RECREATIONAL WATER NEEDS IN NEW MEXICO FOR THE NEXT HUNDRED YEARS

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INTRODUCTION

The probability of either accuracy or precision of projections to 2060 is remote. It is particularly remote when the subject is recreation because the relationships between recreational use and the factors affecting use are imperfectly understood. Consider for a moment the problems of a New Mexico recreational planner in 1860 attempting to project recreational needs in New Mexico to 1960.

According to Clawson and Knetsch the major factors affecting the future demand for recreation are population, leisure, transportation, and income (1, pp. 93-110). Since the impact of these factors on the supply side of recreation are even more imperfectly understood than on the demand side, and especially because mathematical projections for even 10 years rather than 100 are extremely risky, the procedures used in the projections to the year 2060 will be more of an imagineering technique than a scientific one.

Again according to Clawson and Knetsch there are five major methods for projecting the recreational demand for resources (1, p. 117). These are (1) Simple trend extensions of past uses, (2) Extensions of trends of the basic causal factors as mentioned in the preceding paragraph, (3) Applications of the satiety principle to place a ceiling on projected uses, (4) Projections of other authorities, and finally, (5) Judgement using a number of factors in an informal way. Obviously, imagineering lies mainly in the last mentioned technique.

In this paper the three factors of population, leisure and income will be imagineered to the year 2060. Since imagineering may not be completely trustworthy, pessimistic, average and optimistic attitudes will be used to project the effects of these demand factors on the recreational water supply needs in New Mexico. Some current research on consumptive uses of water by recreationists will be applied after they are checked against recent studies.

THE PRESENT SITUATION

Presently the population in New Mexico is about 1,000,000 persons. Leisure time per 56-hour work week in the United States (and presumably New Mexico) is about 20-25 hours, while per capita personal income in New Mexico is about $2,160. With these statistics in mind, a portion of the present recreational situation in New Mexico can be shown in the following.

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The population distribution in New Mexico is pictured in Figure 1 (2, p. 18). Note the radii indicating population concentrations in southeastern New Mexico and in northcentral New Mexico. The figure is partially incomplete in that El Paso is not included.

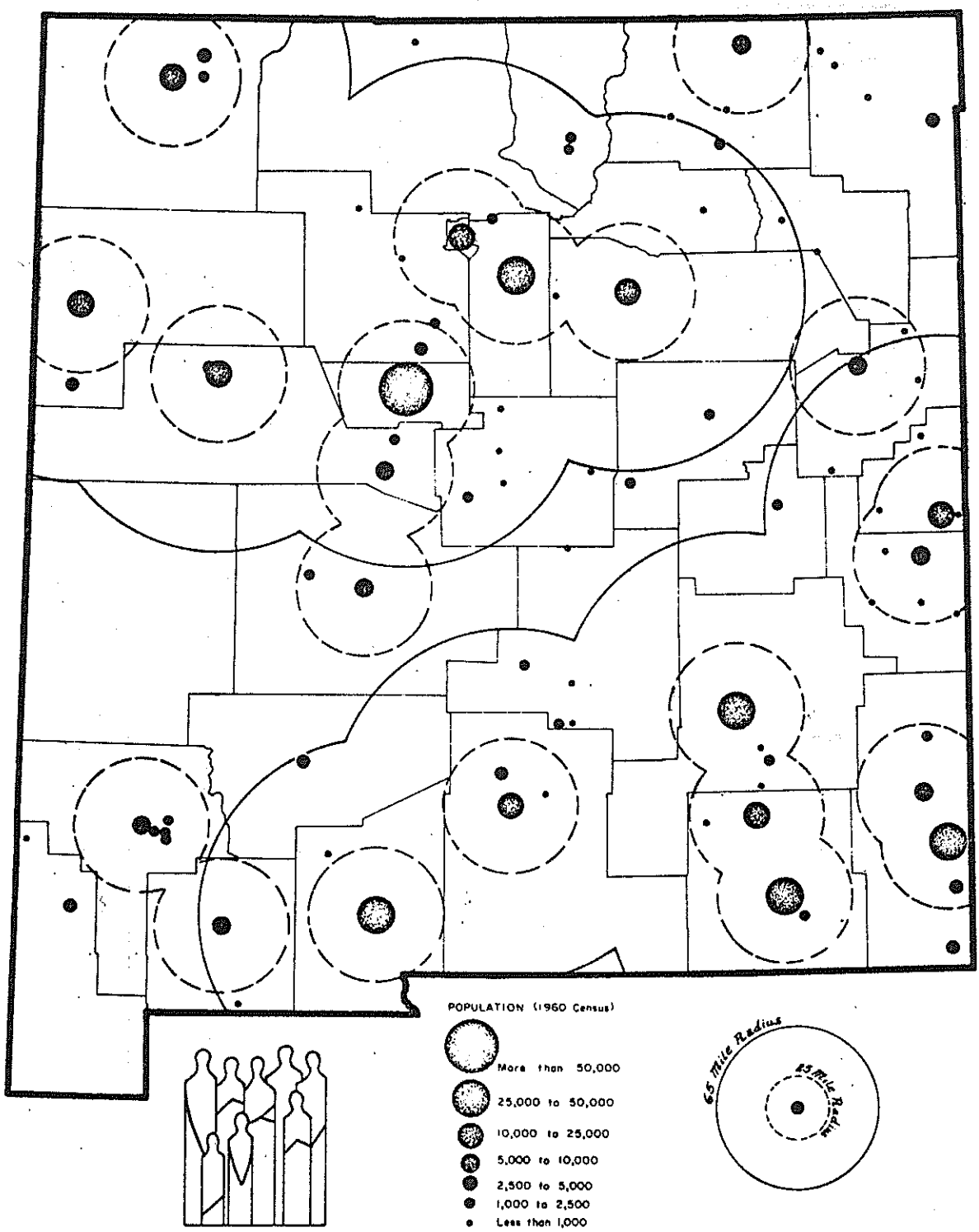
The geographical distribution of recreational waters in the state is shown in Figures 2 (showing fishing streams of the state) and 3 (representing motor-boat and water skiing locations) (2, pp. 40 and 43, respectively). A special use of water for recreation, skiing sites, are shown in Figure 4 (2, p. 26).

Generally the northern population center is well-served by all three types of water sport areas although they lie generally further north of the center. In the southern area, all three types of activities are deficient with the possible exception of warm-water fishing.

A summary of the quantities of the three major recreational resources in New Mexico indicates the state now has about 0.08 acre of lakes per capita and 10 feet of fishing streams on public land (Table 1) (2, p. 52).

The present situation regarding water use by out-of-state recreationists can be partially demonstrated by Figure 5 (2, p. 30). The major routes of I-10 in southern New Mexico and I-40 in central New Mexico miss almost all of the major recreational water areas. The value of the tourist industry in New Mexico in 1963 has been estimated at about $200 million per year, about equally divided for food, lodging, automobile costs, and other costs (3, p. 10). A 1965 tabulation at Elephant Butte and Navajo Reservoirs indicated 25 percent of the sample of visitors at Elephant Butte were from in-state and the remaining 75 percent from out-of-state (4, p. 39). Almost the reverse proportions were recorded at Navajo Reservoir. Many estimates are available regarding number of visitors to various kinds of facilities, number of license holders, etc. The water use of recreationists is more difficult to determine. Carruthers estimated the quantity of water used by businesses serving recreationists in the Reserve Area in 1963 (5,p. 99). According to his estimates using the input-output model and projecting to the year 2000, an increase in the study area of 150,000 recreationists would require 155 additional acre-feet of water, or about .001 acre-foot of water per recreationist to supply the businesses serving recreationists. On the other hand, Coppedge estimated the quantity of water lost in the two above mentioned reservoirs because water was held in them for recreational purposes (4, pp. 72 and 76). The losses were seepage and evaporation from the proportions of the reservoirs considered to be their minimum recreational pools. Water use for 854,000 recreationists in 1966 at Elephant Butte Reservoir was 38,240 acre-feet, or .045 acre-foot per recreationist. At Navajo Reservoir the loss was 9,700 acre-feet for 237,000 recreationists, or a rate of .041 acre-foot. If the

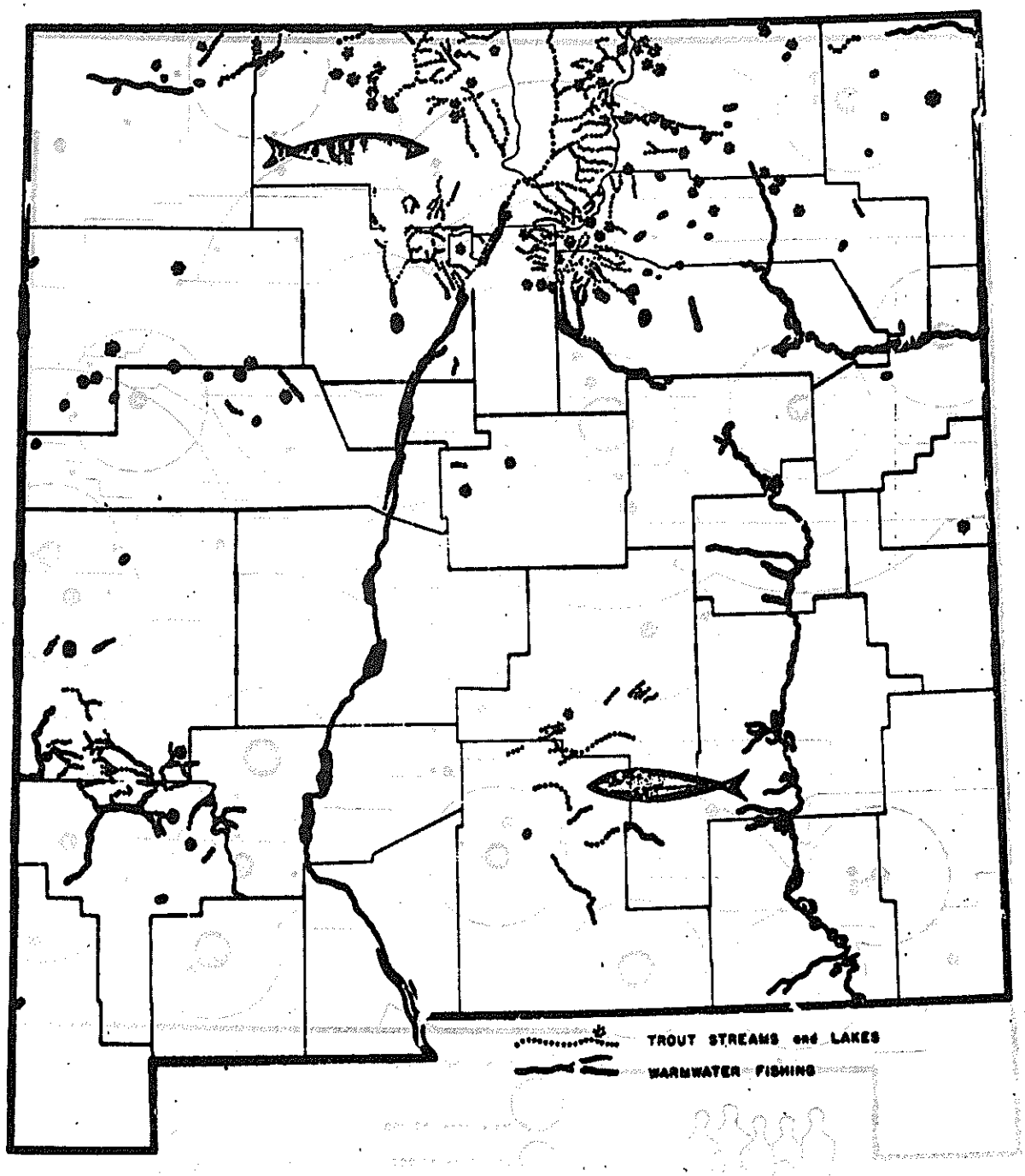
FIGURE 1



C E N T E R S O F P O P U L A T I O N

PLATE III

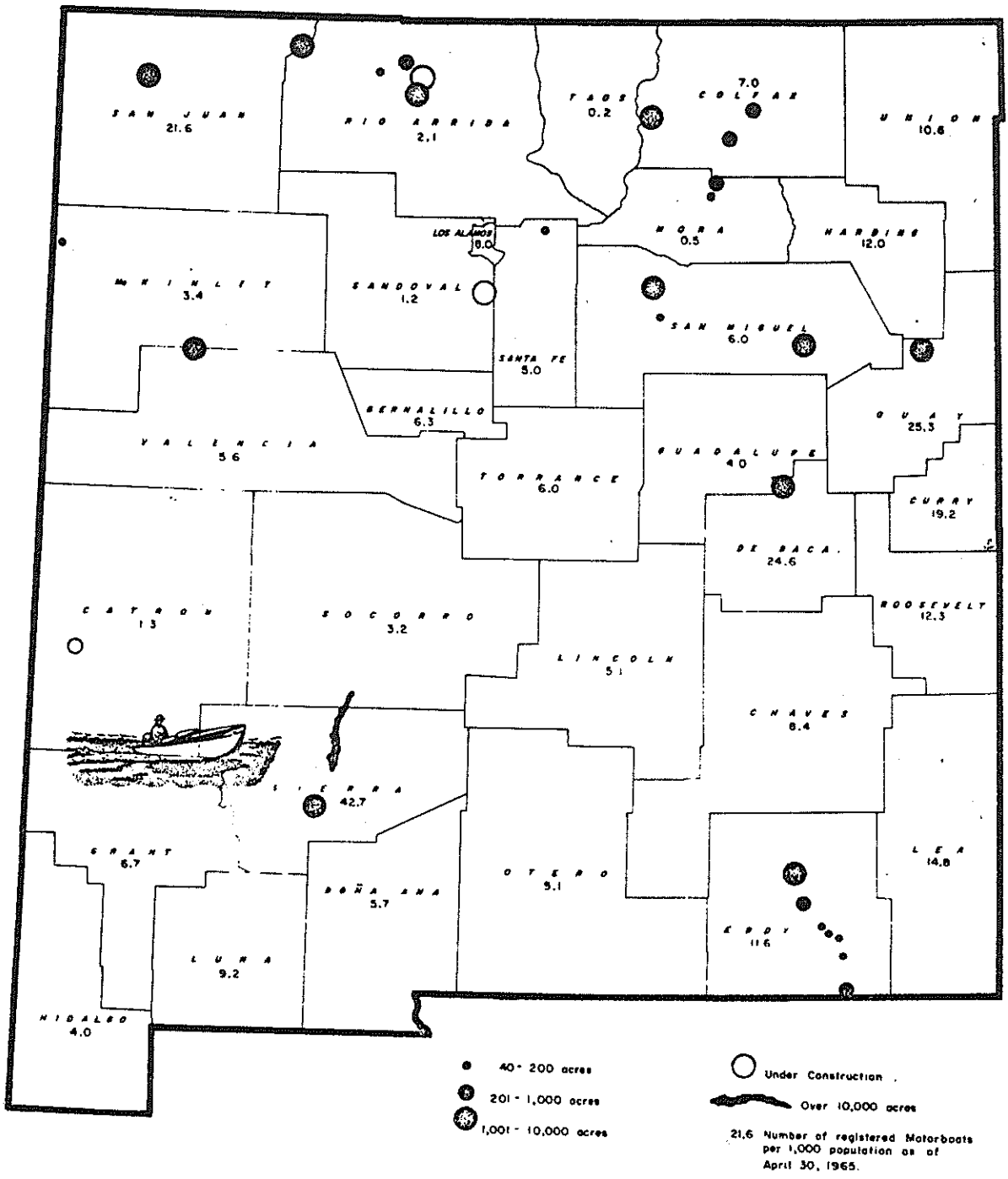
FIGURE 2



F I S H I N G W A T E R S

PLATE XII

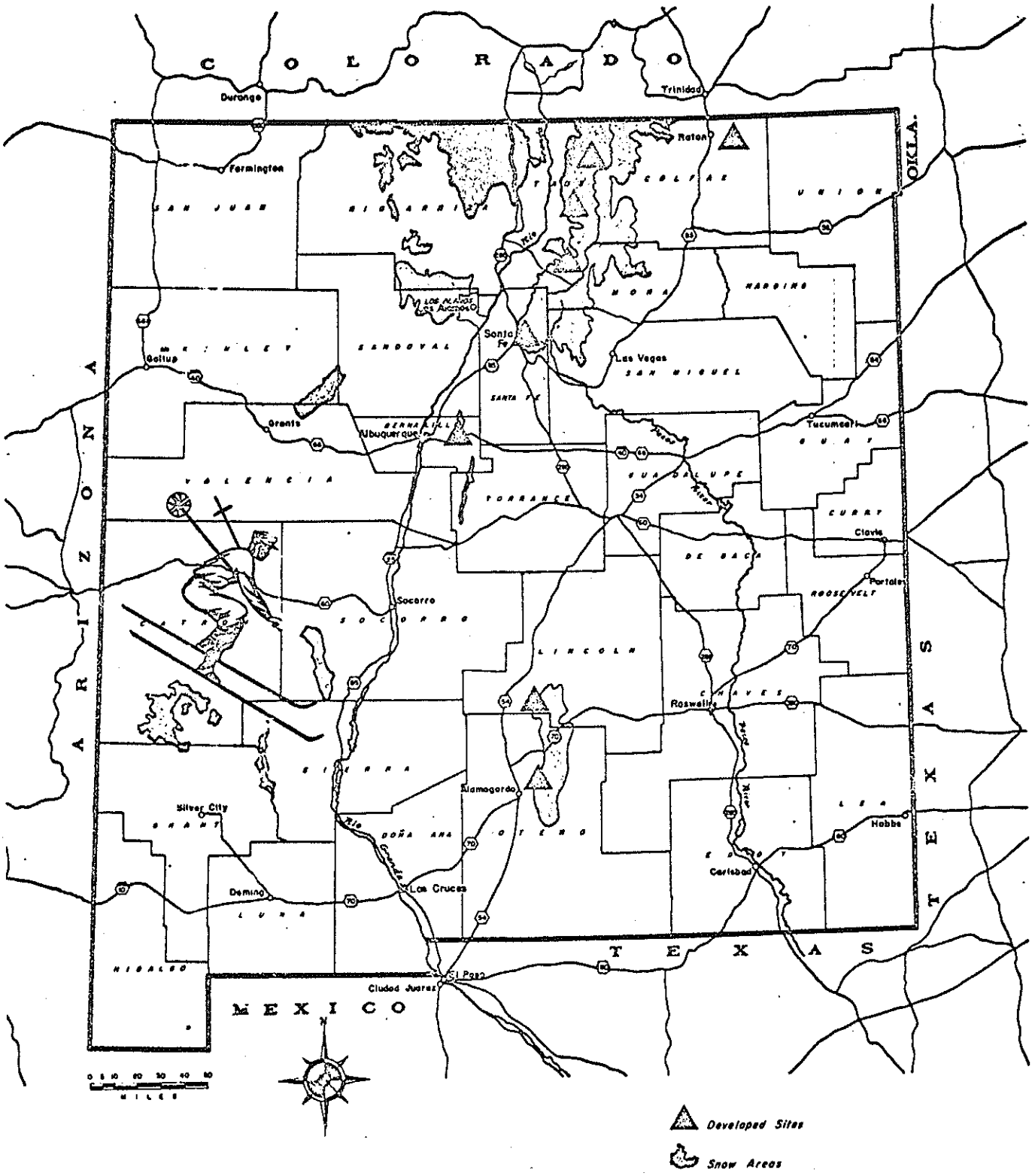
FIGURE 3



WATERS FOR MOTORBOATING AND SKIING

PLATE XIII

FIGURE 4



WINTER SPORTS

PLATE V

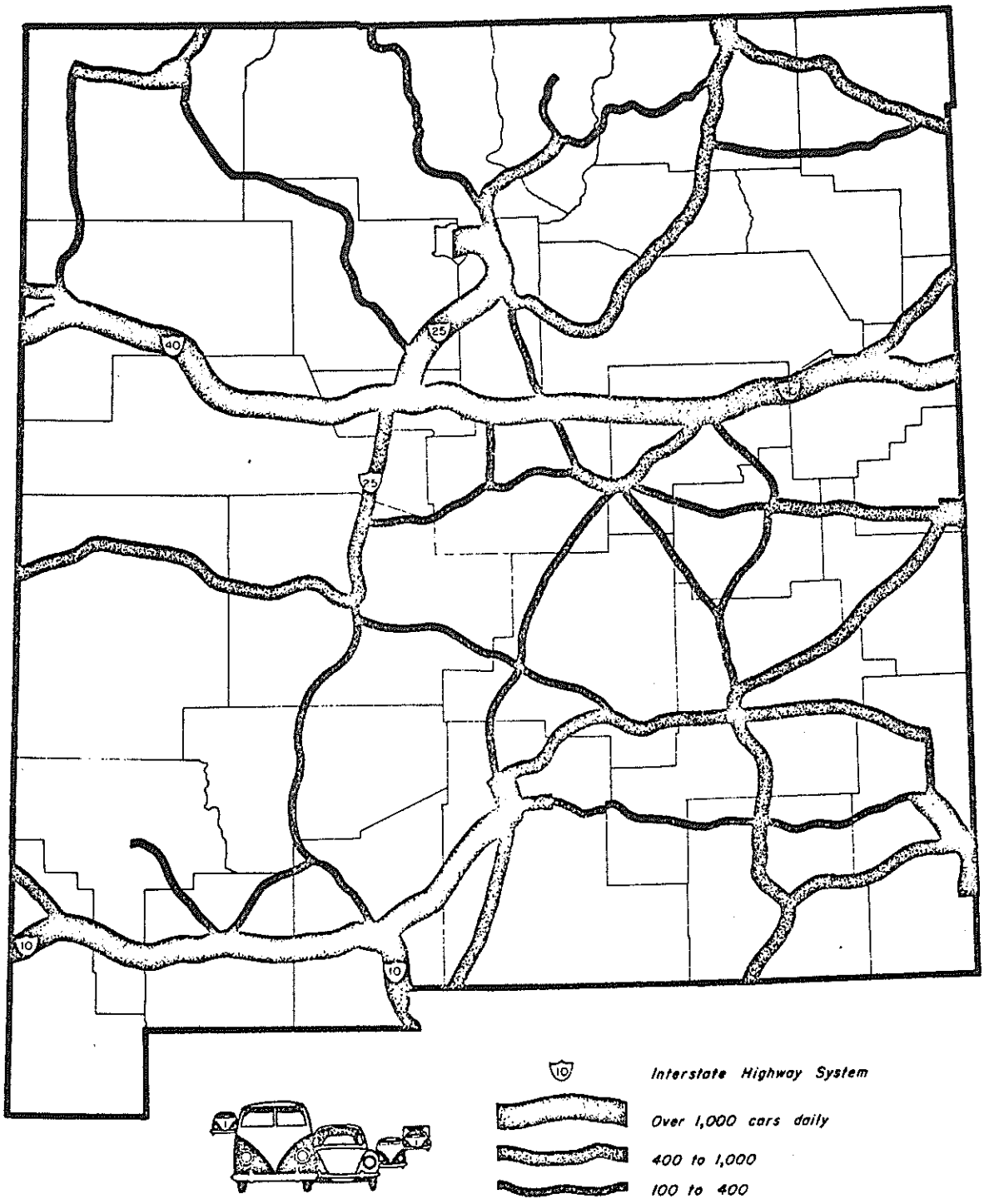
Table 1. Water-Based Recreational Facilities in New Mexico, 1965

Agency and Ownership Class	Total Area of Lakes[1/]	Length of Fishing Streams	Ski Areas
	Acres	Miles	No.
PUBLIC:			
Forest Service	315	1,550	6
National Parks	0	16	0
Park and Recreation Commission	59,575	0	0
Dept. of Game and Fish	2,409	127	0
Municipalities	747	0	0
Public Unclassified	11,880	201	0
Total	74,926	1,890	6
INDIAN	5,498	---	2
PRIVATE	1,597	---	8
State Total	82,021		16

1/ In public areas includes lakes and reservoirs publicly owned or controlled for public use. In Indian areas includes all fishing waters. In private areas all fishing areas.

Source: State Planning Office, "New Mexico Comprehensive Plan for Outdoor Recreation," Santa Fe. October 1965, pp. 52-58. Based partially on the inventory prepared by New Mexico Soil and Water Conservation Districts.

FIGURE 5



OUT-OF-STATE PASSENGER CARS
AVERAGE ANNUAL DAILY TRAFFIC 1963

PLATE VII

average of these accumulated rates, .046 acre-foot at Elephant Butte and .042 at Navajo, or .044 acre-foot is applied to population estimates, then 44,000 acre-feet of water represents the present recreational depletion of water in New Mexico.1/ This estimate is in general agreement with the 49,790 acre-feet estimate made in the State Resource Development Plan, particularly when the Plan excluded evaporation as a charge to recreational uses (6, p. 90).

The relationship that will be used to project uses to 2060 will be based on the above per capita estimate of recreational water use multiplied by the three factors of population, leisure and income changes, as direct variables. Transportation per capita is believed to be a function of leisure and income. Including the transportation factor directly would be at least partially a double counting of this factor. The procedure assumes that out-of-state tourists will increase in proportion to the in-state population. Also judgement was used to reduce the population, leisure, and income projections below that expected from current linear trends.

The formula for the water needs for recreation in New Mexico becomes:

Water quantity = (Rate of use per capita) X (Population of New Mexico) X (Index of leisure) X (Index of New Mexico per capita personal income)

In 1965-66, the solution would be:

Water quantity = (.044) X (1,000,000) X (1.00) X (1.00)

= 44,000 acre-feet

THE PROJECTION FACTORS

The projection factors, using a linear trend extension adjusted to the satiety principle in the leisure area, and judgement regarding projections past 2000, are given in Table 2.

FUTURE SITUATION - LOW LEVEL

The low level of recreational use of water in New Mexico in 2060 is a pessimistic projection in which national and international populations are pressing on the food supply, the growth rate has been zero for many decades (no increase in the per capita income), leisure time has not increased from the present, and water is not being imported into New Mexico.

1/ Actually, the ten major lakes in New Mexico reported 2.7 million recreational visits in 1966 (7,p.59). Many recreationists in New Mexico visit these lakes numerous times during the year, particularly motor boatists and fishermen. They are counted in the 2.7 million estimate for each visit. If the assumption is made that each recreationist visits the reservoir 2.7 times, then the population value can be applied directly.

Table 2. Projections to the Year 2060 for Recreational Water Needs in New Mexico

Factor	Units	1965-66 Level	Projections to 2060		
			Low Level	Medium Level	High Level
Population, N. M.	Mil.	1.0	2.0	4.0	5.0
Per Capita Income in New Mexico	Dol.	2,160	2,160	6,000	13,000
Index	--	100	100	277	602
Leisure in Hours Per 56-Hour Week	Hours	22	22	30	38
Index	--	100	100	136	173

The gross recreational water need, using the formula would be:

$$\text{Water quantity} = (.044) \times (2{,}000{,}000) \times (1.00) \times (1.00)$$

$$= 88{,}000 \text{ acre-feet}$$

In this situation it is probable that (1) Water evaporation will be eliminated from most major water impoundment bodies, (2) Seepage reduced in these bodies, and (3) Pollution will be rigorously controlled. Maximum controls will be exerted to store water efficiently, distribution systems will be developed to reduce waste to a minimum, and recreational uses, both quantity and location-wise, will be secondary to food production and urban uses. As a consequence of these actions, water use for recreation will shift from the partially-competitive category to the completely-supplementary category. That is, if water is needed for food or urban uses, recreational uses of water may well fall below the 88,000 acre-foot requirement, and indeed possibly below the present 44,000 acre-foot use.

Recreational characteristics in this severe water shortage condition will consist of a carefully controlled, restricted use situation in which recreationists will be required to purchase daily entrance permits for water bodies. These water bodies will be designed for most efficient water storage rather than for beauty or other recreational values. The entrance permit demand is expected to exceed the supply, perhaps requiring random drawings in the same way that hunting is restricted for some game species in New Mexico. Motor boating and water skiing will be restricted in favor of fishing. Snow skiing will be encouraged as a relatively light consumptive use of water. Private recreational developments will be permitted if the water quality or quantity remains relatively unaffected by recreational users. If water is allocated to recreational uses, it will be for user-oriented developments near and in metropolitan areas, rather than the combinations now available (resource-oriented and combination user and resource oriented).

FUTURE SITUATION - MEDIUM LEVEL

The medium level of recreational use assumes that population will increase moderately, the per capita income and leisure time will increase at about a half of the projected rate, water will be imported into the Southwest but not at a rate that will change the present competitive positions of the various industries using water, and the state and regional nationalism presently experienced will be relaxed to permit a freer flow of resources and trade.

Gross recreational water needs in this situation will be:

Water Quantity = (.044) X (4,000,000) X (1.36) X (2.77)

= 663,000 acre-feet

This large quantity of water will meet the needs of a population in New Mexico plus accompanying increases in out-of-state tourists that is four times that of the present, the recreationists will have at the minimum almost three times as much income as at present to spend on recreation, and he will have a third more leisure time in which to do it. The present trend regarding income allocation indicates that as incomes increase the proportion spent on recreation also increases. Therefore, insofar as the income variable is concerned, the above estimate is conservative.

The major restriction at the medium level projection will be leisure time and this factor may well determine the characteristics of the recreational development in New Mexico. Readily available water bodies will become prime requisites to the population of recreationists. It is probable that a continuous series of reservoirs may be constructed along the major waterways, particularly in the Rio Grande Valley, to permit easy access to a series of metropolitan areas extending from Taos intermittently to El Paso. To take advantage of the traffic flows in New Mexico, private water-based recreational developments can be expected along routes I-40 and I-10.

FUTURE SITUATION - HIGH LEVEL

Perhaps the most important of the assumptions for the high level of recreational use of water in New Mexico is concerned with water importation. It is assumed that water will be freely imported into New Mexico and/or weather modification will be effective enough to permit an adequate supply of water for all needs. Additionally, leisure time and income will advance at the projected rate while population will stabilize at about the 5,000,000 level. Legal boundaries will cease to be a factor affecting the New Mexico economy and the population center of the continental United States will lie slightly to the East.

With the above assumptions, gross recreational water needs in New Mexico will be as follows:

Water quantity = (.044) X (5,000,000) X (1.73) X (6.02)

= 2,291,000 acre-feet

The immediate reaction to this computation is that it is impossible as we view it from the mid-1960's. Reflect for a moment on our planner in 1860.

Picture his amazement at seeing the San Juan-Chama Diversion, or even at seeing a water skier at Elephant Butte Reservoir. The recreational situation in 2060 may well be equally amazing to any of us surviving to 2060.

One question that might be raised is that of the competitive position of water for recreation with those of other uses. The research by Wollman and others in the 1950's indicated recreational uses can compete with agricultural uses but not with some of the urban uses (8, pp. XVII-XIX). His result was partially supported by those of Coppedge in his study of Elephant Butte and Navajo reservoirs, where the recreational values of water were in the $400-$600 per acre-foot range (4, pp. 72 and 76).

If the above amount of water is to be used for recreation, it is probable that the Rio Grande will become a series of reservoirs to provide adequate supplies of water for recreational, domestic and agricultural uses. With abundant supplies of water and large populations, large-scale private developments are expected in the northcentral area comparable to those presently in some eastern coastal and Pacific areas. Land presently used in and adjacent to small farm enterprises may well be diverted to fish ponds, stream developments, and ski areas. Other developments are expected along the heavy travelled routes in the Albuquerque, Grants and Farmington areas, although water supplies may be limited in the Gallup area. Perhaps the largest relatively undeveloped recreational area in New Mexico is the Gila Area in southwestern New Mexico. If water is imported to Arizona and southwestern New Mexico, present supplies in this area will be retained in the area for broad-scale developments. The area is particularly favorably located, being at the center of the El Paso-Albuquerque-Phoenix triangle, as well as adjacent to the heavy traffic flows along I-10.

CONCLUSIONS

Recreation will be and is being restricted in New Mexico by a paucity of water resources. In the next hundred years, population, leisure and income increases will place heavy burdens on the water resource unless sharply increased quantities of water are allocated to this use. With water importations, an imagineering estimate indicates about 2.3 million acre-feet of water will be needed if the present 1965-66 rate of use is maintained: Water-based recreational developments of public lands will be concentrated in northcentral and southwestern New Mexico. Concentrations will occur on private lands in northcentral New Mexico, along the Rio Grande and Pecos River, but especially along the major transcontinental travel routes.

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