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The possible impact of RECREATION DEVELOPMENT on TIMBER PRODUCTION in three California National Forests

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By

Elliot L. Amidon^{1/} and Ernest M. Gould, Jr.^{2/}

Since World War II outdoor recreation in the National Forests of California has increased tremendously, and this trend promises to continue. On the other hand the report "Timber Resources for America's Future"^{3/} has shown the probable need for more timber products in the future. The growing competition for forest land to support these two uses is a matter of great concern to foresters, and satisfactory estimates of the likely outcome are now lacking. In fact, foresters' opinions span the whole range of possibilities. One extreme maintains that timber production will scarcely be affected, while the other claims that the forests will be taken over exclusively for recreation.

This study was designed to clarify the maximum conflict that could develop between recreation and timber uses, assuming that present administrative standards and practices are followed and that recreation lands will yield no timber, whatsoever.^{4/} Detailed analyses of three selected National Forests in California were made to measure just how much of the productive forest land would be involved if all suitable recreation sites and areas were used, and how much would remain for timber use. The figures we have compiled probably exaggerate the possible impact, but they are intended to define the maximum displacement of timber that could result from recreation development. These figures indicate the magnitude of the timber production adjustments necessary to offset such displacement on recreation sites. One of several possible adjustments might be to increase the productivity of the land remaining in timber production. In this report only the magnitude of these adjustments has been indicated,

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^{3/} U.S. Forest Service, Forest Resource Report No. 14, Washington, D. C. 713 pp., illus. 1958.

^{4/} A word of caution is necessary. The assumption that recreation land will yield no timber does not represent Forest Service Policy. Actually some timber products are cut on certain types of recreation land; this is often essential as a safety precaution or to prevent or salvage losses due to fires, insects, or diseases. However, exclusion of timber yields from recreation lands is an appropriate assumption in view of the objective of defining the maximum timber displacement that could occur because of recreation development.

not the kind. The analyses also explore other facets of recreation management, such as the expansion possibilities for various elements of the recreation complex and the relative cost problems of future development.

This study was possible largely because of the recreation data available in the California Region, Forest Service, that resulted from the National Forest Recreation Resource Review. This inventory of recreation sites and areas in California was made in 1958, before the National Forest Recreation Survey of 1959-60. Foresters cataloged established recreation sites and inspected the National Forests to locate recreation lands suitable for future development. This inventory proved uniquely suitable for the objective of this study in establishing the maximum conflict that could develop between recreation use and timber production for two reasons. First, potential recreation sites were selected without regard to alternative uses.^{5/} Second, the area of land physically suited for recreation^{6/} was not limited by any quota based on a prediction of future requirements.

Although the 1958 inventory was reworked to select sites needed to meet the planning goals established in the 1959-60 recreation survey, the original report was used in our study. Therefore, acreage tabulations and other details may not agree with the later report, which had other objectives.

During the 1958 field inventory each potential recreation site was graded "outstanding," "good," or "fair" according to administrative standards for recreation land. The inventory includes only those areas that meet the specific criteria, including slope, cover, and attraction. Of course, the amount of forest land available for recreation could be further expanded by relaxing these standards, but this would normally increase the cost of development or lower the recreation quality. However, expansion beyond the lands inventoried may be possible if the prospective benefits should ever justify the added cost.

Timber management plans are also available for the National Forests showing the amount of land in various categories, estimates of standing timber volume, sustained yield capacity, and, except for individual southern

^{5/} California Region, Forest Service, "National Forest Recreation Resource Review," p. 2: "During the preparation of the inventory, decisions as to the highest public value for a given site or area will not be made. The site or area will be described and mapped for its recreation values even though it may have an existing or potential conflicting use. Decisions as to highest public values will be made later in ranger district recreation plans following multiple use coordination policies."

^{6/} Ibid., p. 1: "When the inventory is completed, the predicted needs of the future and coordination with the national review may be accomplished."

California forests, the calculated annual allowable cut during an adjustment period. The location of the productive forest land on many of the forests can be derived from maps. This information on timber and recreation, together with the helpful assistance of Regional Forester and supervisory staff officers, made this analysis possible.

PROCEDURE FOR ANALYSIS

We overlaid a recreation map on a forest land map to determine how much of the recreation area fell on productive forest land and on unproductive forest land. Avoiding double counting overlapping areas required especially close attention. Decisions about the handling of data were guided by the study objective of measuring the maximum impact of recreation on timber production.

CLASSIFYING RECREATION LAND

All inventory classes of recreation land were grouped into five types, except for certain categories of recreation land left out either to avoid double counting or because conflicts with timber production seemed minimal. The categories eliminated were water areas inventoried for fishing and boating, and land classed as hunting, mountain climbing, or hiking and riding areas.

1. Occupancy sites include land suitable for overnight or day use, such as campgrounds, picnic areas, organization camps, and summer homes, or for such supporting services as commercial public service sites. The characteristics of the land required by each of these uses, except the last, are so similar that considerable adjustment between them is possible to suit local conditions. The area needed for such public services as gas stations and stores is usually small enough that it can be found in any reasonable amount. Administrators have a good deal of flexibility in assigning land to these uses and thus can balance these components of the recreation complex.

2. Activities sites are much less plentiful than occupancy sites, because the places suitable for swimming beaches, boat ramps, winter sports, and observation sites have peculiarly restrictive terrain and location

7/ Sustained yield capacity is the ultimate capacity of commercial forest land when managed for maximum timber production. The term considers every acre of commercial forest land to be stocked, in normal production, and is the annual volume available from the regulated or normal forest. A regulated forest contains an equal distribution of fully stocked age-classes from seedlings to rotation age. In such a forest the ultimate yield is achieved by harvesting the annual volume reaching rotation age.

The allowable cut objective is to harvest the maximum volume possible on a sustained yield basis while converting the present forest to a regulated or normal forest.

requirements.^{8/} The activities made possible by development of such sites generally supplement the use of occupancy sites, thus expanding recreation opportunities and enriching the local recreation complex.

3. Unusual interest areas resemble activities sites by having special characteristics that attract users. However, this type of recreation area usually has a large acreage, rather than being concentrated in the relatively small compass of a beach or ski slope. Tracts may be included in this class because of unusual scenic, geologic, archeologic, or historical interest. Although some types of improvements are permitted, they are normally held to the minimum needed for the enjoyment and protection of the area.

4. Wilderness type areas include large acreages chiefly valuable for their unspoiled, natural character. The various administrative classifications include roadless, primitive, wild, and wilderness areas. Sizes range from 5,000 to nearly 400,000 acres in California. Improvements are held to the bare minimum needed for safe recreation, except in roadless areas where logging is permitted over temporary roads.

5. Protective zones include the adjoining strips set aside to protect the scenic quality of roads, trails, streams, and lakes. These areas receive little physical use, but they serve that all-important purpose of maintaining the esthetic quality of the whole complex of recreation sites and areas. In this study the buffer zones around development sites, which serve the same purpose as protective areas, are included in each site, rather than being classed with the protective zones associated with roads and waterways.

SCHEDULING LAND DEVELOPMENT

Since no specific level of future demand was assumed in this study, we needed some other logical base on which to schedule the development of available land. The 5-stage development, beginning with a recreationless land base, starts with the addition of the recreation sites and areas presently established and used. The second stage assumes addition of suitable acres immediately adjacent to the established sites. The third stage brings in all the potential "outstanding" sites and all the potential unusual interest and wilderness type areas. The fourth stage adds all the "good," and the fifth stage all the "fair" sites. The zones needed to protect each stage were also estimated. At the fifth stage all the established and potential recreation is fully developed, exhausting all the land found in 1958 that met the inventory's recreation standards. Although other patterns of development could be rationalized, the net effect would not change. The amount of productive forest land displaced by each stage was estimated site by site and area by area.

^{8/} In Forest Service terminology, occupancy sites and a nameless residual group, which we call "activities sites," are collectively called development sites.

ESTIMATING RECREATION CAPACITY

The number of visitor-days of recreation that each stage of development could accommodate when used to capacity was estimated by using the conversion factors developed for the National Forest Recreation Survey. These factors were devised for each region and forest to estimate the visitor-days of each type of recreation that could be accommodated on an acre each year. Actual use may be more or less than the factors indicate, but if it continually exceeds the estimated amount the site may deteriorate unduly, the quality of recreation may be impaired, or more intensive management may be needed.

MEASURING TIMBER IMPACT

Three measures were used to estimate the impact that the use of productive forest land for recreation might have on timber production: (a) volume of sawtimber standing on recreation land, which is a measure of the salable product "invested" in recreation; (b) reduction in yearly allowable cut, which suggests the annual "cost" in terms of foregone timber products in the near future; and (c) reduction in sustained yield capacity, which measures the "cost" in yearly timber production at a much later date.

In this investigation the measures of impact start from a productive forest land base without any recreation development. The timber management plans of the study forests exclude yields from certain types of recreation areas, such as wilderness, which are already withdrawn from timber use. Therefore the base measures of sawtimber volumes, allowable cuts, and sustained yield capacity in this study--before any recreation development--are larger than those in the timber management plans.

All three bases were derived from the timber management plans for the forests studied by assuming that the productive forest land used for recreation had the average characteristics of the commercial forest land in the working circle. This assumption was made because the relatively higher timber productivity of development sites and protective zones, composed of the more level and lower elevation sites, tends to be offset on the study forests by the lower timber productivity of the steeper and higher forest land included in wilderness type areas.

ESTABLISHING RELATIVE VALUES

Dollar values are frequently used as a common measure to relate dissimilar items. This study does not attempt to evaluate recreation, but limits its appraisal to estimating the relative cost of the timber and of the recreation improvements needed. This seems worthwhile as one method of pointing up the magnitude of each as a management problem. The data probably do not warrant elaborate analysis, so that the following simple value assumptions, based on consultation with staff officers, were thought sufficiently realistic. Average sawtimber stumpage was assumed worth \$20 per M bd.-ft. and the average investment cost per acre for new occupancy site

development was assumed at \$4,500. Although in practice these figures will vary considerably and may change radically over time, they were used as a base for the comparisons presented later in this report.

FORESTS SELECTED FOR STUDY

The National Forests selected for analysis were chosen to span the range of physiographic and recreation conditions in California, rather than to represent the region. Consequently, generalizations must be made with extreme care.

The Modoc National Forest lies in the northeast corner of California far removed from the State's largest cities (fig. 1). The terrain is a rolling volcanic plateau east of the Cascade Range. Current recreation use is relatively light. In 1960, for example, visitor-days were about one-fourth of the estimated capacity of the established recreation complex (development sites and unusual interest and wilderness type areas). Hunting, omitted from this analysis for the reasons stated earlier, is a major recreation use.

The Sierra National Forest is moderately accessible to Los Angeles and the San Francisco Bay Area. It lies on the central west side of the Sierra Nevada Range. Recreation use is rather heavy. In 1960, for example, it was about equal to the estimated capacity of the established recreation complex. The forest includes a variety of mountainous terrain from the foothills all the way to the Sierra crest.

The San Bernardino National Forest can be reached in a short time by nearly eight million people. It lies in the mountains that rise above the Los Angeles urbanized area. The terrain is rugged, but roads are excellent, and an extremely heavy recreation load falls on the high country, which is also the forested area. Visitor-days in 1960 were about one-third greater than the estimated capacity of the established recreation complex.

These three case areas thus cover the range of conditions from the remote reaches of the northeastern plateau of California to a mountain area that resembles a city park in many ways.

LAND AND TIMBER BASE

A comparison has been made of the general land area, sawtimber volume, and timber production characteristics of the three National Forests (table 1). The San Bernardino National Forest is not only the smallest forest but also has the lowest proportion of productive forest land, because much of the area is steep brush country that supports neither timber nor recreation use. The impact of recreation on timber should, therefore, be proportionately the greatest on this National Forest.

The Modoc National Forest has the largest proportion of productive forest land, with the Sierra National Forest not far behind. The Sierra forest, however, has over three times as much standing timber and produces

Figure 1.--Location of study forests and distance from major population centers.

about three times as much timber, in a total productive forest area only slightly smaller than that of the Modoc forest. The San Bernardino National Forest has the lowest volume of standing sawtimber per acre of productive forest land, and its capacity to grow timber is the least.

Table 1.--Area, sawtimber volume, and yield of the three study forests

National Forest	Area		Sawtimber volume ^{3/}	Sustained yield ^{4/} : capacity ^{5/}	Annual allowable cut ^{6/}
	Total ^{1/}	Productive ^{2/}			
	- - Thousand acres - -	- - Thousand acres - -	- - Thousand board feet ^{5/} - -		
Modoc	1,646	594	4,944,300	60,300	53,000
Sierra	1,295	566	17,064,000	200,000	150,200
San Bernardino ^{6/}	614	152	966,400	14,400	10,500

1/ National Forest lands owned by the United States and administered by the Forest Service, excluding National Monuments, as of June 30, 1961.

2/ Estimated acreage including commercial forest land and productive forest land reserved from commercial timber use.

3/ Based on productive forest land using timber management plans and unpublished data on file at the Pacific Southwest Forest and Range Experiment Station.

4/ The sustained yield capacity and allowable cut estimates are higher than those in timber management plans where the basis for calculation is commercial forest land or some portion thereof. The forest production base used in this study includes both commercial forest land and forest land which would otherwise qualify as commercial were it not withdrawn from timber utilization for other uses.

5/ Log scale, Scribner rule. All board foot volumes in the remaining tables are by the Scribner rule.

6/ An allowable cut goal is ordinarily not calculated for this forest and is estimated for the purpose of this study only. The current (1962) timber management plan shows an average annual cut of 11 million board feet under a sanitation-salvage treatment program.

RECREATION LAND BASE

Four types of recreation land were allocated to form the established recreation complex. As might be expected, the San Bernardino National Forest is already the most highly developed and the Modoc National Forest the least; the additional acreages available for expansion differ accordingly (table 2). There are also differences in the types of recreation land that can be developed.

Table 2.--Established recreation land and expansion possibilities

Type of recreation	National Forest					
	Modoc		Sierra		San Bernardino	
	Established	Expansion	Established	Expansion	Established	Expansion
	areas	:factor	areas	:factor	areas	:factor
	<u>Acres</u>		<u>Acres</u>		<u>Acres</u>	
<u>Sites</u>						
Occupancy	310	62.8	2,430	11.5	2,700	4.4
Activities	20	5.5	170	3.5	1,250	2.4
All sites	330	59.3	2,600	11.0	3,950	3.8
<u>Areas</u>						
Unusual interest	8,550	0.56	0	(2/)	6,720	2.8
Wilderness type	68,870	0	250,800	3/ 0.64	63,490	0.24
All areas	77,420	0.06	250,800	0.65	70,210	0.48

1/ Inventoried potential acreage divided by inventoried established acreage.

2/ Potential inventory is 2,600 acres.

3/ Mainly potential roadless areas.

The San Bernardino National Forest has more established occupancy and activities sites than either of the other forests. The Sierra National Forest has two-thirds and the Modoc National Forest less than a tenth as much. On the other hand, the Sierra forest has the greatest potential capacity for recreation of this kind. If all the suitable land were developed, the Modoc forest would have about two-thirds as much as the Sierra forest and the San Bernardino forest only about half.

Surprisingly, the San Bernardino National Forest proportionally has almost as great a potential as the Sierra forest for increasing its acreage of unusual interest and wilderness type areas. The Sierra forest, however, has a very large absolute dominance over the other forests in both established and potential acreages of these two types combined. The Modoc forest has the least acreage of established and potential land combined suitable for unusual interest and wilderness type recreation; the San Bernardino forest comes next; and the Sierra forest far outstrips both the other National Forests combined.

RESULTS

DIVERSION OF PRODUCTIVE FOREST LAND

The competition for land on the three study forests affects only a minority of the productive forest land (fig. 2). At most, only about 10 to 12 percent of this land in the Modoc and the Sierra forests is involved, and less than a third of the San Bernardino productive forest land would be diverted to recreation, even if every inventoried acre was assigned to this use. In the Modoc and San Bernardino National Forests two-thirds of the productive forest land that would be diverted at total recreation development has already occurred at the established stage. For all forests, with complete development, the impact in terms of displaced productive forest land would be only twice as great as presently. This supports the view that the conflicting needs of recreation and timber can be resolved by compromise without forcing managers to forego either use. Of course, management adjustments will be needed to accommodate both uses, but it seems likely that competition can be kept within reasonable bounds.

The study forests have a very large reserve of land that could be used for recreation, compared with the established portion (fig. 2). Even in an area as heavily developed as the San Bernardino National Forest, over five times the present visitor-day capacity can be accommodated; the Sierra National Forest can increase its visitor-days 10 times, and the Modoc National Forest more than 40 times. The problem of the immediate future is not one of a general scarcity of suitable land, but rather it is one of an "embarrassment of riches" that requires rational scheduling of development. Managers are faced by alternatives that require a workable set of criteria for selecting those combinations of land that will best satisfy anticipated demand. In most instances investment capital is likely to be a more important limiting factor than lack of land.

Figure 2.--Impact of recreation development on productive forest land.
Shaded area indicates proportion used for recreation.

The Sierra and Modoc forest managers can at least double their visitor-day capacity without using appreciably more land if they move toward stage 2 (fig. 2). Established sites on the San Bernardino National Forest, in contrast, are essentially fully expanded so it is already at stage 2. Moving to stage 3 will create a further very large increase in recreation capacity. Except for the Modoc National Forest, this will make a larger inroad on productive forest land than any other stage except the first, because stage 3 brings in all the potential unusual interest and wilderness areas. The addition of development sites at stages 4 and 5 will make the rest of the recreation capacity available without a great increase in the use of productive forest land. Thus, at least half of the total recreation capacity on these forests can be realized at stage 3, which assumes that only the very best sites are added to the present establishment.

Each stage of development has different land requirements (fig. 3). As the total recreation capacity of each forest expands, the average amount of productive forest land needed to accommodate a thousand visitor-days drops rapidly. This follows naturally from the increasing proportion of occupancy and activities sites in the recreation complex. Thus, doubling the recreation capacity need not require a proportionate increase in the amount of land.

Figure 3.--Acres of productive forest land used per thousand visitor-days annual capacity cumulated through stages 1 to 5.

Present use of productive forest land per thousand visitor-days capacity (M.v.d.) is highest in the Modoc National Forest at 118 acres per M.v.d., while the other two forests are about equal at 12 to 17 acres per M.v.d. At stage 3 and later, all the forests use about 4 to 6 acres per M.v.d. As a result, increasing the recreation capacity of these forests also raises the average intensity of land use.

DIVERSION OF TIMBER

The estimated amounts of standing sawtimber, allowable cut, and sustained yield capacity displaced at each stage closely follow the decreasing trend for land (table 3). The volume of sawtimber tied up on recreation land per thousand visitor-days capacity is highest at stage 1 in the Modoc National Forest, 1,170 M bd.-ft. At full development, however, the figure is only 40 M bd.-ft. per M.v.d., almost equal to the San Bernardino forest. The Sierra and San Bernardino forests start at stage 1 with 360 M and 110 M bd.-ft. and drop to 140 and 30 M bd.-ft. per M.v.d. at stage 5. The average for the three forests at stage 5 is 80 board feet of standing sawtimber displaced per visitor-day.

The amount of sustained yield capacity foregone per thousand visitor-days capacity is very similar to the allowable cut figure, except for minor details. Annual diversion is greatest at stage 1 in the Modoc National Forest, with 12.3 M bd.-ft. per M.v.d., and least in the San Bernardino forest, 1.6 M bd.-ft. At full development of the recreation complex, all three forests show figures between 0.4 and 1.6 M bd.-ft. per M.v.d. while the average for the three forests is about 0.9 of a board foot of sustained yield capacity per visitor-day.

Most of the statistics presented thus far in the results, as well as in additional comparisons, can be derived from data summarized in tables 4 and 5.

RELATIVE INVESTMENT COSTS

Most of the recreation land inventoried will require some investment in improvements before it can be used. Dispersed recreation areas generally do not need very much added investment per acre. However, the average investment cost for new improvements on occupancy sites is substantial. It is estimated, as noted earlier, to be \$4,500 per acre, or \$4.50 per visitor-day for an installed capacity of 1,000 visitor-days per acre. This is generally a one-shot expenditure that can be amortized over a period of years.

The value of sawtimber volume might also be considered as "invested" on recreation land. The average number of board feet per visitor-day displaced at stage 5 on all three forests is worth \$1.60, if stumpage is taken at \$20 per M bd.-ft. This means that for every dollar tied up in sawtimber about \$2.80 will be needed for cash improvements.

Table 3.--Total acreage of productive forest land, board footage of standing sawtimber, sustained yield capacity, and allowable cut displaced per thousand visitor-days, cumulated by stages of recreation development

Stage of recreation development	Displaced per thousand visitor-days			
	Productive forest land	Sawtimber volume	Sustained yield capacity	Annual allowable cut
	Acres	- - - Thousand board feet - - -		
<u>Modoc National Forest</u>				
1	118.0	1,170	12.3	12.3
2	41.6	410	4.3	4.3
3	6.8	70	.7	.7
4	5.8	60	.6	.6
5	4.5	40	.5	.4
<u>Sierra National Forest</u>				
1	11.9	360	3.9	3.0
2	5.8	180	1.9	1.5
3	6.5	210	2.3	1.9
4	4.5	150	1.6	1.3
5	4.4	140	1.6	1.3
<u>San Bernardino National Forest</u>				
1	--	--	--	--
2	17.3	110	1.6	1.2
3	8.5	54	.8	.6
4	5.2	30	.5	.4
5	4.7	30	.4	.3

The contrast in investment "cost" is greater if the value of the annual sustained yield capacity foregone on recreation land is compared with the annual cost of improvements. At stage 5, the average for the three forests is about 1.8 cents worth of timber production displaced for each visitor-day. Thus, in addition to every dollar's worth of reduced sustained yield capacity, the cost of maintaining the investment in improvements is \$25. Clearly the larger proportion of the cost of recreation lies in maintaining the investment in improvements on occupancy sites.

CONCLUSIONS

This study indicates that the recreation capacity of the three forests analyzed can be increased to 10 times the present total and, at the same time, sustained yield capacity from productive forest land would be reduced only 13 percent. Thus, multiple-use management policies applied to these 3.5 million acres of National Forest land can provide about 40 million visitor-days of recreation, plus almost 240 million board feet of timber at sustained yield capacity. The public benefits of such joint production seem large

indeed, even if individual acres within each forest are devoted to only a single use. Even greater efficiency may result whenever land management practices can be devised to use some acres for more than one product. The mounting needs of the future suggest that this is a promising area for research.

Although the three forests analyzed represent a wide range of conditions, the results of this study cannot be unqualifiedly applied to the entire California Region. They can be extended by including more forests within the framework of this report. Additional data would permit certain simplifying assumptions to be dropped and other objectives added. For example, an estimate closer to the actual impact of recreation development on timber production could be made by including timber yields from certain types of recreation land, such as protective zones. Also, the expected impact associated with alternative patterns of development would aid planning to meet specified goals.

This investigation has not touched on uses of forest land other than for recreation and timber. Other interproduct relationships and management problems should be explored, along with some aspects of the recreation-timber conflict left out of this study. For instance, the scenic impact of current timber management practices on the parts of the landscape that lie outside of development sites and protective zones has been entirely ignored. This may prove to be a very troublesome source of conflict between timber managers and recreationists, especially in areas where clear-cutting prevails.

In addition, we have assumed away all the problems of using resources efficiently to produce recreation or timber. Study in this field is needed to insure that the efforts of forest managers produce desirable results. Simply assigning land to one use or another is but a partial answer to the problem of the final satisfaction of public needs. Over a period of time, capital and labor must be properly combined with land--a challenging opportunity requiring managerial skills firmly buttressed by the best planning process that researchers and administrators can devise.

Table 4.--Acres used and visitor-days provided by each stage of recreation development, by types of recreation land with cumulative totals

MODOC NATIONAL FOREST				
Type of recreation land	:	National Forest land ^{1/}		Visitor-day capacity
	:	Total	Productive	
	:	Acres		
				Thousands
<u>Stage 1: Established recreation land</u>				
Occupancy sites	310	270		232
Activities sites ^{2/}	20	20		17
Unusual interest areas	8,550	520		7
Wilderness-type areas	68,870	21,050		46
Protective zones	3/13,830	13,830		(4/)
Subtotal	91,580	35,690		302
<u>Stage 2: Expansion of established sites</u>				
Occupancy sites	770	680		553
Activities sites ^{2/}	30	30		21
Subtotal	800	710		574
Cumulative total	92,380	36,400		876
<u>Stage 3: Addition of all outstanding recreation land</u>				
Occupancy sites	9,340	7,740		6,114
Activities sites ^{2/}	*	*		14
Unusual interest areas	4,800	1,900		3
Wilderness-type areas	0	0		0
Protective zones	3/1,410	1,410		(4/)
Subtotal	15,550	11,050		6,131
Cumulative total	107,930	47,450		7,007

NOTE: Footnotes at end of table.

Table 4.--(con.)

MODOC NATIONAL FOREST			
Type of recreation land	National Forest land ^{1/}		Visitor-day capacity
	Total	Productive	
	- - - - Acres - - - -		Thousands
Stage 4: Addition of all good recreation land			
Occupancy sites	3,500	2,900	1,739
Activities sites ^{2/}	*	*	4
Unusual interest areas	0	0	0
Wilderness-type areas	0	0	0
Protective zones	3/690	690	(4/)
Subtotal	4,190	3,590	1,743
Cumulative total	112,120	51,040	8,750
Stage 5: Addition of all fair recreation land			
Occupancy sites	5,850	5,600	4,131
Activities sites ^{2/}	80	70	71
Unusual interest areas	0	0	0
Wilderness-type areas	0	0	0
Protective zones	3/1,260	1,260	(4/)
Subtotal	7,190	6,930	4,202
Cumulative total	119,310	57,970	12,952
SIERRA NATIONAL FOREST			
Stage 1: Established recreation land			
Occupancy sites	2,430	1,870	1,269
Activities sites ^{2/}	170	170	139
Unusual interest areas	0	0	0
Wilderness-type areas	250,800	7,660	167
Protective zones	3/9,040	9,040	(4/)
Subtotal	262,440	18,740	1,575

NOTE: Footnotes at end of table.

Table 4.--(con.)

SIERRA NATIONAL FOREST			
Type of recreation land	National Forest land ^{1/}		Visitor-day capacity
	Total	Productive	
	- - - - Acres - - - -		Thousands
<u>Stage 2: Expansion of established sites</u>			
Occupancy sites	3,470	1,920	1,952
Activities sites ^{2/}	130	130	49
Subtotal	3,600	2,050	2,000
Cumulative total	266,040	20,790	3,576
<u>Stage 3: Addition of all outstanding recreation land</u>			
Occupancy sites	9,950	7,500	5,218
Activities sites ^{2/}	140	90	144
Unusual interest areas	2,570	1,560	72
Wilderness-type areas	160,800	28,030	107
Protective zones	3/ 1,100	1,100	(4/)
Subtotal	174,560	38,280	5,541
Cumulative total	440,600	59,070	9,117
<u>Stage 4: Addition of all good recreation land</u>			
Occupancy sites	12,750	6,800	6,140
Activities sites ^{2/}	5/ 310	290	156
Unusual interest areas	2/ 40	0	*
Wilderness-type areas	3/ 540	-100	*
Protective zones	3/ 2,510	2,510	(4/)
Subtotal	14,990	9,500	6,296
Cumulative total	455,590	68,570	15,413
<u>Stage 5: Addition of all fair recreation land</u>			
Occupancy sites	1,720	860	614
Activities sites ^{2/}	10	10	22
Unusual interest areas	0	0	0
Wilderness-type areas	3/ 120	0	*
Protective zones	3/ 530	530	(4/)
Subtotal	2,140	1,400	636
Cumulative total	457,730	69,970	16,049

NOTE: Footnotes at end of table.

Table 4.--(con.)

SAN BERNARDINO NATIONAL FOREST			
Type of recreation land	National Forest land ^{1/}		Visitor-day capacity
	Total	Productive	
	- - - - Acres - - - -		Thousands
<u>Stage 2: Established recreation land</u> **			
Occupancy sites	2,700	1,770	1,423
Activities sites ^{2/}	1,250	950	298
Unusual interest areas	6,720	4,440	44
Wilderness-type areas	63,490	18,630	32
Protective zones	3/5,360	5,360	(4/)
Subtotal	79,520	31,150	1,797
<u>Stage 3: Addition of all outstanding recreation land</u>			
Occupancy sites	4,470	2,560	2,886
Activities sites ^{2/}	1,390	510	370
Unusual interest areas	19,790	7,510	21
Wilderness-type areas	14,960	790	7
Protective zones	3/600	600	(4/)
Subtotal	41,210	11,970	3,284
Cumulative total	120,730	43,120	5,081
<u>Stage 4: Addition of all good recreation land</u>			
Occupancy sites	5,560	3,160	3,636
Activities sites ^{2/}	1,010	750	248
Unusual interest areas	2/-760	-560	-1
Wilderness-type areas	0	0	0
Protective zones	3/600	600	(4/)
Subtotal	6,410	3,950	3,883
Cumulative total	127,140	47,070	8,964
<u>Stage 5: Addition of all fair recreation land</u>			
Occupancy sites	1,850	600	1,090
Activities sites ^{2/}	620	470	133
Unusual interest areas	-140	-30	*
Wilderness-type areas	0	0	0
Protective zones	3/100	100	(4/)
Subtotal	2,430	1,140	1,223
Cumulative total	129,570	48,210	10,187

Table 4.--(con.)

* Less than 10 acres or 1,000 visitor-days.

** Since presently established recreation land is fully expanded the development starts with stage 2.

1/ Net National Forest land and other lands administered by the Forest Service, owned by the United States, as of June 30, 1961.

2/ Denotes development sites which are non-occupancy sites.

3/ Includes only productive forest land part of protective zones.

4/ Not applicable.

5/ Negative sign indicates adjustment needed to avoid double-counting.

Table 5.--Standing sawtimber volume and annual sawtimber production on productive forest land displaced at each stage of recreation development

Stage of	:	Displacement of:				
recreation	:	Sawtimber volume	:	Sustained	:	Annual
development	:		:	yield	:	allowable
	:		:	capacity	:	cut
		- - - - -	Thousand board feet		- - - - -	

Modoc National Forest

1	352,996	3,713	3,713
2	6,661	75	72
3	95,621	1,150	1,015
4	33,000	367	359
5	59,361	717	649

Sierra National Forest

1	573,258	6,175	4,720
2	62,064	700	547
3	1,298,746	14,438	11,796
4	308,023	3,431	2,851
5	34,045	466	287

San Bernardino National Forest

1	(1/)	(1/)	(1/)
2	198,483	2,959	2,150
3	76,299	1,138	826
4	25,122	375	272
5	7,257	108	79

1/ Since presently established recreation land is fully expanded the development starts with stage 2.

Amidon, Elliot L., and Gould, Ernest M., Jr.

1962. The possible impact of recreation development on timber production in three California National Forests. U.S. Forest Serv. Pacific Southwest Forest and Range Expt. Sta. Tech. Paper 68. 21 pp., illus.

Presents estimates of the amount of productive forest land displaced at five levels of recreation development in three National Forests in California. Includes expansion possibilities for different components of the recreation complexes. The cash investment needed for recreation facilities, relative to the cost in terms of foregone opportunities for timber production, is explored.

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