slight modifications, may no doubt be made to serve during an extensive resort use.

Coronado National Forest

- F I R E P L A N -

Season of 1916.

FIRE DIVISIONS.

Santa Catalina District, 220,960 acres, Hdqtrs. - Oracle R. S., Summer quarters-Soldier Camp

Rincon-Whetstone District, 136,680 acres, Hdqtrs. - Rincon R. S., Summer Camp-Spud Rock R. S.

Santa Rita District, 150,000 acres, Hdqtrs. - Rosemont R. S.

Huachuca District, 288,340 acres, Hdqtrs. - Rodger's Ranch, Canille.

Tumacacori District, 203,480 acres, Hdqtrs. - Nogales R. S.

Primary lookout and triangulation points:

Mt. Lemmon - Santa Catalinas
Mt. Kellogg - " "
Old Baldy - Santa Ritas
Washington Peak - Patagonias

Patrol and Guard Stations:

Mt. Lemmon and Mt. Bigelow- Santa Catalinas
Spud Rock - Rincons
Whetstone - Whetstones
Old Baldy - Santa Ritas
Huachuca - Huachucas
Montana Mine - Tumacacoris

Tucson, Arizona,

April 6, 1915.

GENERAL PLAN

In order to fix the responsibility for action, the rank of the protective officers is given as a heading to each District plan.

Each District Ranger is to have complete charge of fire protection on his District. He is responsible to the Supervisor for -

1. Complete protection of his District.
2. Quick reporting of fires.
3. Frequent communication with Supervisor.
4. Daily communication with Lookouts.
5. Checking the work of Lookouts.
6. Proper distribution of tools among tool boxes.
7. Mobilizing fire fighters and taking charge of fire-fighting.
8. Complete records: District Rangers, Lookouts and final report - Form 874-6.
9. Testing and efficiency of telephone line.
10. Discipline and absolute compliance with provisions of the protective plan by all men working under him. This applies especially to the matter of standard equipment.

Standard Tool Box Equipment

Large equipment for boxes in timberland:

4 axes	1 lantern
4 rakes	1 pack outfit
4 shovels	1 12" Dutch oven
4 eye hoes	1 large coffee pot
1 cross cut saw	2 large frying pans
1 cant hook	2 stew kettles
2 axe handles	6 cups, knives, forks, spoons,
4 5-gal. water bags	1 can tool grease. (plates
4 1-gal. canteens	1 posted list of equipment

Small equipment for boxes in woodland:

2 axes	4 5-gal. water bags
2 rakes	4 1-gal. canteens
4 shovels	1 pack outfit
1 axe handle	1 can tool grease
1 posted list of equipment.	

While at present there may not be sufficient tools to fully equip each box, these lists are a standard to be worked toward, and in a short time it is hoped that each box may be supplied with complete standard equipment. The tools now available on each District should be distributed among the boxes in accordance with the above plan.

Food Supplies

Numbered chuck lists similar to the attached have been furnished the stores named below and in simply ordering list No. 1, No. 2, or No. 3, for 5 days' supplies for 5, 10 and 15 men respectively, much time will be saved in securing supplied for fire fighters.

Santa Catalina District

Terry & Lawson, Oracle
Chas. Bayless, Redington
Albert Steinfeld & Co., Tucson
George Pusch, Steam Pump Ranch Store

Rincon-Whetstone District

Chas. Getz, Benson
John Purifoy, Pantano
Albert Steinfeld & Co., Tucson

Santa Rita District

Geo. P. Scholefield, Rosemont
White Store, Amadoville
Patagonia Commercial Co., Patagonia
Manuel Mendez, Greaterville
Frank Richard, Alto.

Huachuca District

W. A. Parker, Canille
Ramsey Canyon Store
Parker Canyon Store
Duquesne M & R Co., Duquesne
M.M.Trickey, Washington Camp
Keatong Store, San Rafael

Tumacacori District

Wing Wong, Nogales
Garrett's Store, Tubac
Philip Clark, Ruby
Arivaca L & C Co., Arivaca

Cooperation

Ranger Districts, as well as Forest boundary lines, are to be absolutely disregarded in reporting fires. While each Ranger is responsible for his own District, the closest cooperation must exist in combating fires on adjoining Districts. Close cooperation must also be had with other departments of the Government in the protection of adjoining lands

and reservations under their jurisdiction. An agreement exists between the Forest Service and the Huachuca military authorities whereby soldier assistance may be secured in combating fires on the Forest in return for which Forest Officers are to lend all possible assistance in the reporting and suppressing of fires on the Military Reservation.

All permittees are required to fight fires and every possible use should be made of their services and cooperation.

Cooperation of considerable value can be secured from the mail carriers and stage drivers whose routes lead them through or near parts of the Forest. These men, if properly approached and shown some personal consideration by local Forest Officers will take an interest in fire discovery and can often be depended upon as patrolmen for the sections of country covered by them. This sort of assistance should be cultivated.

Special instructions will be issued in the form of "Fire Orders."

Detailed District plans follow.

R. J. SELKIRK,
Forest Supervisor.

SANTA CATALINA DISTRICT.

Rank:

District Ranger - Soldier Camp - in charge
Primary Lookout - Mt. Lemmon
Primary Lookout - Mt. Kellogg
2 Firemen - Mt. Lemmon
2 Firemen - Mt. Bigelow
Per Diem men:
Geo. S. Wilson - Oracle - Oracle Range
W. N. McAda - Redington - Buehman Canyon Range.

Tool Boxes:

Large Equipment:
Soldier Camp
Mt. Lemmon Cabin
Mt. Bigelow

Small Equipment:
Tanque Verde
3 C Ranch
Brush Corral
Oracle
Pusch's Steam Pump
Lowell Ranger Station.

District Ranger is to act as a patrolman in the course of his regular duties and to give fire protection preference over all other work.

Patrolman's equipment consisting of -
Axe
Shovel, hoe or rake, with handle.
Emergency ration, is to be carried during the fire season. This is imperative.

Mt. Lemmon and Mt. Bigelow Lookouts:

Equipment that must be kept at the lookout:

Binoculars	Saw
Protractor and sight alidade	Axe
Fire map	Rake
Visitors' register	Shovel

Instructions:

1. Remain on lookout tower from 7:45 a.m. until 5:30 p.m. unless otherwise ordered by Supervisor or District Ranger.
2. Telephone to the District Ranger's office each morning at 8:00 o'clock.
3. Report immediately to the District Ranger or Supervisor the angles of all fires sighted, whether on or off the Coronado Forest.
4. Daily reports on the regular lookout form must be made and submitted to the Supervisor through the District Ranger. These reports take the place of a diary and must be carefully and completely made out for each day.
5. Report when asked, on the conditions of fires burning and watch each fire from the time it is first sighted until extinguished.
6. Your food supplies must be packed to you and arrangements for this can be made through the District Ranger. Under no circumstances should you leave your lookout station for supplies.
7. Keep in constant touch with your District Ranger.

Firemen:

You will work under the direction of the District Ranger and are to keep in constant communication with him and the lookouts by means of a portable telephone

and emergency wire. You must be prepared to go to a fire immediately on notice and should keep fire-fighting equipment with you at all times.

Improvement work under direction of the District Ranger: -

Completing lookout tower on Mt. Bigelow.
Maintenance work - Sabino-Soldier Camp trail
Soldier Camp-Mt. Lemmon trail
Soldier Camp-Mt. Bigelow trail
Romero Ridge trail
Oracle Ridge "
Brush Corral " , etc.
Completing pasture fence at Mt. Lemmon.

Fire publicity signs calling attention to the need for care with fire in the mountains can be located effectively at different points on trails and along the proposed road. Care should be exercised in their placement to see that they do not give the bold disfiguration of an advertising sign, but rather that they present their text inconspicuously and modestly to all. The following are suggested:

At Forest boundary at Lowell R. S. -

"Be sure your match is out before you drop it in the Forest. Matches have heads but they don't think with 'em."

At advantageous points along road -

"Be as careful with fire in the forest as you would in your own home."

"Gasoline tanks and Forests -- drop matches in neither."

"Safety first -- prevent Forest fires."

"Help protect your Forest."

"Would you put a burning match in your pocket--- then why in the Forest."

For sign at a spring -

"Protected forest cover maintains this spring. You can help. Prevent forest fires."

For burn where Huntsman trail turns off Mt. Lemmon trail -

"The fire of 1910 left these blackened skeletons. A match was to blame. Be careful with yours."

Besides these signs, very effective fire publicity may be had through the Tucson newspapers, the Tucson Hotels, and through the railroads and main roads leading to the resort. Visitors registers are also suggested for the lookout towers and the Soldier Camp Station. By proper notation in the book, the "prevent forest fire" idea may be conveyed to each visitor as he signs his name.

2. Insects: Dendroctonus beetles are the chief enemies of western yellow pine here, and a number of trees on the area were noted last year as having been infested with them. The attack occurred in the thick grove of black jacks in front of the Soldier Camp Ranger Station, where from 4 to 6 trees were thickly studded with the pitch tubes of this insect. In order to save the grove from further depredations, four of the large living black jacks were cut and two small dead ones near by, the trunks peeled

and bark and branches burned. This work was done in October, 1915. It is hoped that it will effectually check these depredations. However, it will be necessary to closely watch the infested area from now on, and any signs of spread should be immediately dealt with.

Insect infestations in the fir type have not been noted.

A most diligent watch should be kept over the entire resort area for insect depredations, and immediate steps taken to check them, since the saving of this stand is vitally important to resort development on the area.

3. Erosion: With intensive use on the slopes of the Soldier Camp area, erosion becomes a forest menace of such proportions as to demand great care and a close supervision to guard against it. There is always a tendency on the part of resorters and campers to rake their yards and grounds to clear them of trash, rubbish, needles, twigs, etc. While, in the foregoing, mention was made of keeping the resort grounds clean and neat-looking, yet in this particular instance a condition of being too clean can be foreseen and statements of cleanliness and neatness must be modified to preclude the removal of the actual forest floor covering. By this is meant the natural accumulation of pine needles, twigs, leaves and other forest material

commonly forming a surface covering, and includes small plants and shrubs.

Under no circumstances should the removal of this material be permitted, except possibly very closely about buildings and door steps. The removal of this cover leaves the bare earth exposed to the beating torrential rains, and during such storms small rivulets form rapidly, wash the surface soil into the larger streams and arroyas, and form gullies on the hillsides, which rapidly increase in size with each storm. The effect of raking up the ground cover over a very small area at Soldier Camp has proven this beyond doubt. Even the slightest removal of this ground cover will disturb Nature's equilibrium between rainfall and run-off, and a start may thus be made that will eventually overthrow every influence that may be exerted to maintain the forest cover. Every resort user should be cautioned in this respect, and the removal of any part of the natural surface cover closely guarded against. Any erosive action noted on any part of the area should be remedied at once.

Erosion is to be especially guarded against in the light of the proposed power development project in Sabino Canyon.

4. Fungi: Fungus attacks are chiefly made in dead and dying timber, so that this enemy is of little importance as far as the living stand is concerned. Two species of mistletoe are common on yellow pine, and one occurs occasionally on Mexican White Pine. In one or two places on the area, infestations of the species Razoumofskya robuata may become of a serious nature. These enemies must be closely watched, and signs of spread should be an immediate alarm for steps toward eradication.

Wind is not a serious menace here, because of the protection lent by the surrounding mountains and canyon sides. No signs of past wind destruction are evident in either type. Wind damage need hardly be anticipated here unless clear cutting is made. Yellow pine, because of its extensive root system, is resistant to wind throw, and in the fir type the density of the stand is a protection from wind fellings.

Damage from frost, snow, mammals and birds has not been noted on the area. Birds are to be encouraged here because of the noxious insects which they eat, and woodpeckers are to be especially favored for their appetite for wood-destroying insects. As bird life is not plentiful in this region, the erection of bird houses to

protect them and assist in their increase should be encouraged among resort users. An example set at the Ranger Station would be quickly followed by many of the resorters.

(c) Market.

With the growth of the anticipated resort community at Soldier Camp, and the use of the entire mountain top for recreational pursuits, a ready market will exist for all the timber and wood products of the upper Santa Catalina slopes. The summer residence building looked for will require both logs and lumber, and since all fuel for both cooking and heating will be of wood, the demand for cord wood will be extensive and sufficient to rapidly utilize the dead wood on the area. Besides the resort building work anticipated, there are numerous mining claims on the north side of the Santa Catalinas, several of which are now being worked and furnish a demand for mining timbers. With these markets for woods products, it will be possible to bring about ideal forest conditions over almost the entire area within a very few years.

It is understood that parties are now planning to bring in a small portable saw mill. The operations of such a mill should be encouraged, as it will further facilitate the bringing about of ideal forest conditions

and by more fully working up forest products, it may be depended upon to assist in a very close utilization. Since the demand already exists for mining timbers, the present object of the small mill is to get out this material. It is believed that the mill will be located on upper Sabino Creek about two miles from the Soldier Camp area.

With the construction of the Santa Catalina road, it is possible that some timber and cord wood will find its way to the Tucson market, although strictly local needs may be depended upon to use much of the earlier cutting.

(d) Objects of Management.

Inasmuch as the highest use to which the upper slopes of the Santa Catalina mountains can be put is that of recreation and resort grounds, and since the intensive development of such a use is immediately foreseen, it is evident that plans for management must be drawn up strictly along the lines of a park forest. While treatment here will cover only the forest of the resort area, the park forest idea and plans should be followed out over all the timbered area of the Catalinas, with the possible exception of the lower north slopes, where on account of probable infrequent use for recreation purposes, the customary National Forest cutting policy for the southwestern region may be followed.

The primary silvical needs of the Soldier Camp area and adjoining are aesthetic in the extreme. The objective is a forest that is to be admired for its beauty and natural attractiveness -- not in its primeval and idle, non-producing state, but rather as a clean, regulated forest, an active producer showing a maximum of forest and individual tree growth and a minimum of dead and unsightly waste and deformity. To be explicit, an aesthetic producer for the park forest must be useful as well as ornamental. It should not be the object of management here purely to supply the local demand for forest products, but rather to work toward an ideal park forest, using the local demands only as a means to reach that end. The people of Southern Arizona, particularly Tucsonians, have a right to look upon the Santa Catalina heights as their forest, and no doubt in the minds of many it is viewed in a relation not altogether unlike that of the "sacred mountain" of the Japanese. They look upon these mountains with personal interest and pride as their recreation ground, and as such the forest should be perpetuated. Extensive cutting or clearing or even the appearance of so doing will not only mar the aesthetic features of the forest, but with extensive resort use may so modify the cover on the steeper slopes as to endanger its protective function.

(c) Choice of Species

With recreational needs dictating the objects of management here, it is difficult to discriminate against any particular species. Each with characteristic individuality adds its contribution to the attractivenss of the natural forest and helps in making up a whole woodland of particular aesthetic charm, because of its close adherence to the primeval forest composition of nature. For the time being, the commercial characteristics of each species may be cast aside to give place to aesthetic qualifications.

If anything, the hardwood species, particularly maple and oak, are to be favored. There are two reasons for this,-- the first an aesthetic one, the second a recognition of economic needs, for the hardwoods will be in great local demand for fuel. Maple lends unusual beauty to the somber greens of the conifers, and is especially noticeable in spring and fall, when the varying colors of its foliage serve to "freshen up" the forest. For this reason it is given first place among the favored hardwoods. Similarly, aspen and locust win recognition, while oak is the most popular fuel wood. Among the conifers, no discrimination is to be shown. Yellow pine and both Douglas and white fir are fixed in their sites, and all have distinct qualifications from both aesthetic and economic viewpoints,

which warrant a uniform treatment of all. White fir, although of lesser commercial importance than the others, is far ahead of either in the beauty of its foliage and the symmetrical and pleasing form of its younger stages. No doubt by the time ideal forest conditions are brought about, white fir will have some commercial importance. At any rate its pleasing beauty will save it from discrimination for the present.

(f) Cutting

In both pine and fir types, cutting should be entirely confined to a furtherance of forest improvement. All dead, standing timber should be taken, as a step toward improvement in appearance, as well as for reducing the hazard from fire by lightning and danger from insects and fungus. Over-mature and stag-headed or spike-topped trees should be cut to make place for a younger stand capable of a more vigorous growth and rapid volume increment. Suppressed, poorly formed and defective trees, as well as insect infested or diseased individuals, should be taken out. Thinnings in the fir type and in thick black jack stands in the pine type should be made, bearing in mind that the object of all thinning is to increase growth, to remove enough trees to prevent danger of crowding for several years to come, and leave enough to fully utilize the increased

light space. Thinnings in the fir type may be made profitably from the very first, as young Douglas and white firs from 3½ to 10 feet high make excellent Christmas trees and find a very ready market in Tucson, where well-formed and foliaged trees sell for from $3 to $10 apiece, or an average of $1 a foot.

As for mature trees, they should be left wherever possible and taken out only when a definite silvicultural object is to be obtained thereby, and where their removal will result in an improvement to surrounding forest. The aesthetic value of large trees is particularly emphasized in a mixed forest, and this must be born in mind in considering the removal of mature individuals.

In the main body of the stand -- conservatism -- no clear cutting and few openings except where actually demanded as a stimulus to greater growth, bearing in mind always that the highest use of the area is that of a park and recreation ground for the people, and that production to meet a market demand is of secondary importance.

Brush Disposal

Brush should be piled and burned to reduce the fire hazard. Piles should be teepee shaped, with small material at the bottom and larger pieces at the top and in

the center. The butts of logs should always be placed toward the center to insure complete burning of the pile. Piles should not be made where their burning will damage growing stock. Burning may be done from January till March, depending on surface conditions.

(g) Reproduction

While the limited cutting recommended should make possible a fair natural regeneration of the stand, the possibilities of this will be offset to some extent by an intensive recreational use. In many places artificial regeneration must be resorted to, particularly about residences and children's play grounds. Planting and subsequent protection is recommended for such areas, although it is not anticipated that these will prove so extensive as to require elaborate nursery arrangements to provide young stock. It is believed that under ordinary circumstances this stock may be obtained by simply transplanting from another part of the forest, although, if necessary, several small seed beds might be established near the Soldier Camp Station. Broadcast or spot sowing of yellow pine in this general region has proven very unsatisfactory as a means of reforestation, chiefly because of numerous droughts and other seasonal uncertainties. Eventually, as our National Forest

management becomes more intensive, all openings or "blanks" in the forest will be filled by planting, nor is this time believed to be very far distant.