North Atlantic Regional Water Resources Study

Appendix M
Outdoor Recreation

NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY COORDINATING COMMITTEE
MAY 1972

The North Atlantic Regional Water Resources (NAR) Study examined a wide variety of water and related land resources, needs and devices in formulating a broad, coordinated program to guide future resource development and management in the North Atlantic Region. The Study was authorized by the 1965 Water Resources Planning Act (PL 89-80) and the 1965 Flood Control Act (PL 89-298), and carried out under guidelines set by the Water Resources Council.

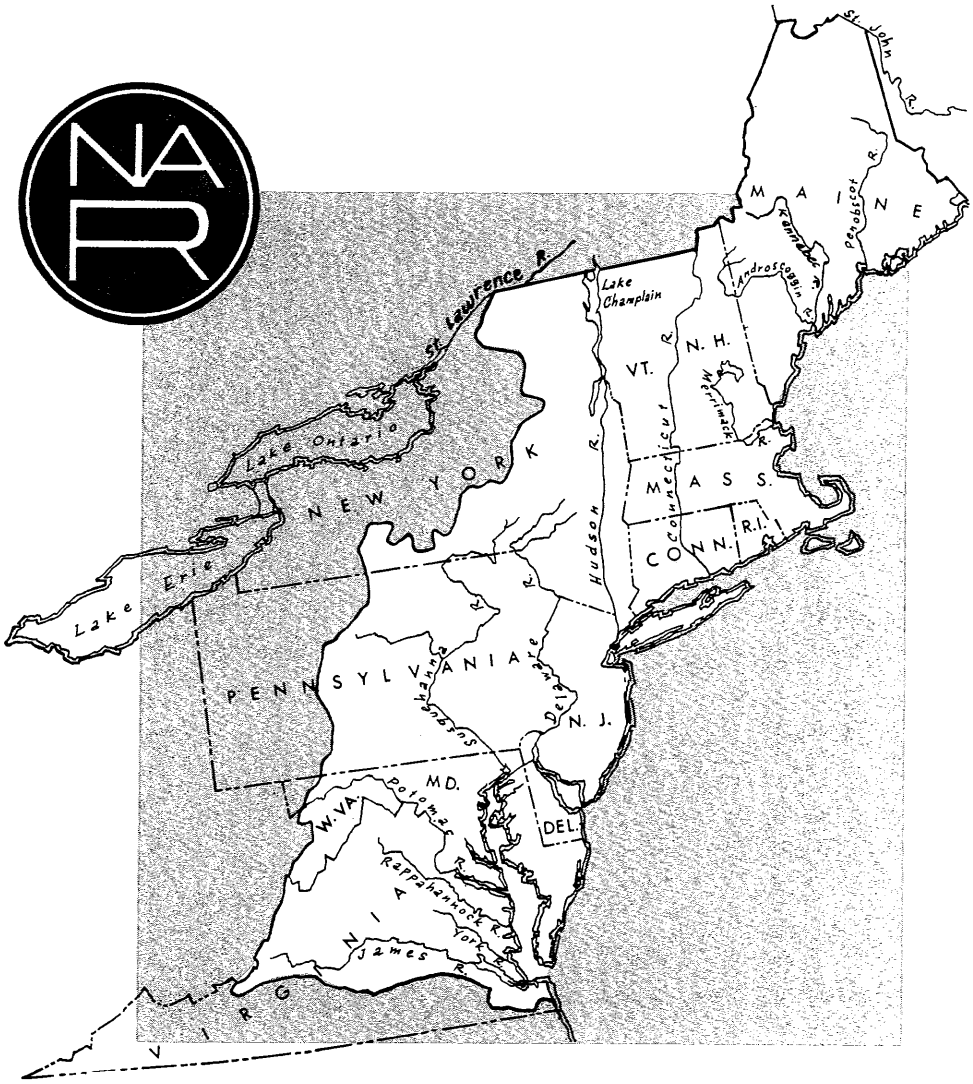
The recommended program and alternatives developed for the North Atlantic Region were prepared under the direction of the NAR Study Coordinating Committee, a partnership of resource planners representing some 25 Federal, regional and State agencies. The NAR Study Report presents this program and the alternatives as a framework for future action based on a planning period running through 2020, with bench mark planning years of 1980 and 2000.

The planning partners focused on three major objectives -- National Income, Regional Development and Environmental Quality -- in developing and documenting the information which decision-makers will need for managing water and related land resources in the interest of the people of the North Atlantic Region.

In addition to the NAR Study Main Report and Annexes, there are the following 22 Appendices:

A. History of Study
B. Economic Base
C. Climate, Meteorology and Hydrology
D. Geology and Ground Water
E. Flood Damage Reduction and Water Management for Major Rivers and Coastal Areas
F. Upstream Flood Prevention and Water Management
G. Land Use and Management
H. Minerals
I. Irrigation
J. Land Drainage
K. Navigation
L. Water Quality and Pollution
M. Outdoor Recreation
N. Visual and Cultural Environment
O. Fish and Wildlife
P. Power
Q. Erosion and Sedimentation
R. Water Supply
S. Legal and Institutional Environment
T. Plan Formulation
U. Coastal and Estuarine Areas
V. Health Aspects

Appendix M
Outdoor Recreation



Prepared by

Bureau of Outdoor Recreation

United States Department of the Interior

for the

NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY
COORDINATING COMMITTEE

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GLOSSARY

Activity Day: The participation in one outdoor recreation activity by one person during a portion or all of a 24-hour day.

Capacity Day: A 24-hour period in which actual use of a recreation facility is equal to or exceeds the designed or intended level of use.

Demand: Refer to Gross Needs.

Design Load: The number of recreationists expected to use a project or facility during the peak period on a typical summer Sunday.

Environmental Quality, National Efficiency, Regional Development: For complete definitions of these terms, please refer to North Atlantic Regional Water Resources Study; Minutes of Fifth Meeting of the Coordinating Committee, Brookline, Massachusetts, September 13-14, 1967, Attachment D, "The Proposed Rationale for Plan Formulation", North Atlantic Regional Study Group, North Atlantic Division, Corps of Engineers, August 1967.

Gross Needs: As used here, the phrase indicates the total amount of a particular recreation resource (both existing and ultimately required) to satisfy projected demand.

Net Needs: The amount of a particular recreation resource which must be provided, over and above that which now exists, to satisfy projected future use. Net need is, essentially, the difference between Gross Needs (demand) and what now exists (supply).

Recreation Day: A significant part of a day during which the recreationist participates in one or more recreation activities one or more times.

Restricted Boating Water: Those water bodies with surface areas between 10 and 499 acres.

Standard Metropolitan Statistical Area (SMSA): Cities or contiguous urbanized areas in which 50,000 or more persons reside.

Summer Recreation Season: Generally June, July and August. Exact duration varies in extreme northern and southern subregions.

Recreation Supply: The resources and facilities capable of providing outdoor recreation.

Unrestricted Boating Water: Those water bodies with surface areas greater than 500 acres.

Water Dependent Activities: Outdoor recreation activities in which water is an essential element.

Water-Oriented Activities: An all inclusive term embracing water dependent, water-enhanced, and any other outdoor recreation activity in which water influences the recreation experience.

Water-Oriented Recreation Day: A "Recreation Day" in which the individual engages in one or more water-oriented activity.

I. SYLLABUS

The North Atlantic Regional Water Resources Study (NAR) will identify the problems involved in meeting the present and future needs of people. It will indicate the magnitude of these needs, and establish priorities for development to meet them. More precisely, the objectives of this framework study are... "The determinations in broad terms of overall basin requirements for water and related land resource development for municipal, industrial, and agricultural water supply; water quality, flood control, and drainage; hydroelectric power; navigation; watershed protection and management; outdoor recreation; fish and wildlife conservation; together with an appraisal of the capability of on-going programs of resource development to meet indicated present and prospective needs. The study involves also the formulation in general terms of a plan of development, including the indication of elements which would be required in the near future and the need for the priority of more detailed studies of tributary basin areas..."

Appendix M is one of 22 subject appendices to the Main Report of the North Atlantic Regional Water Resources Study, and uses the delineations of 21 basins, or areas, grouped into six subregions as established by the North Atlantic Regional Water Resources Study Coordinating Committee. Its format, breadth of coverage, and depth of detail likewise reflect the guidelines proposed by the Coordinating Committee.

Needs for water-based recreation in seven activities: swimming, camping, picnicking, boating, water-skiing, sailing, and canoeing were determined for each of the 21 basins for each target year, i.e., 1980, 2000 and 2020. The data indicates that public demand for such recreation, already at unprecedented levels, will increase constantly as the region's population increases, as the time required to earn a livelihood becomes less, and as the amount of disposable income increases over what is required for day-to-day living expense. In determining the demand, supply, and needs figures used herein, extensive use was made of the various Statewide Comprehensive Outdoor Recreation Plans. Similarly, these same State plans, together with applicable State law, were used in determining standards. Finally, State conservation and recreation personnel participated continually during the plan formulation phase of the study, and their projections, information, and suggestions were incorporated whenever possible.

Accidents of history, topography, and drainage have all affected early settlement and population distribution, which in turn have affected the present recreation situation. The present situation, together with what reasonably can be expected in the way of future growth, and industrial and agricultural changes, comprise the frame of reference in which future demand and, by extension, needs were determined. Such needs were considered at three different levels - each defined to reflect one of three planning objectives:

Environmental Quality, Regional Development, and National Efficiency.

It is obvious that outdoor recreation is closely related to the environment, and measures undertaken to improve the quality of the environment will directly affect recreation opportunity. In this regard, the most obvious and far-reaching advantages will accrue to outdoor recreation if the rivers and water courses found within our largest cities can be upgraded in quality to a point when they can be utilized by urban dwellers, and in particular by ghetto residents, for swimming and related activities at suitable, regulated sites. The need, from a recreation point of view, for improved water quality is of singular importance, and this thought is stressed both in the Regional Summary (Summary and Conclusions), and in each of the Subregional Summaries. The same need is emphasized in Appendix O (Fish and Wildlife), particularly in regard to fresh-water fishing, the reestablishment of migratory runs of anadromous fish, and the shellfish industry.

The demand for outdoor recreation opportunity is being met by developing new areas and facilities, and by the expansion of existing sites when it is feasible and practical to do so. Both of these solutions have been emphasized throughout this Appendix, particularly in the Subregional Summaries. A relatively new approach, and one that is discussed in greater detail on page M-56 is the incorporation of recreation from the very beginning in multiple-purpose reservoir planning. A still more recent development, and one which possesses great potential for quality outdoor recreation, is the Wild and Scenic Rivers Act, and the various provisions thereof. This legislation is discussed at lengths on pages M-57 and M-58.

Finally, in the Summary and Conclusions portion of the Regional Summary, a number of suggestions appear regarding how the recreational assets in NAR might be strengthened. Of particular importance is the need for additional studies, including those already authorized for the Chesapeake Bay and the coastal area of Maine; those that relate to recreational use at public water supply reservoirs; and those which pertain to public access to beaches, shorelines, and riverbanks.

Outdoor recreation is viewed throughout as one of several important human needs, and every effort was made to include recreation opportunity when providing for these other needs, be it municipal or industrial water supply, flood control, or low-flow augmentation. Thus, the broader application of flood plain zoning throughout the North Atlantic Region as a means of decreasing flood costs will at the same time provide open space and add to the recreation base. The latter premise assumes that local officials are prepared to make the capital expenditures necessary for development. This conclusion, as well as several others, may be found at the end of the Regional Summary.

II. INTRODUCTION

AUTHORITY

The Water Resources Council delineated the North Atlantic Region, one of eighteen throughout the United States, for a comprehensive framework study as part of the program inaugurated by President Kennedy in response to the January 1961 Report of the Senate Select Committee on National Water Resources. Congress further authorized and directed the Secretary of the Army to have the Chief of Engineers prepare a framework plan for the North Atlantic Region in Section 208 of Public Law 89-298.

The President and the Congress inaugurated the study by Supplemental Appropriations in fiscal year 1966. The Departments of Agriculture, Health, Education and Welfare, Housing and Urban developments, Interior, and the Federal Power Commission, are participating under general and specific authorities.

The responsibility for the recreation aspects of the North Atlantic Regional Water Resources Study was assigned to the Bureau of Outdoor Recreation (BOR) in accordance with the Organic Act, Public Law 88-29, dated May 28, 1963. Section 2(g) authorizes the Secretary of the Interior to: (1) Cooperate with and provide technical assistance to Federal departments and agencies.... and (2) Promote coordination of Federal plans and activities generally related to outdoor recreation.

PURPOSE AND SCOPE

Purpose. The purpose of this Appendix is to provide an appraisal of recreation needs in the North Atlantic Region (NAR).

Scope. The Northeast Regional Office of the Bureau of Outdoor Recreation (BOR) has, in cooperation both with other Federal agencies and with the States concerned, prepared Appendix M, Outdoor Recreation, of the North Atlantic Regional Water Resources Study. This appendix presents an analysis and appraisal of the current and planned water-related outdoor recreation supply, and considers the present and prospective demands within the region as a whole and in each of the subregions. The study contains estimates of the recreation needs for water and related land resources to the year 2020 and recommends means by which the needs may be met in 1980, 2000, and 2020. It contains evaluations of outdoor recreation resources, recommendations for general measures needed to meet future demand, and identification of specific areas of priority for more detailed studies.

METHODOLOGY

Introduction. The approach utilized to estimate water-oriented outdoor recreation needs within the North Atlantic Water Resources Study Region bears many similarities to those employed in such related studies as the Ohio, Upper Mississippi, Appalachia, and the

Connecticut. The methodologies used in these latter investigations were based primarily on information derived from the Outdoor Recreation Resources Review Commission (ORRRC) Reports. 1/ More recent findings of the Bureau of Outdoor Recreation, as presented in a report entitled "The 1965 Survey of Outdoor Recreation Activities," together with material gleaned from on-going research, have made possible some innovations for use in the current study.

One major difference that sets the North Atlantic Regional Water Resources Study apart from all related previous undertakings is the multiple objective approach. Separate needs were to be determined for each of the following three objectives: National Income Maximization (Economic Efficiency); Regional Development; and Environmental Quality. Restriction to a single set of socio-economic projections, however, seriously limited the possibility of making meaningful distinctions among the three goals. Any divergence in the determination of water-oriented outdoor recreation needs, therefore, was restricted for the most part, to one of varying turnover rates and design loads.

The needs methodology described herein is presented in terms of the National Income Objective. Those innovations related to the remaining two objectives are cited where applicable.

Basic Assumptions.

1. Projected participation in seven activities: boating; canoeing; sailing; swimming; water-skiing; picnicking; and camping provide a reasonable basis for assessing water-oriented outdoor recreation needs.

2. Use of the findings presented in the report entitled "The 1965 Survey of Outdoor Recreation Activities" is valid; in particular, the application of census region participation rates and one-way travel distances by type of trip and activity to residents of the respective census regions.

3. The composite effect of six socio-economic variables upon participation rates as measured in the 1960 ORRRC Survey for the period 1960-1976 and 1960-2000 are equally valid for the time intervals of 1965-1980 and 1965-2000, respectively. These six variables include: Education; Occupation; Age/Sex; Family income; Residence; and Leisure (available).

4. Persons under 12 years of age will participate at the same rate as those over that age.

1/ Outdoor Recreation for America, a Report to the President and to the Congress by the Outdoor Recreation Resources Review Commission (Washington: U.S. Government Printing Office, 1962).

5. If provided the opportunity, recreationists will distribute themselves in a random fashion.

Rate of Participation in Selected Recreation Activities. The computation of needs has been limited to the following recreation pursuits: boating; water-skiing; sailing; canoeing; swimming; picnicking; and camping. The first five activities are water-dependent, while the last two are considered to be water-enhanced.

In 1965, the Bureau of Outdoor Recreation contracted with the Bureau of Census to conduct a nationwide survey of participation and preferences for outdoor recreation activities. The degree and extent to which persons 12 years of age and over recreate was determined for the United States by Census Regions and Divisions. Information pertaining to the number of days that people participated in the selected seven key activities during the summer season is presented in Table M-1.

TABLE M-1

DAYS OF PARTICIPATION PER PERSON 12 YEARS AND OVER IN SELECTED OUTDOOR RECREATION ACTIVITIES FOR THE 1965 SUMMER SEASON BY CENSUS REGIONS1/

	Days of Participation by Census Regions		
Activity	New England	Mid-Atlantic	South Atlantic
Boating	2.71	.93	1.15
Sailing	.62	.15	.15
Canoeing	2/ .19	.11	.17
Water-Skiing	.75	.13	.24
Swimming	11.33	7.45	6.02
Camping	.66	.23	.37
Picnicking	4.82	2.75	2.55

The six socio-economic factor composite effect measured by the 1960 survey was utilized to project the 1965 participation rates for the NAR target years of 1980, 2000, and 2020. In the absence of complete and more recent information concerning these variables, the composite effect for the periods 1960-1976 and 1960-2000 were assumed to be equally applicable to the time intervals of 1965-1980 and 1965-2000, respectively. Projections for 2020 were determined through extrapolation of the predicted changes over the earlier time periods

1/Source: Adopted form "The 1965 Survey of Outdoor Recreation Activities," Table C.

2/Census division rate assumed in absence of data at the region level.

except for swimming. The number of days of participation determined for those persons citing this activity as their favorite for the 1965 summer season and who engaged in it to the fullest extent desired was set as the maximum rate (U.S. = 24.70 days).

The six factor composite effect was not computed in 1960 for two of the selected seven activities utilized to assess the water-oriented recreation needs in NAR. Percent changes for the related activity of boating were assigned to canoeing. Although a similar relationship can be cited between sailing and boating, the highest degree of change for a water-dependent activity, water-skiing, was assumed for the former pursuit. This selection was based on the fact that the highest increase in the volume of participation for the summer season over the period 1960 to 1965 in other than a land-based activity was recorded for sailing.

Participation rates were figured at the basic level and were projected as previously described for utilization in assessing the needs under the National Income Objectives. These rates were adjusted for use under the Regional Development and Environmental Quality Objectives. It was assumed that development under the latter two plans could serve to remove some or all of the restrictions on participation such as lack of time, money or facilities. Picnicking has been selected to illustrate such adjustments in the participation rates.

According to the 1965 Survey of Outdoor Recreation Activities, fifty-seven percent of the population, 12 years of age and over, went picnicking an average number of 5.6 days. There were, therefore, 319.2 days of picnicking per hundred persons per summer season.

Seventy-six percent of all persons had a favorite activity, and of these persons, six percent chose picnicking as their favorite activity. Thus, of one hundred persons, 4.56 were picnickers and enjoyed picnicking most.

Of the group whose favorite summer activity was picnicking, sixty-seven percent felt restricted in their participation, and picnicked only 3.5 days during the summer.

4.56	preferred picnicking
x .67	felt restricted
3.05	picnickers per hundred persons

Thirty-three percent of those whose favorite summer activity was picnicking did not feel restricted in their participation and picnicked 5.9 days.

5.9	picnicking days, unrestricted group
3.5	picnicking days, restricted group
2.4	picnicking days lost by sixty-seven percent of those who chose picnicking as their favorite activity

Thus:

$$\begin{array}{r} 3.05 \\ \times\ 2.4 \\ \hline 7.32 \end{array}$$ activity days lost per hundred population

Restrictions were the result of:

Lack of time	52%
Facility or resource restrictions	15%
Lack of money	14%
Unknown	19%
	100%

The Regional Development and Environmental Quality Plans have as an objective a lessening of some of these restrictions, as follows:

	Percent of Persons	Helped By Regional Development	Helped By Environmental Quality
Lack of time	52	26	26
Facility, resource restrictions	15	15	15
Lack of money	14	14	0
Unknown	19	0	0
	100	55	41

Of the 7.32 days lost, fifty-five percent or 4.02 (days per hundred population) can be helped by the Regional Development Plan.

Of the 7.32 days lost, forty-one percent or 3.00 days can be helped by the Environmental Quality Plan.

Of the thirty-three percent of persons who desired to engage in a summer outdoor activity in which they were not participating, two percent named picnicking as the activity. The principal reason for non-participation was lack of time which accounted for forty-five percent of the reasons.

33	persons desired but did not participate
.02	chose picnicking
.66	(persons)

Reason for Non-Participation	Percent of Persons	Helped By Regional Development	Helped By Environmental Quality
Lack of time	45	45	45
Other	55	0	0
	100	45	45

Both the Regional Development and Environmental Quality Plans remove the lack of time restriction named by forty-five percent of the non-participants. Therefore, of the .66 (or .7) non-participants, these plans are designed to affect .3 people.

Multiplying the non-participation rate because of lack of time of .3 by the average participation rate of 5.6 percent, there is a total of 1.68 days lost per hundred persons.

	Helped By Regional Development	Helped By Environmental Quality
Restrictions on participation	4.02	3.00
Non-participants who chose picnicking	1.68	1.68
	5.70	4.68

319.2	participation days
5.7	days gained in the Regional Development Plan
324.9	

This makes an increase in the basic participation rate by a factor of 1.0178 in the Regional Development Plan.

319.2	participation days
4.7	days gained in the Environmental Quality Plan
323.9	

This results in an increase in the basic participation rate by a factor of 1.0147 in the Environmental Quality Plan.

The Regional Development and Environmental Quality Plans developed by BOR for internal planning purposes were considered equally capable of removing restrictions affecting participation in camping. In camping, the major restriction preventing more participation by campers was lack of time which was named as the reason in sixty-nine percent of the instances. It was estimated that almost half of this restriction would be removed with the Regional Development or Environmental Quality Plans. Among non-participants who desired to participate, inadequate facilities were named as the reason for non-participation in 21 percent of the cases, and lack of time was named in forty-two percent of the cases. It was estimated that the Regional Development or Environmental Quality Plans would remove all of the lack of facilities restriction and half of the lack of time restriction. The removal of these restrictions would increase

the basic participation rate in camping by a factor of 1.0988.

The influence of the Regional Development and Environmental Quality Plans were also assessed for the other outdoor recreation activities. The projected participation rates for the three objectives of National Income, Regional Development and Environmental Quality are shown in Tables M-2, M-3 and M-4, respectively. These have been presented as per capita rates as it has been assumed that persons under the age of 12 will recreate similarly to those over 12 years old.

Projected Participation In Selected Recreation Activities and Its Distribution Within the North Atlantic Region. The North Atlantic Study Region was divided in accordance with hydrological boundaries into six major subregions and 21 river basins or areas which were adjusted to conform with county lines to facilitate the gathering of data. The Office of Business Economics also divided the study area into 23 water resource planning areas. Each of these boundaries plus that of census regions was plotted in an attempt to identify individual population centers for which projected participation in selected water-oriented outdoor recreation activities could be computed and then distributed among the 21 basins. In some instances, it was advisable to delineate the area within one boundary even further. This was accomplished on the basis that a single unit should not exceed 2,200 square miles, extent of the primary day-use service area, but recognizing that a county served as a restraint in that it was the lowest level for which basic information was available. This process resulted in the creation of a total of 110 sub-divisions. Population centers for counties provided by the Geography Division of the Bureau of Census were utilized in the sub-divisions that consisted of one county. In the larger units, the population centers were determined by averaging latitude and longitude in accordance with differential county population weights. In summary, then, the OBE projections of economic and demographic information, as disaggregated and reaggregated by the NAR Study Group to fit the hydrologic areas used for NAR planning, comprise the basis for population estimates used herein. Complete information may be found in Appendix B: Economic Base (May 1968).

TABLE M-2

NATIONAL EFFICIENCY PER CAPITA PARTICIPATION RATES FOR THE SUMMER SEASON BY CENSUS REGION, ACTIVITIES AND TARGET YEARS

		New England	Mid-Atlantic	South Atlantic
Boating.....	1980	3.68	1.26	1.56
	2000	4.85	1.66	2.06
	2020	6.20	2.13	2.63
Sailing.....	1980	1.01	0.24	0.24
	2000	1.53	0.27	0.27
	2020	2.20	0.53	0.53
Canoeing.....	1980	0.26	0.15	0.23
	2000	0.34	0.20	0.30
	2020	0.44	0.25	0.39
Water-skiing....	1980	1.22	0.21	0.39
	2000	1.86	0.32	0.59
	2020	2.60	0.46	0.85
Swimming.....	1980	15.15	9.96	8.05
	2000	19.86	13.06	10.55
	2020	23.44	20.69	12.46
Camping.....	1980	0.95	0.33	0.53
	2000	1.32	0.46	0.74
	2020	1.78	0.62	1.00
Picnicking.....	1980	5.50	3.14	2.91
	2000	6.16	3.52	3.26
	2020	8.17	4.66	4.32

TABLE M-3

REGIONAL DEVELOPMENT PER CAPITA PARTICIPATION RATES FOR THE SUMMER SEASON BY CENSUS REGION, ACTIVITY AND TARGET YEARS

		New England	Mid Atlantic	South Atlantic
Boating.....	1980	3.88	1.33	1.64
	2000	5.11	1.75	2.17
	2020	6.54	2.24	2.77
Sailing.....	1980	1.08	0.26	0.26
	2000	1.64	0.29	0.29
	2020	2.35	0.57	0.57
Canoeing.....	1980	0.26	0.15	0.23
	2000	0.34	0.20	0.30
	2020	0.44	0.25	0.39
Water-skiing....	1980	1.61	0.28	0.52
	2000	2.46	0.42	0.78
	2020	3.43	0.61	1.12
Swimming.....	1980	18.83	12.38	10.00
	2000	24.68	16.23	13.11
	2020	24.70	24.70	15.48
Camping.....	1980	1.04	0.36	0.58
	2000	1.45	0.50	0.81
	2020	1.96	0.68	1.10
Picnicking.....	1980	5.60	3.20	2.96
	2000	6.27	3.58	3.32
	2020	8.32	4.74	4.40

TABLE M-4

ENVIRONMENTAL QUALITY PER CAPITA PARTICIPATION RATES FOR THE SUMMER SEASON BY CENSUS REGION, ACTIVITIES AND TARGET YEARS

		New England	Mid-Atlantic	South Atlantic
Boating.....	1980	3.88	1.33	1.64
	2000	5.11	1.75	2.17
	2020	6.54	2.24	2.77
Sailing.....	1980	1.08	0.26	0.26
	2000	1.64	0.29	0.29
	2020	2.35	0.57	0.57
Canoeing.....	1980	0.26	0.15	0.23
	2000	0.34	0.20	0.30
	2020	0.44	0.25	0.39
Water-skiing....	1980	1.61	0.28	0.52
	2000	2.46	0.42	0.78
	2020	3.43	0.61	1.12
Swimming.....	1980	18.16	11.94	9.65
	2000	23.81	15.66	12.65
	2020	24.70	24.70	14.94
Camping.....	1980	1.04	0.36	0.58
	2000	1.45	0.50	0.81
	2020	1.96	0.68	1.10
Picnicking.....	1980	5.58	3.19	2.95
	2000	6.25	3.57	3.31
	2020	8.29	4.73	4.38

Projected participation in the selected seven recreation activities was computed for each population center by multiplying the population of each by the participation rate identified for each census division and objective on an activity basis. This process was repeated for each of the target years taking into account expected population growth and previously depicted increases in the respective participation rates.

The population centers were then used as the center point of a series of concentric rings, the radii of which are as follows: 5; 10; 25; 50; 100; 250; and 500 miles. The projected number of activity days compiled for an individual population center was then spread among the twenty-one basins in accord with the distribution of the mileage zones and adjusted on the basis of the relationships shown in Table M-5. The projections were augmented to account for participation exerted by the non-resident of the study region. The increment of change was determined by the non-NAR-resident percent of visitation reflected in origin and destination data averaged for basins. Similarly, projections were modified to reflect recreation by NAR-residents outside of the NAR study area.

Visitation statistics were found to be available for only ten of the twenty-one basins and, therefore, it became necessary to assume values for the remaining ones. Non-NAR-resident relationships were formulated for these eleven basins on the basis of physical similarities to those for which data was possessed. The measured and assumed visitation relationships are presented in Table M-6.

Resource Requirements. The conversion of projected participation in selected recreation activities during the summer season is basically a function of turnover rates, instantaneous design loads, and climatic conditions as they affect the duration of seasonal use. Distinctions made among the three objectives are related to the first two factors. The lowest turnover rates and design loads were utilized to compute needed water and related land areas under the Environmental Quality Objective. The converse held true for the National Income Objective while those employed under the Regional Development Objective assessment fell in between.

The first step in converting activity days into resource requirements was to determine the equivalent number of capacity utilization days which would be realized within the summer season. Visitation relationships obtained through individual case studies and censuses were assessed to determine daily and/or seasonal relationships. This data was averaged by subregions and is presented in Table M-7. Differences among projected summer season capacity day utilization equivalents among activities and target years are related to water temperature effects and expected changes in leisure time, respectively.

TABLE M-5

DISTRIBUTION OF OUTDOOR RECREATION ACTIVITIES: PERCENT OF TOTAL NUMBER OF DAYS OF PARTICIPATION IN SELECTED WATER-ORIENTED ACTIVITIES, BY MILEAGE ZONES, DURING THE SUMMER SEASON

	Mileage Zones							
Activity	0--5	5-10	10-25	25-50	50-100	100-250	250-500	500+
Boating	24.9	9.7	17.0	13.4	14.0	12.0	5.0	4.0
Canoeing	25.0	6.4	12.9	9.7	14.0	16.0	7.0	9.0
Sailing	26.8	8.4	15.7	12.1	12.0	12.0	6.0	7.0
Swimming	28.1	10.9	19.7	15.3	12.0	8.0	4.0	2.0
Water-skiing	23.8	10.4	19.7	15.1	14.0	11.0	4.0	2.0
Picnicking	28.4	11.4	21.7	16.5	12.0	6.0	2.0	2.0
Camping	2.6	5.2	7.8	10.4	22.0	28.0	13.0	11.0

TABLE M-6

VISITATION STATISTICS: PERCENT OF NON-NAR-RESIDENT UTILIZATION OF RECREATIONAL FACILITIES BY BASINS

Basin	Non-NAR-Residents (% of Total Use)
1	1.0*
2	12.0*
3	6.5*
4	6.5*
5	6.5*
6	12.0*
7	1.1
8	11.9
9	6.2
10	0.4
11	6.5*
12	6.5*
13	1.0*
14	6.6
15	2.3
16	2.6
17	29.0
18	6.5
19	33.2
20	30.0*
21	30.0*

*Assumed values.

TABLE M-7

SUMMER SEASON OUTDOOR RECREATION FACILITY VISITATION STATISTICS: PROJECTED NUMBER OF CAPACITY DAY EQUIVALENTS OF UTILIZATION BY TARGET YEARS, SUBREGIONS, AND GROUPED ACTIVITIES

Subregion	Number of capacity days equivalent of use by target years 1980	2000	2020
		(swimming, sailing, canoeing, water-skiing)	
A	28	35	40
B	35	43	49
C	43	48	56
D	47	52	60
E	47	52	60
F	47	52	60
		(boating, camping, picnicking)	
A	39	42	50
B	41	44	52
C	43	48	56
D	47	52	60
E	47	52	60
F	47	52	60

Water surface area needs were based on projected activity in the water-dependent recreational pursuits of boating, canoeing, sailing, and water-skiing. This resource requirement, expressed in surface acres and/or stream miles, was formulated for each selected activity through the employment of the following generalized equation:

$$WSA = \frac{\frac{(SAD)}{(ECAD)} \div UC}{TR} \times SS$$

Where:

WSA - water surface area requirement expressed in surface acres and/or miles of stream.

SAD = projected number of seasonal activity days

ECAD = equivalent number of capacity utilization days within a given summer season

UC = unit capacity

TR = turnover rate

SS = spacial standard expressed in acres

In order to better ascertain boating water area requirements, an additional step, which precedes the use of the above cited formula, was necessary. These needs were assessed on the basis of different spacial requirements associated with a particular type of boat. National Association of Engine and Boat Manufacturers and Boating Industry Association statistics on boat ownership and sales were utilized to determine the percent of projected boating activity that could be expected for inboards, outboards, and non-powered vessels. Interpretation of this data indicated that approximately 47 percent of the total projected participation would be realized in inboards and outboards powered by a motor of 20 horsepower or greater. Similarly, 29 percent and 24 percent would be realized through the use of boats powered by an outboard motor of less than 20 horsepower and non-powered vessels, respectively.

For the purpose of this planning effort, minimum water areas of 500, 200, and 10 acres have been adopted upon which the needs of the inboard and 20 horsepower and above outboard, the under 20 horsepower outboard, and the non-powered boat, respectively, can be safely satisfied. These various acreages reflect safety considerations primarily; the number of craft present on a given acreage category, say 200 acres, would of course vary with the objective.

The various numerical values utilized in employing this formula and in some other subsequent resource calculations are presented in Tables M-8 through M-19. Those previously identified are not repeated therein, however.

TABLE M-8

PROJECTED SEASONAL PARTICIPATION IN SELECTED ACTIVITIES
FOR 1980 (000's OF ACTIVITY DAYS) -- NATIONAL EFFICIENCY OBJECTIVE

	ACTIVITIES						
Basin:	Boating	Canoeing	Sailing	Swimming	Water-skiing	Picnicking	Camping
1	350	26	95	1,540	112	519	89
2	695	53	185	2,876	222	958	217
3	848	66	224	3,411	273	1,145	282
4	578	42	151	2,383	190	842	160
5	960	72	252	3,905	314	1,337	308
A	3,431	259	907	14,115	1,111	4,801	1,056
6	2,790	184	715	11,983	952	4,432	636
7	7,299	453	1,898	33,103	2,529	12,496	1,157
8	7,130	511	1,807	31,372	2,308	11,284	1,704
9	11,479	726	3,022	52.363	3,936	19,655	1,656
10	8,335	566	2,071	41,850	2,686	15,359	1,429
B	37,033	2,440	9,513	170,671	12,411	63,226	6,582
11	2,325	200	576	10,711	689	3,550	772
12	5,965	595	1,220	38,890	1,332	12,612	1,850
13	9,169	909	1,758	77,654	1,726	25,670	1,098
C	17,459	1,704	3,554	127,255	3,747	41,832	3,720
14	5,571	549	1,034	48,287	1,024	16,086	775
15	9,260	972	1,720	73,225	1,701	23,856	2,114
16	1,843	185	334	15,095	341	4,992	408
D	16,674	1,706	3,088	136,607	3,066	44,934	3,297
17	6,980	808	1,370	48,828	1,303	15,105	2,304
18	1,146	150	213	6,544	221	1,935	558
E	8,126	958	1,583	55,372	1,524	17,040	2,862
19	2,675	355	470	15,425	584	4,962	937
20	1,070	137	173	5,880	266	2,056	328
21	2,674	347	423	15,155	674	5,478	546
F	6,419	839	1,066	36,460	1,524	12,496	1,811
NAR	89,142	7,906	19,711	540,480	23,383	184,329	19,028

TABLE M-9

PROJECTED SEASONAL PARTICIPATION IN SELECTED ACTIVITIES FOR 2000
(000's OF ACTIVITY DAYS) -- NATIONAL EFFICIENCY OBJECTIVE

	ACTIVITIES						
Basin:	Boating	Canoeing	Sailing	Swimming	Water-skiing	Picnicking	Camping
1	546	40	169	2,384	202	684	149
2	1,090	84	330	4,472	400	1,267	366
3	1,313	103	394	5,215	487	1,486	475
4	882	64	263	3,584	336	1,074	272
5	1,500	113	449	6,040	567	1,757	518
A	5,331	404	1,605	21,695	1,992	6,268	1,780
6	4,588	300	1,346	19,623	1,810	6,198	1,099
7	12,145	750	3,622	54,808	4,864	17,673	2,013
8	11,553	823	3,312	50,467	4,332	15,512	2,930
9	18,580	1,164	5,597	84,259	7,373	27,028	2,843
10	14,084	948	3,939	69,892	5,277	21,960	2,502
B	60,950	3,985	17,816	279,049	23,656	88,371	11,387
11	3,739	321	1,026	16,881	1,288	4,777	1,328
12	10,032	1,006	1,997	65,699	2,582	18,231	3,208
13	14,039	1,400	2,399	117,607	3,088	33,274	1,839
C	27,810	2,727	5,422	200,187	6,958	56,282	6,375
14	9,169	916	1,486	79,019	1,948	22,483	1,334
15	14,983	1,599	2,473	117,714	3,190	32,787	3,642
16	3,249	330	518	26,697	692	7,546	719
D	27,401	2,845	4,477	223,430	5,830	62,816	5,695
17	11,371	1,327	2,049	79,017	2,463	20,903	3,972
18	1,889	248	334	10,701	424	2,712	973
E	13,260	1,575	2,383	89,718	2,887	23,615	4,945
19	4,843	486	870	27,865	1,237	7,795	1,692
20	1,864	237	333	10,187	533	3,060	594
21	4,380	563	787	24,592	1,267	7,598	960
F	11,087	1,286	1,990	62,644	3,037	18,453	3,246
NAR	145,839	12,822	33,693	876,723	44,360	255,805	33,428

TABLE M-10

PROJECTED SEASONAL PARTICIPATION IN SELECTED ACTIVITIES FOR 2020
(000's OF ACTIVITY DAYS) -- NATIONAL EFFICIENCY OBJECTIVE

	ACTIVITIES						
Basin:	Boating	Canoeing	Sailing	Swimming	Water-skiing	Picnicking	Camping
1	826	63	291	3,431	333	1,067	241
2	1,665	131	576	6,497	668	1,993	598
3	1,997	158	681	7,507	806	2,320	776
4	1,353	99	458	5,145	561	1,699	445
5	2,299	175	784	8,706	946	2,761	854
A	8,140	626	2,790	31,286	3,314	9,840	2,914
6	7,279	482	2,415	29,048	3,140	10,203	1,835
7	18,674	1,165	6,274	78,291	8,186	28,160	3,328
8	18,614	1,328	6,120	77,978	7,649	25,976	4,874
9	29,861	1,890	10,163	125,961	12,962	45,044	4,810
10	22,110	1,490	7,150	108,479	9,097	35,665	4,137
B	96,538	6,355	32,122	419,757	41,034	145,048	18,984
11	5,890	503	1,905	26,987	2,237	7,744	2,208
12	16,296	1,611	4,311	127,929	4,612	30,972	5,340
13	20,815	2,020	5,216	211,623	5,141	50,714	2,952
C	43,001	4,134	11,452	366,539	11,990	89,430	10,500
14	14,392	1,407	3,501	152,466	3,415	36,372	2,185
15	23,561	2,440	5,718	226,806	5,607	53,214	6,019
16	5,263	522	1,253	53,284	1,252	12,645	1,197
D	43,216	4,369	10,472	432,556	10,274	102,231	9,401
17	17,928	2,049	4,594	151,372	4,332	34,058	6,572
18	3,021	390	726	20,012	760	4,514	1,634
E	20,949	2,439	5,320	171,384	5,092	38,572	8,206
19	8,641	1,127	1,925	51,901	2,531	14,682	2,982
20	3,214	411	671	17,032	1,038	5,525	1,048
21	6,898	901	1,426	36,632	2,248	12,386	1,631
F	18,753	2,439	4,022	105,565	5,817	32,593	5,661
NAR	230,597	20,362	66,178	1,527,087	77,521	417,714	55,666

TABLE M-11

PROJECTED SEASONAL PARTICIPATION IN SELECTED ACTIVITIES FOR 1980
(000's OF ACTIVITY DAYS) -- REGIONAL DEVELOPMENT OBJECTIVE

	ACTIVITIES						
Basin:	Boating	Canoeing	Sailing	Swimming	Water-skiing	Picnicking	Camping
1	370	26	102	1,914	147	528	98
2	733	53	198	3,574	292	975	239
3	894	66	238	4,238	359	1,166	310
4	608	42	161	2,962	252	857	176
5	1,013	72	270	4,853	415	1,360	338
A	3,618	259	969	17,541	1,465	4,886	1,161
6	2,941	184	765	14,892	1,257	4,511	699
7	7,695	453	2,030	41,142	3,340	12,719	1,271
8	7,518	511	1,932	38,990	3,050	11,485	1,873
9	12,103	726	3,232	65,077	5,197	20,005	1,819
10	8,788	566	2,215	52,011	3,547	15,632	1,570
B	39,045	2,440	10,174	212,112	16,391	64,352	7,232
11	2,451	200	617	13,311	909	3,613	849
12	6,289	595	1,306	48,333	1,758	12,836	2,033
13	9,668	909	1,880	96,509	2,279	26,126	1,207
C	18,408	1,704	3,803	158,153	4,946	42,575	4,089
14	5,874	549	1,106	60,011	1,353	16,372	851
15	9,763	972	1,840	91,004	2,246	24,279	2,324
16	1,942	185	357	18,760	450	5,082	449
D	17,579	1,706	3,303	169,775	4,049	45,733	3,624
17	7,359	808	1,465	60,684	1,720	15,373	2,532
18	1,208	150	228	8,132	293	1,969	613
E	8,567	958	1,693	68,816	2,013	17,342	3,145
19	2,820	355	503	19,170	771	5,051	1,030
20	1,128	137	184	7,307	351	2,093	360
21	2,820	347	453	18,835	890	5,577	600
F	6,768	839	1,140	45,312	2,012	12,721	1,990
NAR	93,985	7,906	21,082	671,709	30,876	187,609	21,241

TABLE M-12

PROJECTED SEASONAL PARTICIPATION IN SELECTED ACTIVITIES FOR 2000
(000's OF ACTIVITY DAYS) -- REGIONAL DEVELOPMENT OBJECTIVE

	ACTIVITIES						
Basin:	Boating	Canoeing	Sailing	Swimming	Water-skiing	Picnicking	Camping
1	576	40	181	2,963	267	696	164
2	1,149	84	353	5,558	528	1,290	402
3	1,384	103	421	6,481	643	1,512	522
4	930	64	281	4,454	444	1,093	299
5	1,582	133	480	7,506	749	1,788	569
A	5,621	404	1,716	26,962	2,631	6,379	1,956
6	4,838	300	1,440	24,387	2,390	6,308	1,208
7	12,806	750	3,874	68,115	6,423	17,988	2,212
8	12,181	823	3,542	62,720	5,721	15,788	3,219
9	19,591	1,164	5,986	104,717	9,737	27,509	3,124
10	14,850	948	4,213	86,862	6,969	22,351	2,749
B	64,266	3,985	19,055	346,801	31,240	89,944	12,512
11	3,942	321	1,097	20,980	1,701	4,862	1,459
12	10,578	1,006	2,136	81,651	3,410	18,556	3,525
13	14,803	1,400	2,566	146,162	4,078	33,866	2,021
C	29,323	2,727	5,799	248,793	9,189	57,284	7,005
14	9,668	916	1,589	98,205	2,572	22,883	1,466
15	15,798	1,599	2,645	146,295	4,213	33,371	4,002
16	3,426	330	554	33,179	914	7,680	790
D	28,892	2,845	4,788	277,679	7,699	63,934	6,258
17	11,990	1,327	2,191	98,202	3,253	21,275	4,364
18	1,992	248	357	13,299	560	2,760	1,069
E	13,982	1,575	2,548	111,501	3,813	24,035	5,433
19	5,106	486	930	34,631	1,634	7,934	1,859
20	1,965	237	356	12,660	704	3,114	653
21	4,618	563	842	30,563	1,673	7,733	1,055
F	11,689	1,286	2,128	77,854	4,011	18,781	3,567
NAR	153,773	12,822	36,034	1,089,590	58,583	260,357	36,731

TABLE M-13

PROJECTED SEASONAL PARTICIPATION IN SELECTED ACTIVITIES FOR 2020
(000's OF ACTIVITY DAYS) -- REGIONAL DEVELOPMENT OBJECTIVE

	ACTIVITIES						
Basin:	Boating	Canoeing	Sailing	Swimming	Water-skiing	Picnicking	Camping
1	871	63	311	3,675	440	1,086	265
2	1,756	131	616	6,963	882	2,028	657
3	2,106	158	728	8,037	1,064	2,361	853
4	1,427	99	490	5,472	741	1,729	489
5	2,424	175	838	9,292	1,249	2,810	938
A	8,584	626	2,983	33,439	4,376	10,014	3,202
6	7,675	482	2,583	30,775	4,147	10,385	2,016
7	19,690	1,165	6,710	82,819	10,810	28,661	3,657
8	19,627	1,328	6,545	83,744	10,101	26,438	5,356
9	31,485	1,890	10,869	133,281	17,118	45,846	5,285
10	23,313	1,490	7,647	118,439	12,013	36,300	4,546
B	101,790	6,355	34,354	449,058	54,189	147,630	20,860
11	6,210	503	2,037	29,910	2,954	7,882	2,426
12	17,182	1,611	4,632	150,479	6,091	31,523	5,868
13	21,947	2,020	5,578	251,538	6,789	51,617	3,244
C	45,339	4,134	12,247	431,927	15,834	91,022	11,538
14	15,175	1,407	3,744	181,758	4,510	37,019	2,401
15	24,843	2,440	6,115	248,186	7,405	54,161	6,614
16	5,549	522	1,340	63,555	1,653	12,870	1,315
D	45,567	4,369	11,199	493,499	13,568	104,050	10,330
17	18,903	2,049	4,913	179,870	5,721	34,664	7,221
18	3,185	390	776	23,878	1,004	4,594	1,795
E	22,088	2,439	5,689	203,748	6,725	39,258	9,016
19	9,111	1,127	2,059	63,099	3,342	14,943	3,277
20	3,389	411	718	20,945	1,371	5,623	1,152
21	7,273	901	1,525	45,265	2,969	12,606	1,792
F	19,773	2,439	4,302	129,309	7,682	33,172	6,221
NAR	243,141	20,362	70,774	1,740,980	102,374	425,146	61,167

TABLE M-14

PROJECTED SEASONAL PARTICIPATION IN SELECTED ACTIVITIES FOR 1980
(000's OF ACTIVITY DAYS) -- ENVIRONMENTAL QUALITY OBJECTIVE

	ACTIVITIES						
Basin:	Boating	Canoeing	Sailing	Swimming	Water-skiing	Picnicking	Camping
1	370	26	102	1,846	147	526	98
2	733	53	198	3,448	292	973	239
3	894	66	238	4,089	359	1,162	310
4	608	42	161	2,858	252	853	176
5	1,013	72	270	4,681	415	1,356	338
A	3,618	259	969	16,992	1,465	4,870	1,161
6	2,941	184	765	14,365	1,257	4,496	669
7	7,695	453	2,030	39,685	3,340	12,680	1,271
8	7,518	511	1,932	37,609	3,050	11,450	1,873
9	12,103	726	3,232	62,774	5,197	19,944	1,819
10	8,788	566	2,215	50,170	3,547	15,585	1,570
B	39,045	2,440	10,174	204,603	16,391	64,155	7,232
11	2,451	200	617	12,840	909	3,601	849
12	6,289	595	1,306	46,622	1,758	12,796	2,033
13	9,668	909	1,880	93,092	2,279	26,046	1,207
C	18,408	1,704	3,803	152,554	4,946	42,443	4,089
14	5,874	549	1,106	57,887	1,353	16,322	851
15	9,763	972	1,840	87,782	2,246	24,206	2,324
16	1,942	185	357	18,096	450	5,066	449
D	17,579	1,706	3,303	163,765	4,049	45,594	3,624
17	7,359	808	1,465	58,534	1,720	15,326	2,532
18	1,208	150	228	7,845	293	1,964	613
E	8,567	958	1,693	66,379	2,013	17,290	3,145
19	2,820	355	503	18,492	771	5,036	1,030
20	1,128	137	184	7,048	351	2,087	360
21	2,820	347	453	18,168	890	5,560	600
F	6,768	839	1,140	43,708	2,012	12,683	1,990
NAR	93,985	7,906	21,082	647,931	30,876	187,035	21,241

TABLE M-15

PROJECTED SEASONAL PARTICIPATION IN SELECTED ACTIVITIES FOR 2000
(000's OF ACTIVITY DAYS) -- ENVIRONMENTAL QUALITY OBJECTIVE

	ACTIVITIES						
Basin:	Boating	Canoeing	Sailing	Swimming	Water-skiing	Picnicking	Camping
1	576	40	181	2,858	267	694	164
2	1,149	84	353	5,361	528	1,286	402
3	1,384	103	421	6,252	643	1,508	522
4	930	64	281	4,296	444	1,090	299
5	1,582	113	480	7,241	749	1,783	569
A	5,621	404	1,716	26,008	2,631	6,361	1,956
6	4,838	300	1,440	23,524	2,390	6,289	1,208
7	12,806	750	3,874	65,704	6,423	17,933	2,212
8	12,181	823	3,542	60,500	5,721	15,740	3,219
9	19,591	1,164	5,986	101,010	9,737	27,425	3,124
10	14,850	948	4,213	83,786	6,969	22,283	2,749
B	64,266	3,985	19,055	334,524	31,240	89,670	12,512
11	3,942	321	1,097	20,237	1,701	4,847	1,459
12	10,578	1,006	2,136	78,760	3,410	18,499	3,525
13	14,803	1,400	2,566	140,987	4,078	33,763	2,021
C	29,323	2,727	5,799	239,984	9,189	57,109	7,005
14	9,668	916	1,589	94,728	2,572	22,814	1,466
15	15,798	1,599	2,645	141,116	4,213	33,269	4,002
16	3,426	330	554	32,004	914	7,657	790
D	28,892	2,845	4,788	267,848	7,699	63,740	6,258
17	11,990	1,327	2,191	94,726	3,253	21,210	4,364
18	1,992	248	257	12,828	560	2,752	1,069
E	13,982	1,575	2,448	107,554	3,813	23,962	5,433
19	5,106	486	930	33,404	1,634	7,910	1,859
20	1,965	237	356	12,212	704	3,105	653
21	4,618	563	842	29,481	1,673	7,710	1,055
F	11,689	1,286	2,128	75,097	4,011	18,725	3,567
NAR	153,773	12,822	35,934	1,051,015	58,583	259,567	36,731

TABLE M-16

PROJECTED SEASONAL PARTICIPATION IN SELECTED ACTIVITIES FOR 2020
(000's OF ACTIVITY DAYS) -- ENVIRONMENTAL QUALITY OBJECTIVE

	ACTIVITIES						
Basin:	Boating	Canoeing	Sailing	Swimming	Water-skiing	Picnicking	Camping
1	871	63	311	3,675	440	1,083	265
2	1,756	131	616	6,963	882	2,022	657
3	2,106	158	728	8,037	1,064	2,354	853
4	1,427	99	490	5,472	741	1,724	489
5	2,424	175	838	9,292	1,249	2,802	938
A	8,584	626	2,983	33,439	4,376	9,985	3,202
6	7,675	482	2,583	30,775	4,147	10,353	2,016
7	19,690	1,165	6,710	82,819	10,810	28,574	3,657
8	19,627	1,328	6,545	83,744	10,101	26,358	5,356
9	31,485	1,890	10,869	133,281	17,118	45,706	5,285
10	23,313	1,490	7,647	118,439	12,013	36,189	4,546
B	101,790	6,355	34,354	449,058	54,189	147,180	20,860
11	6,210	503	2,037	29,908	2,954	7,858	2,426
12	17,182	1,611	4,632	150,479	6,091	31,427	5,868
13	21,947	2,020	5,578	251,538	6,789	51,459	3,244
C	45,339	4,134	12,247	431,925	15,834	90,744	11,538
14	15,175	1,407	3,744	181,758	4,510	36,907	3,041
15	24,843	2,440	6,115	248,168	7,405	53,996	6,614
16	5,549	522	1,340	63,552	1,653	12,831	1,315
D	45,567	4,369	11,199	493,478	13,568	103,734	10,330
17	18,903	2,049	4,913	179,823	5,721	34,559	7,221
18	3,185	390	776	23,768	1,004	4,580	1,795
E	22,088	2,439	5,689	203,591	6,725	39,139	9,016
19	9,111	1,127	2,059	61,909	3,342	14,898	3,277
20	3,389	411	718	20,344	1,371	5,606	1,152
21	7,273	901	1,525	43,828	2,969	12,568	1,792
F	19,773	2,439	4,302	126,081	7,682	33,072	6,221
NAR	243,141	20,362	70,774	1,737,572	102,374	423,854	61,167

TABLE M-17

FACILITY UNIT CAPACITIES FOR SELECTED ACTIVITIES

ACTIVITY	FACILITY	STANDARD
Boating	inboards and > 20 horsepower outboards	5 persons/boat
	20 horsepower outboard and non-powered vessels	3 persons/boat
	ramp, single lane	20 boats/day
Canoeing	canoe	2.5 persons/canoe
Sail boating	vessel	2 persons/vessel
Picnicking	table	5 persons/table
Camping	site	4 persons/site

TABLE M-18

ACTIVITY DAY TURNOVER RATES BY OBJECTIVE

ACTIVITIES	NATIONAL EFFICIENCY	REGIONAL DEVELOPMENT	ENVIRONMENTAL QUALITY
Boating	4	3	2
Sailing	4	3	2
Canoeing	4	4	4
Water-skiing	4	3	2
Swimming beach	3	2	2
pool	4	3	2
Camping	1	1	1
Picnicking	2	1.5	1

TABLE M-19

WATER AREA SPACIAL STANDARDS FOR SELECTED ACTIVITIES AND OBJECTIVES

ACTIVITY	OBJECTIVE	STANDARD
Boating	National Efficiency	inboards and 20 hp outboards (3 acres/boat) 20 hp outboards (1 acre/boat) non-powered (1/3 acre/boat)
	Regional Development	inboards and 20 hp outboard (6 acres/boat) 20 hp outboards (1½ acres/boat) non-powered (2/3 acre/boat)
	Environmental Quality	inboards and 20hp outboards (9 acres/boat) 20 hp outboards (2 acres/boat) non-powered (1 acre/boat)
Sailing	National Efficiency	3 acres/vessel
	Regional Development	6 acres/vessel
	Environmental Quality	9 acres/vessel
Canoeing	National Efficiency	4 canoes/mile of stream or 1/3 acre/canoe
	Regional Development	4 canoes/mile of stream or 2/3 acre/canoe
	Environmental Quality	4 canoes/mile of stream or 1 acre/canoe
*Water-skiing	National Efficiency	plus 1.5 acre/boat
	Regional Development	plus 1 acre/boat
	Environmental Quality	plus 1 acre/boat
**Swimming	National Efficiency	50 sq. ft. of beach/person or 30 sq. ft. of pool/person
	Regional Development	75 sq. ft of beach/person or 45 sq. ft. of pool/person
	Environmental Quality	100 sq. ft. of beach/person or 60 sq. ft. of pool/person

TABLE M-19 (Continued)

ACTIVITY	OBJECTIVE	STANDARD
**Camping	National Efficiency	12 units/acre
	Regional Development	8 units/acre
	Environmental Quality	4 units/acre
**Picnicking	National Efficiency	12 tables/acre
	Regional Development	8 tables/acre
	Environmental Quality	4 tables/acre

*As it applies to boating standards for inboards and >20 hp outboards.

**Exceptions: for basins with a 2020 population density greater than 500 people per acre National Efficiency Standards apply to the Regional Development Objective as well. Also, Regional Development Standards apply to the Environmental Quality Objective.

The various standards utilized in Appendix M, although based on those currently in use by various levels of government, have been modified somewhat to accommodate existing and potential resource capability. They have, in addition, been adjusted in response to the multi-objective planning procedure. Many of the standards used were previously published 1/ by the Bureau of Outdoor Recreation, and have been modified here to reflect knowledge learned from several recently completed comprehensive river basin studies.

Related land needs were formulated on the basis of instantaneous recreation day design load factors. Activity days were converted to recreation days in the following manner. The percent of days of participation for a specific activity engaged in by those people citing it as their favorite summer season pursuit and recreating at a maximum rate were treated as single purpose recreation days (Table M-20). The remaining activity days were totaled for the seven activities and divided by 1.5. This factor was assumed to be the average number of selected activities in which the multi-purpose recreationist would engage in on a given day. Its selection, as opposed to 2.5 used in many previous studies, is related to the limited number of activities for which needs were assessed in the NAR effort.

1/ Outdoor Recreation Space Standards, Department of the Interior, Bureau of Outdoor Recreation (Washington: U.S. Government Printing Office, 1967).

TABLE M-20

SINGLE PURPOSE RECREATION DAYS: PERCENT OF TOTAL ACTIVITY DAYS

Recreation Activity	Percent
Boating	3.2
Sailing	22.5
Canoeing	5.0
Water-skiing	7.3
Swimming	31.5
Camping	8.1
Picnicking	2.8

The land area needed was then computed employing the following equation:

$$LA = \frac{RD}{TR' \times DL}$$

Wherein:

LA = land area in acres
RD = recreation days (projected participation in selected activities on a peak use day during the summer season)
TR' = weighted average turnover rate
DL = instantaneous design load; number of recreators per acre of land at a given instant.

Major differences among the land acreage requirements for the three objectives are again a function of design load and turnover rate differences. In this case, the instantaneous design load factors utilized for the National Efficiency, Regional Development and Environment Quality Objectives are 40, 25, and 10, respectively. Design load factors for the first of these objectives were modified to allow for space used for certain structural improvements and to provide for a minimal amount of buffer area. Thus, this accounting of essentially unusable area results in an effective instantaneous design load factor of 28 for the National Efficiency Objective. Similar adjustments were not made for the Regional Development and Environmental Quality Objectives because the quality of the recreation experience under either of these two objectives would remain relatively unaffected.

Facility Requirements. Facility requirements were assessed for each of the selected activities for the specific purpose of determining costs. However, those facilities associated with providing swimming opportunities, due to their resource implications, are reported in the needs summations presented elsewhere in the Appendix. The swimming needs were determined both in terms of beach acres and in square feet of pool space.

The facility computations were made employing a formula almost identical to that utilized in the water surface area needs determination (page M-16). The basic adjustment involved the substitution of the specific facility requirement being assessed for water surface area in the equation. The appropriate numerical values used in these calculations are shown in Tables M-8 through M-19.

Net Needs. Net needs were computed by subtracting the 1967 recreational resource and facility base (supply) from gross needs as determined above. The coastal supply involved a compilation of facilities adjoining ocean and estuarine waters and a subsequent assessment of their capabilities in providing selected recreation experiences. The inland situation was similarly evaluated, except that an inventory of the surface water resource was included and assessed. The latter consisted of a listing of all lakes and ponds, ten surface acres and larger, by political subdivisions (preliminary inventory published by the Bureau of Outdoor Recreation, Northeast Regional Office, September 1968) and an accounting of naturally pooled stream areas with a similar minimum surface dimension where the distance between river banks was five hundred feet or greater.

Both the resource and facility capability determinations were made through the employment of the gross needs formula. There was one difference, of course, and that was that the left side of each equation was known, and the selected activity day and/or recreation day values were unknown. The only other modification required applied to the assessment of the inland surface area supply evaluation. In this case the inventory information was summarized for each basin, one through twenty-one, by the following three water surface area classes: (1) those greater than 500 acres; (2) greater than 200 but less than 500 acres; and (3) greater than 10 but less than 200 acres. This data was further segregated into ownership categories which consisted of the following: public, quasi-public and private. It was then assumed that the capabilities of all waters in public ownership, irrespective of planning objectives, and quasi-public waters under the Environmental Quality Objective, should be assessed at full value, that is, in accord with the unit capacities and spacial standards established for the three planning objectives. The result is that the water surface area needs formula may be directly applied for these waters.

The effectiveness of those water bodies under quasi-public and private ownership in providing recreation opportunities under the National Efficiency Objective was calculated at 33 and 3 percent, respectively. Similarly, under the Regional Development Objective,

the percentages applied to quasi-public and privately owned waters was 67 and 7 percent respectively, and under Environmental Quality for private waters, 10 percent. It should be noted that single-purpose water supply reservoirs were excluded in this supply assessment.

The basic resource supply information was obtained from various sources which included printed reports, maps, and direct agency inquiries. The source of the lake and pond inventory is as identified in the Bureau of Outdoor Recreation publication, "Lakes and Ponds Inventory, North Atlantic Regional Water Resources Study", September 1968. The stream data was secured through contacts with the respective State offices of the U.S. Bureau of Geological Survey. Additional information regarding access, length, and degree of skill required for canoeing streams was taken from W. F. Burmeister. 1/

The supply of recreation resources and facilities consists of information collected by the Bureau of Outdoor Recreation through the nationwide planning inventory of the public sector in 1963 and 1964, an updating of it through 1967 by inclusion of acquisition and development projects funded by the Land and Water Conservation Fund, and material gleaned from the State Comprehensive Outdoor Recreation Plans. The latter source included data on the private sector which was supplemented by National Association of Conservation Districts inventory information.

Benefits Analysis. The computation of recreation benefits, expressed in dollars, was limited to the quantifiable aspects solely attributed to meeting the expressed needs identified under the National Efficiency Objective. These estimates were based on the "willingness-to-pay" concept and the values used per recreation day are in line with the principles set forth in Senate Document Number 97, May 1962. No attempt was made to ascertain the benefits to be derived under the Regional Development and Environmental Quality Objectives. Such an exercise would have been futile due to the lack of solid foundation upon which to judge the associated benefits and because of those limitations related to the scope of a Type I Study. The latter fact also tends to reduce somewhat the reliability of the National Efficiency evaluation.

The initial step in the calculation of annual quantifiable monetary benefits involved the conversion of summer season recreation days into annual ones. The relationship between the two was determined on the basis of visitation statistics collected by various park or recreation facility administering agencies at all governmental levels. In this regard heavy reliance was placed on such data as was derived from the Bureau of Outdoor Recreation's 1963-1964 nationwide planning inventory.

1/ Appalachian Water, by Walter Frederick Burmeister. The Canoe Cruisers Association, Washington, D.C., 1962. Volumes 1 and 2.

An analysis of this data resulted in the development of the conversion factors presented in Table M-21. Annual activity days for a given basin are computed by multiplying the summer season activity days by the appropriate subregional factor. Transformation to recreation days is identical to the procedure followed in the needs analysis.

TABLE M-21

ANNUAL RECREATION DAY/SUMMER SEASON RECREATION DAY RELATIONSHIP BY SUBREGION

Subregion	Conversion Factor (annual r.d. = summer season r.d. x factor)
A	1.05
B	1.18
C	1.25
D	1.25
E	1.25
F	1.54

The final step in the determination of the measured benefits involved the assignment of "willingness-to-pay" dollar values to specific types of recreation days as shown in Table M-22. Maximum values were applied in coastal areas having a per capita income equal to or greater than the national average. These same values, except for boating which was reduced to $4, were utilized in those inland basins of similar per capita economic wealth. The minimum was employed only in Basin 1, and inland study area with the lowest per capita income. In the remaining cases, variations within this dollar range were made and used which reflected the proportionate differences in their respective population's income.

TABLE M-22

BENEFITS: "WILLINGNESS-TO-PAY" CRITERIA BY TYPES OF RECREATION DAYS

Recreation Day Types	Benefits dollar range/recreation day Maximum	Minimum
Single-purpose		
Boating	6.00	2.70
Canoeing	4.00	2.70
Sailing	4.00	2.70
Swimming	2.00	1.00
Water-skiing	2.00	1.35
Picnicking	0.75	0.50
Camping	1.50	1.00
Multi-purpose		
A 1/	1.50	1.00
B 2/	2.00	1.35

1/ Multi-purpose recreation day consisting of any combination of the following activities: swimming, picnicking and camping.

2/ Multi-purpose recreation day consisting of any combination of the remaining activities not covered under multi-purpose Type A with any other of the seven activities.

Cost Analysis. Costs incurred in the acquisition of recreation resources and the development of related facilities by public agencies during the period 1965 through 1969 were utilized in the cost analysis. Such expenses were compiled by States with that for acquisition being further segregated into the following categories: urban, suburban and rural. These were further subdivided to account for the presence or absence of surface water.

The cost values employed in the determination of separable first costs associated with meeting the projected net needs within each basin reflect three considerations. First, the data compiled by States were transformed to the basins on a proportionate basis relative to that area and population of those States situated within each. Secondly, the median of urban and suburban acquisition costs was used because of where the bulk of the needs must be satisfied. And third, facility costs were varied to account for limited difference in design standards among planning objectives and due to resource and/or facility limitations.

The latter adjustments primarily involved the activities of swimming, boating and sailing. In the case of swimming, the existing relationship between swimming pools and beaches plus the availability of unused natural beaches was taken into consideration. This led to the following percentage distribution of beaches to be developed to meet the net needs: Basins 1 through 7 and 11, 70 percent;

Basins 8 through 10, 82 percent; Basins 12 through 21, excepting 15, 16, and 18, 60 percent; and the exceptions 50 percent. The remaining net needs within each study area were to be satisfied by swimming pools.

The facility breakdown assumed to be required to satisfy the boating and sailing needs is presented in Table 23 and is directly related to vessel size and use.

TABLE M-23

BOATING AND SAILING FACILITY REQUIREMENTS BY VESSEL TYPES

Vessel Type	Facility
>20 hp boats	1/3 serviced by ramps and 2/3 by slips or moorings
< 20 hp and sail boats	1/5 serviced by slips or moorings and 4/5 by ramps
non-powered	1/2 serviced by ramps and no structural improvements required for the remainder

The computation of acquisition cost was then a function of basin values and net resource requirements. Due to resource constraints, it was determined that the costs should be presented with and without stream acquisition included in them. The stream costs represented simple fee purchase of a fifty-foot-wide strip along one bank only, with the assumption that this would be sufficient to obtain stream surface use rights.

The calculation of basic facility costs involved the multiplication of appropriate basin values by the net facility requirements. These were then increased by a factor of 2.5 to account for the cost of support facilities such as roads, park signs, sanitation and the like. Since the inception of the Land and Water Conservation Fund through June 30, 1969, during which time a total of $37,120,500 was expended for recreation development purposes, it was found that support facilities costs comprised approximately sixty percent of the total.

The estimated separable first costs associated with meeting the projected net needs represents the totalling of acquisition and facility costs as determined above for each of the basins, planning objectives and target years.

RELATIONSHIP TO OTHER PARTS OF THE REPORT

The remainder of this Appendix examines in detail the recreation situation as it now exists throughout the North Atlantic Water Resources Study Region, together with the projected situation, based

on population growth, anticipated levels of participation, and other socio-economic variables, for the three target years of 1980, 2000, and 2020. Once the situation was defined in terms of number of recreationists requiring x number of acres for picnicking or camping, or y number of acres of broad-water for boating, sailing, or water-skiing, recommendations followed as to how such needs could best be satisfied.

It must be emphasized that although land and water for recreation are important human needs which are generally conceded to be growing, there are other human needs which are just as important, and many of these are growing too. Water for municipal and industrial use, for rural use, for irrigation, for power cooling, for hydroelectric power generation, for navigation, and for fish and wildlife are but a few of these other needs. During the course of the study, each of these needs, plus others which pertain to water and land use, were examined. The conclusions and findings regarding each of these needs may be found in the appropriate appendix.

Finally, an effort was made to bring all of this data together, and to determine what can be done to insure that adequate supplies of water will exist at a given place at a given time to satisfy the various demands projected for it. This is the business of the Main Report, which of necessity is less specific and less technical than the supporting appendices.

These appendices and the Main Report are subject to review by the Governors of the affected States, by the interested Federal agencies at the Department level, and by the Water Resources Council prior to transmittal to the President of the United States for his review and ultimate transmittal to the Congress for its consideration.

HISTORY

The English discovered, upon their arrival in North America, a world unlike any other they had known. From Canada to the Carolinas they discovered a land blessed with fertile soil and an abundance of water, with forests and wildlife amazing in their variety and extent. To the west, inland from the sea and paralleling it, they discovered a range of mountains which later would be named the Appalachians and which for over a century would act as a barrier to their westward expansion. Upon further exploration they found literally hundreds, perhaps thousands, of clear water streams, many of which originated in or near these mountains, and which flowed either to the sea or to the broad, productive estuaries. And lastly, they discovered a climate and rainfall which were capable of sustaining in perpetuity this rich country of forest, water, fur, and wildlife.

For three hundred years they and their decendants, together with later arrivals from Europe, struggled to conquer this wilderness and to build in it their farms, homes, towns, and later, cities. To them hunting and fishing was not sport, but rather a means of supplementing and adding variety to their diet. Walking and canoeing, similarly, were not viewed as outdoor recreation, but as essential modes of transportation. And so they cut timber and established

farms, and fished and hunted, and extracted from the earth what minerals they needed. With the advent of the industrial revolution, the extraction, processing, manufacturing, and distribution of goods (and wealth) became of paramount importance. Little thought was given to the resource base which made it all possible, or to the streams and air which became the dumping grounds for the by-products and wastes resulting from the manufacturing process. The Myth of Super-Abundance reigned supreme, and the incalculable waste attendant to "nation building", in the form of erosion, fire, diminished wetlands, grossly-polluted rivers, and polluted air went little noticed.

Toward the end of the 19th Century, the inevitable results of nation-building were becoming so obvious, particularly in the east, that demands were being made for reform. In 1891, Congress passed legislation, later to be known as the Forest Reservation Act, which gave to the President the power to set aside or "withdraw" certain forests where all logging would be forbidden. This Act marked the beginning of the "first wave" of conservation in the United States - a period which lasted approximately 20 years, and which was characterized by the "preservation" philosophy. Opposition to the continuing waste of natural resources mounted and in 1901 President Theodore Roosevelt voiced his opinion when, in his first State of the Union Address, he said "... the forest and water problems are perhaps the most vital internal questions of the United States." During his years in office, Roosevelt addressed himself not only to forest and water problems, but also to other vexing land-use problems of the times: grazing on public lands, the private use of public coal and phosphate lands, and the private use of hydroelectric sites on public lands. Twelve years were to elapse, but finally, in 1920, Congress enacted two basic conservation measures: the Mineral Leasing Act of 1920, and the Federal Power Act of 1920, largely as a result of the initial interest created by Roosevelt.

By the time Roosevelt concluded his administration in 1908, the idea of preservation had been inculcated in many important segments of the population. During his administration national forest lands were increased from 42 million acres to 172 million acres; four large and 51 smaller wildlife refuges had been established, and 18 national monuments had been created. Four of these - Grand Canyon; Olympic; Lassen; and Petrified Forest - were later designated as national parks.

From the time that Theodore Roosevelt departed the Presidency in 1908 until the election of Franklin D. Roosevelt in 1932, the conservation movement was to remain dormant. During this interval several singularly important pieces of legislation were enacted but, for the most part, the attention of the government and the citizenry was centered elsewhere. In 1911 the Weeks Act, which authorized the establishment of national forests in the East, was

passed, and in 1916 the National Park Service Act was enacted. In 1929, Congress passed the Norbeck-Andresen Act, which formed the basis for a national system of wildlife refuges. Aside from this legislation, and that previously mentioned, i.e., the Mineral Leasing Act of 1920, and the Federal Power Act of 1920, little else regarding conservation was accomplished.

The election of Franklin D. Roosevelt in 1932 set the stage for a renewed interest in conservation, perhaps with a sense of urgency which equaled, or even exceeded, that which prevailed in his cousin's era. Historians have termed FDR's interest and activities in natural resources as the "second wave" in conservation. The emphasis now was not so much on "preservation", but rather on the wise development and use of resources, including not only natural resources, but also human resources. The activities and accomplishments of the Roosevelt administration in attempting to revitalize the land, and its people, have been narrated elsewhere, and need not be repeated here.

One program having particular interest to the North Atlantic Region Water Resources Study is the successful story of the Tennessee Valley Authority. In this case an independent government agency was charged with the redevelopment of a large physiographic region - which ultimately would include parts of seven States - for the "...economic and social well-being of the people..." Multi-purpose reservoirs, principally for flood control and power generation, were planned and constructed; at the same time, reforestation and soil conservation measures were undertaken on adjoining lands. TVA was one of the first examples of regional planning and comprehensive source to mouth river basin planning undertaken in the United States. The Tennessee Valley Authority continues today, and is still the resource conservation project most often visited by government leaders of other countries.

Also of interest to the North Atlantic Region, and to others in the East, is the fact that while 24 national forests had been established in the East under the Weeks Act, only 5 million acres of land had been acquired from 1911 to 1933. Within 30 months, the new administration had allocated $37 million of public works monies to acquire an additional 11 million acres.

The "third wave" of conservation in the East, indeed, nationwide began early in the 1960's and continues to the present time. Whereas the first effort - in Teddy Roosevelt's time - was essentially one of preservation, and the second wave was a resource-oriented effort: soil, water, rangeland, reforestation, and electric power, the present effort is more comprehensive. It includes all of the foregoing, and much more; the present effort is directed toward improving the total environment of man. It involves preservation of what wilderness areas and wild streams may remain, it includes the prevention of further contamination of air and water, together with cleaning up as much as possible

that which has already been contaminated; and it involves one other important element. This, essentially, is the realization that man and his economy are totally and completely dependent upon the planet earth and that how well he manages it will, in the long run, determine how long his species will survive. The question is not one of choosing between clean water and jobs, as it has so often been posed in the past, but rather of deciding how to proceed to best insure the maximum amount, or number, of each.

Similarly, the question is not whether we should build highways, but rather how can they be located and constructed so that damage to other resources, i.e., natural, cultural, historic, and human, is kept to an absolute minimum. The problems are immense and complex, and their solution involves a necessary ordering of national interests and needs. Fortunately, both the public and government seem aware of the complexity and of the costs involved, and both have indicated an interest in getting on with the job.

Congress, for its part, has enacted important and far-reaching legislation, including the Federal Water Pollution Control Act, the Water Resource Research Act of 1964, the Water Resources Planning Act of 1965, the Water Quality Act of 1965, the Clean Water Restoration Act of 1966, the Federal Water Project Recreation Act of 1965, and the Wild and Scenic Rivers Act. This Act designated certain reaches of three streams in the NAR for potential addition to the National Wild and Scenic Rivers System, including the Penobscot River in Maine, the Delaware River, and Pine Creek, in northern Pennsylvania.

In an effort to coordinate activities among Federal agencies, and between Federal agencies and the States, legislation such as the Land and Water Conservation Fund Act, the Transportation Act (particularly Section 4f thereof), the New England River Basin Commission Order and the Susquehanna River Basin Compact Act, the Hudson River Basin Act, and Public Law 88-29 have been enacted. Other legislation which reflects the interest and concern of Congress in environmental matters include the National Trails System Act, the Wilderness Act, the Air Quality Act of 1967, the Estuarine Act (Public Law 90-454), and the National Environmental Policy Act of 1969. Title II of the Environmental Policy Act established the Council on Environmental Quality, which has, among other responsibilities, that of reporting annually to the President on the status and condition of the major natural, or altered environmental classes of the Nation.

A review of the legislation cited above indicates the growing concern of Congress for all aspects of the environment, and nowhere are the various problems more intense than here in the Northeast. For instance, in 1960 about 25 percent of the total population of the 48 contiguous States lived in the Northeast -

at the same time, the region possessed only 4 percent of the area available for public recreation. By contrast, approximately 17 percent of the country's population lived in the West, and 75 percent of the area available for public recreation was situated in that region. The projected population figures for the Northeast from the 1960 level of 45 million to 55.6 million in 1980, 69.6 million in 2000, and 86.2 million in 2020 indicate that immediate planning, followed by a bold acquisition and development program, effectively coordinated among all levels of government, is urgently required if public demand for outdoor recreation is to be satisfied. In this regard, the proposal of the Regional Plan Association that a 10,000 square mile park be established along the Appalachian Mountain chain is an example of the kind of action which is and will be required. The proposed park would serve several functions, including outdoor recreation and water resource management.

Since its early days as the bridgehead of Europe in North America, the Atlantic Region has had a strong and diversified economic base, with its cities heavily weighted toward both service industries and manufacturing. This is somewhat in contrast to most other cities on the continent which tend to be either predominately service centers for the surrounding hinterlands, or predominately manufacturing towns. Since the economy is advanced, well-balanced, and specialized in top decision-making in government, service industries, and manufacturing, per capita income in the NAR is 15 percent higher than the national average. Indices of education and cultural activity are similarly above the national averages. These high percentages reflect the high degree of the region's economic development and its relative importance in the economic activity of the nation, and further serve to emphasize the urgency for water resources planning in order to identify and preserve those remaining dwindling resources which are rapidly being choked off by expanding urban and industrial development.

In concluding the historic description of the region from a recreation point of view, it appears advisable to review briefly Federal efforts to increase recreation opportunity throughout the region. Foremost in this regard has been cost sharing with the States, and with their political subdivisions, under the Land and Water Conservation Fund, for the acquisition and development of recreation facilities. It should be noted that three Federal agencies - U.S. Forest Service, National Park Service, and the Bureau of Sport Fisheries and Wildlife, are also enlarging their recreation areas under the same program.

Three national seashores have been established; Cape Cod in Massachusetts, Fire Island in New York, and the Assateague in Maryland and Virginia. Two national recreation areas have been authorized, i.e., Delaware Water Gap in Pennsylvania and New Jersey, and Spruce Knob-Seneca Rocks in West Virginia. Two others -

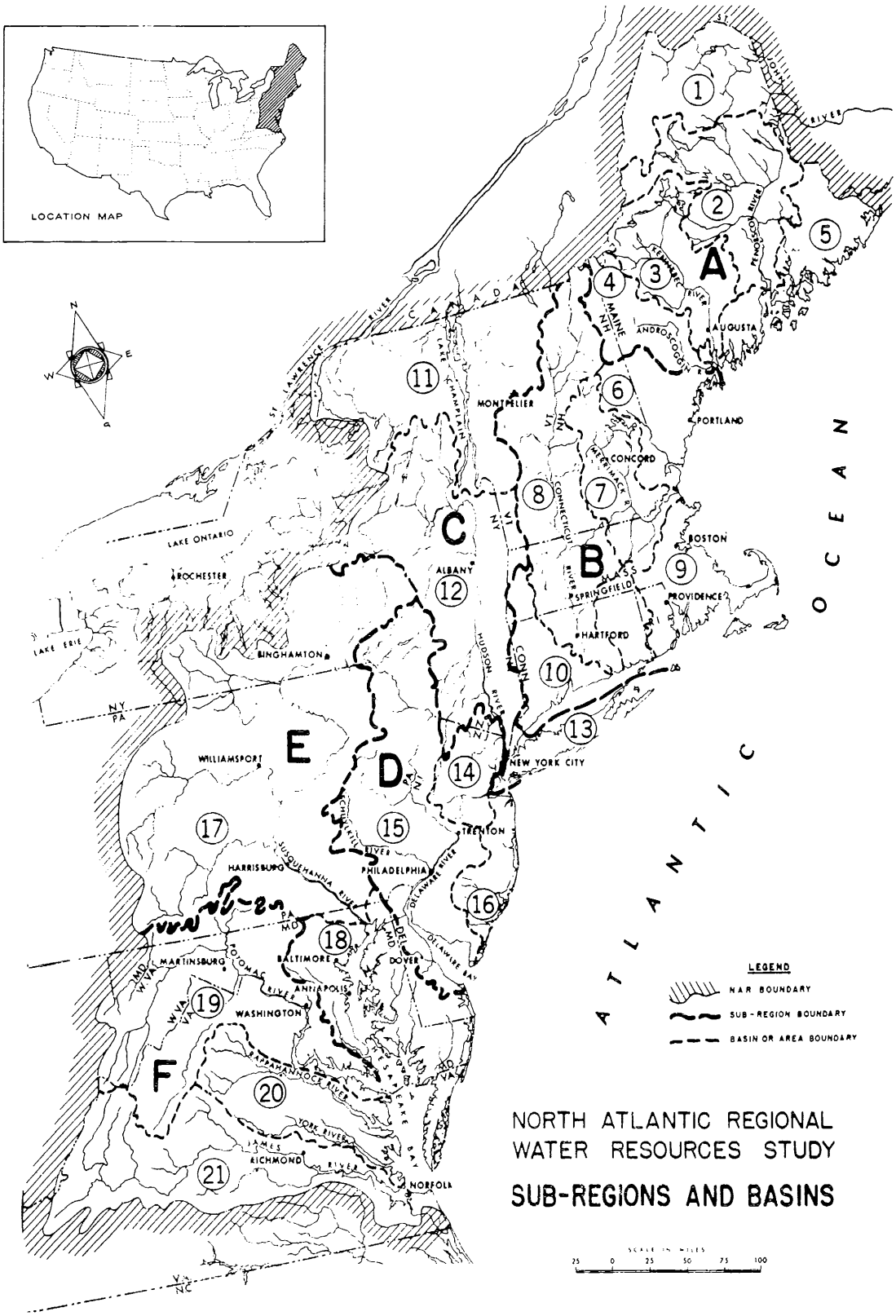
the Connecticut National Recreation Area and the Gateway National Recreation Area in New York Harbor - are presently being studied to determine whether they should be added to the system.

The current demand for outdoor recreation opportunities is great and the projected demand for the three target years, i.e., 1980, 2000, and 2020 indicates a steadily growing demand for such facilities. The purpose here is to present background information on what has been accomplished in the past. The remainder of Appendix M looks to the future; it lists anticipated needs and outlines how these needs can be met.

ACKNOWLEDGEMENT

The Northeastern Regional Office of the Bureau of Outdoor Recreation is indebted to the many Federal, State, County and Municipal Agencies, private organizations, and individuals for their cooperation and assistance in the formulation of this Appendix.

FIGURE M-1


LOCATION MAP
NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY
SUB-REGIONS AND BASINS
LEGEND
NAR BOUNDARY
SUB-REGION BOUNDARY
BASIN OR AREA BOUNDARY
ATLANTIC OCEAN
CANADA
A
B
C
D
E
F
AUGUSTA
PORTLAND
CONCORD
BOSTON
PROVIDENCE
SPRINGFIELD
HARTFORD
MONTPELIER
ALBANY
ROCHESTER
BINGHAMTON
NEW YORK CITY
TRENTON
PHILADELPHIA
WILLIAMSPORT
HARRISBURG
BALTIMORE
ANNAPOLIS
DOVER
MARTINSBURG
WASHINGTON
RICHMOND
NORFOLK
LAKE ONTARIO
LAKE ERIE
LAKE CHAMPLAIN
ST. LAWRENCE RIVER
HUDSON RIVER
DELAWARE RIVER
SUSQUEHANNA RIVER
POTOMAC RIVER
RAPPAHANNOCK RIVER
YORK RIVER
JAMES RIVER
CHESAPEAKE BAY
DELAWARE BAY
SCALE IN MILES
25 0 25 50 75 100

III. REGIONAL SUMMARY

PRESENT STATUS

The Outdoor Recreation situation as it now exists within the North Atlantic Region Water Resource Study Region is not an encouraging one. Federal, State, and local agencies responsible for providing recreation opportunity have, for the most part, performed admirably well, but they have been limited, through fiscal constraints, in the recreation facilities they have been able to provide. Meanwhile, the existing recreation base is subject not only to mounting recreation use, but also to demand that it be utilized for other "public purposes: as highway right-of-way, as utility corridors for electric power transmission and, in isolated cases, for dam construction and surface water storage.

The current use to which our recreation facilities are subjected is obvious: one need only attempt to park his car on a Sunday afternoon at any State or regional park; locate a campsite during a "holiday weekend"; or find a peaceful pool or riffle on any Saturday during the trout season. Indeed, the ever-growing number of trailers, campers, and towed-boats on the public highways is perhaps the most obvious sign of all. And there is every indication that current use will intensify in the years to come. The American heritage and love of the outdoors is a part of the answer. An expanding population having greater mobility, shorter work weeks and longer vacations, and larger disposable incomes are also major factors. Another factor, and one perhaps which will assume added significance in the future, is the human need to seek a respite of a few hours, or a few days, totally removed from the turmoil and tensions which characterize an urbanizing, highly-industrialized society.

The problem, from a recreation point of view, is not one of there not being enough land or enough water throughout the North Atlantic Region, because it appears that there are sufficient quantities of both. The problem, essentially, is one of uneven distribution of people over the land and, even more importantly, the overall degradation of the environment in general, and of the recreation base in particular. This uneven distribution of population is recognized as a problem, not only in NAR, but throughout the United States. The only solution would appear to be a massive resettlement program, but such a course of action would be totally unacceptable on social, economic, and political grounds. Indeed, the problem of uneven distribution will intensify if urbanization trends continue as they have in the past.

Attention should be focused then, on the second problem, namely, the overall degradation of the environment in general, and the recreation base in particular. In geographical areas of high density such as the Boston region, the northern New Jersey area, or the lower Delaware Valley Area, the present recreation situation is critical, not only because so little remains in the way of unspoiled land and pure water which possibly could be added to the existing recreation base, but also because such land, when it does exist, is developed not for recreation, but for maximum monetary return, such as housing sub-divisions, shopping centers, or industrial parks. Thus, with little chance to add to the recreation base, the situation, already critical, is exacerbated by the tendency of governmental bodies to invade existing recreation areas and to use them for highway and utility rights-of-way or, as has happened, to sell a portion outright for private development. The proposed sale of much needed parkland in the Palisades several years ago is a classic example.

In areas where population concentrations are less intense as, for example, northern New Hampshire and Vermont, south central Pennsylvania, and central Virginia, the existing recreation situation, while perhaps not critical, is certainly cause for concern. All too often municipalities and towns in such areas find themselves dependent upon one, or a few, industries and, in an attempt to attract new industry or to cause existing ones to expand, often take a short-sighted view of their land and water resources. Thus zoning, if it does exist at all, becomes so riddled with variances as to be meaningless. Similarly, standards set up to regulate and control pollution emissions are not as closely observed as they might be, and violations are not prosecuted as vigorously as might otherwise be the case. The objectives - a strengthened economy, more jobs, and a broadened tax base - are perfectly acceptable goals, but the means employed are often self-defeating. The fact that conservation and preservation of the environment costs money, and in the case of sewage treatment plants, for instance, large sums of money, should not be overlooked. Nor should the fact that such money comes from only two sources - personal and corporate taxation - be forgotten. Ironically such effort to induce new industry is not always successful because short-sightedness on the part of past generations has resulted in land subsidence, insufficient stocks of water of the required quality, not enough land of the right kind, or insufficient recreation opportunity. At the same time the local authorities lack the financial resources to clean up the local water supplies, or to provide sufficient recreation facilities, so efforts to strengthen the economy come to naught.

Finally, there is the situation which prevails at the extreme northern and southern tips of the study region, and in areas on the headwaters of large rivers like the Connecticut, Hudson and Delaware: recreation land, both developed and undeveloped, does exist in sufficient quantities to satisfy resident demand. That this is the case results from the fact that, percentage-wise, the majority of the Study area's population live, work, and play elsewhere.

FUTURE DEMANDS

In looking to the future, one is struck with the enormity of the projected demand on the recreation base. This demand will result not only from the greater number of persons seeking respite from a highly industrialized and tension-filled society (population in the NAR Study area in the year 2020 is expected to increase by nearly 93 percent over the 1960 population figure), but also from the fact that the work force will have greater amounts of time available to do as they please and, in most cases, sufficient means to do it. In all likelihood the 35-hour work-week and three-week vacation period will be commonplace by the year 2000.

In the subregional analyses which follow, projections were made to determine the annual participation in water-oriented outdoor recreation for each of the 21 basins, and for each of the target years, e.g., 1980, 2000, and 2020. The activities considered were those termed "water-enhanced," such as camping and picnicking, and those described as "water-based," including swimming, boating, water-skiing, sailing, and canoeing. It should be remembered while looking at these participation figures that they refer only to the seven activities cited above. Not included are such highly popular outdoor recreation pursuits as walking for pleasure, driving for pleasure, outdoor games and sports, bicycling, hiking, horseback riding, and skiing. Although of great importance in the overall recreation "picture," these activities are not dependent upon water, and so were excluded from this particular study. A constant consideration throughout the study was Objective: Environment Quality, Regional Development, or National Efficiency. It is assumed that conditions prevailing under a given Objective (time available for recreation, proximity of facility, and amount of disposable income) will affect the total number of persons seeking recreation opportunity, as well as the number of times one individual participates. Thus gross participation is deemed greatest under Environmental Quality, and least under National Efficiency. Individual facilities now existing throughout the NAR were inventoried, and the capacities arrived at were deducted from gross needs to determine net, or unsatisfied needs.

It is these figures that formed the basis for determing resource requirements: recreation land, beach, pool area, broad-water area, and stream mileage, which are itemized in the various Needs Tables. An effort was made in each subregional analysis to relate recreation needs to other social and human needs, and suggestions for meeting recreation needs took into account the devices and tools which conceivably might be employed to satisfy or to provide for these other needs. These other needs include an adequate supply of water for industrial and municipal use, flood control, and a reserve sufficient for low-flow augmentation. Reservoirs of various kinds, and flood plain management, are two of the more important devices utilized for meeting these needs. In both cases increased recreation opportunity can often be a valuable by-product, and this fact is stressed throughout the subregional analyses.

The benefits to be derived from providing for the anticipated recreation demand accrue not only to the recreationists themselves, but also to the geographic areas in which recreation facilities are located. The latter include expenditures by recreationists for gasoline, food, sporting equipment and, in some cases, lodging. The so-called multiplying-effect of such expenditures on the local economy has been studied and described elsewhere in detail, and it is cited here only in passing. Annual quantifiable monetary benefits have been calculated for the National Efficiency Objective, and they are listed in Table M-30 by basin for each of the three target years.

In order to give the reader some idea of the magnitude of estimated costs, these have been computed by Objective, and appear in the following tables. Table M-24, M-25, and M-26 cite separable first costs for land acquisition and development, including stream acquisition. Tables M-27 through M-29 cite the same costs, but without stream acquisition. Thus one can determine the approximate costs in any particular basin for those lands and facilities appropriate under the Objective to be selected for that basin. As previously mentioned, Table M-30 presents annual quantifiable monetary benefits projected under the National Efficiency Objective.

In summarizing future needs for recreation, one cannot but be impressed by their sheer magnitude, together with the tremendous costs involved in providing for them. Nevertheless, it is apparent that sufficient land and water do exist throughout each basin to satisfy anticipated needs. There is one exception - Basin 13 - where local resources are patently insufficient to meet projected needs, and in this case movement to other basins, e.g., 11 and 12, for recreation is anticipated.

In making suggestions as to how recreation needs might be met, the effort was made to consider not only what exists now in the way of developed facilities, but also what recreation development can reasonably be expected as a result of drainage patterns, topography, existing vegetation, and proximity to centers of population. Similarly, thought was given to those devices utilized in providing for other needs, such as water supply, flood control, and low flow augmentation, and to what extent recreation opportunity could be incorporated in such devices. Finally, considerable thought was given to the recreationists themselves: their interests, desires, and needs, and whether in the years to come significant differences may occur in what people seek in the way of outdoor recreation.

TABLE M-24

SEPARABLE FIRST COSTS FOR ACQUISITION AND DEVELOPMENT (INCLUDING STREAM ACQUISITION), ENVIRONMENTAL QUALITY OBJECTIVE (IN MILLION DOLLARS)

Basin	TARGET YEAR 1980	2000	2020
1	37.5	9.8	6.0
2	62.2	18.3	13.6
3	73.6	20.3	14.6
4	48.0	12.7	8.9
5	1.3	8.5	14.3
6	10.4	18.3	48.5
7	983.6	408.8	238.8
8	723.5	353.1	433.2
9	972.5	628.7	672.4
10	916.7	545.3	429.8
11	61.8	58.0	79.9
12	1225.4	702.9	1353.3
13	2474.1	1147.7	2164.8
14	1234.4	743.4	1360.0
15	1318.9	917.3	1502.6
16	23.6	19.4	22.0
17	1301.7	713.9	1461.4
18	54.1	29.8	41.7
19	128.7	173.9	279.0
20	7.5	4.5	9.3
21	21.2	135.4	142.8

TABLE M-25

SEPARABLE FIRST COSTS FOR ACQUISITION AND DEVELOPMENT
(INCLUDING STREAM ACQUISITION), REGIONAL DEVELOPMENT OBJECTIVE
(IN MILLION DOLLARS)

Basin	1980	TARGET YEAR 2000	2020
1	28.1	7.5	18.5
2	44.8	14.0	7.5
3	53.0	15.6	8.0
4	33.6	9.6	4.4
5	0.4	0.2	0.3
6	1.8	0.8	4.3
7	652.6	139.4	117.5
8	352.0	181.1	194.6
9	239.9	124.5	242.8
10	201.5	251.7	254.9
11	13.8	63.6	49.6
12	879.8	525.9	901.2
13	651.9	551.9	908.6
14	430.0	357.2	608.7
15	302.6	407.2	626.5
16	7.7	9.5	9.2
17	913.9	531.0	983.5
18	25.5	12.3	18.8
19	9.1	68.9	139.9
20	3.9	2.7	5.1
21	10.3	36.7	100.6

TABLE M-26

SEPARABLE FIRST COSTS FOR ACQUISITION AND DEVELOPMENT
(INCLUDING STREAM ACQUISITION), NATIONAL EFFICIENCY OBJECTIVE
(IN MILLION DOLLARS)

Basin	TARGET YEARS 1980	2000	2020
1	9.3	3.1	8.2
2	9.0	5.6	9.5
3	10.5	6.3	9.3
4	3.5	3.8	5.9
5	0.2	0.1	0.2
6	0.9	0.5	0.8
7	180.2	119.4	126.7
8	72.7	67.2	98.7
9	139.4	96.0	153.9
10	52.3	153.1	241.1
11	1.7	0.5	1.2
12	252.6	213.0	420.4
13	283.3	385.2	718.3
14	236.8	258.3	482.0
15	104.2	293.4	406.3
16	2.4	6.4	6.4
17	212.8	213.6	446.9
18	17.0	8.5	10.6
19	5.6	26.8	95.3
20	2.9	2.2	3.7
21	6.1	4.7	6.3

TABLE M-27

SEPARABLE FIRST COSTS FOR ACQUISITION AND DEVELOPMENT (NOT INCLUDING STREAM ACQUISITION COSTS), ENVIRONMENTAL QUALITY OBJECTIVE (IN MILLION DOLLARS)

Basin	TARGET YEARS 1980	2000	2020
1	37.5	9.8	6.0
2	62.2	18.3	13.6
3	73.6	20.3	14.6
4	48.0	12.7	8.9
5	1.3	8.5	13.0
6	5.2	8.7	32.5
7	901.3	372.9	188.2
8	645.9	280.2	305.9
9	682.1	527.8	488.1
10	756.2	451.3	296.2
11	61.8	58.0	79.9
12	1225.4	702.9	1333.1
13	1966.4	955.3	1999.3
14	1065.5	624.6	1243.2
15	1318.9	837.0	1423.4
16	0.1	0.1	4.9
17	1301.7	713.9	1461.4
18	2.9	4.4	14.3
19	128.7	173.9	279.0
20	7.5	4.5	9.0
21	21.2	135.4	142.8

TABLE M-28

SEPARABLE FIRST COSTS FOR ACQUISITION AND DEVELOPMENT (NOT INCLUDING STREAM ACQUISITION COSTS), REGIONAL DEVELOPMENT OBJECTIVE (IN MILLION DOLLARS)

Basin	TARGET YEARS 1980	2000	2020
1	28.1	7.5	18.5
2	44.8	14.0	7.5
3	53.0	15.6	8.0
4	33.6	9.6	4.4
5	0.4	0.2	0.3
6	1.8	0.8	1.3
7	622.7	121.7	92.4
8	352.0	181.1	136.5
9	118.5	74.3	151.9
10	172.5	205.2	188.9
11	13.8	63.6	49.6
12	879.8	525.9	901.2
13	402.4	456.1	827.0
14	379.9	298.4	551.3
15	302.6	407.2	626.5
16	0	0.1	0
17	913.9	531.0	983.5
18	0.1	0.2	5.1
19	9.1	68.9	139.9
20	3.9	2.7	5.1
21	10.3	36.7	100.6

TABLE M-29

SEPARABLE FIRST COSTS FOR ACQUISITION AND DEVELOPMENT (NOT INCLUDING STREAM ACQUISITION COSTS), NATIONAL EFFICIENCY OBJECTIVE (IN MILLION DOLLARS)

Basin	TARGET YEARS 1980	2000	2020
1	9.3	3.1	8.2
2	9.0	5.6	9.5
3	10.5	6.3	9.3
4	3.5	3.8	5.9
5	0.2	0.1	0.2
6	0.9	0.5	0.8
7	167.2	100.9	109.8
8	72.7	67.2	98.7
9	71.9	62.2	93.1
10	52.3	135.1	196.7
11	1.7	0.5	1.2
12	252.6	213.0	420.4
13	116.2	321.1	663.7
14	224.2	219.4	443.7
15	104.2	293.4	406.3
16	0	0	0.1
17	212.8	213.6	446.9
18	0.1	0.1	1.6
19	5.6	26.8	95.3
20	2.9	2.2	3.7
21	6.1	4.7	6.3

TABLE M-30

ANNUAL QUANTIFIABLE MONETARY BENEFITS
NATIONAL EFFICIENCY OBJECTIVE
(IN MILLION DOLLARS)

Basin	TARGET YEARS 1980	2000	2020
1	1.1	0.7	1.1
2	1.3	1.3	2.3
3	1.9	1.2	2.7
4	1.0	0.9	1.8
5	0.1	0.1	0.1
6	0.6	0.4	0.9
7	46.4	39.3	52.3
8	23.4	25.2	46.2
9	35.0	29.8	60.4
10	25.6	59.9	101.2
11	0.6	0.3	0.7
12	36.2	4.8	99.6
13	42.1	73.8	184.5
14	60.1	65.9	155.9
15	33.7	64.6	220.9
16	0.1	0.2	0.2
17	35.6	39.9	100.0
18	0.3	0.2	1.3
19	3.4	14.4	69.4
20	3.5	2.9	6.4
21	10.0	7.3	14.1

MEANS OF SATISFYING DEMAND

Earlier in this chapter the point was made that sufficient land and water existed throughout the study area to satisfy projected recreation demand. The problem lies in the fact that land and water best suited for recreation is located at considerable distance from population centers, and that the recreation base closest to the consumer has been befouled as a result of his other activities. In addition, little chance exists in populated areas for adding to the recreation base because of competitive demand for what appropriate land remains. In fact, conservationists must wage a never-ending battle merely to keep intact much of the land now set aside for recreation and similar use.

It should be painfully apparent by now that recreation needs and the struggle for environmental quality are intertwined. If current public interest in ecology and the environment continues, and it proves not to be a fad, and if monies become available in sufficient amounts to accomplish the task, then projected recreation needs can be adequately met even in those basins where the greatest needs have been identified. There is no reason why the largest cities within the study area - New York and Philadelphia - should have a shortage of swimming opportunity, especially when the various rivers which exist in these two areas are considered. Improving the water quality of the Hudson, Delaware of Schuylkill Rivers to a "B" category would be extremely expensive, but if the public, in their roles as consumers and taxpayers, accepted and were willing to pay higher prices and taxes, then this particular need could be provided for. A less costly approach would be to improve these streams to a "C" category - acceptable for boating, sailing, and fishing, and to construct large "natural" lakes adjacent to the stream for swimming. Such a solution, while less costly, would offer correspondingly less swimming opportunity. Another consideration, and an important one, is the fact that many commercial waterfront properties - piers, docks, rail terminals and shipyards, have fallen into disuse over the years, and offer excellent access for mass recreation.

The plan outlined above could be used also for medium and small cities, especially when the waterfront area has progressed from a state of disuse to one of decay, but the principle in all cases is identical: to bring to the city dweller, particularly the ghetto resident, the opportunity for water-based recreation which he heretofore has not had, or could not afford, by making maximum use of the water resources which exist close at hand. This alternative, while admittedly the most "expensive,"

is in the long run the most logical and most desirable, not only for recreation, per se, but also because of scenic and environmental considerations, fish and wildlife, and possibly even public health considerations.

The time has come when Americans want, indeed, they are demanding that the economy and the industrial sector produce more than just an ever-increasing number of "things," the majority of which ultimately are consigned to the junk heap (solid waste), and which during their manufacture and/or use pollute the environment. The public insists, in short, that industry's responsibilities do not end with the purchase of raw materials and labor, and the sale of finished products. There is a growing belief among the public that industry, be it extractive, manufacturing, transportation or of the public-utility type, must show more regard for the environment, and must avail themselves of existing technology to limit air and water pollution to the extent possible. In isolated instances where existing technology does not effectively cope with the pollution problem, then either research must be broadened and answers found quickly, or that particular industrial process appears doomed.

This then, is the "third wave" of conservation referred to earlier. Government, both Federal and State, have recognized the public's dissatisfaction with things as they are, and has moved accordingly. The result, although not spectacular, has been a gradual strengthening of the legislation pertaining to pollution and, in some cases, prosecution in the most flagrant instances. In addition, action taken on the part of industrial firms to limit pollution has not always matched their claims and advertisements, and this discrepancy is now being investigated by the Federal Government.*

A second major way in which water-based recreation needs may be satisfied is to incorporate recreation from the very beginning in multiple-purpose reservoir planning. In previous years the difficulty of assigning benefits to recreation meant that it was not always fully considered in establishing the cost-benefit ratio, and thus was not always developed to its greatest potential. However, enactment of Public Law 89-72 (Federal Water Project Recreation Act) and approval of Senate Document 97, and Supplement No. 1 thereto, have improved this situation greatly.

A third way, and one which has been emphasized in the subregional analyses, is the development of entirely new recreation

*"Pollution: Puffery or Progress?" Newsweek, December 28, 1970, p. 49

facilities, either day-use or extended use, and the expansion and improvement of existing facilities where such is physically possible. Throughout the discussion of each subregion suggestions have been made regarding new or existing facilities, and it should be clearly understood that they are just that: suggestions. In a study as all-encompassing as this, one comes across a variety of recreation areas, including national and State forests and parks, national and State seashores, public hunting and fishing areas, and of course, the many facilities owned and operated by county, township and municipal government. The majority of such areas have within their boundaries or are situated adjacent to water impoundments created for a variety of purposes, which in turn may be owned by one of a number of agencies - public or private. Nevertheless, from a recreation point of view such areas are of the greatest importance, and suggestions regarding expansion, or initial development, if such were the case, were made whenever it appeared appropriate to do so. In general, the suggestion was repeatedly made that existing standards (spacial, turnover) not be lowered to accommodate greater number of recreationists. It may not be physically possible to adhere to this general suggestion in Basin 13, and this is discussed at length in the Subregion C Subregional Analysis.

Another way in which outdoor recreation and environmental quality can be enhanced is to be found in the Wild and Scenic Rivers Act (P.L. 90-542) previously mentioned on page M-2. In addition to listing 27 streams -- three of which occur in NAR -- for potential addition to the National Wild and Scenic Rivers System, Section 5(d) of the Act specifies that... "In all planning for the use and development of water and related land resources, consideration shall be given by all Federal agencies involved to potential national wild, scenic and recreational river areas, and all river basin and project plan reports submitted to the Congress shall consider and discuss any such potentials..." In addition, the Secretary of the Interior and the Secretary of Agriculture have made investigations and studies required by Section 5(d) and have identified 47 streams which must be evaluated in planning reports by Federal agencies as potential alternative uses of the water and related land resources involved. Seven of these exist in the NAR study area, and are listed briefly as follows:

Hudson, New York: Segment from source to Luzerne, including tributaries.

Beaverkill, New York: The entire river.

Mullica, New Jersey: The entire river including tributaries, Wading River and Bass River.

Pocomoke, Maryland: The entire river.

Rappahannock, Virginia: Segment from Tidewater to Remington, including the tributary Rapidan River to the community of Rapidan.

Shenandoah, West Virginia: The entire river.

Cacapon, West Virginia: The entire river.

Several States have responded to the intent of Section 11 of the Act, and either have established State systems, or are exploring the possibility of doing so. Virginia and West Virginia have established State Systems, and each has nominated a number of streams to be included initially. Maryland has established a State Scenic River System, and has designated five streams as potential scenic rivers: the Pocomoke, Severn, Patuxent, Wicomico, and the Youghiogheny. Other States, including New York, Pennsylvania, Massachusetts, Connecticut, and New Jersey are considering the enactment of legislation which would provide for State systems. In certain instances, the protection of individual streams have been the subject of separate legislation such as the Allagash in Maine (the first State managed stream to become a component of the National System), and the upper Hudson in New York. Although the wild and scenic rivers concept -- both at the Federal and State levels -- is relatively new, it appears to have excellent potential as a means of broadening outdoor recreation opportunity.

There exists still another way in which outdoor recreation opportunity can be increased, and that is to more fully utilize water supply reservoirs. Many such water bodies are located relatively close to centers of population, yet they are closed to public recreation under the theory that recreation would conflict with their primary purpose. This is not necessarily true, and an effort should be made to prove that water supply and recreation are not incompatible. The relationship is more fully covered in Appendix V (Health Aspects) and the reader is referred to it. In brief, the Environmental Protection Agency concludes that dual use may indeed be possible, but that each case must ultimately be decided upon its own merits. In any event, three basic elements must be satisfied when recreation use of any reservoir is practiced. These include: (1) adequate recreational development of "physical plant" including sanitary facilities; (2) proper maintenance of the facilities; and (3) sufficient personnel to supervise the public using the reservoir for recreation. Past studies on the subject of recreation at water-supply reservoirs have been done, and six of these are discussed in Appendix V (pages V-22 to V-30).

Over and above the more obvious means recommended above for satisfying recreation demand, the following thoughts have possible merit and should be considered further.

(1) The majority of recreation facilities receive comparatively little use during the week, but on weekends they are saturated. Business and industrial concerns have cooperated in the public interest by staggering work hours in an effort to reduce traffic congestion. Could not the idea be carried one step further and a plan instituted whereby workdays would be staggered? The idea, of course, would be to spread the demand made on existing facilities more evenly over seven, rather than two, days. A variation is the practice now used by some employers of extending work hours for four days, and then having a three-day weekend. The scheme reportedly has been well received in the majority of companies attempting it.

(2) Although the problem has most often been identified with the scenic National Parks in the West, there is the distinct possibility that it exists in NAR recreation areas, and that is the problem of congestion resulting from vehicles: automobiles, campers, and trailers, as opposed to that caused by people. If the problem exists, serious thought should be given to ways whereby vehicles can be kept outside of recreation areas, and the manner in which people would be transported about the park proper.

(3) A third possibility, and one which might become feasible at that time in the future when salt water beaches become saturated, would be to anchor large rafts a mile or so off-shore, and to use them for swimming, picnicking, and as a moorage for boats. Such a platform might well serve as a base for scuba-equipped recreationists to depart for underwater tours to examine indigenous plant and animal life. Such tours are now carried out at the National Park at St. Johns in the Virgin Islands, and reportedly are highly popular.

SUMMARY AND CONCLUSIONS

Summary. Recreation, both that termed "water-based" and "water-enhanced", is strongly dependent upon a water resource of fairly high quality. Public participation in recreation, already at a high level, is predicted to double and, in some cases, to triple within the planning year 2020 as a result of growing population, increased leisure time, greater mobility, and greater disposable income. There is sufficient land and water within the NAR study area to satisfy recreation needs; however, those resources best suited for the purpose are far removed from the loci of greatest demand. Water pollution

varies greatly throughout the Study area in type and degree; nevertheless, pollution does exist in every basin to the extent that swimming potential is nowhere fully realized. The greatest pollution loads occur in those metropolitan areas which exhibit maximum recreation needs.

It is evident that sufficient water and related land exist in the Study area to adequately meet anticipated recreation demand. However, in all too many cases water quality is not sufficiently high to permit recreation, particularly bathing or other activities where the chance for ingestion is high. Water pollution of one kind or another exists in every basin, but the kind and degree of pollution varies widely from one basin to another.

Similarly, it appears that water-based recreation needs other than swimming can be provided for throughout the Study area. Probably the most far reaching and effective means would be as a corollary to the environmental quality movement. In most cases the technology exists to treat industrial and municipal wastes effectively, but the problem is basically one of economics. One important aspect here is the almost limitless opportunity for recreation which would accrue to urban dweller and ghetto resident alike were our streams to be restored to a degree of purity which would permit swimming. If this happy state of affairs is eventually reached, then providing for picnicking, boating, water-skiing, canoeing and sailing would be a relatively simple matter.

Other means cited in the Appendix for increasing recreation opportunity include improved access and recreation facilities at areas developed primarily for other needs, such as water supply, flood control, and low-flow augmentation reservoirs; the development of new parks and recreation areas, and the expansion of existing ones when it appears feasible; and the possibility of allowing recreation at privately-owned reservoirs built primarily for water supply.

Conclusions. It became obvious during the course of study that there are a number of ways whereby the recreation situation could be improved dramatically. Because water pollution is so widespread, and because it is so detrimental to recreation, every effort should be made to achieve approved water quality standards on or before target date. In this regard greatly increased Federal spending is an absolute necessity.

Uniform standards regarding permissible levels of pollutants within industrial wastes appear desirable. The diversity which now exists among State Regulations not only makes

enforcement difficult, but places corporations operating within a "strict" State at an economic disadvantage vis-a-vis competing firms located in States having more permissive regulations.

The advantages, especially the economy of scale, inherent in regional planning (multi-county or multi-state) for public works are not being realized to the maximum extent. A multitude of local governments - boro, township, and county, each jealous of its own authority and prerogatives, needlessly complicates the development of water supply, sewage disposal, and recreation facilities, and makes such improvements more costly than they need be.

Similarly, the concept of strong flood plain zoning and its proven usefulness in lessening flood damage, as well as in providing potential open space and recreation areas, appears to be misunderstood, and in general has not been utilized to the degree that its effectiveness warrants. A strong educational effort by interested State agencies is recommended. Effective flood plain zoning will, of course, limit monetary damage by restricting commercial or industrial development in areas which sooner or later will experience rampaging flood waters. If local officials decide to use areas so protected for active public recreation, then a program to provide for public access, facility development, and maintenance must be instituted.

The Chesapeake Bay and the coastal area of Maine are irreplaceable recreational assets, and the studies authorized for these areas should be vigorously pursued. Similarly, studies should be initiated immediately to ascertain the kind and extent of recreation suitable for public water supply reservoirs, and whether such recreation use would in fact compromise their basic purpose. Finally, it appears obvious that a clear definition of the Legal Rights of the public to use beaches, shorelines, and riverbanks for outdoor recreation is required. Among the various States comprising the NAR, there exists great differences in applicable statutes, and in the philosophy upon which such laws are based. Studies appear warranted to determine whether some uniformity is desirable, or even possible.

A considerable part of the legislation relating to water and recreation development, including the Land and Water Conservation Fund Act, stipulates that State or local interests bear a certain percentage of development costs, together with maintenance costs. In some instances local bodies have been financially unable to do so, and thus urgently required recreation facilities have not been developed. Congress should weigh the possibility of authorizing and funding a revolving trust fund from which local jurisdictions could borrow - at a realistic

rate of interest - to finance their share of such projects. User fees would have to be set high enough so that the recreation facility could be adequately maintained, and sufficient monies set aside to repay the loan.

There is indication that some areas subjected to strip-mining and subsequently reclaimed may again, at some future date, be subject to mining to remove coal which was considered uneconomic and difficult to remove during the first operation. Every effort should be made during strip-mining operations to remove all usable coal, even though such action may decrease the overall profitability of the venture. In this way an area once mined and reclaimed will remain aesthetically acceptable, and recreation facilities subsequently developed will not be lost.

Most of the foregoing conclusions are, by the nature of this study, oriented in one way or another toward water. However, outdoor recreation includes a great many more activities than the seven concentrated upon here, and it is obvious that the land base throughout the NAR - especially that portion which is privately owned - is being underutilized for outdoor recreation. Great strides have been made by a number of private paper and lumber companies in making their lands available for public use, but there is still much that can be done. Similarly, the cooperative program whereby public hunting and fishing opportunities are made available on privately-owned farms and woodlots has been a successful one, and it seems possible that the program could be expanded to include hiking, camping, nature study, photography, and similar activities. In summary, it appears that the portion of the recreation base in private hands is being underutilized, and BOR recommends that future water resource studies, particularly the Type 2 studies, examine this opportunity in greater depth.

IV - SUBREGIONAL SUMMARIES

1. ST. JOHN RIVER, MAINE.
2. PENOBSCOT RIVER, MAINE.
3. KENNEBEC RIVER, MAINE.
4. ANDROSCOGGIN RIVER, MAINE AND NEW HAMPSHIRE.
5. ST. CROIX RIVER, MAINE; AND ATLANTIC COASTAL AREA FROM THE INTERNATIONAL BOUNDARY TO CAPE SMALL, MAINE.

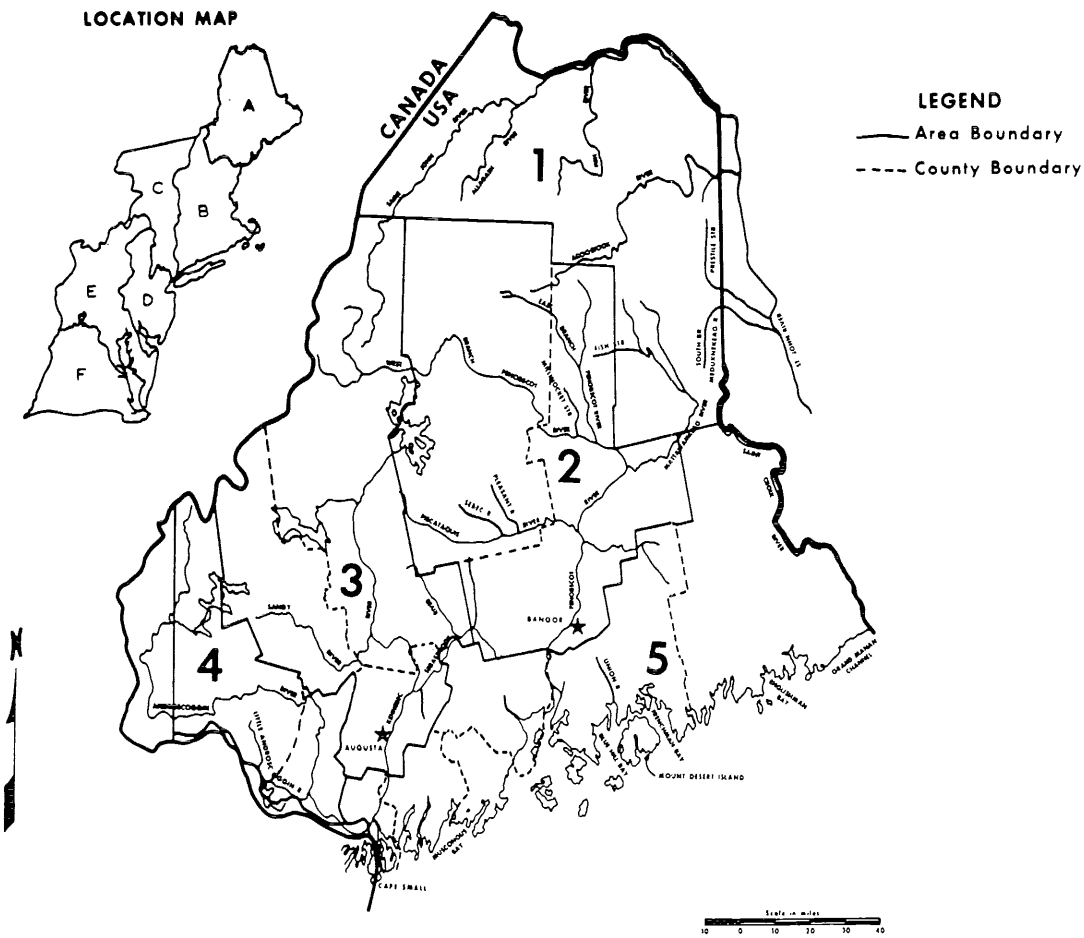


FIGURE M-2

SUBREGION A
Areas 1,2,3,4 and 5

LOCATION AND BOUNDARIES

FWPCA December 1969

IV - SUBREGIONAL SUMMARIES

SUBREGION A

Introduction. This subregion, the most northern part of the study area, comprises the State of Maine with the exception of the two southernmost counties: Cumberland and York. The subregion contains five major river basins which are identified as follows:

Basin 1. St. John River

2. Penobscot River

3. Kennebec River

4. Androscoggin River

5. St. Croix River and Atlantic Coastal Area

In general, the existing total water resource base exceeds the expressed recreation needs through target year 2020. Although the population of the subregion is concentrated in Basin 3, with the result that the Kennebec River is heavily polluted with both municipal and industrial wastes, there are varying amounts, and kinds, of pollutions in each of the remaining four basins. Specifically, municipal and industrial pollution occurs in the mainstems of the St. John, the Penobscot, the Androscoggin and, as mentioned, the Kennebec. In general, the upstream reaches of these streams, and many of the lakes, have been subject to much less pollution. The demand for water-based recreation opportunities in Maine has kept pace with the national trend. Table M-31 illustrates the projected increase in one popular activity - camping - for selected State Parks and for Acadia National Park. (1)

(1) Numerals in parenthesis refer to the bibliography at the end of the Appendix.

RECREATION LAND & WATER NEEDS

BASIN 1
FIGURE M-3

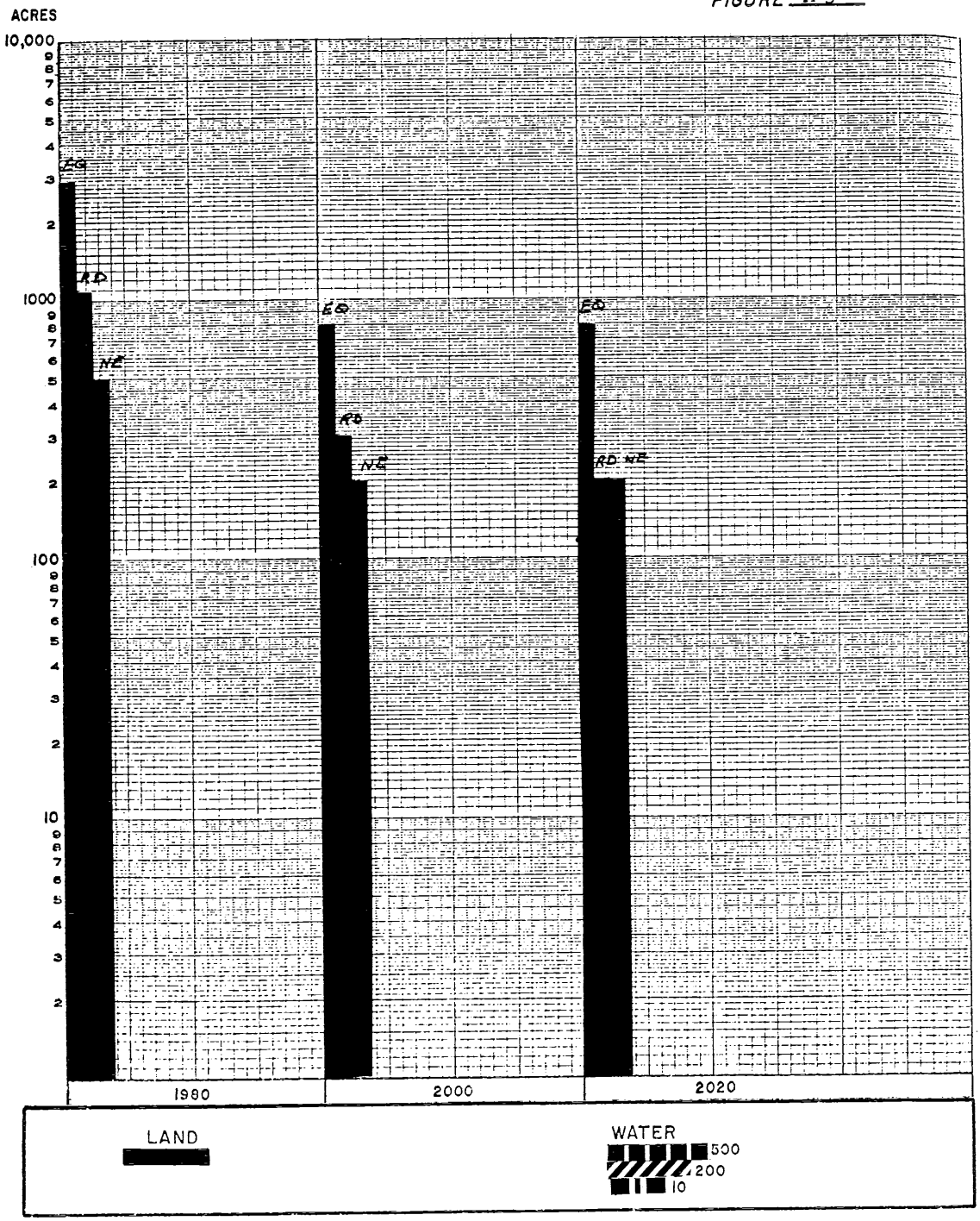


TABLE M-31

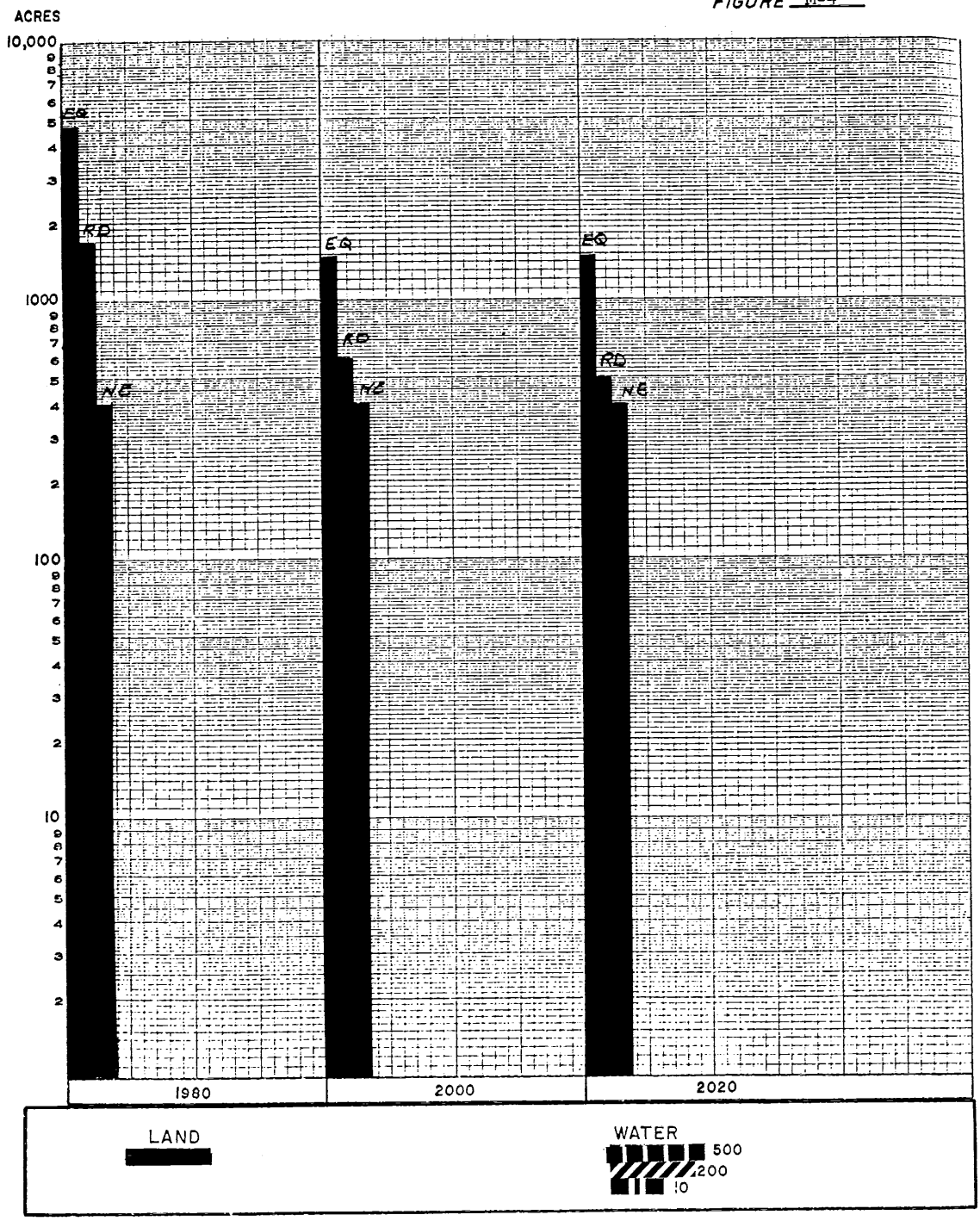
CAMPING TRENDS AND PROJECTS IN
SUBREGION A (RECREATION DAYS PER YEAR).

Parks	Average 1962-64	1976	2000	Percent Change 62-64 (avg).	to 76-2000
Acadia National Park	160,198	224,606	989,725	40	341
State Parks					
Aroostook	3,283	13,804	62,973	320	356
Bradbury	6,953	27,954	106,620	302	281
Camden Hills	24,863	52,448	207,680	111	296
Lamoine	7,446	37,146	102,269	399	175
Lake St. George	10,044	74,617	215,659	643	189
Mt. Blue	21,487	109,978	317,363	412	189
Sebago	96,985	191,408	814,684	97	326
Total State Parks	171,061	507,355	1,827,298	197	260

The Bureau has projected for each of the three target years, the annual participation in water-oriented outdoor recreation. It should be emphasized that the data in Table M-31, and subsequent tables, are not predictions, but rather mathematical extrapolations from a base population which, under various assumptions concerning future trends, such as births, deaths, and migration, indicate what the future size and composition of the population might be, and what must be provided in the way of physical plant to meet the demands of such projected populations for recreation opportunity. The population projected in this subregion for 2020 is 1,050,000; the 1960 population was estimated at 687,000.

RECREATION LAND & WATER NEEDS

BASIN 2
FIGURE M-4



It should be noted also that the values presented in these tables are incremental; that is, values listed for 2020, for instance, are over and above those listed for 2000, and those listed for 2000 are over and above those cited for 1980. In all cases, values given are net, unless otherwise indicated.

TABLE M-32

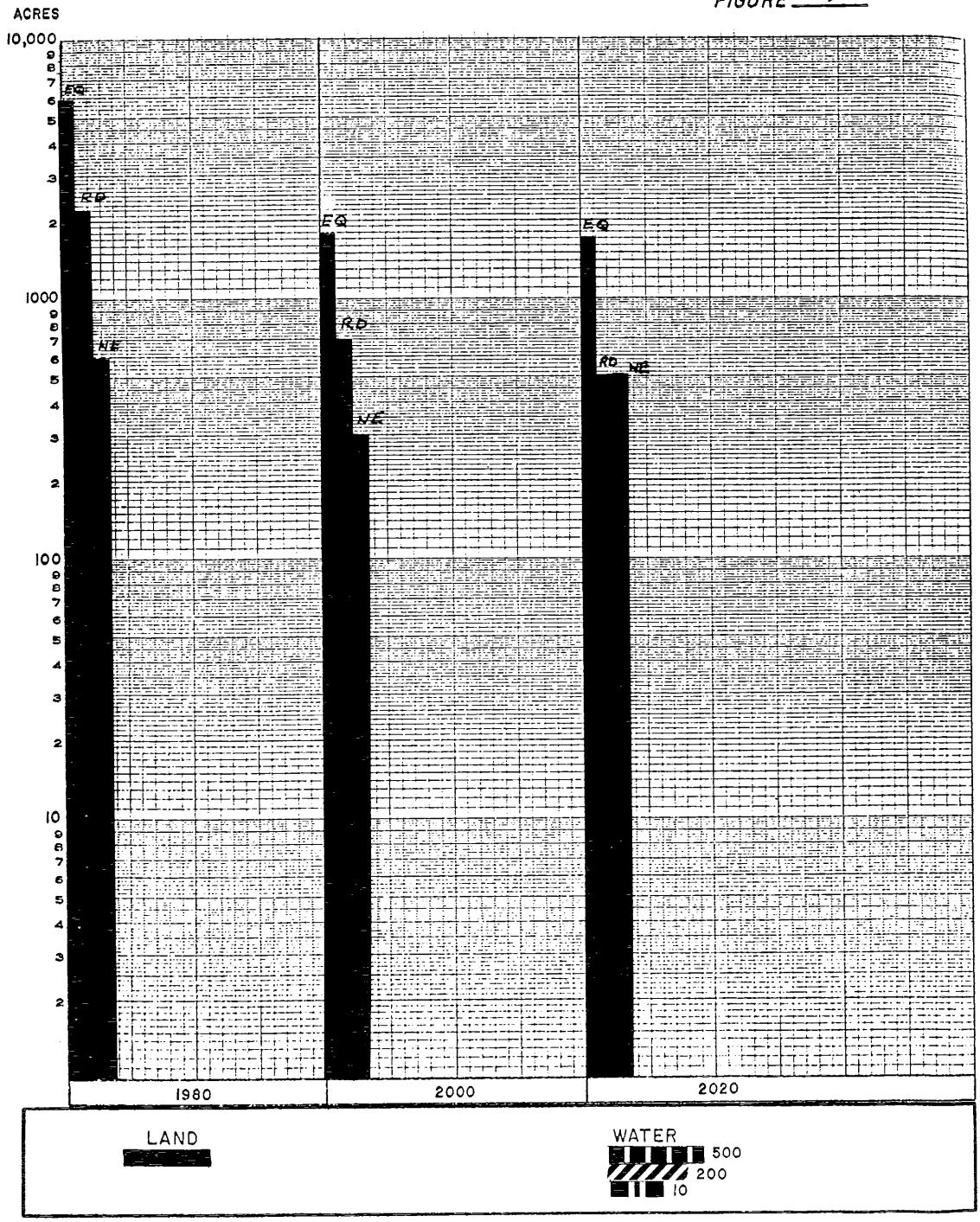
PROJECTED ANNUAL PARTICIPATION IN WATER-ORIENTED OUTDOOR RECREATION IN SUBREGION A BY BASIN AND TARGET YEAR (IN THOUSANDS)

	GROSS			NET		
Basin	1980	2000	2020	1980	2000	2020
			ENVIRONMENTAL OBJECTIVE			
1	2,406	1,294	1,463	1,681	949	957
2	4,585	2,500	2,934	2,763	1,644	1,811
3	5,492	2,876	3,385	4,952	1,936	2,095
4	3,820	1,899	2,298	2,339	1,157	1,255
5	6,286	3,356	3,967	663	816	1,541
			REGIONAL DEVELOPMENT OBJECTIVE			
1	2,464	1,323	1,464	1,662	946	857
2	4,689	2,558	2,776	2,589	1,656	1,600
3	5,616	2,940	3,202	3,290	1,949	1,863
4	3,907	1,943	2,171	2,171	1,193	1,120
5	6,429	3,459	3,727	516	268	633
			NATIONAL INCOME OBJECTIVE			
1	2,104	1,115	1,593	1,143	740	1,080
2	4,006	2,165	3,155	1,098	1,123	1,892
3	4,804	2,490	3,649	1,580	993	2,246
4	3,342	1,644	2,509	758	726	1,383
5	5,496	2,930	4,266	357	251	589

Needs. In order to meet the ever-increasing demand for outdoor recreation facilities as illustrated in Table M-32, the needs for recreation land, beach acreage, and for other facets of the recreation base have been computed. The standards utilized have been discussed in detail in Chapter II under Methodology; suffice to say, the standards used in computing needs under the Environmental Quality Objective are the most conservative, so

RECREATION LAND & WATER NEEDS

BASIN 3
FIGURE M-5



that use of facilities designed to these standards will result in a quality recreation experience. The standards used in computing needs under the National Income Objective are the least demanding, whereas those used for the Regional Development Objective fall midway between the two.

Table M-33 lists recreation land needs for each target year and objective. The acreage involved, particularly under Regional Development and the National Income Objectives, are not particularly large, and even the acreage required under the Environmental Quality Objective is small when compared to the other five subregions. As might be expected, the greatest needs are anticipated for 1980, regardless of the objective selected. This, of course, reflects the accumulated, unmet demand for outdoor recreation, and the difficulties that many public agencies are having in providing for it.

RECREATION LAND & WATER NEEDS

BASIN 4
FIGURE M-6

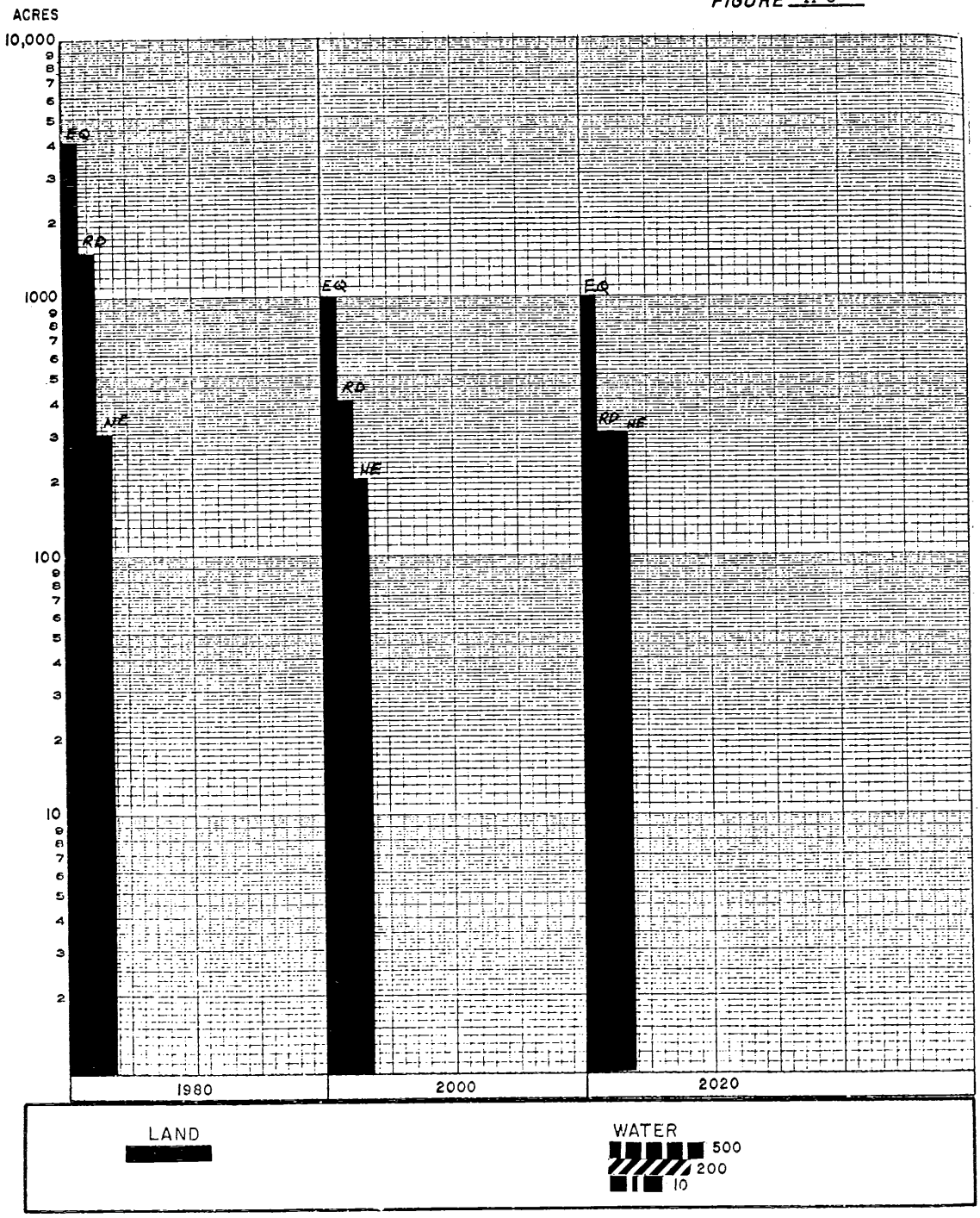


TABLE M-33

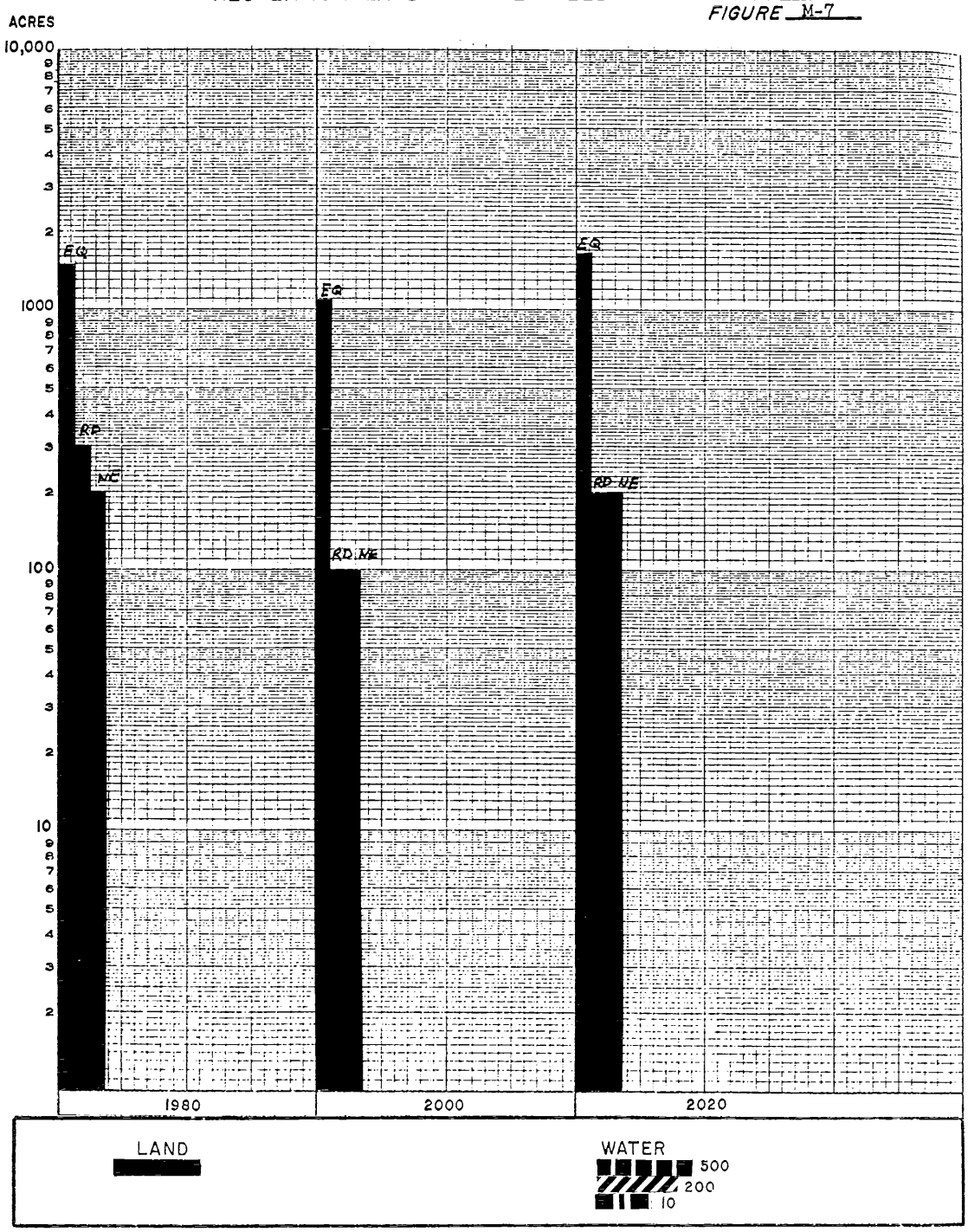
RECREATION LAND NEEDS IN SUBREGION A
BY BASIN AND TARGET YEAR
(IN ACRES)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
			ENVIRONMENTAL QUALITY OBJECTIVE			
1	4,200	1,200	1,100	2,900	800	800
2	7,900	2,300	2,200	4,800	1,500	1,500
3	9,500	2,600	2,500	6,000	1,800	1,700
4	6,600	1,600	1,700	4,100	1,000	1,000
5	10,800	3,100	3,200	1,500	1,100	1,700
			REGIONAL DEVELOPMENT OBJECTIVE			
1	1,500	400	300	1,100	300	200
2	2,800	800	700	1,700	600	500
3	3,300	900	800	2,200	700	500
4	2,300	600	500	1,500	400	300
5	3,800	1,100	900	300	100	200
			NATIONAL INCOME OBJECTIVE			
1	800	200	300	500	200	200
2	1,400	400	600	400	400	400
3	1,700	500	700	600	300	500
4	1,200	300	400	300	200	300
5	2,000	600	800	200	100	200

Tables M-34 and M-35 list the gross and net recreation beach and pool requirements, respectively. As might be expected, the requirements under Regional Development and National Income Objectives for Basin 5 are zero, since the existing capacity at Crescent Beach State Park, Reid State Park, Popham Beach State Park, and Acadia National Park appears sufficient to meet the standards inherent in these two objectives. Under the Environmental Quality Objective, however, needs of 21 and 29 acres are anticipated for 2000 and 2020, respectively, for the basin. It would appear desirable that some thought be given to prompt acquisition of beach property whenever it becomes available - either by State or local recreation authorities - as a reserve for

RECREATION LAND & WATER NEEDS

BASIN 5
FIGURE M-7



satisfying the needs which are expected to materialize in 2000 and 2020 under the Environmental Quality Objective. One technique which suggests itself here is the "leaseback" arrangement, whereby a public agency acquires title in fee to a certain tract for eventual public use; however, since the need is not immediate, the property can be leased to the former owner, usually for his lifetime. Such an arrangement has worked to the mutual satisfaction of all concerned in similar situations.

TABLE M-34

RECREATION BEACH NEEDS IN SUBREGION A
BY BASIN AND TARGET YEAR
(IN ACRES)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
			ENVIRONMENTAL QUALITY OBJECTIVE			
1	76	18	12	71	18	12
2	142	34	24	118	34	24
3	168	37	26	139	37	26
4	117	24	17	90	24	17
5	192	46	29	0	21	29
			REGIONAL DEVELOPMENT OBJECTIVE			
1	59	15	6	54	15	6
2	111	27	13	87	27	13
3	132	29	14	103	29	14
4	92	19	8	65	19	8
5	151	35	16	0	0	0
			NATIONAL INCOME OBJECTIVE			
1	21	5	7	16	5	7
2	40	9	13	16	9	13
3	47	10	15	18	10	15
4	33	6	10	6	6	10
5	54	12	18	0	0	0

Table M-35 pertains to the pool acreage required to satisfy the swimming demand in the unlikely event that beach needs previously discussed cannot be provided. Swimming, of course, is a highly popular outdoor recreation activity and, in actual

practice, the demand will no doubt be met by a combination of beach development (ocean and fresh water) and pool construction.

TABLE M-35

SWIMMING POOL NEEDS IN SUBREGION A
BY BASIN AND TARGET YEAR
(IN THOUSANDS SQUARE FEET)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
		ENVIRONMENTAL QUALITY OBJECTIVE				
1	1,319	315	204	1,232	315	204
2	2,463	600	418	2,045	600	418
3	2,921	652	446	2,416	652	446
4	2,041	413	281	1,572	413	281
5	3,344	792	508	0	362	508
		REGIONAL DEVELOPMENT OBJECTIVE				
1	1,025	244	108	939	244	108
2	1,915	467	229	1,501	467	229
3	2,270	507	236	1,770	507	236
4	1,587	322	143	1,121	322	143
5	2,600	617	268	0	0	0
		NATIONAL INCOME OBJECTIVE				
1	412	98	132	315	98	132
2	770	188	260	302	188	260
3	914	204	290	348	204	290
4	638	130	197	112	130	197
5	1,046	248	338	0	0	0

Boating, sailing, canoeing, and water-skiing are all popular recreation activities and, unlike camping and picnicking, a body of water is absolutely essential if they are to take place. A study of the accumulated data reveals that in each of the five basins comprising Subregion A there is sufficient water for such activities. In this regard, Subregion A is in much better condition than any of the other subregions comprising the study area. Table M-36 lists needs for gross water surface acreage; there is no table listing net needs since none were identified. The

significance of the size classification is chiefly one of safety, i.e., the belief that boats greater than 20 h.p. require broad water areas of 500 acres or more, while less powerful craft, and sailboats, can be safely operated on smaller water bodies. The classification also served as an effective means to adequately review and analyze the basic data. It should be noted that although gross water surface acreage needs are, for the most part, of considerable magnitude, no net needs have been identified - even under the Environmental Quality Objective for 2020. Thus, the use of recreation, either singly or in combination with other purposes, as justification for proposed impoundments would be extremely difficult to justify.

TABLE M-36

GROSS WATER SURFACE ACREAGE NEEDS IN SUBREGION A
BY UNIT SIZE CLASSES, FOR INDIVIDUAL BASINS AND TARGET YEARS
(ACRES)

Basin	1980 >500	1980 >200	1980 >10	2000 >500	2000 >200	2000 >10	2020 >500	2020 >200	2020 >10
				ENVIRONMENTAL QUALITY OBJECTIVE					
1	5,000	2,100	400	2,200	900	200	1,900	1,200	100
2	9,800	4,200	700	4,500	1,900	300	4,100	2,500	300
3	12,000	5,100	900	5,200	2,200	400	4,800	3,000	400
4	8,200	3,400	600	3,500	1,400	300	3,300	2,000	300
5	13,600	5,700	1,000	6,100	2,500	500	5,700	3,500	400
				REGIONAL DEVELOPMENT OBJECTIVE					
1	2,700	1,000	200	1,200	500	200	1,000	600	100
2	5,300	2,100	300	2,500	900	200	2,200	1,300	100
3	6,500	2,500	400	2,800	1,100	200	2,600	1,500	200
4	4,400	1,700	300	1,900	700	100	1,800	1,000	100
5	7,400	2,900	500	3,300	1,200	200	3,100	1,700	200
				NATIONAL INCOME OBJECTIVE					
1	1,500	500	100	700	200	0	600	300	0
2	2,900	1,000	100	1,400	400	100	1,200	600	0
3	3,600	1,200	100	1,600	500	100	1,400	700	100
4	2,300	800	100	1,000	300	0	1,100	500	100
5	4,100	1,300	200	1,800	600	100	1,700	800	100

The final item to be discussed under NEEDS is streams, principally for canoeing, but possibly also for such water-enhanced activities as camping and picnicking. Table M-37 indicates that no net needs exist other than in Basin 5 under the Environmental Quality for the year 2020. What is required, specifically, are public access areas to those stream which offer good canoeing, and also overnight campsites along those streams and lakes favored by canoeists.

TABLE M-37

RECREATION STREAM NEEDS IN SUBREGION A
BY INDIVIDUAL BASIN AND TARGET YEAR
(MILES)

	GROSS			NET		
Basin	1980	2000	2020	1980	2000	2020
		ENVIRONMENTAL QUALITY OBJECTIVE				
1	28	7	13	0	0	0
2	57	16	26	0	0	0
3	71	18	31	0	0	0
4	45	10	20	0	0	0
5	78	20	34	0	0	7
		REGIONAL DEVELOPMENT OBJECTIVE				
1	14	3	7	0	0	0
2	28	8	13	0	0	0
3	35	9	15	0	0	0
4	22	5	10	0	0	0
5	38	10	17	0	0	0
		NATIONAL INCOME OBJECTIVE				
1	9	2	5	0	0	0
2	19	5	9	0	0	0
3	24	5	11	0	0	0
4	15	3	7	0	0	0
5	26	6	12	0	0	0

Satisfying Needs. Everything about Subregion A - the climate, topography, vegetation, and adequate water supply - indicates that it could become a recreation paradise. To a certain extent, it already has, but there is no reason why, with proper regional

planning and judicious investment, this role could not be expanded immensely. Situated to the north of megalopis, and yet relatively close to large population centers, i.e., Massachusetts, Connecticut, and eastern New York, the region contains an abundance of the natural amenities for which people are willing to travel ever-increasing distances, and to expend considerable sums while so doing. It appears most desirable, in short, that recreation planning in this subregion proceed under the Environmental Quality Objective.

Thus, in the discussion that follows, an effort will be made to satisfy those needs identified under the Environmental Quality Objective in Tables M-33 through M-37. In general, it appears most desirable to utilize natural water bodies by either establishing new recreation areas, or by expanding existing ones, rather than by lowering standards to accommodate additional recreationists at existing sites. The construction of reservoirs, either as single purpose recreation projects, or in conjunction with flood control, appears unwarranted.

The greatest needs exist in Basins 2, 3, and 4; here is found the bulk of the Region's population, and it is here that the demand, particularly for day-use facilities, is greatest.

Basin 2. In order to alleviate growing pressure on Baxter State Park, some thought should be given to expanding this Reservation to include Togue Ponds to the southeast, or Nesowadnehunk Lake to the west, with appropriate development for camping, swimming, picnicking and boating. In addition, the expansion of existing camping areas and trailside development in Baxter State Park and development of new camping areas at appropriate locations, in keeping with the policy of preserving the natural wilderness character of the Park, appears feasible. It also appears desirable to expand the existing camping facility on White Horse Lake to allow for increased camping, swimming and boating, and to develop a second area having similar facilities. A total of 500 acres is envisioned for both areas. Such development at White Horse Lake could be designed principally for camper and trailer-type camping in a natural environment area, and would do much to help preserve the wilderness aspect for which Baxter State Park was established.

Basin 3. This basin - the Kennebec - has the largest population of the five basins, and is characterized by a lack of both weekend and day-use facilities. In order to rectify this situation, the development of a 2500-acre park with appropriate facilities for day, weekend, and vacation use is recommended in the Belgrade Lakes Area to the west of Augusta. This city has a proven lack of water-based recreation opportunity, and such a park would

do much to alleviate the situation. To the north, it is recommended that existing campgrounds be expanded to approximately 1500 acres on Moosehead Lake for general public recreational purposes. Appropriate facilities for day, weekend, and vacation use, principally for camping, swimming, picnicking, and boating are recommended. In addition, development of three new public camping areas, totaling approximately 500 acres, is proposed in the headwaters portion of the basin above Moosehead Lake and in the Dead River Sub-basin, with appropriate facilities, including access roads to the sites. Thus, by a judicious combination of new development and expansion of existing facilities, a total of 4500 acres could be made available. Table M-33 indicates that some 6000 acres are required by 1980 in this basin if the Environmental Quality Objective standards are to be satisfied. The demand for vacation cottages and recreation land for private use is greater here than elsewhere in the State, and prompt acquisition is urged before land prices spiral beyond the reach of public recreation agencies.

Basin 4. The Androscoggin Basin contains a number of scenic areas which, when properly developed, will offer ample opportunity for a variety of water-based recreation activities, including camping, swimming, picnicking, boating, and related activities. Two of the more promising include development of approximately 900 acres at Mooselookmeguntic Lake, and a larger development of 1200 acres at Androscoggin Lake. In addition, development of three campgrounds in the upper part of the basin, each with lake frontage, appears highly feasible. Each campground should have necessary facilities including roads, parking spaces, campsites, trails, sanitary facilities, and waterfront development. Location and approximate acreage are as follows: Aziscohos Lake, 200 acres; Lower Richardson Lake, 400 acres; and Grafton Notch, 500 acres. In the southern portion of the basin, anticipated development of park facilities at Poland Spring, together with those existing at Sebago Lake State Park, should provide adequate recreation opportunity for residents of the Lewiston - Auburn region.

Basin 5. As previously mentioned, the usual needs as calculated for this basin are extremely small, even under the Environmental Quality Objective. What is required here is a broad, in-depth look at the entire basin - its resources, especially the coast, and its people. Every effort should be made to maintain the northern portion (identified in this Study as sub-area 5a) in its present state. The ideal way of accomplishing this would be to set aside as wilderness some 40,000 to 50,000 acres in the West Grand Lake country. In addition, serious thought should be given to establishing a large, varied-use, destination-type park either as an adjunct to, or as a facility completely separated from, the wilderness area. The development of the

park appears justifiable under either the Environmental Quality or the Regional Development standards and, if done properly, might act as a significant stimulus to the local economy.

The in-depth study mentioned above must of necessity include the coast. The kind of eventual development, its extent, location, and its possible destructive effects on the environment and on other human pursuits must be considered and weighed most carefully.

Throughout this chapter the desirability of implementing Environmental Quality Objective standards in Subregion A has been emphasized. Our studies indicate that surface water exists in sufficient quantity to meet projected demands for water-based outdoor recreation, and that recreation needs should be met either by the development of new recreation areas, or by the expansion of existing ones. In its publication OUTDOOR RECREATION FOR MAINE, 1966, the Maine State Park and Recreation Commission indicates that it will pursue this course. Thus, in order to satisfy recreation demand originating in the Lewiston - Auburn Area, a new park at Poland Spring is planned and is currently being developed. Similarly, a new park similar to Reid State Park (ocean bathing, no camping) is recommended. The establishment of this park was given top priority.

In order to satisfy demand, the Commission recommended that other parks be expanded to provide for day use. Lily Bay, Bradsbury Mountain, and Moose Point State Park are in this category, and the needs being provided for include picnicking, swimming, playfields, and parking. In order to satisfy the demand for day-use recreation, the construction of small state parks of not less than 100 acres has been proposed. Such areas would provide for swimming and picnicking, but would not be developed for camping or other extended use. Two such parks, scaled to meet the market area for which they are intended, have been proposed for the Bangor area and for the Lewiston - Auburn area. (2)

Special Considerations. The foregoing recommendations, if implemented, would provide greatly increased opportunities for both day-use and vacation-type recreation to resident and visitor alike. Our purpose in this section is to consider, however briefly, some problems of a more specific nature. As time progresses, areas generally identified as being wild or wilderness are being destroyed, not only by the direct incursion of civilization, i.e., roads, bridges, dams, and other works of man, but also through overuse by the very same recreationists dedicated to their preservation. The opportunity exists to identify and set aside for future use two wilderness areas in Subregion A.

The first is situated in the area between Rangely Lake State Park in the western portion of Basin 3, and Grafton Notch State Park in Basin 4. The establishment of a wild or wilderness area embracing some 40,000 to 50,000 acres, including a considerable portion of the Appalachian Trail, would do much to preserve high quality recreation land for the use of future generations. The second area, already mentioned, would involve some 40,000 acres near West Grand Lake in the northern portion of Basin 5. It is interesting, and somewhat depressing, to note that these two areas, together with one possible wilderness area in north central Pennsylvania, constitute the last remaining areas in the Study area deemed suitable for designation as "wilderness."

Similarly, some thought should be given to investigating and possibly including in the National Wild and Scenic River System those streams which meet the requirements. The East and West Branches of the Penobscot are mentioned by name in the Wild and Scenic Rivers Act (P.L. 90-542) as a potential addition to the national system; it would appear that others, such as the Aroostook, and the upper reaches of the Androscoggin and the Kennebec, warrant similar investigations. In this regard, it should be mentioned that the Maine State Park and Recreation Commission has initiated a study of the State's river corridors to determine possible sites for acquisition and development or preservation by Federal, State, or local agencies. The first such study has been concluded, and a report on it - the Saco River Study - was released in late 1969. (3) Similar studies are proposed on the Salmon Falls River Corridor, the Androscoggin River Corridor, the Kennebec River Corridor, the Penobscot River Corridor, the Machias River Corridor, the St. Croix River Corridor, the Aroostook River Corridor, the Allagash Wilderness Waterway, and the St. John River Corridor. Hopefully, such a series of studies might form the nucleus for a State System of Wild and Scenic Rivers. Such action by the various States is recommended in the Federal legislation referred to above.

In addition to the problem of industrial and municipal pollution previously discussed, other problem areas affecting water management and hence, outdoor recreation, exist, and these should be examined.

One phenomenon which warrants special consideration is the growth in popularity of the "vacation home," and the havoc which results to the landscape, and often to ground water, when such homes are built on soils poorly suited to that purpose. Strong regional planning and effective zoning or other controls will be required to avoid the water pollution and poor land-use practices which all too often have characterized vacation home construction elsewhere in the study area.

Another problem, and one which stirs a great deal of controversy, is the type of use which will evolve in the coastal area. The coast of Maine is well know for its rugged beauty and charm; nevertheless, certain portions are fragile, from an ecological point of view, and means must be found whereby these areas, indeed, the entire coast, are managed and developed (or left undeveloped) in an intelligent and logical manner. The Coastal Zone Planning effort scheduled for 1972 by the State Planning Office hopefully will provide some much needed information and answers.

Summary. Subregion A possesses the potential of being developed into a recreation paradise, and it is recommended that water management goals be set that will, when achieved, result in a quality environment. It is recognized that in certain locales, for instance, along the coast in Basin 5, and in certain portions of Basin 1, steps may be undertaken to stimulate the economy, but the needs to protect the environment during such development cannot be overemphasized.

The Region possesses a variety of land forms, all of which lend themselves to one kind or another of outdoor recreation. There is sufficient surface water to satisfy anticipated needs for water-based outdoor recreation through 2020, even under the Environmental Quality Objective standards, and it is, in many cases, largely unpolluted. However, extensive water pollution does exist locally, particularly around centers of population, and in the downstream reaches of the largest rivers. Water quality thus appears as a major problem, and somehow the money must be found to fund adequately the construction of waste treatment plants, and to assist industry in finding some solution to the economic squeeze of pollution control.

Recreation needs have been studied, and it appears that those needs relating to swimming are the most critical. The problem arises from the high pollution loads in heavily-populated areas, and limited public access to high quality water - both fresh and ocean. Adequate control of liquid waste and solid waste should in time correct the first problem, but the other problem may not be solved until such time as the right of eminent domain becomes a reality. In the meantime, short range needs can be provided for either by expanding existing sites, when it is possible to do so without jeopardizing existing high standards, or by acquiring and developing new recreation areas. The construction of indoor - outdoor pools for year-round use, especially in areas having high water pollution, should be explored. It is not recommended that the increasing swimming demand be met by lowering design standards of existing areas so that more recreationists can be accommodated.

Boating, water-skiing, sailing and canoeing are all popular recreation activities, and it appears that slack-water sufficient to meet anticipated demand exists in all basins. No net needs have been identified - even under the Environmental Quality Objective for 2020 - thus the use of recreation, either singly or in combination with other purposes, as justification for proposed impoundments would be difficult to defend. It appears that flood control can best be realized by non-structural measures, particularly flood-plain management techniques.

In several less-inhabited portions of the Region the opportunity exists to set aside unspoiled land as wilderness areas, and serious thought should be given to it. Two such areas have been named specifically: the area between Rangely Lake State Park and Grafton Notch State Park, in Basins 3 and 4, and at or near West Grand Lake in Basin 5. Similarly, many streams currently unspoiled and unregulated appear eminently qualified for addition to the National System of Wild and Scenic Rivers, and studies to ascertain which streams are in fact so qualified are recommended.

Other problems exist which, although they appear principally as land use problems, may ultimately involve the pollution of both surface and ground water supplies. One problem, perhaps the less-complicated, relates to the development of "recreation-communities," typically on a lake-shore by large, land-holding or timber companies or their subsidiaries. The other, perhaps more serious problem, concerns the individual who purchases a small tract and constructs a vacation or weekend shelter thereon. The "A"-frame-type shelter could serve as a typical example. In all too many cases such development has been done on soils poorly suited to the purpose, and the end result has been contamination of ground-water or nearby surface waters or both.

Management of the water resource, and related lands, should proceed within the Environmental Quality Objective. It is recognized that other human needs exist, and that at times the Environmental Quality Objective must be modified either to stimulate economic activity, or to provide for its continued growth. One of the best ways to achieve the latter objective, of course, is to give a man quality environment in which to live and work.

6 PRESUMPSCOT RIVER, MAINE; SACO RIVER, MAINE AND NEW HAMPSHIRE; PISCATAQUA RIVER, NEW HAMPSHIRE AND MAINE; AND ATLANTIC COASTAL AREA FROM CAPE SMALL, MAINE TO NEW HAMPSHIRE-MASSACHUSETTS STATE LINE
7 MERRIMACK RIVER, NEW HAMPSHIRE AND MASSACHUSETTS
8 CONNECTICUT RIVER, VERMONT, NEW HAMPSHIRE, MASSACHUSETTS AND CONNECTICUT
9 NARRAGANSETT BAY DRAINAGE, MASSACHUSETTS AND RHODE ISLAND; PAWCATUCK RIVER, RHODE ISLAND AND CONNECTICUT; AND ATLANTIC COASTAL AREA FROM NEW HAMPSHIRE-MASSACHUSETTS STATE LINE TO RHODE ISLAND-CONNECTICUT STATE LINE.
10 THAMES RIVER, CONNECTICUT, MASSACHUSETTS AND RHODE ISLAND; HOUSATONIC RIVER, CONNECTICUT, MASSACHUSETTS AND NEW YORK, AND CONNECTICUT COASTAL AREA

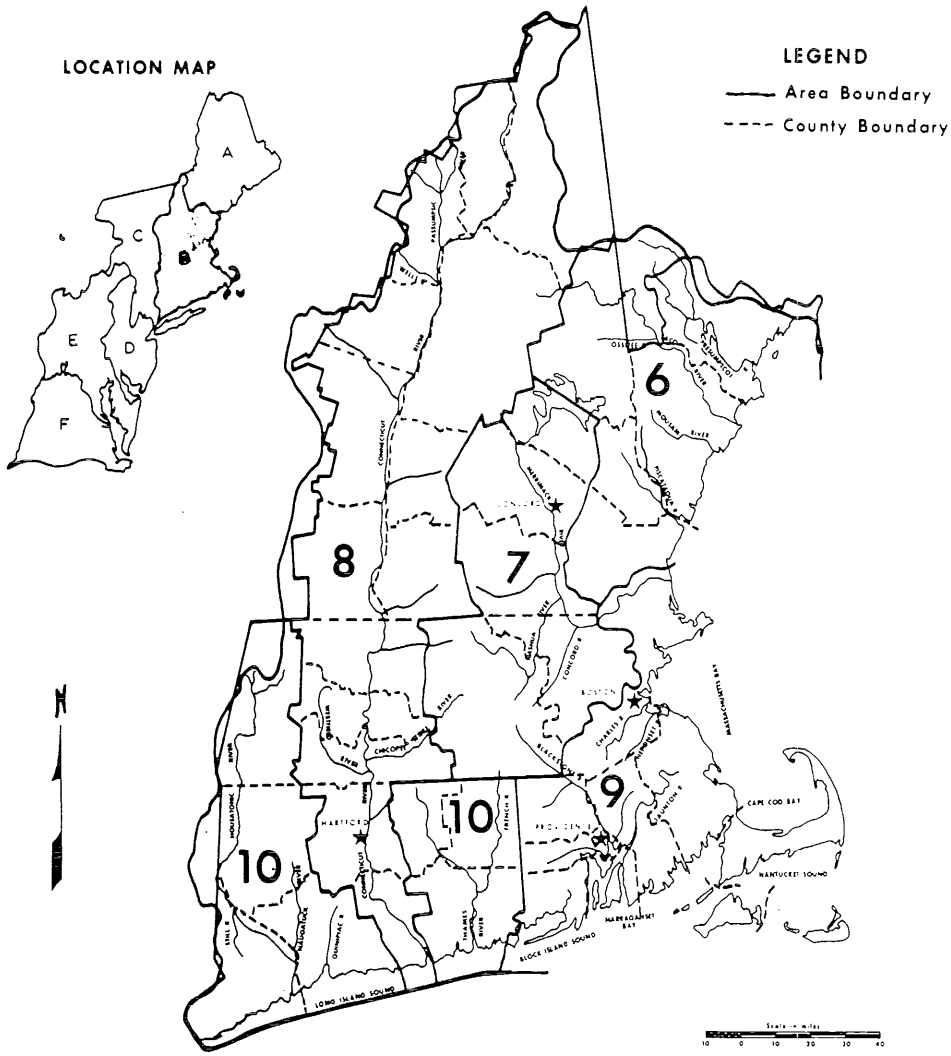


FIGURE M-8

SUBREGION B
Areas 6,7,8,9 and 10

LOCATION AND BOUNDARIES

FWPCA December 1969

SUBREGION B

Introduction. This subregion stretches from Canada south to Long Island Sound, and is bounded on the east by Maine, and on the west by New York State. It includes all of New Hampshire, Massachusetts, Connecticut, Rhode Island, and that portion of Vermont drained by the Connecticut River. Also included are the two southern counties of Maine not included in Subregion A, i.e., York and Cumberland. This Subregion is divided into five principal basins, as follows:

Basin 6. Presumpscot and Saco Rivers, Piscataqua River, and the Atlantic Coastal area.

Basin 7. Merrimack River

Basin 8. Connecticut River

Basin 9. Narragansett Bay, Pawcatuck River, and Atlantic Coastal area.

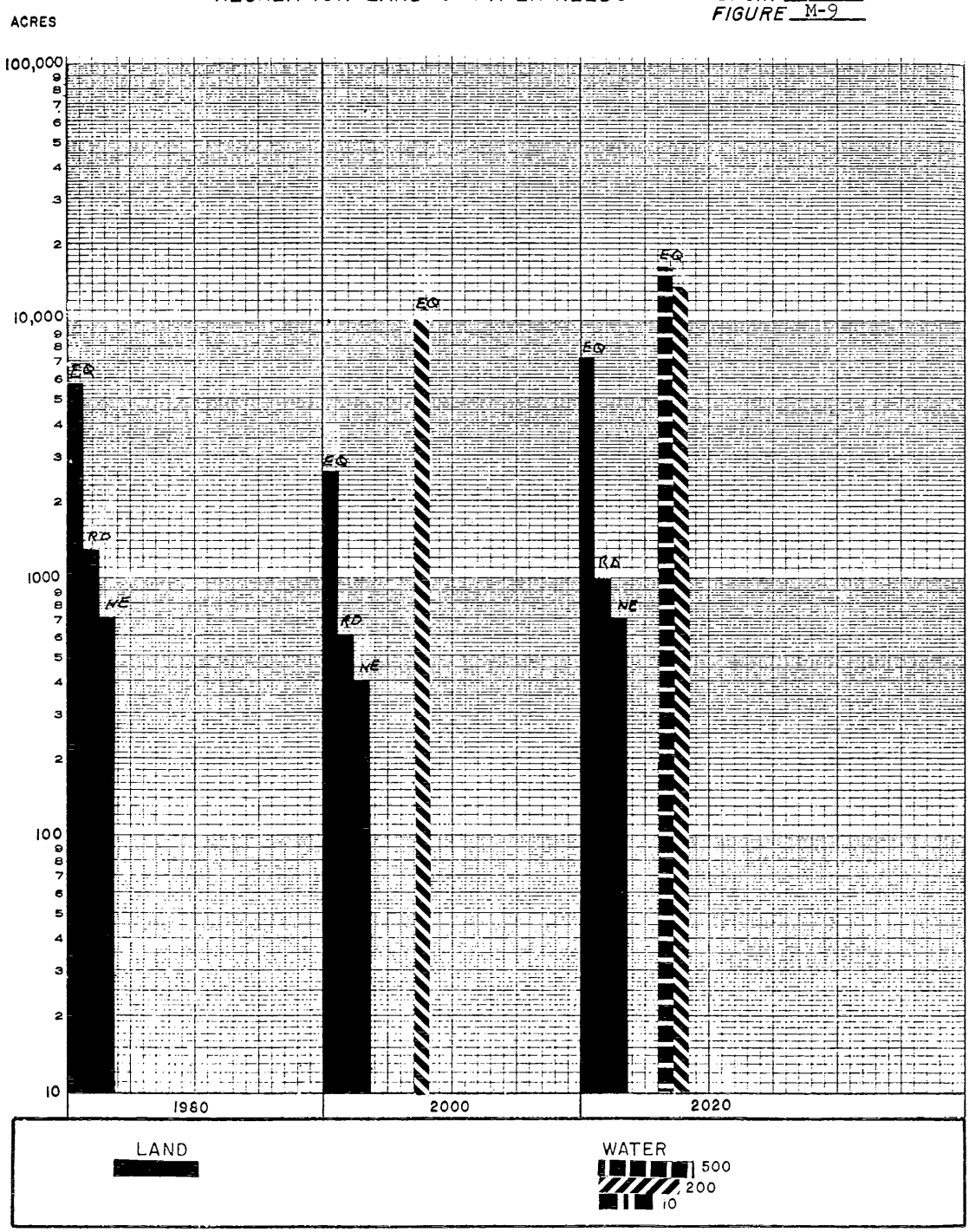
Basin 10. Thames and Housatonic Rivers, and Connecticut Coastal area.

The topography, physiographic form, climate, and vegetation of the subregion are remarkably varied, and the potential exists for a great diversity in kinds of outdoor recreation. Much of the region is characterized by rugged topography, with the most spectacular being, perhaps, the Presidential Range of the White Mountains in New Hampshire. There is an extensive network of rivers and streams throughout the area which offer many picturesque waterfalls and river gorges. The climate is as favorable to recreation enjoyment as is the topography. Relatively cool summers along the coast and in the mountain areas make it ideal for summer vacations. The heavy snowfall in the mountain areas makes the region popular as a winter sports center. In some years summer activities are engaged in along the southern seacoast before skiing opportunities cease in the mountains. The long mild springs and the clear crisp autums with their brilliant foliage are also conducive to an extensive tourist season. Nowhere else in the United States does this annual display of brilliant color occur on the scale that it does in the northeast, and it surely must be one of the principal attractions of the area. Interestingly enough, this phenomenon is duplicated in only one other portion of the world, i.e., northern China.

The population of Subregion B is much greater than that of Subregion A, and it is concentrated in the southern half of the region, i.e., Massachusetts, Connecticut, and Rhode Island. The number of persons residing in Subregion B in 1960 was estimated to be 9,549,678. Resident population for the target years of 1980, 2000, and 2020 are estimated to be 11,782,000; 14,766,000; and

RECREATION LAND & WATER NEEDS

BASIN 6
FIGURE M-9



18,317,000, respectively. In essence, then, the resident population is expected to double between 1960 and 2020. In terms of recreation demand upon the resource base by this ever-expanding population, the statistics in Table M-38 are of interest.

TABLE M-38

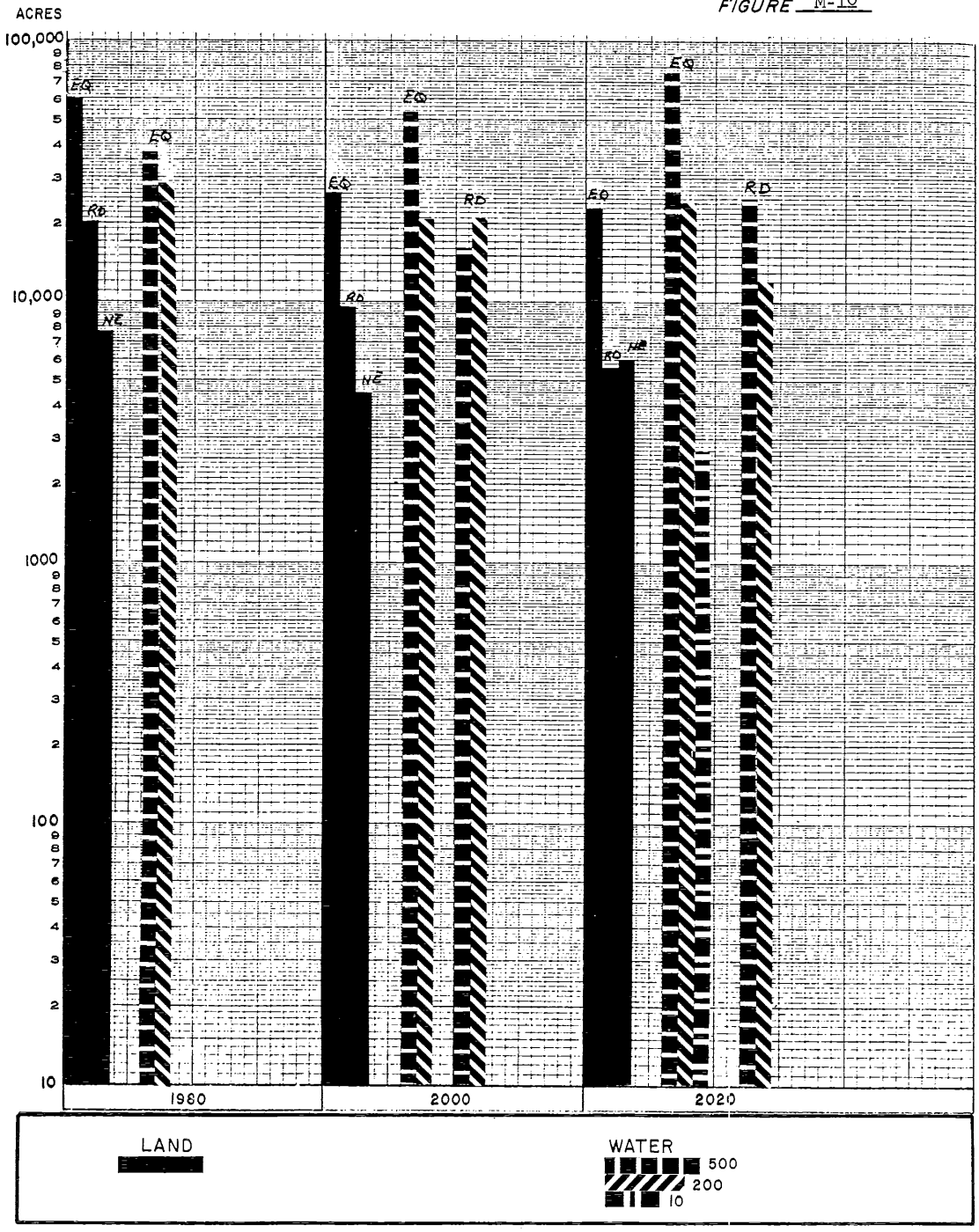
PROJECTED ANNUAL PARTICIPATION IN WATER-ORIENTED OUTDOOR RECREATION IN SUBREGION B BY BASINS AND TARGET YEARS (IN THOUSAND OF RECREATION DAYS)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
		ENVIRONMENTAL QUALITY OBJECTIVE				
6	21,399	13,311	15,326	2,822	2,514	8,623
7	58,306	37,105	37,133	45,251	34,214	34,343
8	55,577	33,002	49,941	40,236	29,563	40,592
9	91,883	54,302	66,118	43,525	43,249	57,145
10	91,157	59,250	74,283	47,437	41,885	53,894
		REGIONAL DEVELOPMENT OBJECTIVE				
6	21,923	13,621	14,550	2,411	1,344	3,067
7	59,660	37,990	34,981	40,779	34,486	30,084
8	56,795	33,778	43,960	34,281	29,586	36,254
9	94,029	55,597	62,788	21,291	15,721	36,898
10	93,335	60,702	66,587	27,617	37,834	46,040
		NATIONAL INCOME OBJECTIVE				
6	18,747	11,568	16,696	1,951	1,290	2,891
7	50,991	32,135	41,391	25,070	21,449	28,329
8	48,536	28,317	46,204	15,763	16,904	30,935
9	80,344	46,982	72,107	17,303	14,091	28,834
10	79,638	51,265	76,866	12,987	29,484	49,758

It must be remembered in studying Table M-38 that the values given are incremental. The significance of the gross figures lies in the fact that these are the total attendance figures projected for the seven recreation activities under consideration for the Basin and Target Year indicated. Some part of this demand will, of course, be provided for by facilities which now exist or which definitely will be developed between now and a given target year. Some part of the demand will not be met, and the magnitude of this net unsatisfied demand is indicated in the net figures.

RECREATION LAND & WATER NEEDS

BASIN 7
FIGURE M-10



It is possible, therefore, not only to discern the relation proportion, or percentage, which a given basin bears to the subregion's total recreation load, but also to see just what must be accomplished within each individual basin. In Basin 6, for instance, the picture is relatively bright: existing facilities will provide for some 87 percent of the anticipated 1980 demand. In the remaining four basins, however, the picture is less encouraging. It appears that for Basins 7, 8, 9, and 10 the existing, and definitely proposed, recreation plant will provide for only 22, 28,53, and 47 percent, respectively, of the anticipated 1980 recreation load. A comparison of the data in Table M-38 with similar data for the other five subregions indicates that the projected annual participation in water-oriented outdoor recreation is greater in this subregion than in any other portion of the entire North Atlantic Study Area.

Needs. During the course of the Study, an effort was made to determine what would be required in the way of recreation facilities to meet, or attempt to meet, the great demand previously discussed. Thus, the Bureau has determined, utilizing the spatial and quality standards ascribed to each objective, the lands and waters required to satisfy the projected demand, for each of the three target years, for seven popular outdoor recreation pursuits. Five of these: boating, water-skiing, swimming, canoeing, and sailing, are considered water-dependent, while the remaining two - picnicking and camping - are termed "water-enhanced." The latter term refers to the fact that while the two activities indicated can be pursued almost anywhere, people invariably will picnic or camp beside a lake or stream if given the choice.

Table M-39 lists the recreation land needs by basin and year for each objective. As one would suspect, the greatest net needs are those expressed under the Environmental Quality Objective, while the smallest needs are cited under the National Income Objective. This relationship also exists in the various tables which follow. Another interesting relationship appearing here, and in many of the other Needs Tables as well, is a pronounced "saddle" curve. The initial, or 1980, value is generally maximum, and indicates the comparatively large, unmet demand which has existed in the past, and which continues to exist. In 2000 the demands decrease, and in the 2020 time-frame they increase slightly over the 2000 values. The significance here is the predicted increase in per capita use following the year 2000, and, of course, the real, or absolute, increase in the number of people seeking recreation.

RECREATION LAND & WATER NEEDS

BASIN 8
FIGURE M-11

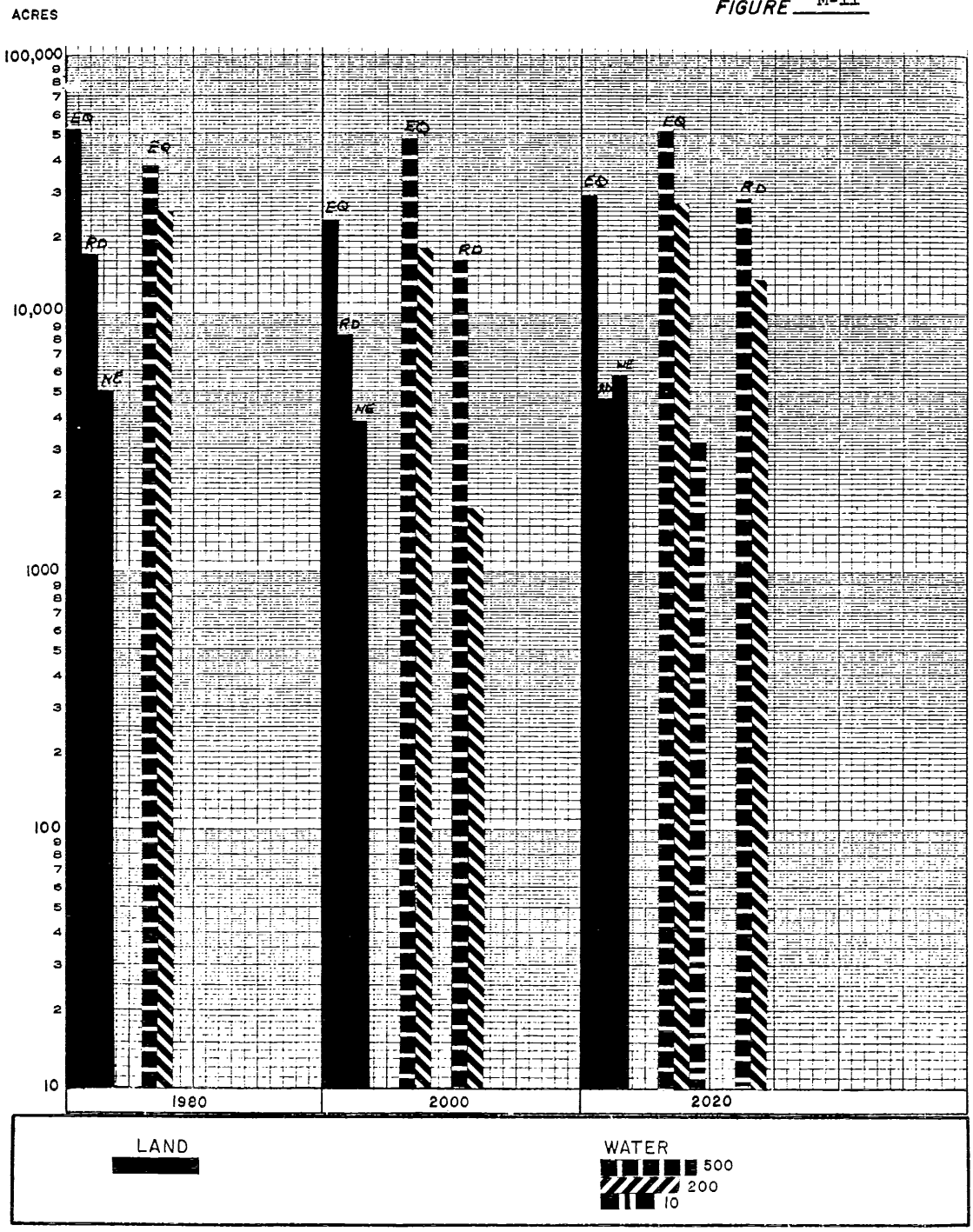


TABLE M-39

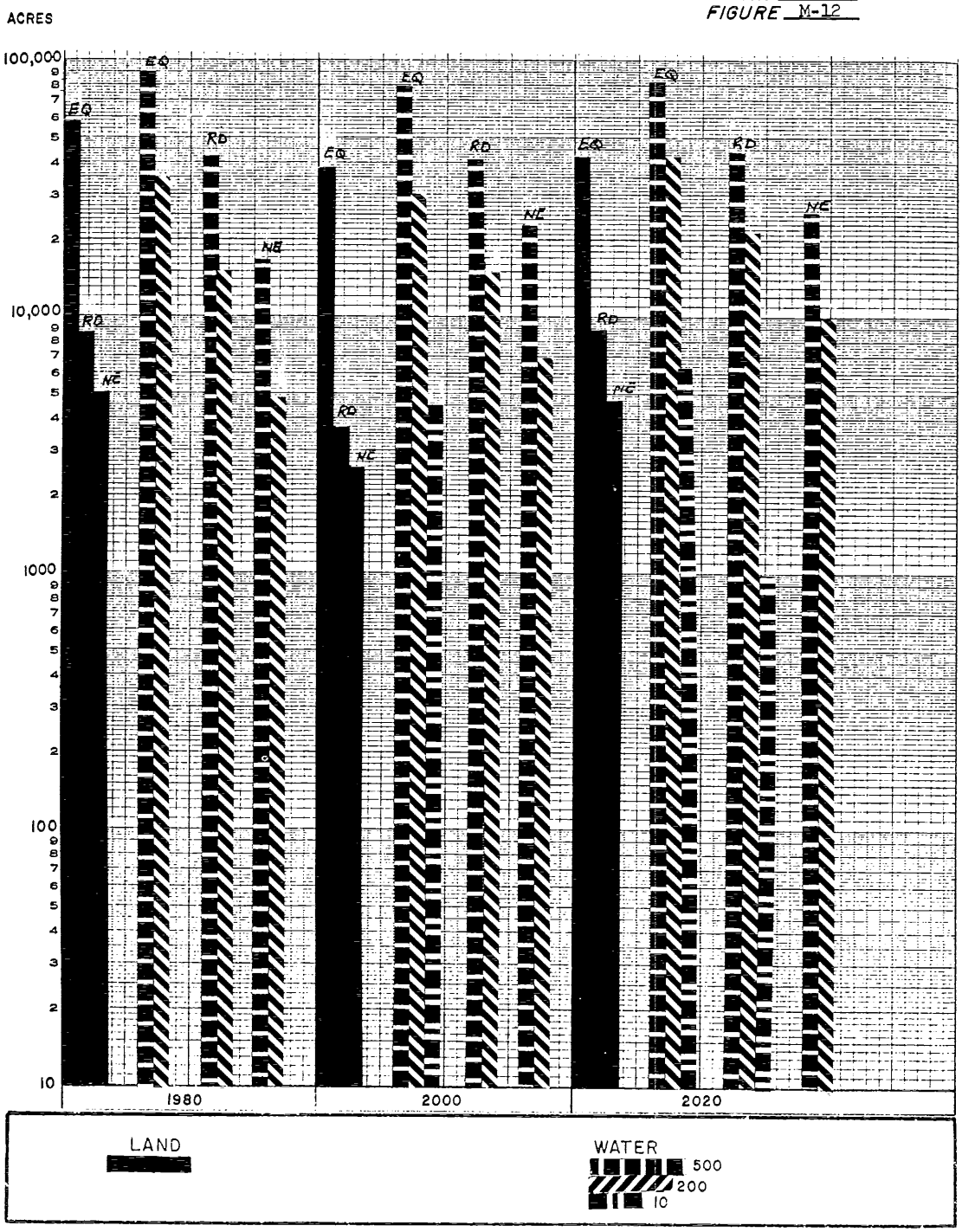
RECREATION LAND NEEDS IN SUBREGION B BY BASIN AND TARGET YEAR (IN ACRES)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
			ENVIRONMENTAL QUALITY OBJECTIVE			
6	27,500	10,200	7,500	5,700	2,600	7,200
7	75,000	28,800	23,300	59,500	25,900	23,100
8	71,400	24,800	28,700	51,800	23,600	28,700
9	118,300	40,800	42,500	57,800	38,200	42,400
10	92,400	36,400	38,200	61,400	35,300	12,000
			REGIONAL DEVELOPMENT OBJECTIVE			
6	9,700	3,600	2,900	1,300	600	1,000
7	26,300	10,100	6,500	20,100	9,500	5,600
8	24,600	8,500	10,800	17,000	8,300	4,700
9	41,500	14,300	12,800	8,700	3,700	9,000
10	32,500	12,200	12,800	12,700	12,100	11,500
			NATIONAL INCOME OBJECTIVE			
6	3,900	3,000	2,400	700	400	700
7	13,700	5,300	5,900	7,700	4,400	5,900
8	13,000	4,500	6,800	5,000	3,800	5,900
9	21,600	7,500	10,400	5,000	2,600	4,700
10	16,900	6,600	8,900	4,300	6,400	8,800

If we turn our attention for the moment from land needs, and consider swimming - a highly popular form of outdoor recreation, we will observe that the need for facilities, both beach and pool areas, are also greater here than in any other subregion of the NAR Study area. Basins 6 and 9, with their extensive coastlines, are comparatively well-off, but Basins 7 and 8 exhibit a pressing demand for swimming facilities. The establishment of the proposed Connecticut River National Recreation area, together with proposed related State facilities, such as Windsor Locks - King's Island State Park in Connecticut, and Turner Falls - Northfield Mountain State Park in Massachusetts, would do much to satisfy this need in Basin 8. Tables M-40 and M-41 present beach and pool needs, respectively, for each basin, under each objective, for each of the three target years. It should be noted that anticipated needs

RECREATION LAND & WATER NEEDS

BASIN 9
FIGURE M-12



could be met by providiing either the beach-acres tabulated in Table M-40, or the pool acreage cited in Table M-41; in actuality, a "mix" comprised of each kind probably will be achieved.

TABLE M-40

RECREATION BEACH NEEDS IN SUBREGION B BY BASIN AND TARGET YEAR (ACRES)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
			ENVIRONMENTAL QUALITY OBJECTIVE			
6	472	157	93	0	0	57
7	1,303	453	187	1,134	453	187
8	1,235	382	347	993	382	347
9	1,560	483	322	553	483	322
10	1,246	448	408	835	448	408
			REGIONAL DEVELOPMENT OBJECTIVE			
6	370	123	53	0	0	0
7	1,022	355	93	853	355	93
8	969	299	218	727	299	218
9	715	222	109	0	0	49
10	572	205	153	166	205	153
			NATIONAL INCOME OBJECTIVE			
6	132	44	52	0	0	0
7	364	126	125	197	126	125
8	345	107	160	107	107	160
9	575	179	235	0	0	0
10	460	165	226	54	165	226

RECREATION LAND & WATER NEEDS

BASIN 10
FIGURE M-13

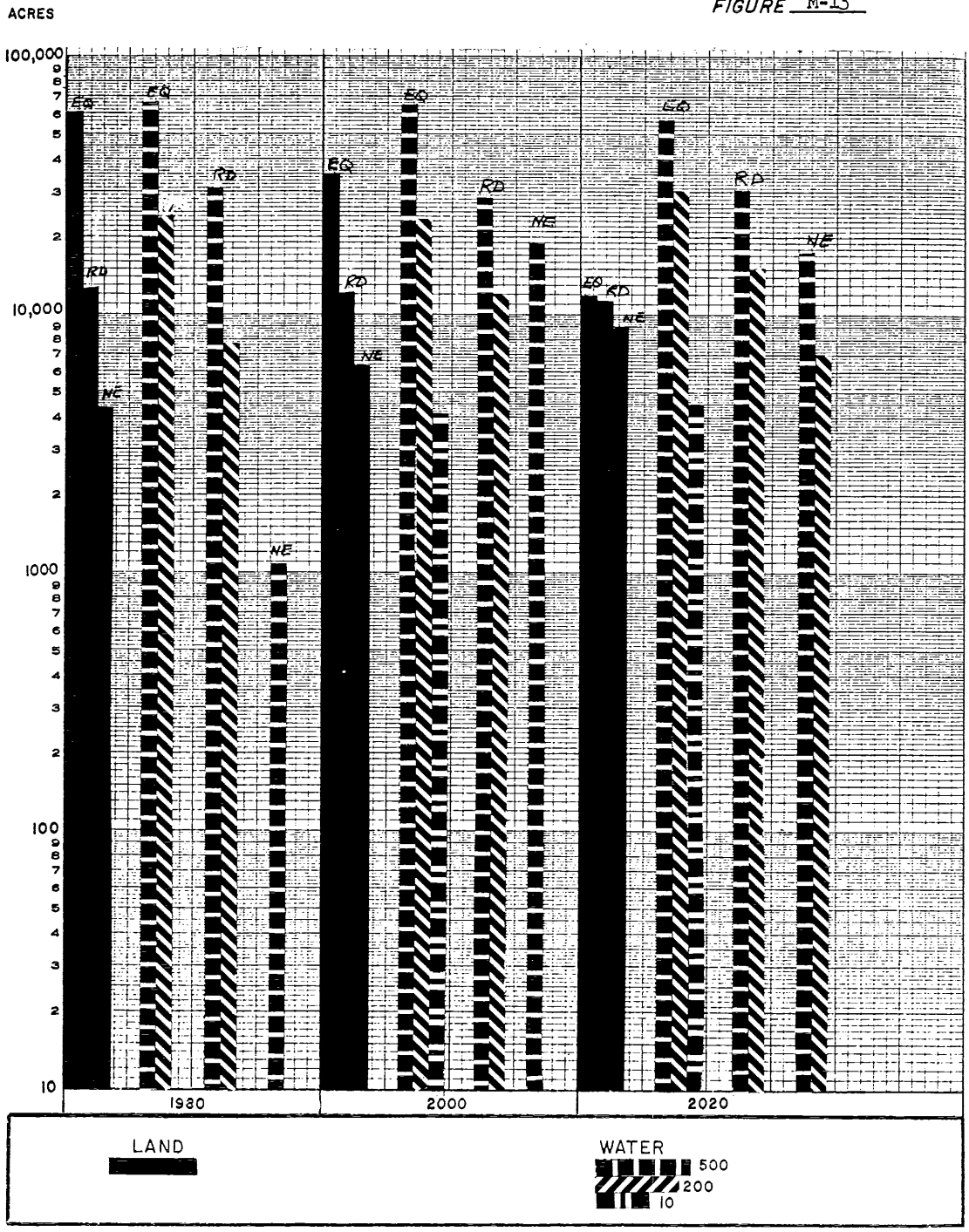


TABLE M-41

SWIMMING POOL NEEDS IN SUBREGION B BY BASIN AND TARGET YEAR (IN THOUSANDS SQ. FT.)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
			ENVIRONMENTAL QUALITY OBJECTIVE			
6	8,209	2,733	1,620	0	0	990
7	22,677	7,883	3,244	19,736	7,883	3,244
8	21,491	6,649	6,042	17,380	6,649	6,042
9	26,903	8,333	5,564	9,532	8,333	5,564
10	21,501	7,726	7,029	14,412	7,726	7,029
			REGIONAL DEVELOPMENT OBJECTIVE			
6	6,382	2,125	914	0	0	0
7	17,633	6,129	1,592	14,717	6,129	1,592
8	16,710	5,169	3,757	12,536	5,169	3,757
9	13,945	4,320	2,136	0	0	959
10	11,145	4,005	2,978	3,228	4,005	2,978
			NATIONAL INCOME OBJECTIVE			
6	2,568	855	1,024	0	0	0
7	7,094	2,466	2,424	3,837	2,466	2,424
8	6,723	2,080	3,133	2,088	2,080	3,133
9	11,221	3,476	4,583	0	0	0
10	8,968	3,223	4,414	1,051	3,223	4,414

In discussing needs, it seems appropriate to discuss at this time water acreage needs by unit size classes. The presence, or absence, of broad water areas directly influence such activities as boating, water-skiing, sailing, and swimming, and may indirectly affect the quality or desirability of camping and picnicking. Gross and net needs in unit size classes of such waters have been calculated, and they are listed in Tables M-42 and M-43, respectively. As indicated, the acreage required to satisfy anticipated demand under the various objectives varies tremendously. For instance, under Environmental Quality a net total of 92,100 acres will be required in the greater than 500 acre category for Basin 9 by the year 1980. Under the Nation Efficiency Objective, the required value drops to 16,900 acres. The acreage required to meet standards inherent in the Regional Development Objective

falls midway between the two, i.e., 43,100 acres.

TABLE M-42

GROSS WATER SURFACE ACREAGE NEEDS IN SUBREGION B BY UNIT SIZE CLASSES, FOR INDIVIDUAL BASINS AND TARGET YEARS (ACRES)

	1980			2000			2020		
Basin	>500	>200	>10	>500	>200	>10	>500	>200	>10
				ENVIRONMENTAL QUALITY OBJECTIVE					
6	37,600	14,300	2,800	19,900	10,000	1,500	19,700	13,600	1,500
7	98,200	37,600	7,400	54,300	20,800	4,100	76,700	24,100	3,400
8	96,100	36,200	7,200	48,900	18,200	3,700	52,600	26,900	4,000
9	154,700	59,500	11,600	78,800	30,200	5,900	84,100	43,100	6,300
10	112,200	42,000	8,400	64,400	23,600	4,800	58,000	30,400	4,400
				REGIONAL DEVELOPMENT OBJECTIVE					
6	20,300	7,100	1,300	10,700	3,800	700	10,700	5,000	700
7	53,100	18,800	3,300	29,500	10,400	1,800	28,100	12,100	1,500
8	52,000	18,100	3,200	26,300	9,100	1,600	28,400	13,400	1,800
9	83,700	29,800	5,200	42,800	15,100	2,600	45,600	21,600	2,800
10	60,700	21,000	3,700	34,800	11,800	2,200	31,500	15,100	1,900
				NATIONAL INCOME OBJECTIVE					
6	11,300	3,400	400	5,900	1,800	200	6,100	2,400	200
7	29,300	8,800	1,200	15,800	4,900	600	14,200	5,700	500
8	28,700	8,500	1,100	14,900	4,300	600	15,500	6,300	600
9	46,500	14,000	1,800	24,700	7,100	900	25,900	10,100	1,000
10	33,500	9,900	1,300	19,700	5,500	800	21,100	7,100	700

TABLE M-43

NET WATER SURFACE ACREAGE NEEDS IN SUBREGION B BY UNIT SIZE CLASSES, FOR INDIVIDUAL BASINS AND TARGET YEARS (ACRES)

	1980			2000			2020		
Basin	>500	>200	>10	>500	>200	>10	>500	>200	>10
				ENVIRONMENTAL QUALITY OBJECTIVE					
6	0	0	0	0	9,900	0	15,900	13,600	0
7	37,700	28,300	0	54,200	20,800	0	76,700	24,100	2,600
8	37,100	24,900	0	48,900	18,200	0	52,600	26,900	3,200
9	92,100	34,200	0	78,800	30,200	4,500	83,600	43,100	6,300
10	66,200	23,200	0	64,400	23,600	4,000	58,000	30,200	4,400
				REGIONAL DEVELOPMENT OBJECTIVE					
6	0	0	0	0	0	0	0	0	0
7	0	0	0	15,300	10,300	0	25,000	12,100	0
8	0	0	0	16,600	9,100	0	28,400	13,400	0
9	43,100	14,800	0	42,600	15,100	0	45,600	21,600	500
10	31,900	7,700	0	28,600	11,800	0	31,400	15,100	0
				NATIONAL INCOME OBJECTIVE					
6	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	16,900	4,800	0	23,300	7,100	0	25,900	10,100	0
10	1,100	0	0	19,500	5,100	0	17,300	7,100	0

The last needs to be discussed are stream needs. The mileage necessary to meet public demand for canoeing, and for other recreation pursuits associated with this type of resource, is listed in Table M-44. Again, needs have been calculated by objective, and by target year and, as one would suspect, needs are greatest under the Environmental Quality Objective. How well the needs identified in Table M-44 are provided for is directly dependent upon present and future pollution control programs and, to a lesser extent, efforts to increase public access. This particular kind of recreation asset is directly related to drainage patterns, topography, and geology, and it may be entirely possible that the needs indicated cannot be met physically. In this sense they are "ideal," or opportunities which the recreating public has indicated it

would utilize were it physically possible to provide them.

TABLE M-44

RECREATION STREAM NEEDS IN SUBREGION B BY BASIN AND TARGET YEAR (IN MILES)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
		ENVIRONMENTAL QUALITY OBJECTIVE				
6	159	52	87	28	52	87
7	392	136	192	312	136	192
8	442	138	241	147	138	241
9	629	191	349	550	191	349
10	490	178	253	304	178	253
		REGIONAL DEVELOPMENT OBJECTIVE				
6	78	26	43	0	0	16
7	193	67	95	113	67	95
8	218	68	118	0	0	110
9	310	95	172	230	95	172
10	241	88	125	55	88	125
		NATIONAL INCOME OBJECTIVE				
6	53	17	28	0	0	0
7	129	45	64	49	45	64
8	146	45	80	0	0	0
9	207	64	115	128	64	115
10	162	58	84	0	34	84

Means of Satisfying Demands. As the foregoing indicates, the anticipated increase in the demand for water-based and water-enhanced outdoor recreation in the New England area is expected to increase tremendously. By 1980 the recreation demand of New England's water resources is expected to be twice the demand experienced in 1960, and by 2000 the level may be four times the 1969 demands. (4)

Subregion B, as mentioned previously, is varied in terms of topography, vegetation, and population. It is,therefore, almost impossible to state that planning for water and related land resource should be oriented about one particular objective. Rather, it appears more feasible to keep two, or possibly all three,

objectives in mind, always remembering that they are not mutually exclusive, but rather that one objective may more logically "fit" or meet conditions - existing and proposed - in a given portion of the subregion than does either of the remaining two objectives. Thus, it is the Bureau's recommendation that the Environmental Quality concept, modified whenever necessary to fit existing or proposed economic goals, should comprise the frame of the reference in which future water resource planning is to be accomplished in Subregion B. The subregion, particularly the northern half, is blessed with an abundance of natural resources, including water, and it is these resources upon which the future economy of this portion of the subregion will be based. At the same time, family income is below the New England - and national - average, and a major effort should be made to rectify this unfortunate imbalance. The southern half of the subregion, on the other hand, is more intensely developed and, accordingly, faces water-related problems somewhat different from those existing in the northern portion.

An example of the dissimilar problems which can exist, even within one particular basin, may be found in the Merrimack River (Basin 7). The portion of the river above Goffs Falls, New Hampshire, is situated in a mountainous, relatively undeveloped, area possessing approximately 25 percent of the basin's population, while below Goffs Falls the population and degree of industrialization become much greater. Needs, and the means considered most suitable to satisfy these needs, vary. In the case of Basin 7 it appears that Environmental Quality Objective, with enclaves of Regional Development, would best satisfy the recreation needs identified in the northern portion of the basin; in the southern portion of Basin 7 existing conditions indicated that Regional Development, with emphasis on environmental protection, would be the most logical choice.

In the discussion which follows, the recreation needs existing in the northern half of Subregion B will be considered first, followed by those existing in the southern portion. However, it must be emphasized that geography does not, in any way, alter the fact that recreation is a basic human need, among several, and that the object of planning should be to develop the water and related land resources for the mutual benefit of resident and visitor alike, in such a way that the benefits continue indefinitely without impairing the resource. To facilitate discussion, the northern portion of Subregion B has been divided into three areas: the Connecticut River and associated drainages from its headwaters to the Massachusetts State line; the lakes area in southeastern New Hampshire, including the Merrimack River Valley

to the south, and the coastal zone.

The first of these - the Connecticut River - is truly a great natural resource, and with proper planning and development, this river could become of inestimable value to Vermont and New Hampshire alike. In this regard, the recommendations put forth in NEW ENGLAND HERITAGE (5) are of singular value, and if implemented, would do much to strengthen the economy of the region by adding to, and diversifying, the recreation base. In addition to the establishment of the 21,200-acre Coos Scenic River Unit (northernmost of three Federal areas which would comprise a Federal National Recreation Area), the report also recommends substantial State Action. Foremost is the recommendation that existing holdings in the Connecticut Lakes area be enlarged to create a 14,000-acre State Park at the northern end of the Coos Scenic River Unit. The establishment of these two areas - one Federal and one State - together with the proposed Moore-Comerford Interstate Park, appear more than sufficient to meet the localized land and water needs for Basin 8 cited previously in Tables M-39 through M-44. The Report's recommendation for more intensive use of Moore and Comerford Reservoirs as a result of cooperative action between the New England Power Company and State agencies is well taken and, in this regard, Vermont has made similar proposals in its State Comprehensive Outdoor Recreation Plan. (6) One other recommendation of interest is the establishment of the Rogers' Rangers Historic Riverway between Comerford Dam and Charlestown, New Hampshire. Such a facility would provide an estimated 600,000 recreation days per season, principally boating, water-skiing, and canoeing.

In addition to the creation of new recreation areas, as discussed above, the opportunity exists to expand existing sites to provide recreation opportunity. Thus, although recreation opportunities - picnicking, swimming, boating, fishing and hunting - do exist at each of the seven Corps of Engineers reservoirs located in the upper portion of Basin 8, it seems possible that some individual sites might be enlarged, or that additional ones might be developed in the event that the reservoirs themselves are enlarged. The same possibilities appear to exist at the dozen or so privately-owned dams. Two of these - Moore and Comerford, have been mentioned previously, but several others, especially Bellows Falls and Wilder Dams, appear to have some potential for increased recreation opportunity. Other recreation areas which now exist, and which presumably can be expanded, involve principally the outstanding State Parks and State Forest systems of Vermont and New Hampshire.

The second major grouping of water resources in the northern portion of Subregion B are the lakes situated in east central

New Hampshire, principally in Carroll and Belknap Counties, and the Merrimack River drainage to the south. The upper, or lake, portion is sparsely populated, and has in recent years experienced very little population growth. The region has the lowest median family income in New Hampshire. The Merrimack River Valley, on the other hand, is one of the most populous regions in the State, and contains such relatively large cities as Concord, Manchester, and Nashua. It is this highly populated region, together with the Boston area to the south, which exerts such a heavy demand on recreation facilities in the lake region, and in the White Mountain National Forest to the north. Water supplies are sufficient for both recreation and other legitimate use; however, problems exist in both sections which must be solved if recreation demands are to be met in the future. In the lake region, public access to the water bodies and pollution, to a lesser extent, are the principal problems. In this regard, the State's plans to expand Pawtuckaway State Park are highly important, as are expansion plans for White Lake State Park and Wellington State Park near Newfound Lake. Proposals for lake development on the Turkey River in Concord, and State acquisition at Pemigewasset Lake and Chocorua Lake, would add to the overall supply of water-based recreation opportunity in the area. (7)

The southern portion of this region consists of the Merrimack River and its tributaries. Although water resources are abundant, the water quality of the lower Merrimack is so seriously degraded by municipal and industrial wastes and combined sewer overflows that it is one of the most polluted basins in the entire subregion. At present the only sewage treatment plant between Concord, New Hampshire and the ocean is at Newburyport near the mouth of the river. (8) Another characteristic of the Merrimack is the flood threat. Average annual flood damages are approximately $2 million and, based upon current trends, this may be expected to increase to $3 million in 1980 and $5 million by the 2000. (9) What is required here, even before recreation can reasonably be discussed, is a major effort to control pollution, together with a program involving both structural and non-structural measures designed to minimize the flood threat. Effective flood plain zoning is an important example of a non-structural measure, and one which could have positive value in broadening the recreation base. Currently there are several Corps of Engineers flood control reservoirs and local protection works, as well as active USDA small watershed programs that contribute to the reduction of flood damages. The schedule indicates that two additional multiple-purpose reservoirs (flood control and water supply), a local protection project, and four small watershed dams are scheduled for the 1971-75 planning period. (10)

The third and last area to be considered in the northern portion of Subregion B is the coastal area. In essence, it is Basin 6, and includes not only the New Hampshire coast, but also the coastal area of Maine up to Cape Small. Three rivers, each with varying degrees of pollution, reach the sea in this sub-basin: The Presumpscot, the Saco and the Piscataqua. Recreation is an important component of the local economy, and measures undertaken to maintain, or to increase, the monetary return from recreation are deemed appropriate under the Environmental Quality Objective. It should be noted in passing that in 1960 the recreation-tourist industry contributed $1.3 billion to the economy of New England, and in the Saco Basin alone such expenditures exceeded $16 million. (11) A review of Tables M-39 and M-44 indicates that the net land needs and net stream needs, respectively, for Basin 6 are extremely small in comparison to the other four basins comprising Subregion B. Similarly, beach and pool needs (Tables M-40 and M-41) are small. What is required here, rather than providing recreation facilities, per se, is pollution abatement and, to a lesser extent, erosion control. Strong pollution control would not only help revive shellfishing and related recreation activities, but it would also enhance present efforts to re-establish an anadromous fishery in the three streams mentioned.

Previously the recommendation was made that planning in Subregion B for water and related land resources should proceed under the Environmental Quality Objective, modified where necessary to provide for other human needs. This recommendation was made specifically for the northern portion, and it is made now for the more populated southern portion, i.e., Massachusetts, Connecticut and Rhode Island. It is here that people, literally millions of them, live, and it is here that they seek the opportunity to relax and to "recreate," particularly on a day-to-day and weekend basis. In addition, the close proximity of this portion of Subregion B to the populous New York City and northern New Jersey region results in recreation demand greater than would otherwise normally be the case.

Admittedly, demands are large and over time will increase, but the resource base does exist to satisfy most, if not all, of the anticipated demand.

The resource base consists of some of the finest water bodies in NAR Study area, including Long Island Sound and Narragansett Bay, together with the streams flowing into them, principally the Connecticut, but also including the Housatonic, the Quinnipiac, the Thames, the Pawcatuck, the Blackstone, the Pawtucket, and the Taunton Rivers. As diverse as these streams may be, they all share certain shortcomings which limit their usefulness for

recreation, including poor water quality and limited access. In addition, the flood threat is a much more serious problem here than in the less populated, and less developed, upper portion of the subregion.

In considering demand, a review of Table M-38 - Projected Annual Participation - is instructive. Under Environmental Quality, net demand for 1980 is anticipated to reach 40 million recreation days each for Basins 7 through 10, and by 2020, it is believed that demand in Basins 9 and 10 will reach 57 million and 53 million recreation days, respectively. These figures, while admittedly projections, underscore the need for recreation to be fully considered in any land use or water development plans. In addition, every effort should be made to preserve the quality aspect of the recreation experience, rather than to attempt to blindly meet anticipated demand by constructing beaches, boating access areas, and campgrounds of questionable worth or desirability. It may be that measures such as licensing boaters, as contrasted to registering boats, or restricting the number of craft by time or geographic zoning, or by some other means, may be required in the interest of safety. Undoubtedly, the two greatest recreation assets in the southern portion of Subregion B are the Connecticut River and the Coastal Area itself. How well future needs are met; indeed, the quality of life itself, will depend upon how well these resources are developed. That this is true is reflected in the fact that NERBC indicates that the highest priority item in these basins is the water quality improvement program. (12)

The proposed Connecticut National Recreation Area was discussed on page M-102, and again it appears that this might be the best vehicle for meeting needs identified in Basin 10 and the lower portion of Basin 8. Specifically, the study (13) recommends the establishment of two federal areas along the lower Connecticut River. The first of these - the 12,000-acre Mount Holyoke Unit - would be established near Northampton, Massachusetts. Situated principally on the eastern bank, the unit would be developed to provide a variety of year-round recreation opportunities, including camping, picnicking, and water sports. The Study also recommends the establishment of a 4800-acre Mt. Tom-Northampton State Park on the western shore, comprised of the present 1800-acre Mt. Tom State Reservation, the Great Oxbow immediately north of the Reservation, and the flood plain surrounding the Oxbow in the towns of Easthampton and Northampton. Such a facility could provide outstanding opportunity for boating, swimming, picnicking, fishing, and camping. These two ares - one Federal and one State - would share a common boundary, and it appears that with coordinated planning and liaison their activities could complement each other. Population pressures exerted by the cities of Springfield, Holyoke, and Chicopee (500,000 combined population) threaten to engulf scenic vistas along the river

and Mt. Holyoke Range. These same pressures and those from Boston, which is only two hours away by auto, are also generating an increasing demand for outdoor recreation. This recreation complex would do much to both preserve natural beauty and to provide for water-based recreation.

The other Federal area, identified as the Gateway Unit, would be composed of 23,500 acres of river frontage and adjacent upland along the Connecticut River estuary. About 4,100 acres would be acquired in fee while the greater portion, some 17,500 acres would be protected within a Conservation Zone, and would remain in private ownership. The balance of some 1900 acres is presently owned by the State. The Gateway Unit, in addition to preserving the scenic charm of the river and its adjoining lands, would facilitate public access and use at suitable places along the river. As was the case with the Mount Holyoke Unit, complementary State action is recommended. Specifically, the study recommends that Connecticut expand and round out the Cockaponset State Forest, particularly in those tracts adjacent to the Gateway Unit, so that an 18,300-acre State forest results. The study suggests that development for general recreation be the goal, and that 13 existing impoundments be enlarged, or that more be constructed, so that a total of some 1600 surface acres results. It is again envisioned that these areas - one Federal and one State - would complement one another.

In addition to the two State facilities discussed in conjunction with the Mount Holyoke and with the Gateway Units, the study recommends additional State action. Connecticut is urged to acquire 4,400 acres of flood plain in an area known as "the Meadows," and to develop thereon facilities for both intensive and extensive recreation. Glastonbury Meadows State Park, as the area would be known, would help to satisfy recreation demand emanating from the Hartford metropolitan area. The study further recommends that a smaller area to be known as Windsor Locks - King's Island State Park be established near Enfield. Situated between the major metropolitan areas of Hartford and Springfield, this area offers unlimited opportunity for creating an extensive recreation and conservation complex along the river; it would include the historic Windsor Locks Canal and adjacent land, the Enfield Dam and Rapids, and the wooded 120-acre King's Island. Few areas are presently developed for recreation between Hartford and Springfield, and facilities for swimming, boating, and fishing are required. Since some of the State's finest shad fishing is found in the vicinity of Enfield Dam, there is a need for more boat launching sites and better access to the river's shores.

In addition to the proposed State parks in Connecticut, NEW ENGLAND HERITAGE recommends that the proposed Turners Falls - Northfield Mountain project in Massachusetts be pursued. This

project, a joint endeavor between the Commonwealth of Massachusetts and several private electric companies, involves the development of nine recreation areas on or near the Connecticut River from a point near Turners Falls Dam upstream for a distance of approximately 20 miles. When completed, the opportunity for quality recreation would exist not only for water-based recreation, with which we are primarly concerned, but also for other outdoor pursuits, such as hiking, field games, and winter sports - including snowmobile trails and toboggan runs.

In summation, the anticipated needs for both land and water-based facilities in Basin 8 and Basin 10 have been tabulated earlier in this Chapter, and they are indeed large. The Connecticut River is the greatest single recreation asset in this part of New England and, if developed properly, it can meet most, if not all, of the anticipated needs. The plan for the establishment of a National Recreation Area, in close cooperation with the States of Massachusetts and Connecticut, and with their political subdivisions, points the way.

The other great asset in the southern portion of Subregion B is the coastal area itself - comprised principally of Long Island Sound and Narragansett Bay. It has been these broad-water areas which have, in the past, supplied the major supply of swimming, boating, and water-skiing, and there is every indication that they will continue to do so. Connecticut, for instance, predicts that instant capacity demand in 1980 will be 106,350 units or recreation days for the eastern and western coastal areas. (14) The State indicates that facilities to satisfy 49,100 activity days (units) are required if present unsatisfied demand is to be met in the eastern and western coastal areas by 1980. One solution proposed has been to intensify the use of existing public facilities through a large scale development program. (15) Thus, Hammonasset and Sherwood Island State Parks, which reported instant swimming capacities of 30,000 and 10,000 respectively, for 1967 could be developed to provide for a greatly increased volume of use. It is anticipated that development at Silver Sands and Bluff Point State Parks could add 65,000 to 90,000 units, or recreation days, to existing instant capacity. Further east, the demand for swimming is just as great: Rhode Island reports that on a typical summer Sunday upwards of 200,000 persons utilize salt water beaches designed for 179,000. (16) Rhode Island has acquired additional acreage at East Matunuck, and has initiated further development at Galilee and Fort Greene.

Much of the above also pertains to boating, namely, demand is increasing continually throughout the region, yet only along the coast and in the Connecticut River estuary do existing facilities and acreage come close to meeting the demand. The problem is particularly acute in the eastern and western highlands of Connecticut and in western Massachusetts, where a lack of broad water limits boating, water-skiing, and sailing. The problem is

exacerbated by the exiting heavy use of many lakes, the frequent controls on boating, and the lack of available access points on many waterbodies. Prompt action is necessary to insure satisfactory public access to all major waterbodies in these areas (including Candlewood Lake in particular). Furthermore, large scale development of these sites will also be necessary to foster their effective use. An outstanding example of how the access problem may be approached is a study recently completed in Rhode Island entitled Public Rights-of-Way to the Shore. (17) The entire problem of public access to a waterbody, in this case, the Narragansett Bay, is examined, including the legal ramifications and precedence. Each and every access is studied, and aerial photography is provided for each. It is, in short, an excellent treatment of what can be, at times, a vexing problem.

Sub-basin 9 contains the last of the salt water beaches in the southern portion of Subregion B so far undiscussed, and these will now be considered. As was the case with Connecticut and Rhode Island beaches, the demands for recreation opportunities along the Massachusetts Coast have been and will continue to increase greatly. Estimates indicate that demand for swimming, picnicking, boating, and water-skiing opportunities in 2000 will be twice that existing in 1965. (18) In the Boston Metropolitan area, for instance, it was estimated that 162,800 persons engage in swimming near their homes during an average weekend day in 1970, and that 50,500 more persons on vacations or trips within the area also sought the opportunity to swim. The Massachusetts Outdoor Recreation Plan (1966) indicates that in 1965 installed capacity could accommodate 120,200 users. The same plan indicates that in 2000 some 312,100 persons will seek swimming opportunities near their homes, and that those on vacation seeking similar opportunities will have increased to 93,300.

Similar increases have been predicted for other water-based recreation activities. New and expanded recreation facilities is part of the answer, but other facets of the problem should be considered. Major efforts have been undertaken to control water pollution by the construction of waste treatment plants and intercepting facilities, but progress has been threatened by lower than expected Federal assistance. In the Boston area, improved water quality would be a boon not only to recreation interests, but to municipal water supply needs as well. Efforts are underway to develop the Boston Harbor and islands for recreation, and the Corps of Engineers has scheduled a beach erosion project for Revere Beach during the 1972-75 time frame. All of this activity will help to meet the recreation demand in the Boston area. Further south, demand for both day-use and camping opportunity can be partially met by expanding existing State facilities, particularly Scusset State Beach and Horseneck State Beach. Similarly, those to the north of Boston, especially Salisbury State Beach, could be similarly expanded.

In summary, then, the coastal reaches of Massachusetts, Rhode Island, and Connecticut comprise a recreation resource second to none in Subregion B. Poor water quality (in some locales), erosion, and limited public access are problems, as are the overuse of some existing parks and facilities, and the lingering doubts regarding the effects of thermal pollution on the biology of Long Island Sound.

To complete our review of Subregion B, some consideration should be given to the streams, ponds, and reservoirs located there. Although not as glamorous, perhaps, as the Connecticut River or the Coastal reaches, these resources nevertheless do exist and, under proper conditions, they could be made to provide considerable opportunity for water-based outdoor recreation. To the west of the Connecticut River, both in Massachusetts and Connecticut, are a number of rivers and lakes which have the inherent capability of satisfying locally-generated demand for outdoor recreation. Examples of such water bodies include Cobble Mountain Reservoir, Ashmere Lake, Barkhamsted Reservoir, Compensating Reservoir, Candlewood Lake, and the Housatonic River. Other use, i.e., water supply, poor access and, in some cases, water pollution, are the principal reasons why these waterbodies have remained undeveloped for recreation use. The problems have been recognized, and a major commitment to the development of these water resources for recreation has been urged in the Massachusetts SCORP. (19) The same document also recommends that a tri-state park be established in the southwest corner of the State. The recommended park would center around Bash-Bish State Forest and Mount Everett Reservation in Massachusetts, Taconic State Park in New York, and Mt. Rega State Park in Connecticut.

Hopefully, pollution abatement programs underway or planned will result in upgrading the water quality of the Housatonic - particularly the upper and lower reaches, the Blackstone, the Pawcatuck, and the Thames to a degree compatible with water contact recreation activity. The Thames apparently could be developed to provide much more recreation opportunity than currently exists.

Another resource not now utilized, or underutilized, are the many water supply reservoirs. Quabbin, of course, is the largest, but there are many more, and in the aggregate their water surface is considerable. A major effort should be made to determine the kind and extent of recreation for which these reservoirs and their adjoining lands are best suited, and the additional costs involved as a result of such use in preparing the water for domestic consumption. We are dealing with public needs, and it seems unrealistic to sacrifice one for the other, particularly when no good reason - economic or otherwise - supports the present policy.

Summary. Subregion B comprises a major part of what is commonly known as New England: it extends from southern Maine westward to New York State, and from Canada southward to Long Island Sound.

It contains all or part of six States: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. The sub-region is characterized by great diversity in topography, climate, vegetation, and economic viability.

The Bureau recommends that water resources planning should pursue Environmental Quality objectives, with the understanding that at certain times, and in certain places, this goal may be tempered with other objectives - principally those associated with Regional Development. Therefore, in the northern half of the sub-basin, including Basin 6, and the upper portions of Basins 7 and 8, Environmental Quality should be the primary objective. This less populated northern portion, i.e., southern Maine, New Hampshire, and Vermont are dependent to a great extent on the natural beauty, scenic mountains, and clean water with which the area is blessed, yet these very attributes are in danger of degradation as a result of unplanned activity in both the recreation and industrial spheres. At the same time, major efforts must be made to bring family income - generally lower than the national average - up to a more favorable level. Thus, in the upper portion of Basin 7 the recommended objective of Environmental Quality carries with it the strong implication that enclaves of Regional Development may be highly desirable in order to achieve other equally worthwhile social and human goals. The lower portion of the Merrimack River (Basin 7) is, on the other hand, so industrially developed that Regional Development, coupled with a maximum amount of environmental protection, probably is a more realistic objective than Environmental Quality alone.

In the southern portion of the sub-basin, i.e., Massachusetts, Rhode Island, and Connecticut, different problems exist. It is here that the subregion's population is concentrated and their incomes, for the most part, meet or exceed national averages. But the price paid, in despoiled landscape; polluted - in some cases, grossly polluted, streams; and decreasing opportunity for quality recreation, has been high. It appears most desirable that the Environmental Quality Objective form the frame-of-reference here for further action. Again, this general goal may be supplemented with the Regional Development Objective - for instance, in areas with stagnated or depressed economies - whenever it appears desirable to do so. General areas where this combination might be practical include some communities along the southern reaches of the Connecticut River, and in the area between Boston and Providence.

It is recognized that the flood threat, as well as municipal and industrial pollution loads, are greater in the southern portion, and that the construction of multi-purpose reservoirs to alleviate these and associated problems, is in many cases the only feasible solution. Whenever possible, outdoor recreation

should be provided for during the planning of such impoundments. In the northern portion, the need for reservoirs for flood control and low flow augmentation appears less pressing, but again, recreation is a legitimate use, and should be included in water resources planning whenever and wherever feasible.

11. ST. LAWRENCE RIVER, NEW YORK; AND LAKE CHAMPLAIN, VERMONT AND NEW YORK.
12. HUDSON RIVER, NEW YORK, VERMONT AND MASSACHUSETTS.
13. NEW YORK CITY; LONG ISLAND; AND WESTCHESTER COUNTY COASTAL AREA.

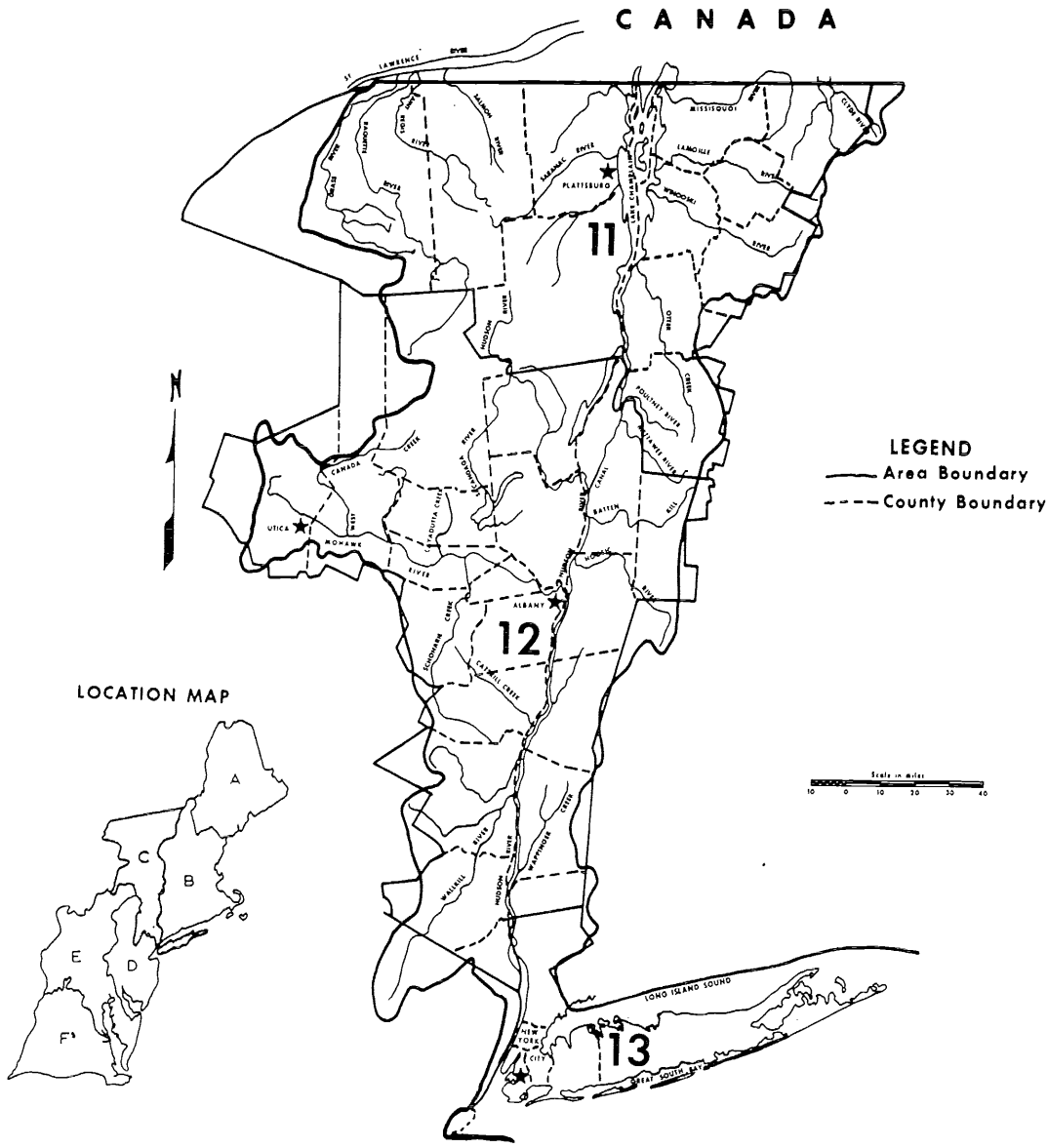


FIGURE M-14

SUBREGION C
Areas 11,12 and 13

LOCATION AND BOUNDARIES

FWPCA December 1969

SUBREGION C

Introduction. Subregion C is situated west of and adjacent to Subregion B; the latter subregion was discussed in detail in the preceding chapter. In essence, Subregion C consists of the Hudson River and associated drainages to the north and south, and is characterized by great diversity in topography, vegetation, population-densities, and land use patterns. Specifically, Subregion C consists of three distinct basins, as follows:

Basin 11. The Lake Memphremagog drainage, the Lake Champlain area, and the St. Lawrence drainage basin.

Basin 12. The Hudson River, from source to mouth.

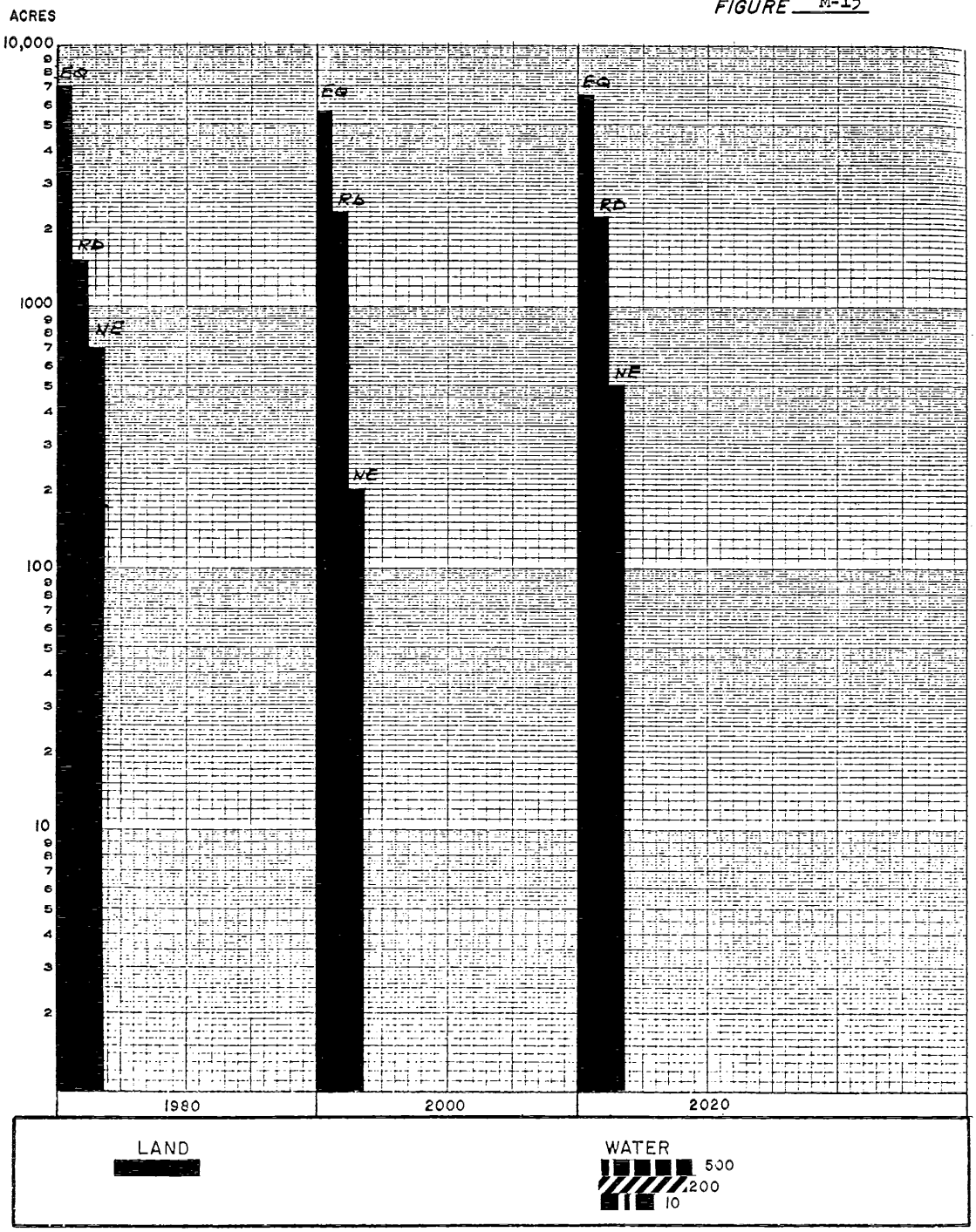
Basin 13. New York City, together with Long Island and the coastal reaches of Westchester County.

Annual participation in water-oriented outdoor recreation was projected for each of the three target years, and the data appear in Table M-45. In studying these estimates, one cannot escape the conclusion that most of the pressure originating in Basin 13 will have to be satisfied prinicpally in Basin 11 and, to a lesser degree, in Basin 12. A review of the various needs listed in Tables M-46 through M-50 strengthens such a conclusion. It is, for example, extremely difficult to imagine the resources required to meet projected annual participation in Basin 13. Table M-45 indicates that the net values are 79 million and 49.7 million recreation days, respectively, for the years 1980 and 2000 under the Environmental Quality Objective. If, as appears likely, a certain amount of demand in Basin 13 will remain unsatisfied, thought should be given to satisfying it elsewhere. What is suggested, then, is that heavy use of recreation facilities in Basin 11 by residents of Basin 13 be anticipated and provided for. Basin 12, of course, will share some of this participation and, in addition, will serve as a "funnel" for those headed north on weekend and vacation trips from New York City to the Lake Champlain region. It was estimated that the 1960 population of 13,055,000 in Subregion C will increase to 22,955,000 by 2020.

Subregion C, containing as it does the Nation's largest city, as well as areas long known for their recreation capability, such as the Catskills and the Adirondacks, is truly a unique region. In the Needs Tables which follow the needs cited under the Environmental Quality Objective are uniformly high (as compared to Regional Development and National Income) and, as one would suspect, these various needs become greater as one progresses from north to south. In Basin 13, the New York City and Long Island area, some of these needs seem overwhelming. It appears most appropriate, therefore, that Regional Development Objectives

RECREATION LAND & WATER NEEDS

BASIN 11
FIGURE M-15



comprise the frame of reference for water and related land use planning, particularly in Basins 11 and 12. In Basin 13, it appears realistic to emphasize National Efficiency, rather than Regional Development. It may well be that the recreation needs associated with the National Efficiency Objective in Basin 13, as modest as they are in comparison to those inherent in the other two objectives, will still not be met. If such is the case - and it appears that it will be - recreation demands will have to be met outside the basin - probably in Basins 11 and 12.

TABLE M-45

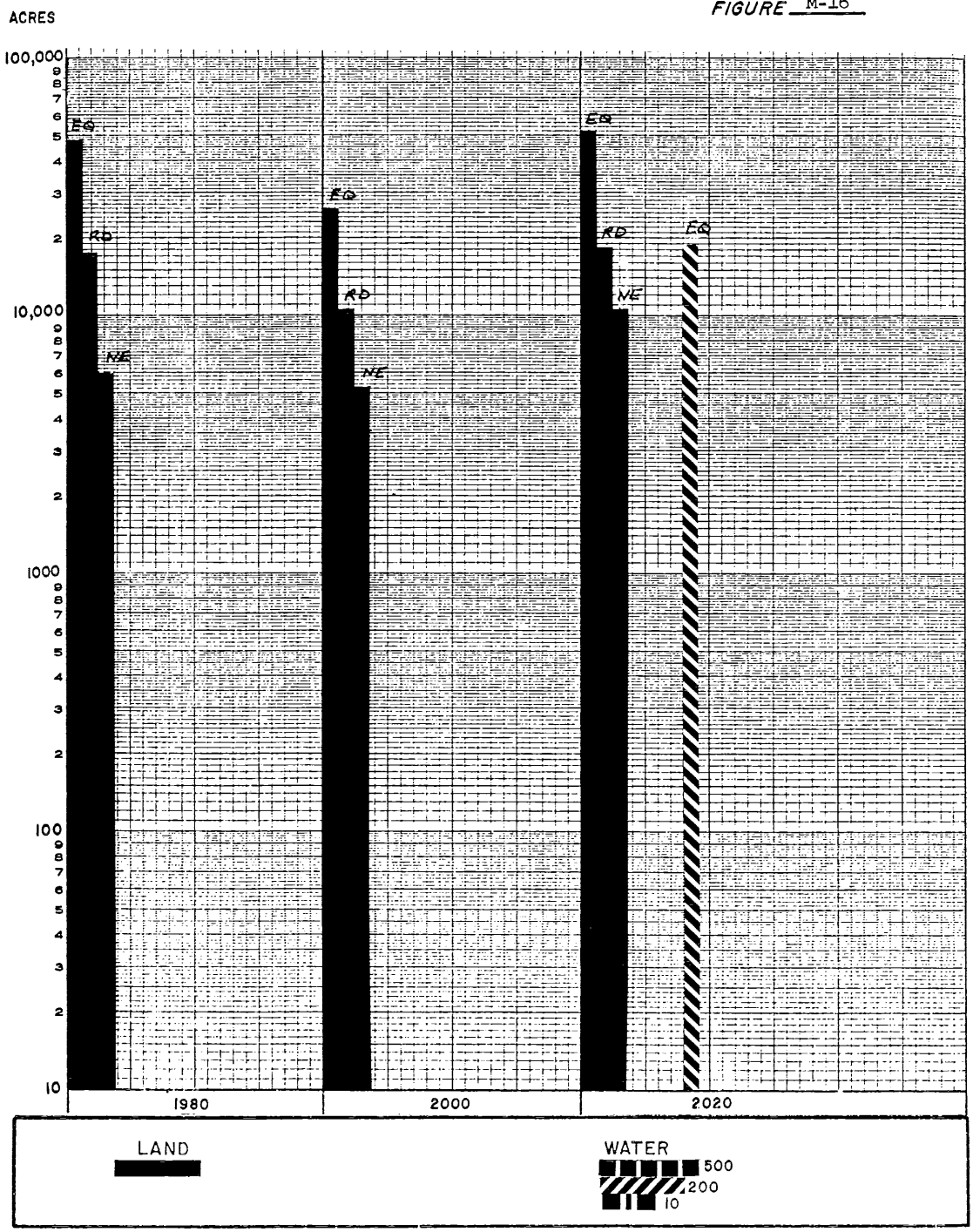
PROJECTED ANNUAL PARTICIPATION IN WATER-ORIENTED OUTDOOR RECREATION IN SUBREGION C BY BASIN AND TARGET YEAR (IN THOUSANDS)

	GROSS			NET		
Basin	1980	2000	2020	1980	2000	2020
			ENVIRONMENTAL OBJECTIVE			
11	19,767	11,212	16,741	5,864	7,069	10,092
12	66,109	43,291	92,804	46,878	34,735	81,362
13	125,525	60,484	134,360	79,037	49,742	116,730
			REGIONAL DEVELOPMENT OBJECTIVE			
11	20,231	11,478	16,035	3,202	6,974	8,803
12	67,792	44,444	90,049	44,912	35,466	75,224
13	79,288	62,198	129,415	41,498	46,740	104,181
			NATIONAL INCOME OBJECTIVE			
11	17,270	9,706	16,630	1,977	916	2,316
12	57,613	37,381	82,378	25,553	27,951	66,580
13	109,141	56,079	117,509	21,423	37,061	92,608

The most northern portion of Subregion C is comprised of the Lake Memphremagog drainage in Vermont, the Lake Champlain drainage in New York and Vermont, and the New York portion of the St. Lawrence drainage. It includes, in addition, the northern part of the Adirondack Mountains, the western slopes of the Green Mountains, and the northern portions of the Taconic range. Large, heavily forested, and with a sufficient supply of large unpolluted water, this area is truly a recreation paradise. Both the public and private sectors have invested heavily in recreation facilities, so that net needs - land and water - required to satisfy the demand anticipated for each of the three target years are considerably

RECREATION LAND & WATER NEEDS

BASIN 12
FIGURE M-16



lower than similar needs in Basins 12 and 13. In view of the extensive recreation facilities already existing, and the huge financial outlays required to provide for needs deemed appropriate under the Environmental Quality Objective, it is recommended that water resource planning in this basin, particularly as it relates to recreation, be done within the Regional Development Objective. No reason exists, however, why those devices appropriate for Environmental Quality cannot be used, since in this instance they are identical. The most important include the expansion of existing sites, the development of untapped resources, and the conversion of existing projects to include recreation.

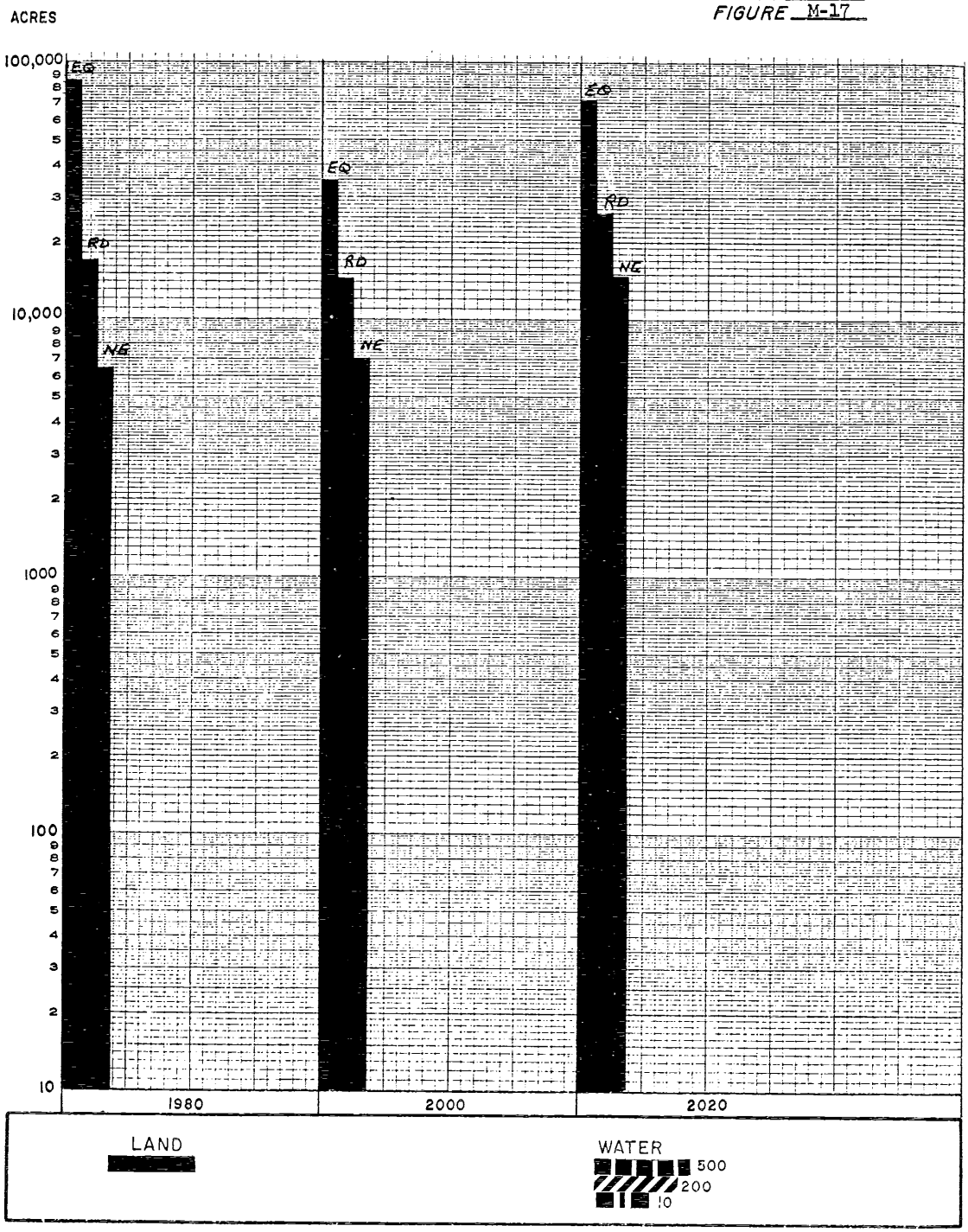
Table M-45 indicates that in Basin 12 the projected annual participation in 1980 under the Environmental Quality Objective is 46.8 million recreation days, whereas under the Regional Development Objective the estimate is 44.9 million. This rather modest decrease of some 4 percent in visitors served corresponds to a 28 percent decrease in estimated first costs, which for Environmental Quality are estimated at $1225.4 million, and for Regional Development, some 879.8 million. The Bureau recommends, therefore, that recreation planning proceed under the Regional Development Objective.

In the remaining basin - Basin 13 - the picture changes dramatically. Tables M-46 through M-50 indicate that the anticipated demand is at a maximum, as are the various needs required to satisfy this huge demand, yet the resource base is limited both in quality and quantity. A combination of factors - high population levels, pollution, high industrialization, and competing uses for the limited amount of undeveloped land remaining would indicate that the only realistic choice here is the National Efficiency Objective. The most desirable devices are the expansion of existing sites, and the development of untapped resources. A less desirable device, but one which probably will be used because of necessity, would be to modify design loads of existing facilities so as to accommodate more persons.

Needs. Tables M-46 through M-50, which follow, list both the gross and net needs which have been determined by basin for each target year and for each planning objective. It will be noted that as one progresses from north to south through Basins 11 to 13, needs become progressively greater, and their costs become correspondingly larger. Thus, in discussing those needs called for under the Environmental Quality Objective in Basin 13, we are discussing costs - acquisition and initial development costs - which range into the billions of dollars. It must be remembered that the values listed are incremental, i.e., those values given for 2000 and 2020 are over and above those cited for the preceding target year.

RECREATION LAND & WATER NEEDS

BASIN 13
FIGURE M-17



It has been mentioned previously, but will be repeated here, that the needs in these tables - be it so many acres of beach, or so many miles of stream - are "ideal" or theoretical values, and reflect the quantity or units necessary to provide for the recreation needs of a given population, and which experience has demonstrated would be utilized were it available. In many cases it is obviously impossible to provide for certain needs because of existing development, accidents of geology, or astronomical costs, but the theoretical values are cited nevertheless to indicate what the demand might be in the unlikely event that devotees of that particular recreation pursuit were to travel en masse from a basin where opportunity did not exist to an adjoining basin where it did.

The tables indicate, essentially, that needs do exist for recreation land, always in this case adjacent to a body of water, and intended for picnicking, camping, for change stations at those sites where swimming is possible, and for support facilities such as parking areas. Tables M-47 and M-48 indicate that beach and pool needs are extensive throughout the entire subregion; in this case beach refers to the sand area at the water's edge, and to the grassy area immediately beyond.

TABLE M-46

RECREATION LAND NEEDS IN SUBREGION C
BY BASIN AND TARGET YEAR (IN ACRES)

	GROSS			NET		
Basin	1980	2000	2020	1980	2000	2020
			ENVIRONMENTAL QUALITY OBJECTIVE			
11	20,400	8,300	9,200	7,100	5,600	6,500
12	68,700	32,600	59,200	47,400	26,400	51,700
13	118,600	53,500	82,000	84,400	35,500	72,400
			REGIONAL DEVELOPMENT OBJECTIVE			
11	7,200	2,900	2,900	1,500	2,300	2,200
12	23,800	11,800	19,400	17,200	10,400	18,400
13	48,000	15,100	27,600	17,200	14,400	26,200
			NATIONAL INCOME OBJECTIVE			
11	3,700	1,500	2,000	700	200	500
12	12,500	6,000	11,100	5,900	5,200	10,400
13	23,700	7,300	15,000	6,400	7,100	14,800

TABLE M-47

RECREATION BEACH NEEDS IN SUBREGION C
BY BASIN AND TARGET YEAR (IN ACRES)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
			ENVIRONMENTAL QUALITY OBJECTIVE			
11	343	142	129	92	142	129
12	1,246	640	1,203	1,110	640	1,203
13	1,882	671	1,352	1,223	671	1,352
			REGIONAL DEVELOPMENT OBJECTIVE			
11	269	111	84	19	111	84
12	977	502	858	840	502	858
13	863	308	556	205	308	556
			NATIONAL INCOME OBJECTIVE			
11	96	39	50	0	0	0
12	348	178	353	213	178	353
13	695	247	511	37	247	511

TABLE M-48

SWIMMING POOL NEEDS IN SUBREGION C BY BASIN AND
TARGET YEAR (IN THOUSANDS OF SQUARE FEET)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
			ENVIRONMENTAL QUALITY OBJECTIVE			
11	5,972	2,460	2,249	1,605	2,460	2,249
12	21,685	11,132	20,926	19,318	11,132	20,926
13	32,474	11,584	23,318	21,089	11,584	23,318
			REGIONAL DEVELOPMENT OBJECTIVE			
11	4,643	1,913	1,455	331	1,913	1,455
12	16,860	8,656	14,791	14,497	8,656	14,791
13	16,833	6,005	10,850	4,002	6,005	10,850
			NATIONAL INCOME OBJECTIVE			
11	1,868	769	977	0	0	0
12	6,783	3,482	6,868	4,151	3,482	6,868
13	13,544	4,832	9,966	713	4,832	9,966

TABLE M-49

GROSS WATER SURFACE ACREAGE NEEDS IN SUBREGION C BY UNIT SIZE CLASSES, FOR INDIVIDUAL BASINS AND TARGET YEARS (ACRES)

Basin	1980 > 500	1980 > 200	1980 > 10	2000 > 500	2000 > 200	2000 > 10	2020 > 500	2020 > 200	2020 > 10
ENVIRONMENTAL QUALITY OBJECTIVE									
11	29,900	10,300	2,200	13,200	5,300	1,000	15,000	7,300	1,100
12	70,900	24,300	5,800	37,600	12,000	2,900	41,900	21,000	3,400
13	117,700	36,500	8,800	4,400	11,400	3,300	43,300	23,500	3,300
REGIONAL DEVELOPMENT OBJECTIVE									
11	16,200	5,200	1,000	7,100	2,600	400	8,100	3,700	500
12	35,800	12,200	2,600	19,700	6,000	1,300	21,100	10,600	1,500
13	63,600	18,200	3,900	23,900	5,700	1,500	23,200	11,500	1,500
NATIONAL INCOME OBJECTIVE									
11	8,900	1,400	400	4,000	1,200	200	4,600	1,700	200
12	17,500	5,700	900	10,700	2,800	500	10,200	5,000	500
13	35,100	8,600	1,400	13,500	2,700	500	12,900	5,500	500

TABLE M-50

RECREATION STREAM NEEDS IN SUBREGION C BY BASIN AND TARGET YEAR (IN MILES)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
ENVIRONMENTAL QUALITY OBJECTIVE						
11	141	62	69	0	0	0
12	419	216	237	0	0	51
13	641	243	209	641	243	209
REGIONAL DEVELOPMENT OBJECTIVE						
11	69	31	34	0	0	0
12	207	106	116	0	0	0
13	315	121	103	315	121	103
NATIONAL INCOME OBJECTIVE						
11	47	20	23	0	0	0
12	138	72	78	0	0	0
13	211	81	69	211	81	69

Table M-49 lists the gross water surface in acres by unit size classes, target year, and objective. There is no table indicating net water surface needs, because there is, with but one exception, sufficient broad water in each category, i.e., 500 acres and greater, 200 to 499 acres, and over 10 acres, to satisfy expectant demand throughout the subregion. The one exception is an apparent shortage by the year 2020 of 18,800 acres in the greater than 200 acre category in Basin 12 under the Environmental Quality standards. The exception is of no immediate concern, since Regional Development is the objective recommended for Basin 12.

In the following section the needs enumerated above are considered as they appear under the recommended planning objective of Regional Development (in the case of Basin 13 - National Efficiency) and, using the devices deemed most appropriate, recommendations are made regarding how these needs might be satisfied.

Satisfying Needs. A review of the Needs Tables will indicate that while some needs do exist in Basin 11, they are uniformly low, and considerably less than those existing in Basins 12 and 13. A primary reason for this happy state of affairs is the large number of varied recreation areas maintained by the States involved, together, of course, with the topography and natural drainage characteristic of the basin. Vermont has developed eleven parks within the basin, ten of which are in the Lake Champlain drainage area, while the eleventh - Crystal Lake State Forest Park - is situated further east in the Memphremagog drainage. New York has developed eleven State parks, nine of which are in the St. Lawrence drainage, while two - Lake George Beach State Park and Lake George Battlefield Park - are in the Lake Champlain Basin. In addition, the Division of Lands and Forests of the New York Department of Conservation maintains a total of nineteen camping areas scattered throughout Basin 11. In order to satisfy the anticipated annual participation as outlined in Table M-45, it is suggested that existing recreation areas be expanded whenever natural and budgetary constraints permit. It is not recommended that quality standards be lowered so as to allow greater intensity of use of existing facilities.

Further, it is recommended that thought be given to the following suggestions and ideas. Entirely new recreation complexes will be required in the years to come, and the BOR review of Basin 11 indicates that new day-use facilities might profitably be located at Lake Willowby and at Lake Memphremagog, and that camping facilities might properly be located at Seymore Lake, Salem Pond, and Averill Lake. Both Lake Willowby and Averill Lake are noted for their excellent rainbow trout and landlocked salmon fishing. Total acreage suggested for the two day-use areas might approximate 1200 to 1500 acres, while that for the three public camping areas might total 500 acres.

Further west, in the Lake Champlain drainage area, additional major recreation development is suggested at Saranac Lakes so as to provide general year-round recreation opportunities; at Prospect Mountain on the southwestern tip of Lake George, and also along the eastern shore; along the Vermont shoreline of Lake Champlain; and in the northern peaks of the Green Mountains in Vermont. Additional recreational facilities in Vermont might properly be undertaken along the southern section of Lake Champlain; within the Green Mountain National Forest, and on or near existing State-owned forest lands. Development of additional campgrounds in the New York portion of the basin to provide recreational use of land and water features appears both possible and desirable at Lake George and in the northern Taconic Mountains; at Lake Placid; at Whiteface Mountain, the Wilmington Notch area, and the West Branch of the Ausable River; on both branches of the Saranac River; and at the upper end of Chazy Lake.

In the St. Lawrence drainage basin, the development of additional camping areas to utilize outstanding natural features lying to the north and west of the Adirondacks appears to be a distinct possibility. Upper and Lower Chateaugay Lakes, Titusville Mountain, Little Tupper Lake, Raquette Lake, and Bonaparte Lake are areas where such development should be considered.

In addition to the parks and camping areas proposed above, thought should be given to other measures which would add to the recreation base. There are areas, both within the Adirondack Forest Preserve and in northern Vermont, that might be best utilized in a wilderness or semi-wilderness condition. Good examples in Vermont include the Jay Peaks area, the headwaters areas of the Missisquai River, and Hazens Notch. Similarly, there are many streams which should remain undeveloped or, if such is the case, developed no further. The Ausable River, of course, is nationally known as a trout fishery, and serves as an example. Other streams which should be preserved "as is" include the Saranac River, Bouquet River, the Raquette, the St. Regis, and the Salmon Rivers.

Basin 12. This basin includes the entire Hudson River from its source in the Adirondacks to New York Harbor. The basin is remarkably different from Basin 11 to the north, in that demand for recreation opportunity - both from a much larger resident population, and as a result of being closer to New York City - is considerably greater. The data in Table M-45 indicates that the projected annual participation in this basin varies from 5 to 8 times that projected for Basin 11. Under the Regional Development Objective, the projected annual participation for 1980 and 2020 is 44.8 million and 75.2 million recreation days, respectively.

A review of Tables M-46 through M-50 indicates that land and water needs, while substantially higher than the needs existing in the basin to the north (#11), are not as great as in the New York metropolitan area. For example, it appears from Table M-50 that no recreation stream needs exist under Environmental Quality except for an estimated 51 miles by 2020. Under the other two objectives, there are no additional needs at all for this particular resource. Regarding broad water, it has been estimated that under the Environmental Quality Objective there will be a net need for 18,800 acres in the greater than 200 acre category by the year 2020. Under the other two objectives, no such needs are anticipated.

Both the State and the private sector have made a major effort to meet the ever-increasing demand for recreation opportunity. The New York Department of Conservation has developed twenty State parks of various sizes in the basin, as well as sixteen recreation areas within the Catskill and Adirondack Forect Preserves. The privately-operated resorts which exist throughout the basin are famous - particularly those found in the Catskills.

It is recommended that camping demand be met by the acquisition and development of ten new campground areas. They should be located so as to provide scenic advantages, and they should contain facilities primarily for camping, swimming, boating and hiking. The general locations for these facilities should be in the southern Adirondacks, the western Taconics and the Catskills. If possible, one of these new campgrounds should be located on Sacandaga Reservoir. In addition, six parks or general recreation areas should be developed in the central and eastern portions of the basin. Three of these are recommended for the Albany-Troy Schenectady Region, principally to aid in meeting day-use demands for swimming, picnicking and boating. One is recommended on or near the Delta Reservoir, and the remaining two are recommended for development in the southern portion of the basin. It is further recommended that thought be given to undeveloped parklands, and how they can best be developed for outdoor recreation. High-Tor, Hook Mountain, and Blauvelt State Parks all fall in this category.

Basin 13. This basin, the most heavily populated of Subregion C, includes New York City, Long Island, and the West Chester County coastal area. As indicated in Table M-45, the anticipated annual participation in water-oriented outdoor recreation is tremendous: in 1980, under the Environmental Quality Objective, facilities will be required for 79 million recreation days, and for 2020, an additional 116.7 million. Similarly, the various needs itemized in Table M-46 through M-50 are staggering. Since this is the case, it is recommended that water and related land use planning, particularly recreation, be done within the framework of the National Efficiency Objective.

The Regional Plan Association, in their report The Lower Hudson, treats the lower Hudson River in great detail. (20) They are particularly concerned with that segment of the river lying between the George Washington Bridge and the Harbor, and their recommendations regarding the Manhattan side of the river deserve further attention. In an effort to increase public accessibility to the river, the Association recommends that Riverside Park be extended south to 59th Street, and that the existing gap between 125th and 145th Streets be designated as parkland. Although present water quality precludes the use of the river for many recreation uses, the action recommended would provide additional land for passive recreation, and perhaps for picnicking. Also, in the event that cleaning up the river proceeds as anticipated, the land, already in public ownership, could then be further developed for boating and sailing, and possibly even for water skiing. The report also makes excellent suggestions regarding the New Jersey side of the river, particularly with regard to the Palisades.

Another area in New York City possessing the potential for a complete array of water-based recreation pursuits is Jamaica Bay. In their outstanding report regarding New York outdoor recreation needs, the National Recreation and Park Association envisions a recreation complex unique among the urban parks of the world. (21) Such a facility would include the whole area of the Bay, its islands and north shore upland, Breezy Point, Fort Tilden, Jacob Riis Park, and Rockaway Bay, and would provide for a large variety of outdoor recreation, including swimming, picnicking, boating, sailing, water skiing and camping. A major problem, or drawback, in developing such a facility is, of course, the severe water pollution which now exists. The pollution problem is worsened by the limited capacity of the Bay to empty itself into the ocean at ebb tides through the narrow inlet. On balance, the plan is a good one, and it is thinking such as this which is required if the projected annual participation figures cited in M-45 are to be provided for to any significant extent in Basin 13. An excellent suggestion regarding access is the suggestion for the inauguration of an inter-island, inter-park ferry service. Such a service would augment other means of access and would also produce supporting revenue for the parks. Ferries could bring passengers from various points along the Hudson River and Manhattan Island, with stops at the New Jersey side, the Battery, Staten Island, Coney Island, Broad Channel Island and at Breezy Point, Jacob Riis and Rockaway Parks around the Bay. Such a ferry would have a tremendous recreation value in itself. In any case, access to the island should not be limited to the parkway on Broad Channel, and the ferry system, as proposed, would do much to alleviate the parking situation.

Another, even more ambitious, undertaking involves the proposed establishment of the 20,000 acre Gateway National Recreation Area. This National Recreation Area would be comprised of five units, including Jamaica Bay, Breezy Point, Hoffman-Swinburne Island, Great Kills Park on Staten Island, and the Sandy Hook peninsula in New Jersey, and would provide outdoor recreation opportunity for well over half-a-million persons daily. Conceived principally as a day use complex, opportunity would exist for swimming, picnicking, boating, water-skiing, and sailing, as well as for surfing, golf, and nature study.

Summary. Subregion C, in essence, consists of the Hudson River Basin, and adjacent drainages to the north and south. It comprises three entirely dissimilar basins, the most southern of which includes the populous New York City and Long Island. In general, there is sufficient water to provide for all anticipated water-based recreation needs; however, as one progresses from north to south, the quality of much of the available water deteriorates to such an extent that it is useless for activities such as swimming and water-skiing.

Needs have been determined on three different levels to correspond to each of the three possible objectives. It is the Bureau's recommendation that recreation planning under the Regional Development Objective be pursued in Basins 11 and 12, and that in Basin 13 such planning be done under the National Efficiency Objective. Recreation land, beach, and pool needs have been determined, and for Basin 11 they are deemed slight - with no difficulty anticipated in providing for them. In Basin 12, such needs are moderate, and little or no difficulty is anticipated. In Basin 13, however, recreation needs are exceedingly great, and grave doubt exists as to whether they can all be satisfied within that particular basin. It seems logical to expect that much of the demand originating in Basin 13 may have to be provided for in Basins 11 and 12 to the north.

Similarly, no needs have been determined to exist for broad water areas, with the one exception noted under the Environmental Quality Objective. Thus, the construction of reservoirs for recreation boating, water-skiing or sailing, or for this type of recreation in conjunction with other uses, appears unwarranted. The needs for swimming, picnicking, and camping, on the other hand, have been demonstrated, and the opportunity for them should be included in any multiple-purpose reservoir planning.

It is recommended that existing recreation areas be expanded whenever possible, and that undeveloped areas be developed as needs dictate, and as fiscal constraints permit. The downgrading of standards to permit greater intensity of use is not recommended, except in Basin 13 under the National Efficiency Objective. Such action results only in lowering the quality of the recreation experience, and in threatening the physical worth of the resource

involved. Entirely new recreation complexes will be required within a decade or two, and some possible locations have been suggested in this chapter. The basic problem is not a shortage of water, but rather a shortage of water with quality high enough to permit recreation. This problem is particularly acute in Basin 13.

Finally, the almost overwhelming needs in Basin 13 indicate that every available resource, and even those not presently available, will have to be utilized. This will result only if bold, imaginative thinking is done, and if this is followed up promptly by incisive action. The establishment of Jamaica Bay as a regional park, or as a part of a National Recreation Area, is a case in point.

14. PASSAIC RIVER, NEW JERSEY AND NEW YORK; RARITAN RIVER, NEW JERSEY; AND OTHER NORTHERN NEW JERSEY STREAMS.
15. DELAWARE RIVER AND DELAWARE BAY, NEW YORK, NEW JERSEY, PENNSYLVANIA AND DELAWARE.
16. ATLANTIC COASTAL AREA FROM SANDY HOOK, NEW JERSEY TO CAPE MAY, NEW JERSEY.

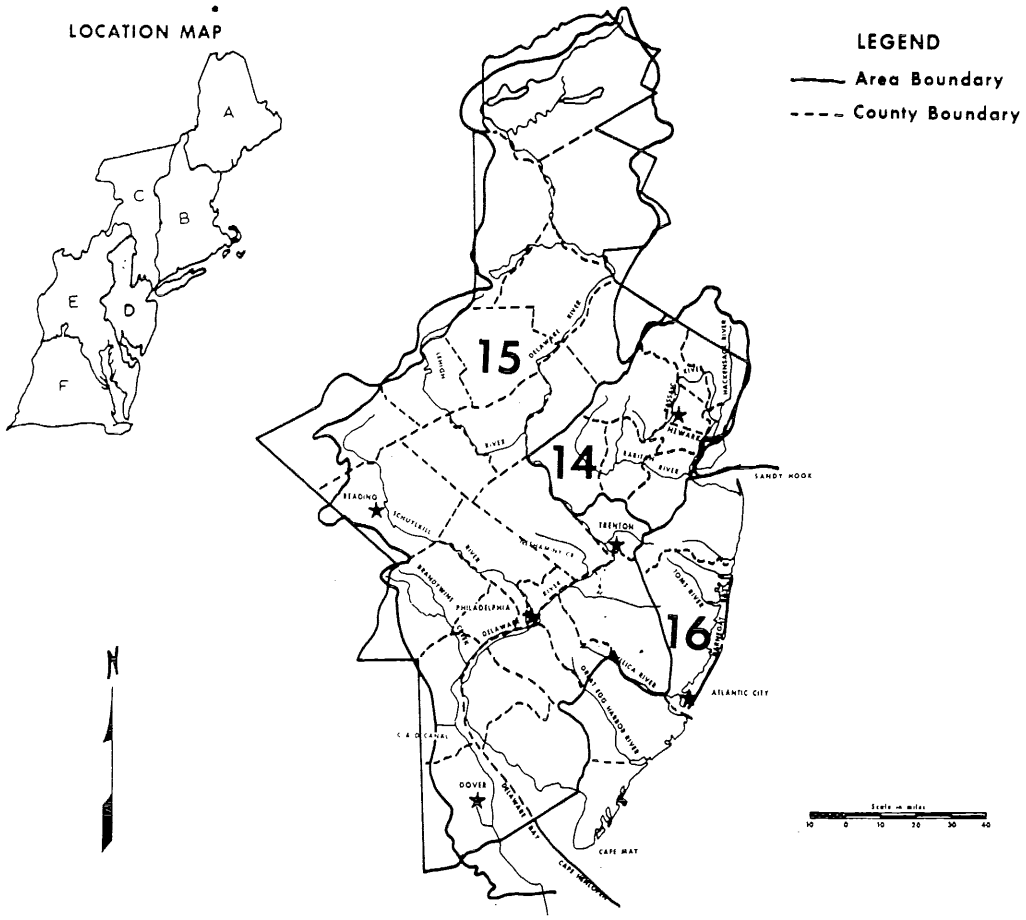


FIGURE M-18

SUBREGION D
Areas 14,15 and 16

LOCATION AND BOUNDARIES

FWPCA December 1969

SUBREGION D

Introduction. Subregion D consists essentailly of the Delaware River Valley. The subregion includes all but a small portion of northeastern New Jersey, roughly half the State of Delaware, eastern Pennsylvania, and a portion of New York State, and is comprised specifically of three basins, as follows:

Basin 14. The Passaic, Raritan, and other northern New Jersey streams.

Basin 15. The Delaware River and Bay.

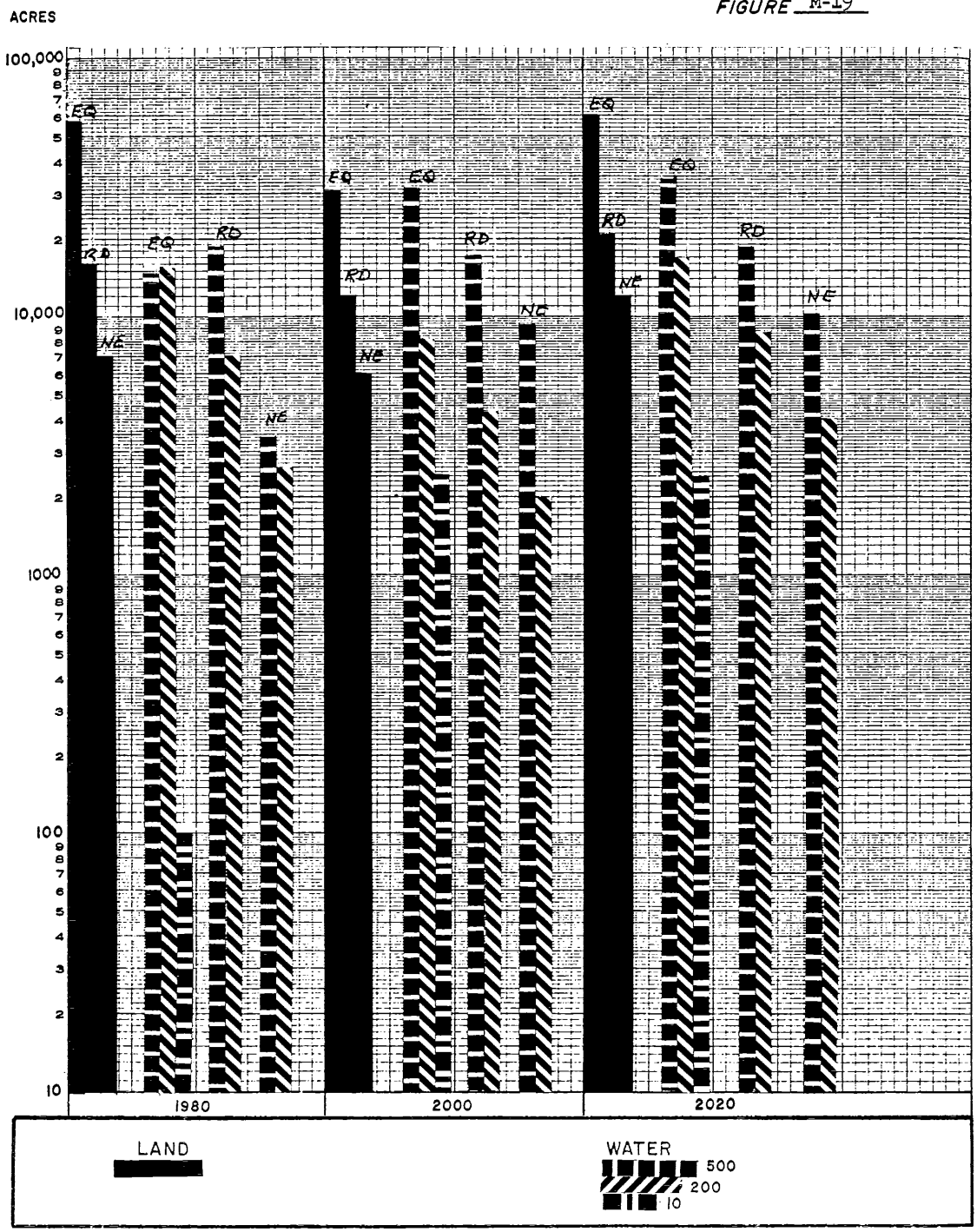
Basin 16. Atlantic Coastal Area from Sandy Hook to Cape May, New Jersey.

The subregion is highly populated, and contains a number of physiographic forms, including the Atlantic coastal plain, the Piedmont Plateau, and the Appalachian Ridge and Valley Highlands. A variety of forest cover, varying from the northern hardwoods type of beech, birch, and maple in northern Pennsylvania to the pine and cedar forests of southern New Jersey, prevails. In general, Subregion D is an area of rapid industrial expansion, and it is an integral part of that phenomenon termed megalopolis. An ever-expanding population, conflicting land-use priorities and plans, industrial and municipal pollution, and improper use of wetlands and estuaries characterize the present condition of the area. Population is not evenly distributed throughout the Region, but is concentrated in the eastern portion of Basin 14, and along the southern half of the Delaware River (Basin 15). Included here are the industrialized cities of Trenton, Camden, Philadelphia, Chester, and Wilmington. By comparison, Basin 16 (Atlantic coastal area) is considerably less densely populated. In 1960 the population of this subregion was 11,124,000; it is estimated to be 21,122,000 by 2020.

A review of Table M-51, which cites the projected annual participation in water-oriented outdoor recreation by basin, is instructive, and illustrates the disproportionate participation anticipated among the three basins. It will be noted that differences in gross figures (recreation days) for the various objectives are fairly consistent for a given basin; however, the net figures vary considerably. This diversity, of course, reflects the varying degrees of opportunity inherent in each objective. Another interesting point relates to Basin 16: heretofore projected net participation figures for the year 2000 have generally been lower than for 1980, indicating the possibility of a "breathing spell" once these needs - both those which are presently unsatisfied and those which will materialize between now and 1980 - are provided for. In the present case, however, no such "breathing spell" is indicated, and it appears that demand, particularly under the Environmental Quality Objective, will

RECREATION LAND & WATER NEEDS

BASIN 14
FIGURE M-19



soar. In summary, the anticipated participation in outdoor recreation in Subregion D is as great as anywhere else in the North Atlantic Region - including the populous New York City area - but the resource base, particularly in Basin 16, appears adequate to provide for it. The "Jersey coast" has long been identified as a recreation area, and this area is largely responsible for the fact that recreation is the largest industry in that State. In Table M-52 it is interesting to observe that net needs represent an extremely high proportion of gross needs for Basins 14 and 15. Thus, land set aside for 2020 will have to be twice the acreage set aside by 1980, particularly under the Regional Development and National Income Objectives. If that is the case, a fascinating question suggests itself, namely, might it not be less expensive in the long run to attempt to achieve the environmental quality objective, recognizing and absorbing the large costs involved initially, rather than choosing the regional development objective, for example, wherein the greater precentage of the acreage involved is added after 2000, when land costs might be prohibitive?

Needs. A review of Tables M-52 through Table M-57 indicates that recreation needs are consistently greatest in Basin 15, followed closely by those in Basin 14. No recreation needs were identified in Basin 16, even under the Environmental Quality Objective, other than stream needs and modest land needs of 100 and 1200 acres, respectively, for 2000 and 2020.

RECREATION LAND & WATER NEEDS

BASIN 15
FIGURE M-20

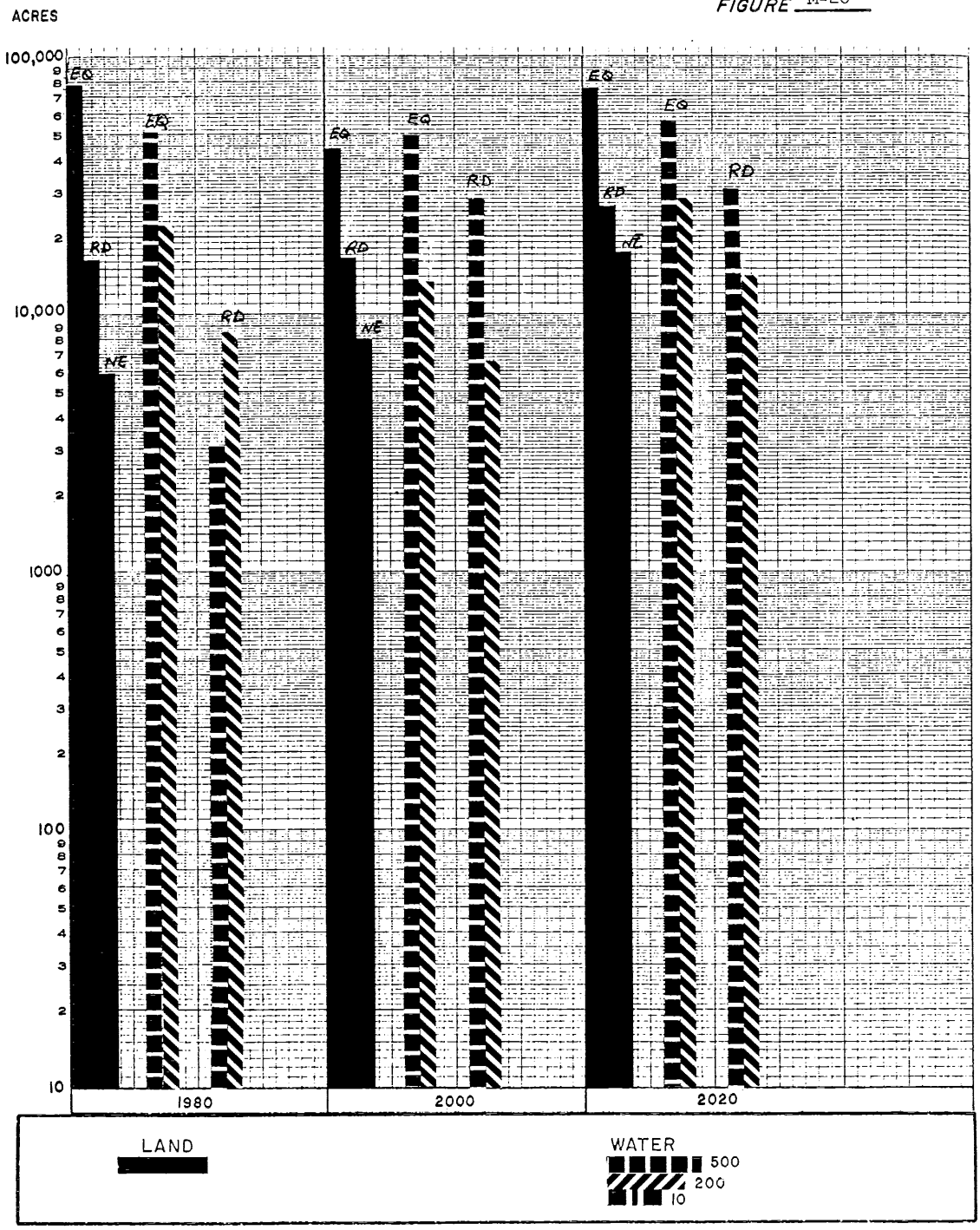


TABLE M-51

PROJECTED ANNUAL PARTICIPATION IN WATER-ORIENTED OUTDOOR RECREATION IN SUBREGION D BY BASIN AND TARGET YEAR (THOUSANDS OF RECREATION DAYS)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
			ENVIRONMENTAL QUALITY OBJECTIVE			
14	78,004	46,581	105,421	60,147	44,566	102,296
15	119,900	68,647	137,391	80,004	61,931	127,246
16	24,647	17,865	38,698	100	137	1,399
			REGIONAL DEVELOPMENT OBJECTIVE			
14	80,094	47,902	102,104	47,125	43,630	95,911
15	123,055	70,560	132,465	44,144	59,147	114,932
16	25,302	18,365	37,582	77	115	150
			NATIONAL INCOME OBJECTIVE			
14	67,874	40,108	108,348	32,251	35,506	84,228
15	104,356	59,152	137,628	22,762	43,202	119,193
16	21,456	15,448	33,402	38	111	144

RECREATION LAND & WATER NEEDS

BASIN 16
FIGURE M-21

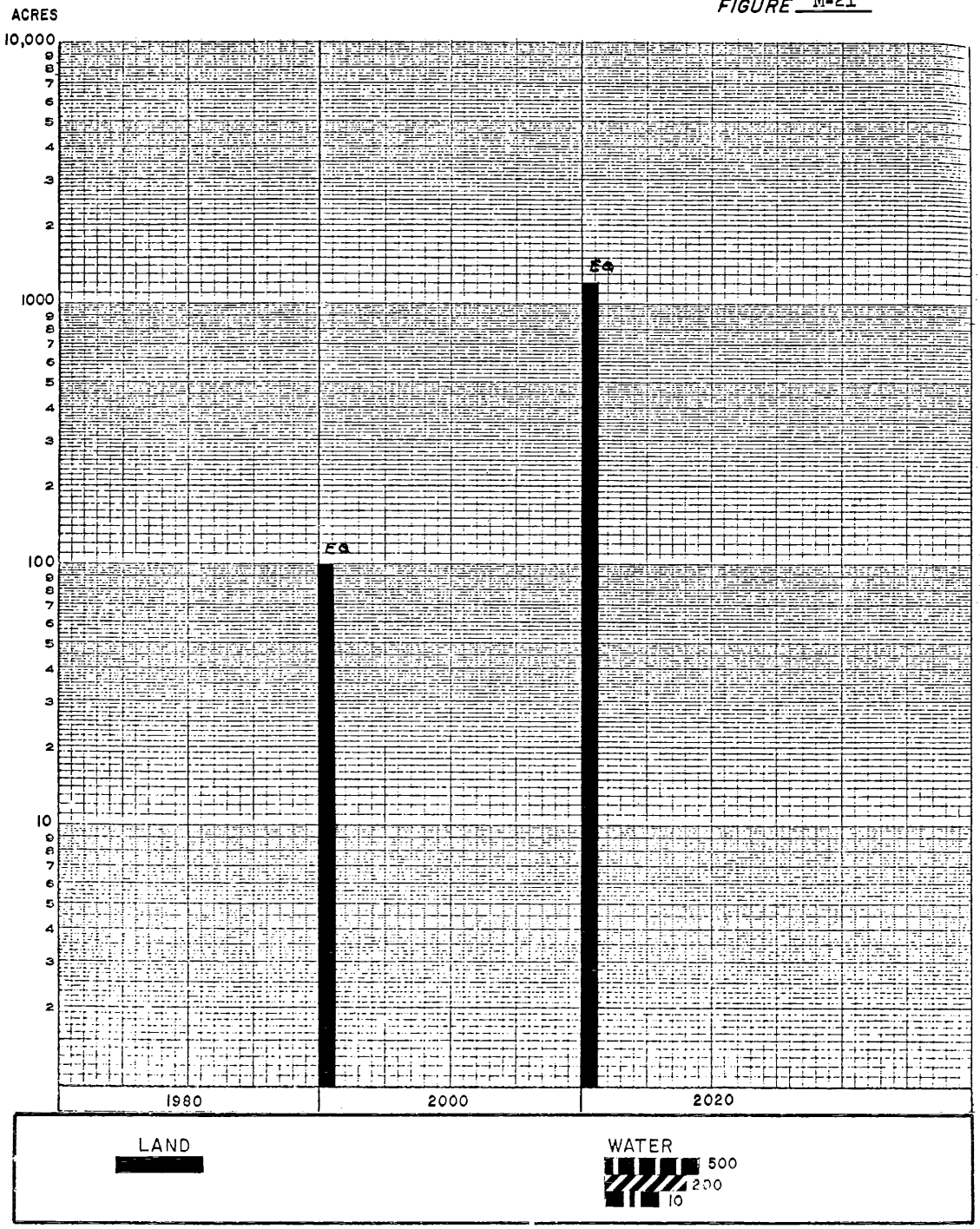


TABLE M-52

RECREATION LAND NEEDS IN SUBREGION D BY BASIN AND TARGET YEAR (ACRES)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
			ENVIRONMENTAL QUALITY OBJECTIVE			
14	73,800	32,700	63,900	56,500	31,200	60,900
15	113,400	47,800	80,300	77,300	43,100	75,200
16	23,300	13,000	23,700	0	100	1,200
			REGIONAL DEVELOPMENT OBJECTIVE			
14	27,300	12,100	22,000	16,200	11,800	21,600
15	39,900	16,800	26,100	16,200	16,300	26,100
16	8,200	4,600	7,800	0	0	0
			NATIONAL INCOME OBJECTIVE			
14	13,500	6,000	11,800	7,000	6,000	11,800
15	20,700	8,600	15,600	5,900	7,800	15,600
16	4,300	2,400	4,300	0	0	0

TABLE M-53

RECREATION BEACH NEEDS IN SUBREGION D BY BASIN AND TARGET YEAR (ACRES)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
		ENVIRONMENTAL QUALITY OBJECTIVE				
14	1071	513	1050	853	513	1050
15	1624	736	1237	1091	736	1237
16	335	200	376	0	0	0
		REGIONAL DEVELOPMENT OBJECTIVE				
14	491	235	439	286	235	439
15	745	337	509	218	337	509
16	154	91	162	0	0	0
		NATIONAL INCOME OBJECTIVE				
14	395	189	393	190	189	393
15	599	272	583	72	272	583
16	124	73	145	0	0	0

TABLE M-54

SWIMMING POOL NEEDS IN SUBREGION D BY
BASIN AND TARGET YEAR (IN THOUSAND SQUARE FEET)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
			ENVIRONMENTAL QUALITY OBJECTIVE			
14	18,475	8,851	18,114	14,714	8,851	18,114
15	28,016	12,691	21,336	18,821	12,691	21,336
16	5,775	3,457	6,657	0	0	0
			REGIONAL DEVELOPMENT OBJECTIVE			
14	9,576	4,588	8,556	5,579	4,588	8,556
15	14,522	6,578	9,923	4,245	6,578	9,923
16	2,994	1,792	3,159	0	0	0
			NATIONAL INCOME OBJECTIVE			
14	7,705	3,692	7,661	3,708	3,692	7,661
15	11,685	5,293	11,373	1,408	5,293	11,373
16	2,409	1,442	2,810	0	0	0

TABLE M-55

GROSS WATER SURFACE ACREAGE IN SUBREGION D BY UNIT SIZE CLASSES, FOR INDIVIDUAL BASINS AND TARGET YEARS (ACRES)

Basin	>500	>200	>10	2000 >500	2000 >200	2000 >10	2020 >500	2020 >200	2020 >10
				ENVIRONMENTAL QUALITY OBJECTIVE					
14	65,400	20,000	4,900	32,100	8,200	2,400	34,900	12,700	2,600
15	109,000	33,300	8,200	50,300	14,000	3,800	58,200	28,000	4,300
16	21,600	6,600	1,600	12,800	3,400	1,000	14,000	6,500	1,000
				REGIONAL DEVELOPMENT OBJECTIVE					
14	35,300	10,000	2,200	17,400	4,100	1,100	18,800	8,600	1,200
15	59,100	16,600	3,600	27,200	6,600	1,700	31,700	13,900	1,900
16	11,700	3,300	700	6,900	1,700	400	7,600	3,200	500
				NATIONAL INCOME OBJECTIVE					
14	19,500	4,700	800	9,500	2,000	400	10,600	4,000	400
15	32,900	7,800	1,300	15,300	3,100	600	16,900	5,500	700
16	6,500	1,500	300	3,800	800	200	4,200	1,500	200

TABLE M-56

NET WATER SURFACE ACREAGE NEEDS IN SUBREGION D BY UNIT SIZE CLASSES, FOR INDIVIDUAL BASINS AND TARGET YEARS (ACRES)

	1980			2000			2020		
Basin	500	200	10	500	200	10	500	200	10
				ENVIRONMENTAL QUALITY OBJECTIVE					
14	44,800	15,200	100	32,100	8,200	2,400	34,900	10,600	2,600
15	52,500	22,200	0	50,300	13,300	0	58,000	27,700	0
16	0	0	0	0	0	0	0	0	0
				REGIONAL DEVELOPMENT OBJECTIVE					
14	18,600	6,900	0	17,400	4,100	0	18,800	8,600	600
15	3,100	8,400	0	27,200	6,600	0	31,400	13,900	0
	0	0	0	0	0	0	0	0	0
				NATIONAL INCOME OBJECTIVE					
14	3,400	2,600	0	9,500	2,000	0	10,600	4,000	0
15	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0

TABLE M-57

RECREATION STREAM NEEDS IN SUBREGION D BY BASIN AND TARGET YEAR (MILES)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
		ENVIRONMENTAL QUALITY OBJECTIVE				
14	354	180	177	256	180	177
15	627	304	300	0	304	300
16	119	73	72	89	73	72
		REGIONAL DEVELOPMENT OBJECTIVE				
14	174	89	87	76	89	87
15	309	150	148	0	0	0
16	59	36	35	29	36	35
		NATIONAL INCOME OBJECTIVE				
14	117	59	58	19	59	58
15	207	100	100	0	0	0
16	39	24	24	9	24	24

In Basin 14 any effort to provide quality recreation opportunity over and above what exists now will be complicated by high population densities, an extremely high level of industrialization, and widespread water pollution. The estimated costs of acquiring and developing the facilities required to satisfy needs associated with the Regional Development Objective total $379.9, 298.4, and 551.3 million, respectively, for 1980, 2000, and 2020. The projected costs for land and facilities associated with National Efficiency are $224.2, 219.4, and 443.7 million for the same target years. The cost of stream rights are excluded in both instances. Regardless of the objective ultimately selected to meet the recreation need, planning should be pursued with some degree of environmental quality in mind. Benefits have been computed, and for the National Efficiency Objective they are $60.1, 65.9, and 155.9 million, respectively, for 1980, 2000, and 2020.

Basin 15 - the Delaware River - has uniformly higher needs than either of the other two basins; however, it appears that the probability of satisfying them is much greater, particularly in the northern half of the basin. Topography, existing recreation facilities, a natural resources base (principally State forests) from which high intensity parks can be developed as the need arises, and the Delaware Water Gap National Recreation Area all indicate that Environmental Quality is the logical framework in which to pursue the recreation aspects of water and related land use planning. In that portion of the basin below Trenton, and in the associated Schuylkill drainage, existing conditions are entirely different. Here the undesirable effects of industrialization, high population levels, and mining are all too evident, and recreation planning will in all likelihood involve either National Efficiency or Regional Development Objectives. Conditions here bear a certain resemblance to those prevailing in Basin 14, and recreation needs are for the most part similar.

In Basin 16 existing conditions are entirely different. Recreation plays a vital economic role throughout the basin, and water and related land use planning, if it is to be successful, must consider this fact. Needs have been identified for each objective, and even under the Environmental Quality Objective they are comparatively small: land needs are 100 and 1200 acres for 2000 and 2020; stream needs are 89, 73, and 72 miles for 1980, 2000, and 2020. It appears most logical that recreation planning be done under the Environmental Quality Objective, both because of the importance of recreation to the economy, and because little or no difficulty should be experienced in achieving it.

Satisfying Needs. As indicated in the Needs analysis, the greatest needs, in general, exist in Basin 15 followed closely by those in Basin 14. Basin 14 includes the populous northeast corner of New Jersey, and such heavily polluted streams as the Hackensack, Passaic, and Raritan Rivers. Around the turn of the century, the area adjacent to Raritan Bay was a recreation area of considerable importance, primarily because of its close proximity to New York City; however, its importance diminished as increased urbanization and industrialization brought pollution to the waters of the Raritan Bay. In addition, the same physical characteristics that made the beaches ideal for swimming, i.e., gentle slopes and shallow water, also made them susceptible to the natural disasters of severe pounding and flooding from coastal storms and hurricanes. Although the recreational value of the Raritan Bay has been considerably decreased through the various factors of water pollution, erosion caused by periodic coastal storms, and deterioration of nearby residences and other structures, the potential for intensive recreation remains. Perhaps the greatest factor relating to this potential is the current high demand for water-based recreation to serve the New York metropolitan area, and the certainty of these demands increasing as the metropolitan area continues to grow. The ability of the Bay to help satisfy these needs is reflected in the estimated holding capacity of the existing beaches compared to the current use they receive. Based upon the standard of 150-square feet per person, these beaches have an instant capacity of 14,000 persons. (22) Thus, over the summer season approximately 1.4 million recreation days could be provided. The acreage involved - 48 acres - seems small when compared to the beach needs listed in Table M-53; nevertheless, the situation is such that all possibilities which might result in adding to the recreation base should be explored.

One such possibility is discussed in Water Resources for Recreation, where the feasibility of enclosing certain portions of beach and water within a concrete structure is discussed. (23) The idea, of course, is to provide additional swimming capacity, and is predicated upon the premise that not all polluted streams will ultimately have water quality sufficiently high to permit swimming. Water drawn from polluted streams would be filtered and purified, and then pumped to an enclosure, which would be designed not as a swimming pool, but as a large "natural" water body. The outer side of the enclosure could be used for docking boats, and the top for walkways and sunbathing areas. Reportedly, the scheme has been employed successfully on portions of the Seine River in Paris.

For Basin 14, the principal recreation area will in all likelihood by the Skyland Recreation Region in Passaic County, and it is within this complex that most of the needs outlined earlier, particularly those relating to camping, fresh-water boating and swimming, and canoeing, will be met. The Skyland Region encompasses a variety of public, quasi-public, and private recreation lands, including the Norvin Green and Hewitt State Forests, four State parks, two public hunting and fishing grounds, and two watershed areas, i.e., the Pequannock and Wanaque. Other recreation areas proposed closer to the populated areas are Great Piece Meadows and Troy Meadows. The former will consist of 2900 acres, while Troy Meadows will have approximately 2550 acres. Each area will have a daily capacity of 2000 persons. (24)

In Basin 14 it may be possible to provide recreation opportunity in a number of other ways. For instance, some thought has been given to the construction of 20 small reservoirs having a total capacity of 22,000 acre-feet on upstream portions of the basin's rivers for flood control purposes. Similarly, it appears that reservoirs might also be used for low-flow augmentation, and for industrial and municipal water supply. The latter need indicates storage on the order of 53.4 and 80 thousand acre-feet for 2000 and 2020, respectively, under the National Efficiency Objective. Under Regional Development, the same amount would be provided in total by 2000. Recreation should be an integral part of low-flow augmentation and water supply reservoirs, and should be included in preliminary planning through to completion and operation. Serious thought should be given to means whereby privately-owned water supply reservoirs can be made available for public recreation. The State operates at least two water supply reservoirs, i.e., Round Valley and Spruce Run, in this basin, and a variety of recreation activities, including swimming, is allowed.

It appears realistic to expect that recreation needs identified under the Regional Development Objective can be met in Basin 14, but it will take a determined effort on the part of all public agencies. The prediction above is based partially on the assumption that the excellent county park systems which now exist will be continued and somewhat expanded.

Basin 15 - the Delaware River drainage - is by far the largest and most heavily populated in Subregion D. The projected annual participation in water-oriented outdoor recreation, for 1980, under the Environmental Quality Objective, exceeds 80 million recreation days. It follows that the various needs are correspondingly high, and this fact is clearly reflected in Tables M-52 through M-57. However, a considerable portion of these needs will be met by the Delaware Water Gap National Recreation Area. When completed, this National Recreation Area will have a capacity of over 10 million recreation days annually. The NRA will be developed around the 12,900-acre pool of the multi-purpose Tocks Island Dam, and will be the largest recreation complex by far in the basin. Facilities are planned for both day and extended use, and will provide opportunity for swimming, camping, picnicking, boating, canoeing, sailing, hiking, and nature study.

Further downstream, in Delaware Bay, the opportunity exists for developing a complex almost as large as Tocks Island, but the eventual desirability, or even feasibility, of such an undertaking will depend directly upon how successfully the lower river and bay can be cleaned up. There exists in Cumberland County, and in lower Salem County, New Jersey, a number of State lands, principally fish and game areas, which could form the nucleus of such a complex. Such an area could be developed for both day and extended use, including camping, boating, water-skiing, sailing, swimming, picnicking, and both fresh and salt water fishing. It is possible that such a facility could in some way be "tied-in" with the 30,000-acre Wharton State Forest situated to the northeast. It is conceivable that at some future date the south coastal resorts, particularly Atlantic City, Ocean City, and Cape May will become totally saturated, and completely new areas will have to be developed. Lower Delaware Bay appears to be one such area. This 18,500-acre complex, identified as the Cohansey project, is mentioned in the New Jersey Open Space Recreation Plan for action after the year 2000, and is an example of the kind of action future conditions might require. (25)

The remaining portion of the present recreation base in Basin 15 are the lakes and ponds, and these appear to have no great additional recreation potential because most of them, particularly the larger ones, have already been developed and are presently functioning as recreation facilities. (26)

It appears, then, that if additional broad water is required, and if existing reaches are too polluted and cannot be reclaimed, then additional acreage will have to be created. From a recreation point of view, this generally is done in conjunction with one or more uses, including flood control, water supply, hydro-electric power generation, or low-flow augmentation. When the other purpose is water supply, the question often arises about the desirability of permitting recreation and if so, then how much and what kind. Generally speaking, fishing is most often permitted, boating in rare instances, and swimming, for all intents and purposes, not at all.

The State of New Jersey has considered outdoor recreation at reservoirs to be a perfectly acceptable use, and at Spruce Run and Round Valley - the first state-owned reservoirs - has provided both boating, swimming, camping, hunting and fishing. In addition, most proposed reservoirs such as Hackettstown, Hard Scrabble, and Six Mile Run will have provisions for multi-purpose recreational use. Other proposals such as Crab Island, Ravine Lake, and Two Bridges will have additional watershed property amounting to 10-20 percent of the water surface area. This additional land - in combination with the water area it encompasses - will make these sites potentially usable as multi-purpose reservoirs.

The State of New Jersey may be able to prove, through its experience at Spruce Run and Round Valley reservoirs, that public outdoor recreation in conjunction with domestic water supply is entirely feasible, and hopefully private and municipally-owned reservoir managers will take a second look at the restrictive practices now in vogue. It is entirely possible that the extra costs required for preparing water for human consumption, as a result of using the reservoir and watershed properties for recreation, can easily be recovered by instituting a realistic fee schedule for such recreation. Such a move would greatly help meet the demand for day-use activities, since many of these reservoirs are located close to population centers. Other controls, in addition to fees, could be established to insure that the primary purpose of water supply is in no way threatened.

We have thus far discussed in Basin 15 the Delaware River and recreation opportunities, proposed and existing, including Tocks Island and possible development at Cohansey River. Also, we have briefly examined lakes and reservoirs, and how they might be utilized for recreation. One other resource in the basin exists, and this is the large number of State parks and forests situated on both sides of the river. It appears that the four States involved will establish new areas, and also expand existing ones, in an effort to meet recreation demand. In New Jersey, the development of facilities for day-use recreation is underway at Wawayanda State Park, and similar development is planned for Allamuchy Mountain State Park. The latter will also include camping facilities, natural areas, and ski slopes. This recreation area,

incidentally, will surround the proposed Hackettstown Reservoir. Swimming, boating and picnicking will be provided at Steenyhill Lake in High Point State Park, and swimming and camping facilities are planned for Lake Ocquittunk and Stony Lake in Stokes State Forest. Looking even further ahead - to the year 2000- New Jersey anticipates recreation development throughout the basin, particularly at Voorhees and Swartswood State Parks, at Jenny Jump State Forest and, further downstream, at Frenchtown, Palmyra, and Rancocas.

In Pennsylvania, the State is aware that the possibility of visitor overflow from the Delaware Water Gap National Recreation Area exists, and the State Comprehensive Outdoor Recreation Plan (SCORP) recommends that a feasibility study be done to determine the need for additional low-density State parks west of the NRA. Considerable acreage of State-owned land - principally State forest land - exists, and portions of such land will probably be dedicated to park purposes as the need arises. In discussing the Pocono Region, the SCORP points out that destination-type recreation activities must be emphasized, with quality of experience taking precedence over intensive-use. The same need - camping facilities - is emphasized in the recreation development to accompany proposed water impoundments at Blue Marsh Lake and Aquashicola Lake.

The SCORP discusses three other recreation areas, and the desirability of developing each to a different level of intensity, so that a "Package" or complex results which will offer the recreationist a choice of accommodation. The first area is the remote and undeveloped Lehigh River Gorge extending for 29 miles from Jim Thorpe to the Francis E. Walter Dam. The development of an abandoned railroad right-of-way at the bottom of the Gorge into a hiking trail and the construction of some primitive campsites without direct access would comprise the total development contemplated for this area. The second part of the complex is Hickory Run State Park, which is to be resource-oriented, as contrasted to user-oriented, and in which emphasis would be placed on a quality recreation experience. The third, and final area of the complex would be the recreation area at the Francis E. Walter impoundment. This area would be intensely developed for both overnight and day-use. The impoundment is managed by the Corps of Engineers, and to date the kind and extent of recreational development has not been fully determined. The recreationist could then decide, based upon his own preference and experience, which area would be the most rewarding for him.

Downstream, near the Philadelphia County Line, the State is now completing a large marina which will provide access for boating, sailing, and fishing in that portion of the river. Further south, in the Bay area itself, the possibility of major recreation development on the New Jersey side has been discussed previously. In Delaware, the State has set as first priority..."the acquisition

of land and (the) exercise of other controls over the inland bays and rivers, the State's wetlands, and areas necessary to complete "urban parks." (27) This policy is significant, and hopefully it will result in the entire bayfront, from the Chesapeake and Delaware Canal south to Cape Henlopen, remaining open and available for public use. Such an undertaking, when achieved, would have a most beneficial effect on the ecology of Delaware Bay, particularly on the fish and game resources found therein. Development proposed along the Bay includes the expansion of Cape Henlopen State Park to instant capacity of 26,000, and development of swimming and boating facilities at the Indian River Inlet area and on Burton Island.

Basin 16 comprises the eastern half of New Jersey, including the entire coastal area from Raritan Bay south to Cape May. It is, and has been for the past century, an area dedicated to water-based recreation, particularly salt-water swimming, boating, and fishing. Projected needs, even under the Environmental Quality Objective, are small. Included are 100 and 1200 acres of recreation land for 2000 and 2020, and 89, 73, and 72 miles of white-water streams for the three target years. It is obvious that the second need cannot be provided; nevertheless, the close prosimity of the various bays, the Ocean, and a number of tidal streams should offer some canoeing opportunity.

If development of Corson Inlet proceeds as indicated in the New Jersey Open Space Recreation Plan, (28) then this one facility of 1500 acres would satisfy the projected recreation land need. The State indicates, in the same plan, that development of 1500 acres at Cape May - Higbee will provide day-use facilities with a daily capacity of 4000. (29) Thus these two State facilities, with a total area of 3000 acres, and a daily capacity of 6500, would more than satisfy those land needs calculated under the Environmental Quality Objective.

It would appear that Basin 16 possesses all of the natural resources required to satisfy public demand for water-based recreation. What follows then, is not a discussion of needs, per se, but rather a brief review of some developments which threaten part of this outstanding recreation resource.

Foremost among these threats is that kind of activity described as "lagoon development." Essentially, this is real estate development which consists of filling-in marshes and wetlands, and building structures, principally summer housing, on the filled areas. In many cases, provision is made for constructing a pier or dock at the end of each lot. With the increased cost of housing on Long Beach Island and on the barrier beach to the north, such development has occurred on the mainland immediately west of the various bays. The immediate effect is, of course, complete and utter destruction by mechanical action of the marsh areas directly affected. Secondary effects, principally pollution

and siltation, are known to adversely affect the ecology and marine productivity of nearby marshes not directly involved in the lagooning process.

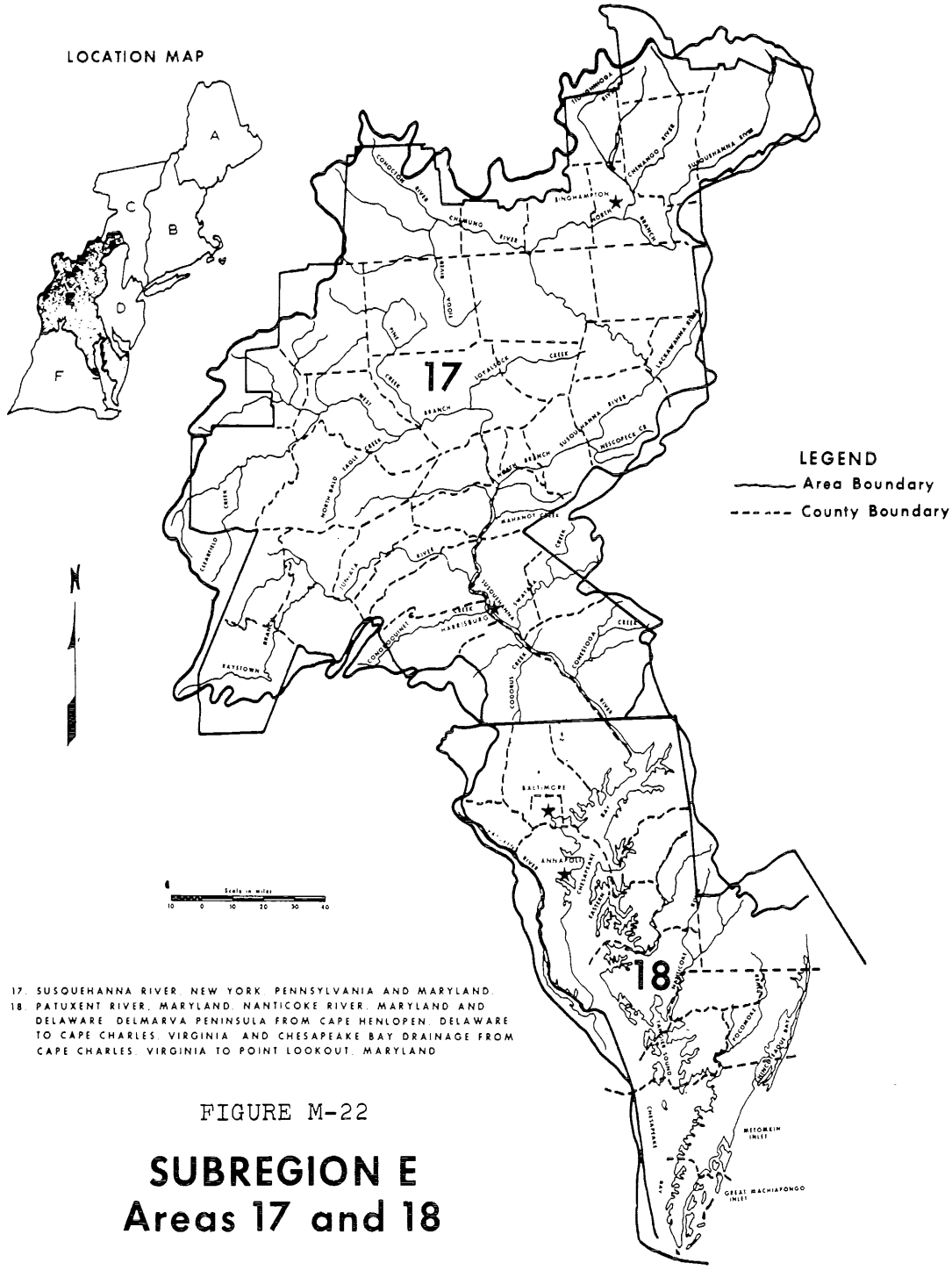
Another problem directly affecting the quality of recreation in Basin 16 concerns vehicular access to Long Beach Island and the barrier beach. Some means must be found to transport day-users, principally swimmers and picnickers, from the mainland to the recreation areas themselves. The present situation, particularly as it develops on a warm, summer weekend, cannot continue indefinitely. Other problems noted include poor and indirect public access to publicly-owned beaches, with access possible in some cases only across privately-owned land, and a marked discrepancy in the fees charged by various municipalities for the use of their beaches. Some of these problems are unique to the cities in Basin 16; others can be found in the municipalities of any coastal State. Regardless, solutions must invariably be found, or sooner or later the recreation quality will decline.

Summary. Subregion D consists of the Delaware River Basin, and the separate drainage areas of northern and southern New Jersey. Resident population exists unevenly throughout the subregion, and is heavily concentrated in the northeast corner of New Jersey, and along the southern half of the Delaware River. Rapid industrial expansion, an expanding population, conflicting land use priorities and plans, and improper use of wetlands and estuaries characterize Subregion D. In general, sufficient water and related land does exist to satisfy projected recreation needs; however, much of the water has been degraded by municipal and industrial pollution and consequently is not available for recreation use.

In Basin 14, and the lower portion of Basin 15, recreation planning should proceed utilizing either the National Efficiency or Regional Development Objectives. Recreation needs associated with the latter Objective are more extensive, but should the decision be made to invest the necessary capital, then the projected needs could be met. Devices recommended include the development of new faciltiies and the expansion of existing ones; the inclusion of recreation opportunity in devices designed primarily for other needs, such as flood control; and the use of water-supply reservoirs for recreation at those sites where it currently is not permitted.

Basin 16 and the upper portion of Basin 15 are now used extensively for recreation. Planning for recreation in these areas should be done utilizing Environmental Quality as the objective. In this way the opportunity for quality recreation will continue and not be degraded as a result of greatly increased use. In Basin 16 several problem areas have been identified. These include the problem of lagoon development; the physical

movement of recreationists and their vehicles from the mainland to the barrier beaches; poor public access from towns and public highways to the publicly-owned beaches; and a marked discrepancy in the fees charged by muncipalities for the use of their beaches.



17. SUSQUEHANNA RIVER, NEW YORK, PENNSYLVANIA AND MARYLAND.
18. PATUXENT RIVER, MARYLAND, NANTICOKE RIVER, MARYLAND AND DELAWARE, DELMARVA PENINSULA FROM CAPE HENLOPEN, DELAWARE TO CAPE CHARLES, VIRGINIA, AND CHESAPEAKE BAY DRAINAGE FROM CAPE CHARLES, VIRGINIA TO POINT LOOKOUT, MARYLAND

FIGURE M-22

SUBREGION E
Areas 17 and 18

LOCATION AND BOUNDARIES

FWPCA December 1969

SUBREGION E

Introduction. This subregion - the Susquehanna River drainage and the upper half of Chesapeake Bay - includes portions of four States: south-central New York, the central portion of Pennsylvania, the southern third of Delaware, the eastern Shore of Virginia, and that portion of Maryland situated east of the District of Columbia. In this chapter, and throughout this Appendix, the Susquehanna River proper, from the source of the North Branch in Broome and Chenango Counties in New York State, to its mouth near Havre de Grace, Maryland, is identified as Basin 17. Basin 18 begins at that point (at the head of the Chesapeake), and extends south through Prince Georges and St. Mary's Counties to Point Lookout, Maryland. All of the Eastern Shore of Maryland, as well as the southern third of Delaware, is included in Basin 18. Also included is Virginia's Eastern Shore.

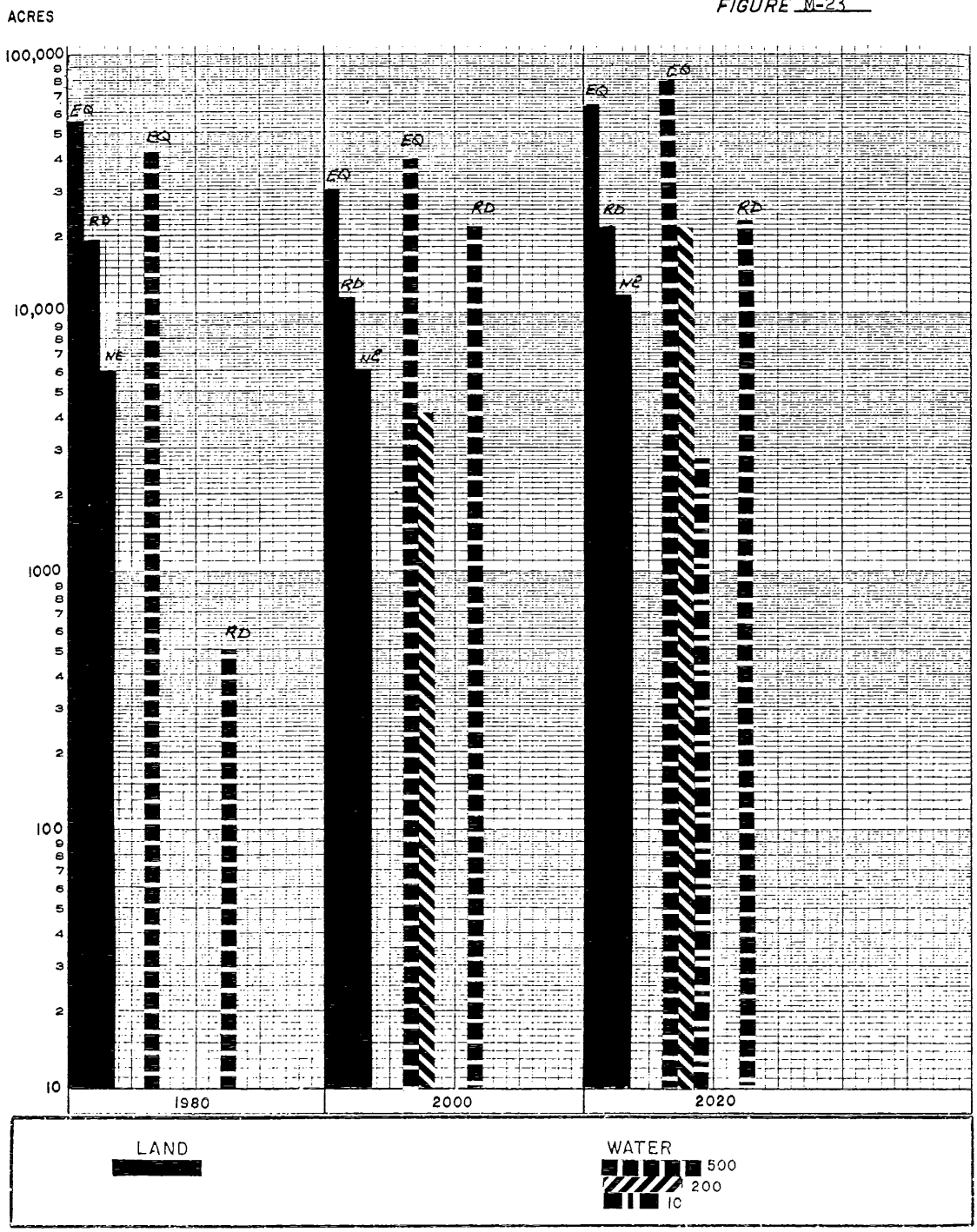
Basin 17 - which comprises approximately 77 percent of the subregion - drains some 27,500 square miles, and is the second largest river basin east of the Mississippi River. Only the St. Lawrence drainage to the north is larger. An average of some 23 billion gallons of water flows daily from the Susquehanna into Chesapeake Bay. Basin 17 is generally rural in character, and is about 55 percent forested. Cropland accounts for 24 percent, pasture 9 percent, and other rural uses 7 percent. Of the remaining 5 percent, 4 percent is classified urban, while one percent is water. It is expected that the Basin's 1960 population of 3.2 million persons will increase to slightly over 6 million by the year 2020.

Basin 18 - which has a drainage area of 8,130 square miles - differs from Basin 17 in being not only considerably smaller (23 percent of the total subregion area), but also in having a marked difference in topography, land-form, and population characteristics. Whereas Basin 17 is situated within a number of physiographic regions, including the Piedmont, the Ridge and Valley, the Allegheny Mountains, and the glaciated portion of the Allegheny Plateau, Basin 18 is confined almost solely to the Coastal Plain. Although the 1960 population of Basin 18 is smaller than 17 (2.1 million vs 3.2 million), the average density per square mile is considerably greater. The great majority of Basin 18's population (some 1.8 out of 2.1 million) is situated on the west shore, particularly in the Baltimore SMSA, and in the densely populated suburbs surrounding Washington, D. C. The remaining 300,000 live on the predominately agricultural eastern shore.

The direct effects of population distribution within Subregion E, and the indirect effects of topography, can be seen in the data presented in Table M-58. The projected gross annual participated figures for Basin 17 are on the order of 7 to 8 times those for

RECREATION LAND & WATER NEEDS

BASIN 17
FIGURE M-23



Basin 18, while the corresponding ratio in net figures is infinitely greater. If one assumes that the population in each basin increases at the same rate, one must conclude that the recreation problem in Basin 17 appears infinitely more complex than in Basin 18. The lack of broad water acreage in Basin 17, particularly in the greater than 500-acre category, contributes to the problem, as does the geographic fact of life that the Susquehanna Basin is adjacent to three of the most rapid growing urban areas in North America. To the east lies the New York - Philadelphia - Wilmington segment of Megalopolis; to the west one finds the Pittsburgh and northeastern Ohio urban-industrial complex; and northward, there is the belt of New York cities extending from Albany through the Mohawk Valley and along the shores of the Great Lakes to Buffalo. All of these cities lie within two hours driving time of the Susquehanna River.

Table M-58 presents some other interesting comparisons, one being the vast difference between gross and net figures for Basin 18 - a relationship which holds true regardless of objective. The apparent ease with which demand can be met in this basin is directly attributable, of course, to the close proximity of the Chesapeake Bay and the Atlantic Ocean.

In summary, the two basins may be adjacent, but the recreation needs of each, and the means by which these needs will be satisfied, are entirely dissimilar.

RECREATION LAND & WATER NEEDS

BASIN 18
FIGURE M-24

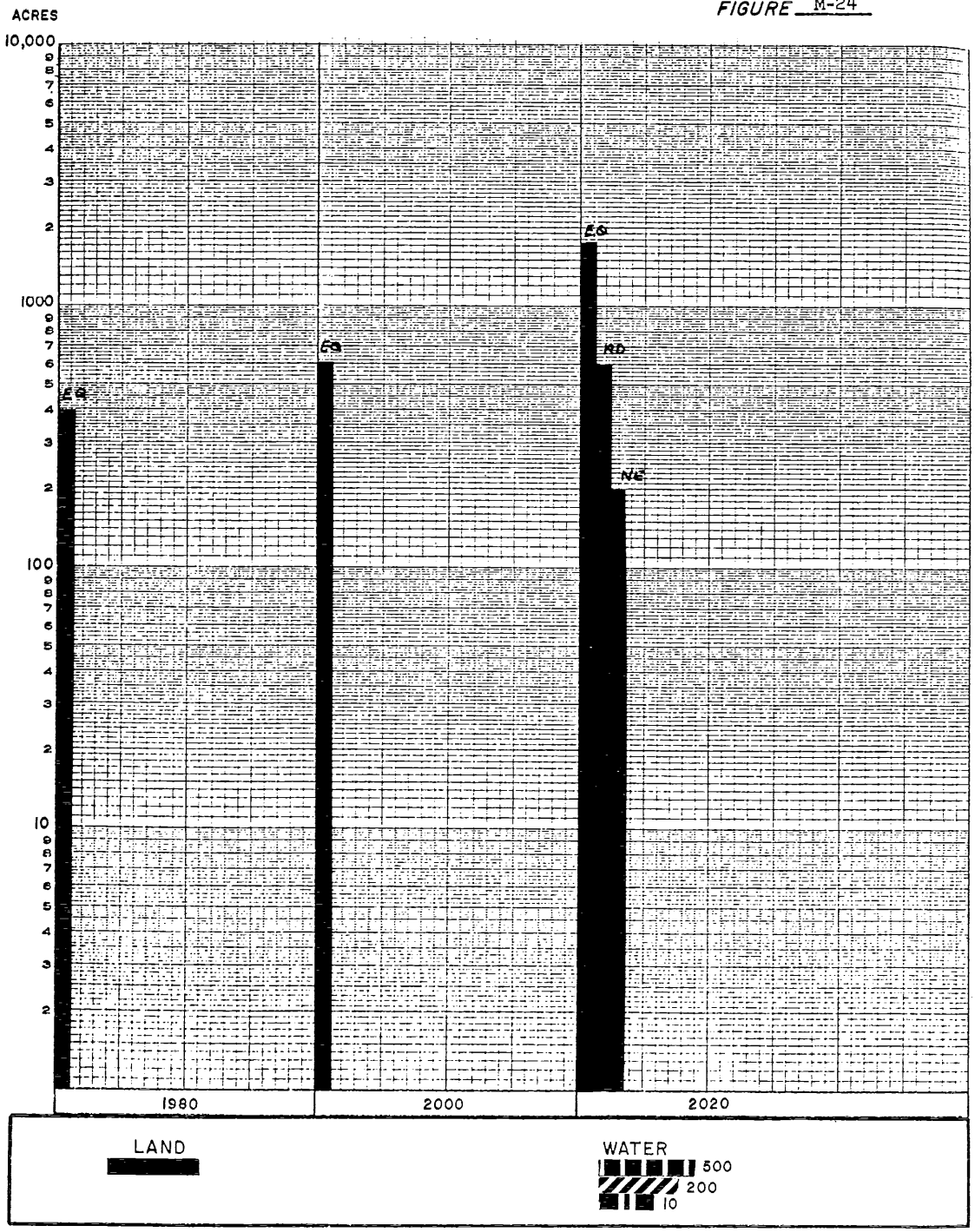


TABLE M-58

PROJECTED ANNUAL PARTICIPATION IN WATER-ORIENTED OUTDOOR RECREATION IN SUBREGION E BY BASIN AND TARGET YEAR (THOUSANDS OF RECREATION DAYS)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
			ENVIRONMENTAL QUALITY OBJECTIVE			
17	81,370	47,831	106,963	59,775	42,561	102,490
18	11,373	6,965	14,631	407	603	1,808
			REGIONAL DEVELOPMENT OBJECTIVE			
17	83,484	49,126	103,291	54,998	42,250	93,701
18	11,654	7,145	14,288	128	123	1,696
			NATIONAL INCOME OBJECTIVE			
17	75,051	41,259	92,596	27,494	30,781	77,156
18	9,918	6,026	12,810	128	83	647

Needs. As noted in the Introduction, the recreation needs of the two basins comprising Subregion E are entire dissimilar. Prior to discussing the recreation needs outlined in the tables which follow, it seems advisable to review present conditions in both Basin 17 and 18, and ascertain what needs other than recreation needs now exist.

That portion of the Susquehanna River above Sayre, Pennsylvania is characterized by a number of problems which limit recreation, but the region contains very few mines, so acid mine drainage is not a problem. The most pressing immediate problem is the lack of water-oriented recreation facilities. Another major problem is flood control; at Binghamton, the flood threat is particularly great. Still another problem is the extensive amount of municipal and industrial pollution; reaches so affected include the Chenango River below Norwich, the Tioughnioga River below Cortland, and the Susquehanna River itself below Binghamton - Endicott. Although water supply is not a large problem now, if the predicted increases in manufacturing and irrigation use predicted through 2020 do materialize, there is no doubt that water supply will become the chief problem, followed closely by the need for flood control and recreation.

At Athens, the Chemung River joins the Susquehanna after flowing through Elmira and Corning, New York. Again, the lack of recreation opportunity throughout the drainage is the chief problem, followed closely by poor water quality. Degradation resulting from sewage and industrial wastes occurs in the Tioga River below Mansfield, the Canisteo River below Hornell, and the Chemung below Corning and Elmira. In addition, the Tioga River is rendered acid or intermittently acid for some 40 miles by drainage from mines chiefly in the Morris Run drainage area of Tioga County, Pennsylvania. The flood threat is not nearly as great here as it is in that section of the Susquehanna discussed above. It appears that the best overall water and related land planning objective in this area - generally identified as Sub-Area A - is Regional Development, with emphasis on Environmental Quality. Emphasis on EQ would help rectify the lack of recreation opportunity - a situation mentioned twice as the chief problem.

Downstream, in Sub-Area D, mine acid drainage is the major problem affecting the Susquehanna in the reach between Sayre and its confluence with the West Branch at Northumberland. In addition, organic pollution occurs in the river below Wilkes Barre, and in a major tributary - the Lackawanna River, below Carbondale. Recreation facilities are lacking in the area, and it is not unreasonable to expect that this situation will continue until such time as water quality improves. In Sub-Area B, the acid mine pollution problem exists, especially on the upper reach of the West Branch above Renovo, Pennsylvania. In addition to extensive acid drainage, this reach - some 130 miles - is polluted locally with municipal and industrial wastes. Below Renovo, municipal and industrial wastes become more of a problem than acid mine drainage; in addition, the flood threat becomes very serious along the lower portion of the West Branch. The average amount of flood damage is estimated at $3.6 million on that reach between Renovo and Northumberland. Again, it appears that the most favorable overall planning objective is a judicious blend of regional development and environmental quality. The latter should be emphasized in the western portion of Sub-Area B, and in the eastern portion of Sub-Area D - especially in the country north and east of Williamsport.

Further south, in the Juniata drainage, the recreation picture brightens somewhat principally because of the comparatively large number of existing recreation areas. Nevertheless, some problems, such as pollution, water-supply, and flood control do exist. Organic degradation exists in the Little Juniata River below Altoona and Tyrone, in the Frankstown Branch below Roaring Spring and Williamsburg, and in the Juniata River below Huntingdon and Lewistown. Acid mine drainage occurs on the Beaverdam Branch, Raystown Branch and Aughwick Creek. Flood damage is a serious problem in several sections of the Juniata drainage, particularly

on the upper Raystown Branch, the Little Juniata, and the Frankstown Branch at or below Williamsburg. All of these reaches are above the influence of the Raystown project.

From Northumberland south to its mouth, the picture is more of the same. The Susquehanna receives organic pollution loads from a number of cities along both banks, including Shamokin, Mahanoy City, Harrisburg, and Columbia. Acid mine drainage results when polluted streams such as Shamokin, Mahanoy, Mahantango, and Wiconisco Creeks join the river. Another problem is that of nutrient pollution, including agricultural runoff, which occurs chiefly in the York and Lancaster County area. A new threat, and one whose potential dangers are not fully understood, is thermal pollution. The proposed large nuclear generating stations at Peach Bottom and Three Mile Island will add great amounts of heat to that now produced by the Brunner Island plant below York Haven. It is recommended that the Regional Development Objective be pursued in that portion of the river between Northumberland and Harrisburg, and that Environmental Quality be emphasized in that reach between Harrisburg and Havre de Grace, Maryland.

In Basin 18, it is recommended that Environmental Quality form the basis for both recreation and overall water and related land use planning. In the Baltimore area, this basic recommendation of EQ will of necessity be combined with Regional Development to provide for such needs as municipal and industrial water and liquid waste disposal.

The above review indicates that in this subregion water and related land use planning should be done utilizing the Regional Development as the frame of reference from the headwaters area in New York State south to Harrisburg. From Harrisburg south through Basin 18 such planning should emphasize Environmental Quality. There are areas where a mix of objectives seem most appropriate, for example, the Baltimore area - and such exceptions have been noted.

In general, the various needs cited in Table M-59 through Table M-64 reveal moderate to severe needs in Basin 17 for the planning objectives recommended, while in Basin 18 the needs identified under the recommended objective of Environmental Quality are small: 400 acres and 600 acres of water-based recreation land by 1980 and 2000, respectively, and 97 and 48 miles of stream for the same target years. No broad water acreage needs for boating, sailing, or water skiing have been identified in Basin 18; similarly, no beach or pool needs are deemed to exist.

In Basin 17, the greatest needs identified are recreation land needs: 55,400 acres and 19,400 acres under the Environmental Quality and Regional Development Objectives, respectively, for 1980, and broad water surface acreage, particularly in the largest

TABLE M-59

RECREATION LAND NEEDS IN SUBREGION E BY
BASIN AND TARGET YEAR (IN ACRES)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
			ENVIRONMENTAL QUALITY OBJECTIVE			
17	72,900	37,500	64,500	55,400	30,000	62,900
18	10,700	4,900	8,700	400	600	1,800
			REGIONAL DEVELOPMENT OBJECTIVE			
17	27,100	11,800	21,300	19,400	11,300	21,300
18	3,800	1,700	2,900	0	0	600
			NATIONAL INCOME OBJECTIVE			
17	14,600	5,500	11,900	6,000	5,400	11,600
18	2,000	900	1,700	0	0	200

TABLE M-60

RECREATION BEACH NEEDS IN SUBREGION E BY
BASIN AND TARGET YEAR (IN ACRES)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
			ENVIRONMENTAL QUALITY OBJECTIVE			
17	1,431	663	1,351	1,214	663	1,351
18	145	70	130	0	0	0
			REGIONAL DEVELOPMENT OBJECTIVE			
17	1,123	519	965	906	519	965
18	67	31	55	0	0	0
			NATIONAL INCOME OBJECTIVE			
17	400	184	386	184	184	386
18	54	26	50	0	0	0

TABLE M-61

SWIMMING POOL NEEDS IN SUBREGION E BY
BASIN AND TARGET YEAR (THOUSANDS OF SQUARE FEET)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
			ENVIRONMENTAL QUALITY OBJECTIVE			
17	24,908	11,525	23,508	21,132	11,525	23,508
18	2,504	1,199	2,242	0	0	0
			REGIONAL DEVELOPMENT OBJECTIVE			
17	19,367	8,960	16,640	15,624	8,960	16,640
18	1,298	620	1,067	0	0	0
			NATIONAL INCOME OBJECTIVE			
17	7,792	3,605	7,525	3,580	3,605	7,525
18	1,044	499	961	0	0	0

TABLE M-62

GROSS WATER SURFACE ACREAGE NEEDS IN SUBREGION E
BY UNIT CLASSES,
FOR INDIVIDUAL BASINS AND TARGET YEARS (ACRES)

Basin	1980 >500	1980 > 200	1980 > 10	2000 >500	2000 > 200	2000 > 10	2020 > 500	2020 > 200	2020 > 10
				ENVIRONMENTAL QUALITY OBJECTIVE					
17	81,800	25,600	6,200	39,500	10,900	2,900	46,500	21,500	3,300
18	13,500	4,100	1,000	6,500	1,900	500	7,800	3,500	600
				REGIONAL DEVELOPMENT OBJECTIVE					
17	44,200	12,800	2,700	25,700	5,400	1,300	23,400	10,700	1,500
18	7,300	2,100	500	3,500	900	200	4,300	1,700	300
				NATIONAL INCOME OBJECTIVE					
17	24,300	6,000	1,000	11,700	2,400	500	12,800	5,100	500
18	4,100	1,000	200	1,900	400	100	2,500	800	100

TABLE M-63

NET WATER SURFACE ACREAGE NEEDS IN SUBREGION E
BY UNIT SIZE CLASSES, FOR INDIVIDUAL BASINS AND TARGET YEARS
(ACRES)

Basin	1980 > 500	1980 > 200	1980 > 10	2000 > 500	2000 > 200	2000 > 10	2020 > 500	2020 > 200	2020 > 10
				ENVIRONMENTAL QUALITY OBJECTIVE					
17	42,500	0	0	39,300	4,100	0	43,800	21,500	2,800
18	0	0	0	0	0	0	0	0	0
				REGIONAL DEVELOPMENT OBJECTIVE					
17	500	0	0	21,900	0	0	23,000	0	0
18	0	0	0	0	0	0	0	0	0
				NATIONAL INCOME OBJECTIVE					
17	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0

TABLE M-64

RECREATION STREAM NEEDS IN SUBREGION E BY
BASIN AND TARGET YEAR (IN MILES)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
			ENVIRONMENTAL QUALITY OBJECTIVE			
17	521	252	262	0	0	0
18	97	48	52	97	48	52
			REGIONAL DEVELOPMENT OBJECTIVE			
17	257	124	129	0	0	0
18	48	23	26	48	23	26
			NATIONAL INCOME OBJECTIVE			
17	172	83	87	0	0	0
18	32	16	17	32	16	17

category, i.e., 500 acres and greater. The next part of this chapter will examine the means whereby these various needs can be provided for.

Satisfying Needs. We have, thus far, pointed out that recreation needs are more varied, and much more pressing, in Basin 17 than those in Basin 18. The sole exception to the above is stream mileage required. In order to provide for these recreation needs, and at the same time, to raise the income of the residents involved, it was recommended that a judicious blending of Regional Development and Environmental Quality be undertaken in Basin 17. It is further recommended that environmental quality be set as the goal in Basin 18, to the south. In the Baltimore area, the Environmental Quality Objective will essentially be a mixed one comprised of Environmental Quality and Regional Development.

Although the recreation needs in Basin 17 are extremely immense and varied, and complicated further, in some cases, by acid mine drainage, a great recreation resource does exist and, if properly developed, this resource could meet all anticipated demand. In general, recreation development appears feasible along both the Main stem and the West Branch of the Susquehanna.

On the Main stem, recreation development appears particularly suitable down to its confluence with the Lackawanna River near Pittston. Below this point, acid mine drainage, together with other by-products of the mining industry: unsightly culm banks, subsidence, and air pollution from abandoned coal refuse banks are evident, and have contributed to a marked absence of recreation opportunity within the Anthracite region. Under the Pennsylvania Land and Water Conservation and Reclamation Program (Project 500), some $200 million is available to the Department of Environmental Resources to alleviate these undesirable conditions. Upstream from Pittston, the opportunity exists for major public recreation development. The Commonwealth has indicated that in addition to building new parks throughout the North Branch drainage, existing parks will be modernized and expanded. Two new parks have been tentatively identified, and include Mount Pisgah in Bradford County, and 1500-acre Meshoppen State Park in Susquehanna County. Concurrently, modernization is programmed at World's End, Hills Creek, and Leonard Harrison State Parks; in addition, camping facilities at Ricketts Glen and Leonard Harrison State Parks will be expanded. The State has also indicated that water-based recreation is contemplated at several Federal water impoundments, namely, Cowanesque Reservoir and Tioga-Hammond Reservoir. The latter will have a designed conservation pool of approximately 1200 acres.

Regarding the recommended goal of combined Regional Development and Environmental Quality, an article appearing in Appalachia is of interest. (30) Of the fourteen "recreation complexes" in Appalachia recommended for further study to determine recreation

market potential and economic feasibility, two are situated in Basin 17: Raystown - State Parks, and Susquehanna - North Tier. The latter occurs in the North Branch drainage, principally in Bradford County, but with considerable acreage in Tioga County to the west. It appears that a joint effort by public conservation agencies and private capital could result in a well-planned recreation complex offering the full spectrum of outdoor recreation opportunity. Hopefully, such cooperation will result in quality development, and the charm and beauty of this region - the Endless Mountains - will be preserved.

In discussing the West Branch of the Susquehanna, the recommended objective of Environmental Quality - Regional Development in combination comes into even sharper focus. The opportunity exists to develop a variety of year-round recreation opportunity of the highest quality, but if anything the mine acid pollution problem is more acute here then in the main stem. In addition, the strip mining techniques used for mining bituminous coal result in "visual pollution," something not usually associated with the deep-pit method normally employed to mine anthracite. In Clearfield County, some 43,000 acres of land have been subjected to open pit mining, and in Clarion County, Pennsylvania's second ranking open pit mining county, some 21,000 acres have been similarly mined. Hopefully, strict legislation enacted within the past decade, together with the State reclamation program discussed above, will result in limiting further water pollution and visual degradation, and will restore, or reclaim, land and water already effected.

In the Appalachia article cited previously (31), reference was made to another "terminal recreation complex" identified as Otocsin - State Forests, but it was not recommended for further study because either it was an established terminal complex, or it was planned and/or under construction. A report dated 1969 confirms that the first alternative is the case. (32) What is proposed, essentially, is the construction of a 1440-acre reservoir on Anderson Creek approximately 4 or 5 miles east of DuBois in Clearfield County. Development for water-based recreation would be done around the 23 mile shoreline, and would include swimming beaches, picnic groves, boat launching ramps, two public marinas, parking areas, tent and trailer camping facilities, a group camping area, and rental cabins. To complete this recreation complex, a wilderness area situated to the northeast would be established, and associated recreation development at the Elliott Interchange of the Keystone Shortway would be undertaken. Facilities planned at the Interchange include a pioneer village, riding stables, a children's zoo, a narrow gauge railroad, ski runs, and a ski lodge. The estimated annual attendance is 7.5 million visitors, of whom approximately 2 million would be attracted by the lake and related facilities. (33) Total costs - public and private - to develop the entire project are estimated at $41 million; total annual visitor expenditures are estimated at $30 million.

Another plan, slightly different from the Otocsin project, has been proposed further east, but still within the drainage area of the West Branch. As outlined in the latest draft of Pennsylvania's Comprehensive Outdoor Recreation Plan, the forested areas of Clinton and Lycoming Counties - the North Central High Mountains of the Allegheny Range - would be preserved as one of the few remaining wilderness areas on the eastern seaboard. This region, together with the Pennsylvania Dutch Country in Lancaster County, are referred to in the Commonwealth's SCORP as "unique," which indeed they are. What the State proposes in developing the former is the establishment of multi-faceted, major recreation complexes around the area's perimeter. These complexes would be created adjacent to, or a short distance from, the limited-access highways bordering the area: I-80 to the south; US 6 on the north; US 219 on the west; and US 15 on the east. These high-density recreation complexes, each intended as a self-contained unit, would be designed to safeguard the wilderness aspects of the interior by intercepting the majority of recreationists at the perimeter. Entry to roadless primitive areas would be restricted to travel on foot or horseback, and the recreation opportunity available would be limited to that normally available in such areas: hiking, wilderness camping, canoeing, fishing and hunting.

The number of recreation days for swimming, camping, etc., resulting from the implementation of these projects in the West Branch, and from the proposed Susquehanna North Tier terminal recreation complex on the North Branch, are difficult to ascertain, because of the lack of detailed information available; nevertheless, their very size and location indicate that their effects on recreation and on the local economy will be of considerable importance. Similarly, their effects on other aspects of regional water planning, particularly water quality, will probably be of equal importance.

Another proposal in the West Branch drainage with significant implications for water-based recreation is the proposed Foster Joseph Sayers Lake of 1730 acres on Bald Eagle Creek in Centre County. Although Federally sponsored, the reservoir will be operated by the Pennsylvania Department of Environmental Resources, and the shoreline and adjacent lands will be developed for swimming, boating, picnicking, fishing and probably camping. The instant capacity contemplated for each activity is not known.

In addition to new recreation areas, as discussed above, the State intends to improve and expand certain existing State parks. For instance, the water supply and sanitary facilities at Raymond B. Winter, Parker Dam, and Ole Bull State Parks will be improved, while camping expansion is planned at Little Pine State Park, and marina, picnicking and beach improvement work is programmed for Bald Eagle. Again, the paucity of data makes the relationship between increased capacity and the needs summarized in Table M-59 through Table M-64 extremely difficult to ascertain.

From the juncture of the West Branch and the main stem at Northumberland, the Susquehanna Flows south to Harrisburg, and then angles slightly to the east and flows in a south-southeast direction to Chesapeake Bay. Approximately 40 miles south of Northumberland, the Juniata enters from the north and west. The Juniata River, and its most important tributary, the Raystown Branch, are important recreation resources in their own right, and will be considered briefly. Both the Juniata and the Raystown Branch rise in the southern Alleghenies and, after joining near Huntingdon, the Juniata flows northeast to Lewistown, then east and southeast to its confluence with the Susquehanna near Duncannon, Pennsylvania. The area through which it flows, identified generally as the Ridge and Valley physiographic province, is a highly important recreation area, not only for water-based recreation activities, but also for hunting and skiing. The southern area, often referred to as the Laurel Highlands, is becoming increasingly attractive to residents of Baltimore, Washington and Pittsburgh.

In an effort to meet this increased demand for recreation opportunity, the State has acquired sites for two new parks - Canoe Creek in Blair County, and Laurel Ridge in Cambria and Somerset Counties, to augment the dozen or so existing parks. Concurrently, existing parks will be upgraded and expanded; primitive camping is planned for Laurel Hill and Blue Knob State Parks, and marina development is planned for Prince Gallitzin State Park. Other improvements, apparently of a support nature, are programmed for Whipple Dam, Cowans Gap, and Shawnee State Parks. These new and improved park facilities, together with the 2 million acres of State forest located throughout the region, comprise a recreation area possessing outstanding usefulness. It is not surprising, therefore, that the area should be the site for the other "terminal recreation complex" recommended for Basin 17 (see page M-161). This recreation complex, identified as Raystown - State Parks, would be developed around an 8300-acre impoundment to be constructed by the Corps of Engineers on the Raystown Branch in Huntington County. Construction of the reservoir is now underway, and plans call for recreation development with a design load (instant capacity) of 20,000, principally for swimming, picnicking, boating, and camping. Fishing, and probably hunting also, because of the extensive acreage, will be possible. Annual visitation for recreation purposes is expected to approximate 1.4 million visits.

In discussing Basin 17, we have thus far reviewed water-based recreation - exiting and planned - on the main stem and West Branches of the Susquehanna, and on the major tributary - the Juniata. What remains to be done now is to examine the main stem of the Susquehanna from Northumberland to its mouth at the upper Chesapeake near Havre de Grace, Maryland, a distance of some 125 miles. This segment of the Susquehanna presents an interesting study of contrasts: its water is used for hydroelectric generation

of power, power cooling, industrial use, and as a depository for treated (and, in some cases, untreated) municipal and industrial wastes, yet in a sense it is under-utilized from a recreation point of view. Undoubtedly, this situation will change as a result of increased demand exerted both by the resident population and by the populated metropolitan regions to the east and southeast - principally Wilmington and Philadelphia. The State, in an effort to improve public access, has programmed park or marina development at Codorus State Park, in York County, and at Shikellamy Marina in Snyder County, just below Northumberland. In addition, a new facility identified as Little Buffalo State Park is now being developed in Perry County, and expansion of camping facilities at Gifford Pinchot State Park is also planned. Further south, in Maryland, the development of Susquehanna State Park has created increased public access and public use of this portion of the river.

On pages M-163 and M-164 reference was made to two "unique" areas mentioned specifically in the State Comprehensive Outdoor Recreation Plan. One is the North Central High Mountains project, discussed previously, the other is the Pennsylvania Dutch County in Lancaster and York Counties. Although not a water-based recreation area, per se, it is mentioned in passing because of its importance to other aspects of the North Atlantic Region Water Resource Study, particularly irrigation, land management (drainage and erosion), and visual and cultural considerations. Also, the possibility exists that the Pennsylvania Dutch Region drains off some unknown amount of recreation demand which otherwise would make itself felt around the Susquehanna itself. Thus, although not strictly water based, the Pennsylvania Dutch Region is highly important from a basin-wide point of view.

Below Basin 17 is situated Basin 18 which, as has been pointed out earlier, is entirely different in topography and landform, and in the unsatisfied recreation needs which are deemed to exist. Essentially, Basin 18 comprises the upper portion of the Chesapeake Bay from the mouth of the Susquehanna River to Point Lookout, and includes the Maryland portion of the Eastern Shore. A review of the Needs Tables indicates that, with one exception - streams, no land and water needs are deemed to exist, even under the Environmental Quality Objective standards for the earliest target year, i.e., 1980. It is recommended that the planning and management of water and related lands for recreation purposes be oriented toward achieving Environmental Quality Objectives, except in the Baltimore area, where a mix of Regional Development and Environmental Quality is recommended.

Regarding stream needs, the State of Maryland recognizes the problem in the Maryland Outdoor Recreation and Open Space Plan. (34) Under Regional recommendations, the need to implement open space and parks along stream and river valleys is recognized, as is the need to acquire land along Chesapeake Bay for public access,

particularly areas of confluence between stream valleys and the Bay. The Patuxent River and Pocomoke River are named specifically as streams worthy of preservation and development as major recreation areas, and both were included initially in the State's Scenic Rivers System.

It seems appropriate at this time to relate the information and conclusions presented herein to the findings of the Susquehanna River Basin Study. (35) This Study was an in-depth, Type II study of the Susquehanna River Basin, and many of its findings and recommendations corroborate what has been mentioned here. For instance, the recommendation for six large dam and reservoir projects - of which five would be in New York State (Charlotte Creek, South Plymouth, Fabius, Mud Run and Five Mile Creek) - would result in approximately 3 million recreation days per year in an area where such opportunity is urgently needed. (see page M-156).

Similarly, the need for flat-water acreage - especially in the greater than 500 acre category - has been mentioned repeatedly in this chapter. See page M-151 and Tables M-62 and M-63. The implementation of the Susquehanna River Basin Study Coordinating Committee's recommendation for four low channel dams (one each on the North Branch, the West Branch, the Juniata, and on the mainstem near Duncannon) would provide on the order of 8.5 million recreation days - the majority for boating and water-skiing.

The Committee recommended also that 62 small reservoirs (varying in size from 30 to 1,100 acres) be constructed throughout the basin principally for recreation purposes. Together, these reservoirs would annually provide over 14 million recreation days and more than 6 million fishing days.

Thus, if one assumes that all three of these recommendations are adopted, and if recreation use materializes on the scale predicted, then a total of some 25 or 26 million recreation days will be added to the recreation base. A glance at Table M-58 indicates that this would satisfy about 50 percent of the projected net annual participation under the Regional Development Objective for 1980. Finally, it should be emphasized that quality recreation is to be preferred, rather than an effort to provide for all anticipated demands, especially if such an effort results in inferior development.

Summary. Subregion E comprises the Susquehanna River and the Chesapeake Bay south to Point Lookout, Maryland. The subregion is divided into two basins: the more northern is identified as Basin 17, and is the larger of the two. It extends from the Susquehanna's headwaters in New York State to its mouth near Havre de Grace. The basin is situated within a number of physiographic regions, including the Piedmont Plateau, the Ridge and Valley Region, the Allegheny Mountains, and the glaciated portion of the Allegheny Plateau.

In general, Basin 17 possesses the potential for meeting all demands which may reasonably be placed on it for legitimate water use - including recreation; however, problems such as industrial and municipal pollution, acid mine pollution, a lack of recreation opportunity - particularly that kind associated with broad water, nutrient pollution, and the threat of floods do exist. Future problems include adequate water supply, and the increasing amount of heat from nuclear power generating stations which somehow must be used beneficially or disposed of.

In that portion of the basin north of Harrisburg, it appears that the competing demands for water can best be satisfied by employing those standards and devices inherent in the Regional Development Objective. There are areas within this portion of the basin where Environmental Quality should be emphasized - either to improve various aspects of the existing condition, such as certain upstream locales in New York State, or to maintain and enhance desirable natural conditions which now exist. It is recommended that the remainder of the basin, in particular, that portion of the mainstem below Harrisburg, receive recreation planning utilizing the Environmental Quality Objective as the frame of reference.

Basin 18 - which comprises the upper portion of Chesapeake Bay - makes up the remainder of Subregion E. The problem here is not so much setting past wrongs right, but of maintaining an already existing quality environment. Long a favorite of boaters, fishermen - both fin and shell, hunters, picnickers, and swimmers, the Chesapeake is faced with growing pollution, restricted public access and "thermal enrichment" as a result of the increasing number of thermal (nuclear) generating plants. In order to protect a scenic and economic asset of the highest value, it is recommended that water and related land use planning be done with Environmental Quality as the objective. In the Baltimore area a mix of Environmental Quality and Regional Development may at times prove a viable alternative. In any event, Chesapeake Bay is a natural resource which can never be replaced, and it should be managed with this fact in mind. If additional information regarding the ecology of the Bay is required for intelligent planning and decision-making, then studies and research now underway should be expanded and intensified.

19 POTOMAC RIVER, MARYLAND, VIRGINIA, WEST VIRGINIA, PENNSYLVANIA AND MARYLAND
20. RAPPAHANNOCK RIVER, VIRGINIA, YORK RIVER, VIRGINIA, AND CHESAPEAKE BAY DRAINAGE FROM SMITH POINT, VIRGINIA TO OLD POINT COMFORT, VIRGINIA
21 JAMES RIVER, VIRGINIA AND WEST VIRGINIA, AND CHESAPEAKE BAY AND ATLANTIC COASTAL DRAINAGE FROM OLD POINT COMFORT, VIRGINIA TO VIRGINIA BEACH, VIRGINIA

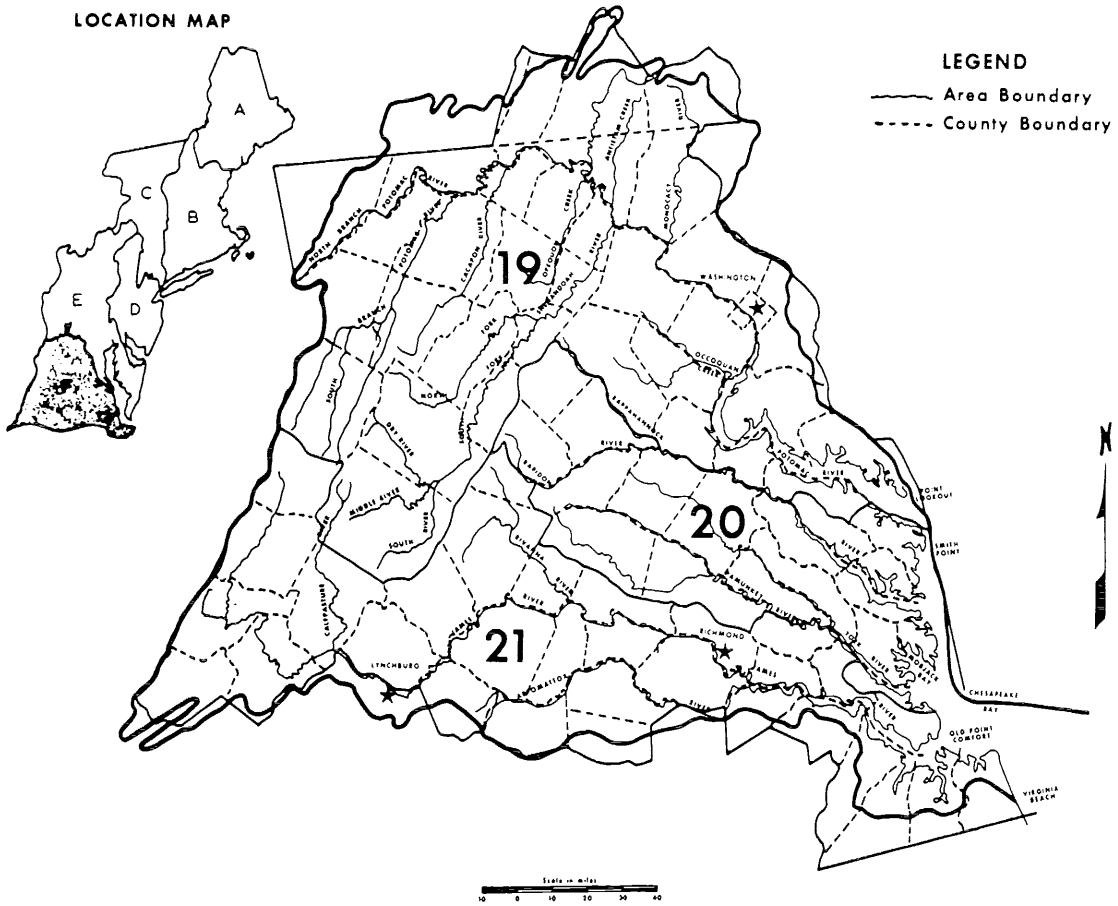


FIGURE M-25

SUBREGION F
Areas 19,20 and 21

LOCATION AND BOUNDARIES

PWPCA December 1969

SUBREGION F

Introduction. Subregion F is the most southern of the six main subregions in the North Atlantic Region Water Resource Study Area. The subregion encompasses southern Pennsylvania, eastern West Virginia, Maryland (excluding the Baltimore area and eastern shore), and northern and eastern Virginia. Three main basins are included, which are described briefly below:

Basin 19. The Potomac River.

Basin 20. The Rappahannock and York Rivers.

Basin 21. The James River.

Basin 19 - The Potomac Basin - drains a very small portion of southern Pennsylvania; the panhandle of West Virginia; western Maryland and the western half of Prince Georges, Charles, and St. Marys Counties; and most of northern Virginia. The Susquehanna Basin (#17) lies to the north; the upper Chesapeake Bay drainage (#18) lies to the east; the Monongahela drainage is to the west; and the Rappahannock (#20) and James (#21) are to the south. Most of the Potomac Basin in West Virginia lies within the Valley and Ridge physiographic province, while the center and eastern portions of the basin are situated in the Piedmont and Coastal Plain physiographic regions.

Basins 20 and 21 contain the Rappahannock and York Rivers, and the James River, respectively. All three of these streams rise in the mountainous area of central and north-central Virginia, and then flow generally parallel to each other in a southeast direction before emptying into lower Chesapeake Bay. This subregion's population is expected to increase from 4,865,818 in 1960 to 12,562,200 by 2020.

Needs. Annual participation in water-oriented outdoor recreation has been projected for each of the three basins by objectives and target years, and such data is summarized in Table M-65.

RECREATION LAND & WATER NEEDS

BASIN 19
FIGURE M-26

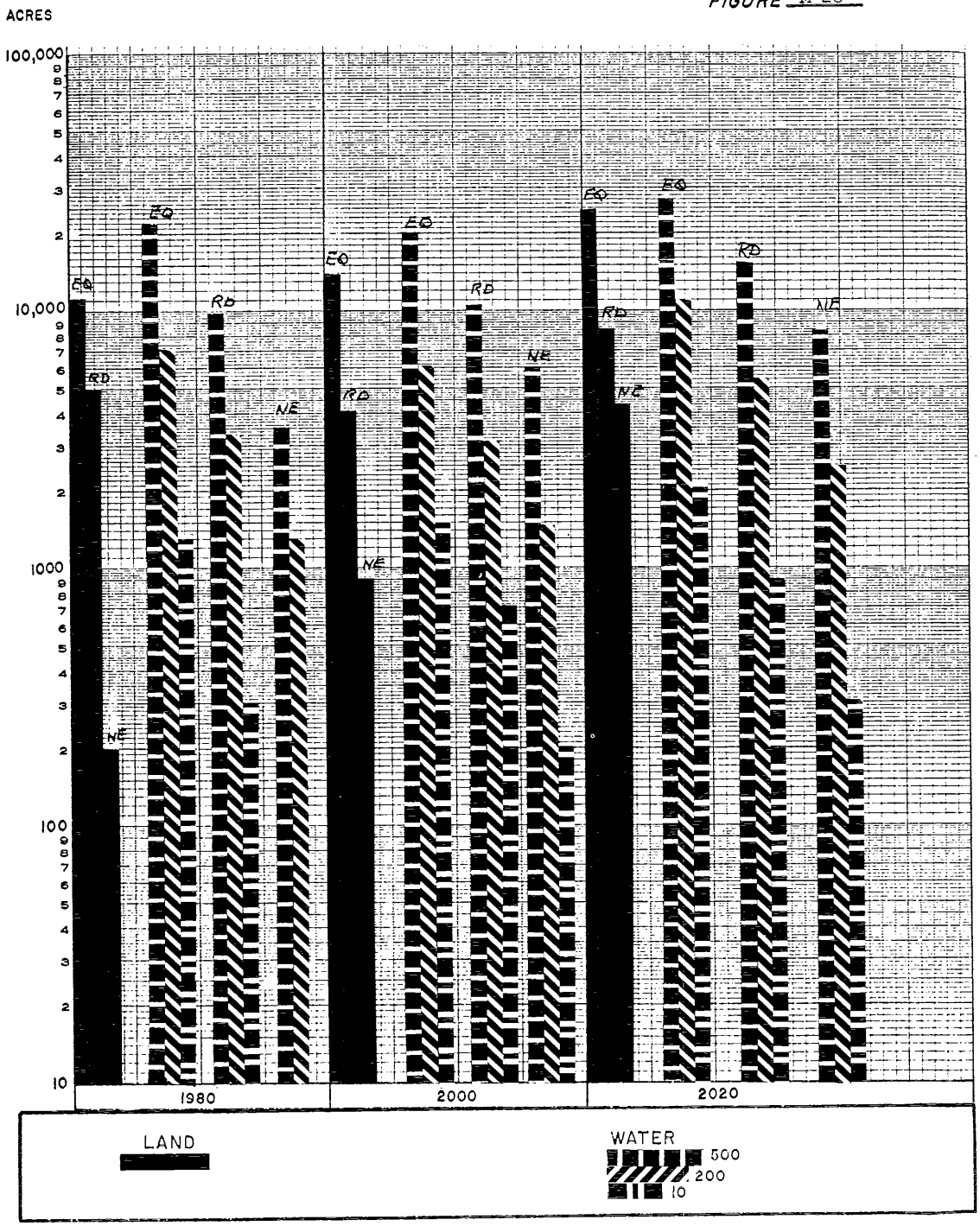


TABLE M-65

PROJECTED ANNUAL PARTICIPATION IN WATER-ORIENTED OUTDOOR RECREATION IN SUBERGION F BY BASIN AND TARGET YEARS (THOUSANDS OF RECREATION DAYS)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
		ENVIRONMENTAL QUALITY OBJECTIVE				
19	33,028	25,526	50,625	14,574	22,691	46,413
20	12,837	9,060	15,592	2,959	2,271	5,183
21	32,791	19,549	28,179	8,220	15,399	22,976
		REGIONAL DEVELOPMENT OBJECTIVE				
19	33,849	26,188	50,602	2,574	17,886	43,499
20	13,147	9,289	15,967	2,803	2,197	4,974
21	33,602	20,054	28,616	7,345	8,154	20,140
		NATIONAL INCOME OBJECTIVE				
19	28,819	22,090	44,330	1,508	7,317	36,640
20	11,219	7,849	13,700	2,488	2,032	4,443
21	28,644	16,918	21,496	5,857	4,189	8,110

It is interesting, first of all, to note that the anticipated participation-both gross and net - is lower here than in any of the other subregions, with the exception of Subregion A (Basins 1 through 5). This appears reasonable, since each basin is at the extreme end of megalopolis, and each is somewhat physically removed from the heavily populated Boston-Washington Corridor. Within the subregion itself, the relative needs also appear reasonable. Basin 19 - the Potomac, possesses the greatest population, followed by the Norfolk-Virginia Beach complex, and the anticipated participation figures reflect this population distribution. It follows that the various needs which are discussed will reflect the same relationship, except in those cases where the presence of a highly important natural resource is obvious, i.e., salt water beach in Basin 21. The greatest short term need appears under the Environmental Quality Objective for Basin 19, where some 14.5 million recreation days must be provided for between now and 1980.

The next table, Table M-66, pertains to Recreation Land Needs, and generally substantiates the data appearing in Table M-65. For instance, it was mentioned above that some 14.5 million recreation days are anticipated in Basin 19 by 1980 under the Environmental Quality Objective standards. In Table M-66 the need for 11,100 acres of land is indicated for Basin 19 for the same objective and target year. Similarly, Basin 21 has the next largest anticipated participation, and the next largest need for land.

RECREATION LAND & WATER NEEDS

BASIN 20
FIGURE M-27

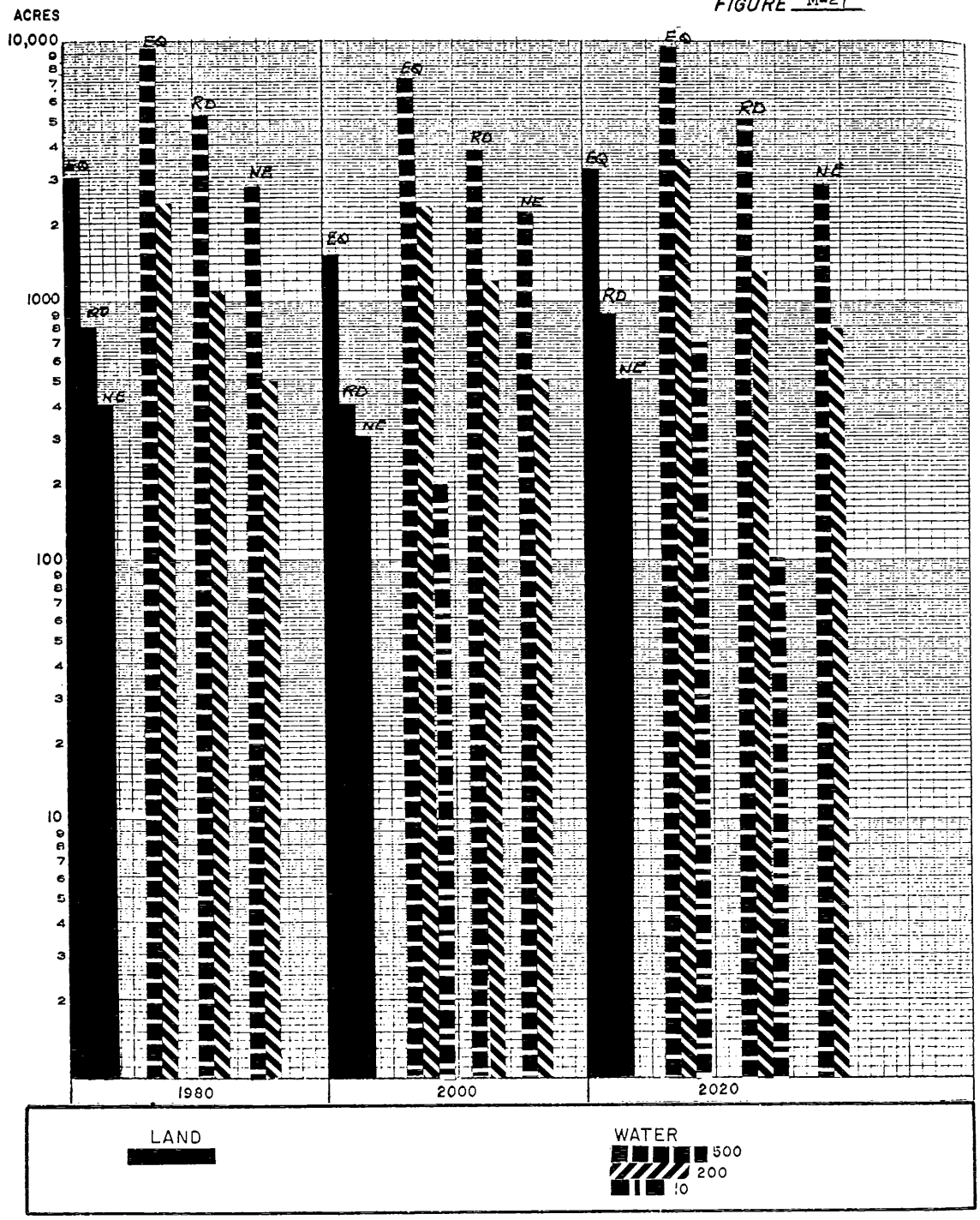


TABLE M-66

RECREATION LAND NEEDS IN SUBREGION F BY BASIN AND TARGET YEAR (IN ACRES)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
			ENVIRONMENTAL QUALITY OBJECTIVE			
19	24,900	16,600	25,000	11,100	14,100	24,300
20	9,900	5,400	7,300	3,000	1,500	3,200
21	25,200	11,100	12,100	8,300	9,400	11,800
			REGIONAL DEVELOPMENT OBJECTIVE			
19	9,400	5,600	8,200	500	4,100	8,100
20	3,600	1,700	2,500	800	400	900
21	8,800	3,900	4,200	2,000	1,700	3,900
			NATIONAL INCOME OBJECTIVE			
19	4,800	2,900	4,800	200	900	4,600
20	1,900	1,000	1,400	400	300	500
21	4,600	2,000	2,200	1,200	500	900

The next two tables - M-67 and M-68 present the beach needs in acres, and pool needs in square feet, as they were determined for each of the three basins. Under the Environmental Quality Objective, a need was determined to exist only for Basin 19 for the nearest target year, i.e., 1980, and the areas required are not unduly large. The tables indicate that 158 acres of beach or 2.7 million square feet of pool will be required. As was mentioned previously in discussing other subregions, the anticipated net swimming needs could be met by providing one or the other. In practice, such needs will probably be met by a combination of beach and pool acreage. It is interesting also to note that although only 158 acres of beach are required by 1980 in Basin 19, a total of 713 acres will be required by the year 2020. Overall, the swimming situation in Subregion F is good, compared to the other subregions in the NAR Study area.

RECREATION LAND & WATER NEEDS

BASIN 21
FIGURE M-28

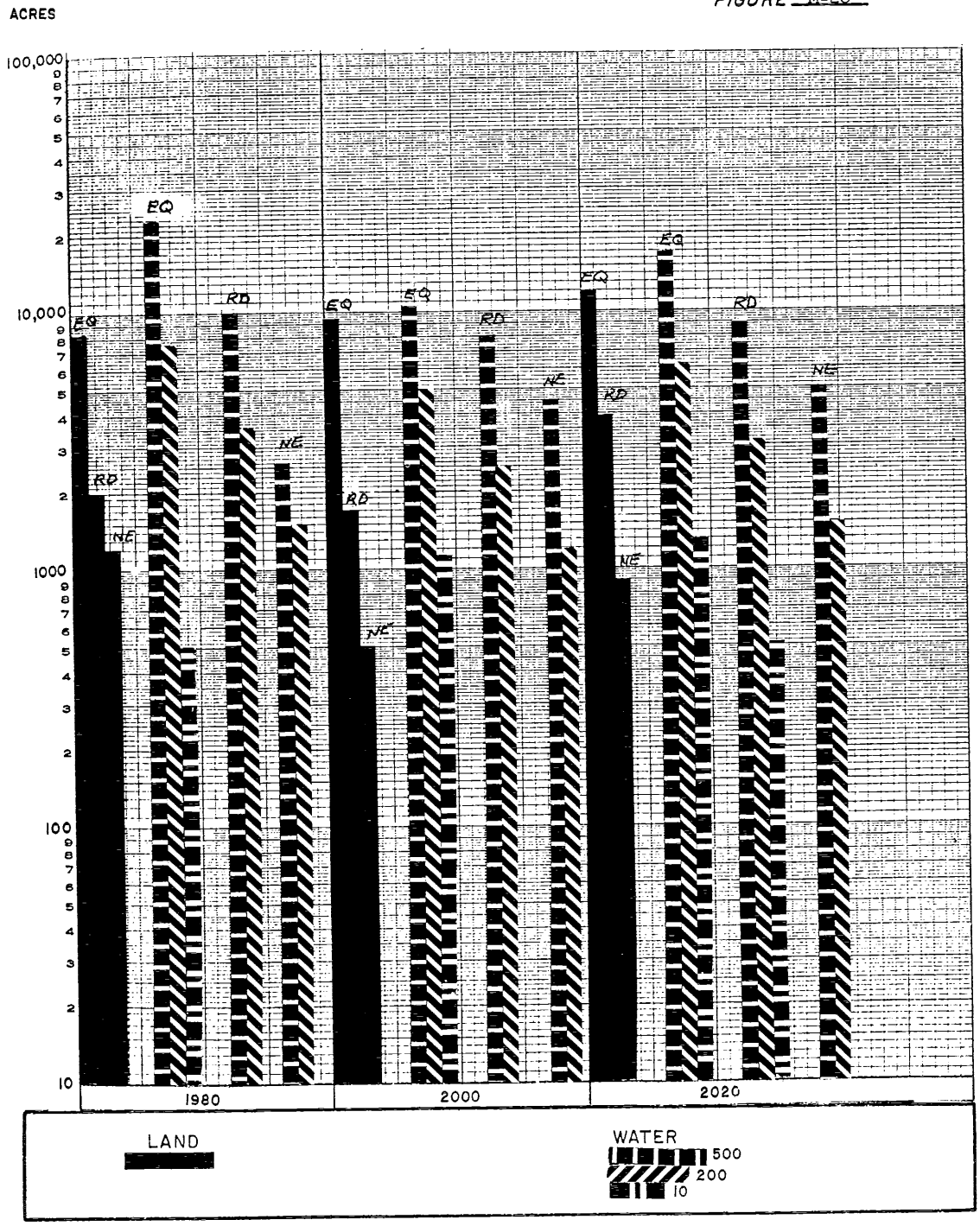


TABLE M-67

RECREATION BEACH NEEDS IN SUBREGION F BY BASIN AND TARGET YEAR (ACRES)

Basin	1980	GROSS 2000	2020	1980	NET 2000	2020
		ENVIRONMENTAL QUALITY OBJECTIVE				
19	342	216	339	158	216	339
20	172	98	120	0	0	0
21	444	208	188	0	191	188
		REGIONAL DEVELOPMENT OBJECTIVE				
19	157	99	148	0	74	148
20	135	77	93	0	0	0
21	348	163	145	0	49	145
		NATIONAL INCOME OBJECTIVE				
19	126	80	127	0	24	127
20	48	27	34	0	0	0
21	124	58	53	0	0	0

TABLE M-68

SWIMMING POOL NEEDS IN SUBREGION F BY BASIN AND TARGET YEAR (IN THOUSANDS SQUARE FEET)

Basin	1980	GROSS 2000	2020	1980	NET 2000	2020
		ENVIRONMENTAL QUALITY OBJECTIVE				
19	5,902	3,734	5,841	2,728	3,734	5,841
20	2,999	1,698	2,084	0	0	0
21	7,732	3,608	3,270	0	3,317	3,270
		REGIONAL DEVELOPMENT OBJECTIVE				
19	3,059	1,936	2,892	0	1,446	2,892
20	2,332	1,320	1,584	0	0	0
21	6,011	2,805	2,500	0	847	2,500
		NATIONAL INCOME OBJECTIVE				
19	2,461	1,558	2,469	0	470	2,469
20	938	531	660	0	0	0
21	2,415	1,132	1,032	0	0	0

The next facet of the recreation base to be examined was broad water acreage. Again, this particular resource was classified into three size categories: greater than 500 acres; greater than 200 acres; and greater than 10 acres. Unrestricted boating, i.e., boats of 20 h.p., or greater, was deemed appropriate only for the largest category, while the two smaller area categories were considered to be better utilized -- from a practical and safety point of view -- by craft having engines of less than 20 h.p. The gross and net acreages needs determined during the study appear in Tables M-69 and M-70 respectively. As one would suspect, the greatest needs appear in Basins 19 and 21. For instance, for 1980 under the Environmental Quality Objective, net needs of 22,000 acres and 24,000 acres were identified for these two basins in the greater than 500-acre category. It appears that in later years the situation will grow even more desperate in Basin 19, while in Basin 21 the situation is expected to ease somewhat. The most revealing conclusion to be drawn for these two tables is the great acreage required -- in all size categories-for Basin 21, even though this basin contains the broad estuary of the James River, and considerable ocean front from Norfolk south to the North Carolina line. It is apparent from the great number of private marinas existing in the James Basin that boating is a highly popular activity, but apparently, as population and disposal income levels rise, the demand is going to become greatly intensified.

The last recreation need explored was that of stream mileage. Net needs -- even under the Environmental Quality Objective, were found to be negligible and, in this regard, Subregion F is in the same enviable position as Subregion A. The data for stream mileage are presented in Table M-71.

TABLE M-69

GROSS WATER SURFACE ACREAGE IN SUBREGION F BY UNIT SIZE CLASSES, FOR INDIVIDUAL BASINS AND TARGET YEARS (ACRES)

	1980			2000			2020		
Basin	>500	>200	>10	>500	>200	>10	>500	>200	>10
ENVIRONMENTAL QUALITY OBJECTIVE									
19	31,400	9,400	2,300	20,000	6,100	1,500	35,200	10,700	2,100
20	12,600	3,600	900	7,200	2,300	500	9,800	3,500	700
21	31,500	9,100	2,400	15,100	5,000	1,100	17,900	6,200	1,300
REGIONAL DEVELOPMENT OBJECTIVE									
19	17,200	4,700	1,000	10,600	3,100	700	15,200	5,400	900
20	6,800	1,800	400	4,900	1,200	200	5,300	1,800	300
21	17,100	4,500	1,000	8,200	2,500	500	9,200	3,100	600
NATIONAL INCOME OBJECTIVE									
19	9,400	2,200	400	6,000	1,400	200	8,400	2,500	300
20	3,800	1,200	300	2,200	700	200	2,900	1,100	200
21	9,500	2,100	400	4,500	1,200	200	5,100	1,500	200

TABLE M-70

NET WATER SURFACE ACREAGE IN SUBREGION F BY UNIT SIZE CLASSES, FOR INDIVIDUAL BASINS AND TARGET YEARS (ACRES)

	1980			2000			2020		
Basin	>500	>200	>10	>500	>200	>10	>500	>200	>10
ENVIRONMENTAL QUALITY OBJECTIVE									
19	22,000	7,200	1,300	20,000	6,100	1,500	28,100	10,700	2,100
20	9,600	2,400	0	7,200	2,300	200	9,800	3,500	700
21	24,000	7,700	500	15,100	5,000	1,100	17,000	6,200	1,300
REGIONAL DEVELOPMENT OBJECTIVE									
19	10,000	3,300	300	10,600	3,100	700	15,200	5,400	900
20	5,200	1,100	0	3,900	1,200	0	5,300	1,800	100
21	10,400	3,600	0	8,200	2,500	0	9,200	3,100	500
NATIONAL INCOME OBJECTIVE									
19	3,600	1,300	0	6,000	1,400	200	8,400	2,500	300
20	2,800	500	0	2,200	500	0	2,900	800	0
21	2,700	1,500	0	4,500	1,200	0	5,100	1,500	0

TABLE M-71

RECREATION STREAM NEEDS IN SUBREGION F BY BASIN AND TARGET YEAR (MILES)

Basin	GROSS 1980	GROSS 2000	GROSS 2020	NET 1980	NET 2000	NET 2020
			ENVIRONMENTAL QUALITY OBJECTIVE			
19	229	54	286	0	0	0
20	88	50	69	0	0	2
21	224	104	127	0	0	0
			REGIONAL DEVELOPMENT OBJECTIVE			
19	113	26	146	0	0	0
20	44	24	34	0	0	0
21	110	51	63	0	0	0
			NATIONAL INCOME OBJECTIVE			
19	76	18	94	0	0	0
20	29	17	22	0	0	0
21	74	34	42	0	0	0

Satisfying Needs. Of the three basins comprising Subregion F, needs in Basin 19 - the Potomac Basin - are greatest and, in all likelihood, most pressing. As indicated in Table M-65, the projected annual participation throughout the Basin in 1980 is 14.5 million recreation days under the Environmental Quality Objective. The anticipated increase in recreation, looking beyond 1980, is estimated at 22.7 million additional recreation days by target year 2000, and an additional 46.4 million by 2020. Aside from the recreation demand, other needs, such as water-supply, flood protection, and improved water quality for an ever-increasing population must be taken into consideration. In view of these interrelated needs, and the high standards inherent in the Environmental Quality Objective as it relates to each of these needs, the Bureau recommends that the Environmental Quality Objective be set as the overall goal in the management of the basin's water and related lands. Regarding outdoor recreation, the only feasible course is to recommend the Environmental Quality Objective. To recommend a less ambitious recreation objective for this - the Nation's River - would be a disservice both to it and to the people residing within its basin.

As mentioned previously, there is a host of problems confronting the Potomac River, including low flow, poor quality, flooding, organic pollution, limited access, and acid mine pollution (in the

North Branch). There is a need, from the residents' point of view, that appropriate measures be taken to minimize or to correct as many of these problems as possible. Since it is practically impossible to divorce recreation from man's other needs, what follows must and should refer to these other needs from time to time.

At the present time, recreation facilities in the basin are woefully inadequate: no State parks exist in the eight counties comprising the Virginia Study Region west of the Nation's Capital, and there is only one -- Westmoreland State Park -- in the study region south of the Capital. Upstream in West Virginia, the situation improves somewhat. West Virginia reports a total of 49,530 acres available for public recreation in Standard Planning Area 6, which is comprised of the eight eastern counties. However, of this total, only 9,801 acres are in State parks; the remainder consists of public hunting or public hunting and fishing areas. (36) Across the river, in Maryland, there are likewise a number of existing State facilities, including the Potomac State Forest, Savage River State Forest, Big Run State Park, Green Ridge State Forest, Fort Frederick State Park and Dorchester State Forest. Total acreage is 92,424 acres, of which some 579 acres are dedicated to park purposes. By far the greatest acreage held in public ownership is that land managed by the U.S. Forest Service in the Monongahela and George Washington National Forests. Another recreation facility of growing importance is the recently established Chesapeake and Ohio Canal National Historical Park. In summary, then, the opportunity exists to provide the needed recreation base by creating new areas, either singly or in conjunction with other public works, and by using existing facilities as a nucleus for recreation expansion.

Probably the greatest need in the Potomac Basin - aside from a much needed improvement in water quality - is the need for flat water. A part of this need will be met by the construction of the Bloomington Reservoir on the North Branch about eight miles upstream from the mouth of the Savage River. The project, authorized by Congress in 1962 as a multiple-purpose reservoir, will have a pool of some 952 acres, and will provide low flow augmentation, flood control, and recreation, including swimming, camping, and boating. Realization of these recreational opportunities and benefits will be heavily dependent upon a reduction in the poor quality of water flows into the reservoir which are contaminated due to acid mine drainage.

Another authorized project is the Rowlesburg Lake impoundment authorized by the Flood Control Act of 1965 for flood control, water quality, hydroelectric power generation, and recreation. Although located in the Monongahela River drainage, and thus technically not in the NAR study area, this impoundment will in all likelihood have some as yet unknown effect on recreation at

Bloomington, because of the relatively short distance - some 25 miles - between the two, and because Rowlesburg Lake will be so much larger, i.e., some 7,175 acres.

Still another proposed impoundment, and one surrounded by a great deal of controversy, is the Royal Glen Reservoir. The impoundment is proposed at the confluence of the South Branch of the Potomac and the North Fork of the South Branch, and would have a surface area of 1,150 acres. Primary purposes of the project are to provide flood control and outdoor recreation. This project would be operated in conjunction with other structures in the Potomac River Basin. Under normal operating conditions the reservoir would have only minor drawdowns during the summer outdoor recreation season. Estimated annual use at the most basic level of recreation development is 20,000 recreation days. At maximum development, 231,500 recreation days annually are expected at the initial stage, and 511,500 at ultimate development, i.e., about 5 years following completion of the project. An estimated 31,500 recreation days annually of maximum use would be derived from fishing. (37)

The controversy mentioned above stems from the fact that the South Branch of the Potomac River has been identified as having high potential as a free-flowing stream. The unique scenic qualities of the South Branch of the Potomac, and those of the North Fork tributary, together with the existence of alternate locations which could be developed, combine to raise serious questions as to the appropriateness of an impoundment at the Royal Glen site. Further, the complete compatibility of this project with the overall management objectives of both the Spruce Knob-Seneca Rocks NRA and the entire Potomac Basin must be demonstrated before a sound decision can be reached. (38)

The development of recreation facilities in conjunction with other public works - in this case, dams, can be an excellent way of providing for recreation needs. However, diligent care must be exercised so that one kind of a recreation resource, perhaps a beautiful, highly scenic valley with an excellent trout fishery, is not replaced by a warm water fishery, particularly when the dam can be relocated and still provide for other needs. The point is important, since it appears that impoundments will be required both on tributaries and on the mainstem to provide for flood control and low-flow augmentation. The latter appears to be a necessity in the Potomac even if water quality standards are achieved.

Another example of providing recreation facilities in conjunction with other development work is the Small Watershed Program of the Soil Conservation Service. The Soil Conservation Service plans to construct three recreation and flood retention reservoirs as part of the Potomac Basin Plan for the Appalachian Water Resource Survey. Recreation development costs are estimated to be $2,122,000. (39)

A second way in which public recreation demand can be satisfied is to acquire or rededicate land and develop entirely new recreation areas. The Spruce Knob-Seneca Rocks National Recreation Area, a 100,000 acre reservation established by Congress in 1965, is an example. Studies indicate that recreation use in the NRA will increase to 2.5 million visitor days by 1980, and to 5 million by the year 2000. An important adjunct to the NRA is the Spruce Knot Lakes Recreation Complex proposed by the Forest Service. (40) This complex, consisting of existing Spruce Knob Lake and five proposed new lakes ranging in size from 25 to 110 acres, would be designed for picnicking, swimming, camping, and boating. This second alternative - the development of new parks - generally springs to mind as the most common way of meeting recreation needs.

In addition to providing recreation opportunity at multiple-purpose dams and other public works, and by acquiring or rededicating entirely new areas, the opportunity often exists to upgrade and expand existing areas or facilities. The latter approach appears ideal in the upper and middle portions of the Potomac Estuary, where a tremendous recreation resource exists, but is under-utilized, principally because of water pollution. The Bureau of Outdoor Recreation, in its report entitled The Potomac - A Model Estuary, recommended that efforts to improve all sewage and solid waste treatment in the Estuary should be accelerated, and that facilities should be modified where needed to provide tertiary treatment. (41) The Bureau likewise recommended that measures be taken to halt the discharge of untreated or inadequately treated wastes from boats and marinas, and that steps be taken - at the county level - to control land use and development and thus prevent further degradation of the Estuary by siltation.

Other factors, in addition to pollution, directly influence public use of the Estuary's 207,000 water surface acres, including poor access, a lack of developed recreation areas, the jellyfish nuisance, and military control of a large portion of the shoreline (nearly 10 percent) and adjacent lands. The latter is a mixed blessing, because while the lands in question have not been available to the public for recreation, by the same token they have not been available for private or industrial development. The BOR report cited above recommended that most military uses of the Potomac Estuary's lands and waters be reviewed and, if feasible, relocated. The lands involved would then be available for water-based recreation, fish and game management, or simply as open-space.

A major effort was made in The Potomac - A Model Estuary to identify those areas throughout the Estuary with the greatest recreation potential. In this regard, the Estuary was divided into three units, as follows: the Washington National Unit, which extends from Chain Bridge to Piscataway Creek and Mount

Vernon; the Accokeek Unit, extending along both shores of the river from the downstream limits of the Washington National Unit to the Route 301 bridge; and the Smith Point - Point Lookout Unit, extending from the Route 301 bridge downstream to the river's confluence with Chesapeake Bay.

Each of the three units was then examined in detail, and recommendations were made as to how the water and related land resources of each unit could best be made to serve the public. The highlights of this Model Plan follow; of necessity they appear in a form considerably condensed from the original.

In the Washington National Unit, emphasis was placed on the establishment of a Potomac Estuary national recreation area extending along the Potomac River from Chain Bridge to Woodrow Wilson Memorial Bridge (I-495) and up the Anacostia River to Greenbelt, Maryland. The national recreation area would encompass around 14,000 acres, but no more than 300 acres would have to be purchased. The remainder is already in public ownership. Contiguous park areas such as Glover-Archbold Park, Oxon Run, the Fort Parks, and others could provide opportunities to expand and diversify the national recreation area. Eventually parts of the military installations along the two rivers and a portion of National Airport could be considered for inclusion in the national recreation area. The Model Plan also recommends acquisition at Piscataway Park, chiefly for open space purposes in conjunction with Mount Vernon, and at Belle Haven and Dyke Marsh, and at Broad Creek, for fish and wildlife purposes. The latter areas would provide much needed day-use recreation opportunity in the metropolitan area.

The Accokeek Unit, which encompasses about one-third of the total river miles of the Potomac Estuary, is suitable for many forms of water-related recreation, and has some of the Estuary's most scenic and productive embayments. One area - Maryland Neck - is described in the Plan as ..."Perhaps the most promising recreation open space resource along the entire Potomac Estuary..." and recommends development of a recreation area of approximately 8500 acres. Similarly, the Plan recommends concurrent protection of significant wildlife habitat south of the town of Nanjemoy, Maryland. The latter area, which encompasses approximately 11,450 acres, could be developed for primitive camping opportunities, trails, and educational opportunities as an adjunct to intensive recreation development on the riverfront.

On the Virginia side of the Estuary, mention is made of Mason Neck, and the 5800-acre State park now being acquired by the Commonwealth of Virginia. This facility, when developed and available for public use, will do much to alleviate the shortage of recreation opportunity in Basin 19. The Northern Virginia Regional Park Authority administers 1600-acre Bull Run Regional Park, and has acquired land for park development at Pohick Bay and

at Occoquan Bay. These facilities, together with those recommended for development by the Bureau downstream at the mouths of Aquia, Accakeet, and Potomac Creeks would provide access to the Estuary, and strengthen the recreation base, but again their full usefulness will depend upon improved water quality in the Estuary. Further downstream, potential recreation sites have been identified at Cedar Point Neck, Port Tobacco River, Popes Creek, and in Virginia, on Chotank Creek.

The third unit of the Estuary, identified as the Smith Point - Point Lookout Unit, extends from the Route 301 bridge downstream to the river's confluence with Chesapeake Bay. This unit contains approximately half of the Estuary's surface and, like the other two units, possesses great recreation potential. In Virginia, Hack Creek in Northumberland County and Smith Point have been identified as sites having outstanding potential for State Park Development. These areas approximate 1000 acres and 3000 acres, respectively, and the latter is listed for potential development in Virginia's SCORP. (42) Significant wildlife habitat include Popes Creek, Nomini Bay, and Hollis Marsh.

In Maryland, a number of areas have been identified either as potential recreation sites, or as areas best managed for fish and wildlife, or as natural areas. Included in the first category are St. Clements Creek and McIntosh Run, the St. Mary's River (including Cherryfield Point, Goose Point, St. Inigoes Neck, and Kitts' Point), and the Cuckold Creek embayment and areas on Swan Point Neck. The most significant wildlife areas include Zekiah Swamp, Allens Fresh Run, Chaptico Run, and the Popular Hill Creek drainage.

In retrospect, then, it appears that recreation needs previously identified in Basin 19 will be provided by a variety of means, including the development of recreation facilities in conjunction with other improvements; the expansion and modernization of existing facilities; and the acquisition and development of entirely new areas. A great number of problems exist, however, and many will have to be solved before recreation potential is fully realized. The most widespread and, in many ways, the most difficult to rectify is the existent pollution problem. Aside from a few welcomed exceptions like the Cacapon, nearly all of the basin's flowing streams of any size receive damaging loads of waste from towns and industries. (43) Other pollution problems include the acid mine drainage in the North Branch; sediment, bacteria, fertilizer, and pesticide pollution resulting from runoff in agricultural regions; and pollution as a result of combined sewer overflow in the upper estuary.

Another problem, and one that is emphasized in the West Virginia SCORP, is that of drawdown. (44) The State's suggestion that the recreation season be extended from late April to late October, and that pool fluctuation be governed accordingly, appears to have

merit, and should be considered by the Corps. The lack of public access to rivers and streams is also mentioned by the State as a problem which limits public use of existing water resources.

Basin 20. The Rappahannock, because of its remoteness and absence of individual land ownership, is a fine natural river close to urban centers. Upper stretches are pastoral in character while reaches above and below its confluence with the Rapidan are largely wooded. The Rapidan rises in Shenandoah National Park and in this area is an outstanding trout stream. Just before it joins the Rappahannock it changes abruptly and becomes pastoral with shaded banks. The Rapidan also is generally free of development, and both streams are largely unpolluted. In its report, Virginia's Common Wealth the Virginia Outdoor Recreation Study Commission made several recommendations regarding recreation development on or near these streams, and their work has been referred to time and again in the preparation of this portion of the Appendix. (45) At the Kelly's Ford area near the confluence of the Rappahannock and the Rapidan, for examply, the Commission proposed development of a State park. A chief attraction here would be the white water canoeing opportunities. The Commission further proposed that should the dam at Salem Church materialize, then the design of the park should be altered to fit the impoundment. The Commission recommended also that thought be given to converting a part of the Rapidan Wildlife Management area to State park purposes. Such a facility would serve the Northern Piedmont and northern Virginia metropolitan regions.

Downstream, it is recommended in the 1970 Virginia Outdoors Plan that a State park be established on the Rappahannock near the river's mouth in Lancaster County. This is one of the State's most popular boating and fishing areas, and is extremely close to the Chesapeake Bay itself. The implementation of these plans would result in three State parks offering varied water-based recreation opportunity.

In addition, the Commission of Outdoor Recreation is recommending that Dragon Run, in King and Queen, Middlesix, Gloucester, and Essex counties, be designated a Scenic River, with public access points at the main road crossings. Situated in Dragon Swamp, this stream is remote and clean and is bridged in only three places in 25 miles.

The Virginia Outdoor Recreation Study Commission made a number of recommendations, one of which was that an indpendent State agency - a Commission of Outdoor Recreation - be created to guide and coordinate continuing Statewide implementation of the Virginia Outdoor Plan. Such an agency was duly created and, in 1968, was directed by resolution of the General Assembly to make a study to identify those rivers, streams, runs and waterways which possess great natural and pastoral beauty, and to recommend ways of protecting and preserving these scenic rivers and streams by public

and private effort. Among those streams recommended as worthy of preservation were the Rapidan River, from its source to its confluence with the Rappahannock (77 miles), and the Rappahannock River itself, from Remington to Port Royal (60 miles), and Dragon Run, as mentioned above (15 miles).

The Outdoor Recreation Study Commission recommended development of a State park on the York River near Gloucester Point in Gloucester County. This is another extremely popular boating and fishing area, and there is no doubt that a park - perhaps in conjunction with a marian, would be well used. Another 2500-acre State park on the York River is being acquired in James City County near Williamsburg, which will include swimming facilities and a marina. The only other park recommended in Basin 20 was development on Chesapeake Bay above New Point. This facility, like the one near Gloucester Point, would be oriented toward boating, fishing, swimming, and picnicking.

A review of the Needs Tables for Basin 20 indicates that net needs have been identified for recreation land and for flat water. No needs have been identified for swimming or for stream mileage, except for 2 miles by target year 2020. Even under the Environmental Quality Objective land requirements are not unduly high; for instance, 3000 acres and 1500 acres are the required acreages predicted for 1980 and 2000, respectively. It seems entirely possible that development of the six parks referred to above will provide most, if not all, of the land needs associated with the Environmental Quality Objective, as well as a sizeable proportion of the flat water needs. For this reason, and because of the subregion's strategic location between Basin 19 and Basin 21, it appears logical that recreation planning proceed with the Environmental Quality Objective as the goal.

Basin 21. This basin is essentially the James River Drainage. Unlike the Rappahannock and the Rapidan Rivers, the James River is heavily polluted in certain portions; nevertheless, it is a highly valued recreation resource, and with proper development could provide many more recreation days per year. In the vicinity of Lynchburg, for instance, the stream and related lands offer desirable park sites near a population center. The kind and degree of park development hinge largely on efforts to abate existing water pollution. Downstream, below the confluence of the James and Rivanna Rivers, and west of Richmond, similar development opportunities exist. Thought should be given to land acquisition now before the westward expansion of the Richmond metropolitan area makes itself felt in escalating real estate prices. The Rivanna River was recommended for inclusion in the State's Scenic River program, not only for scenic reasons, but for historic and fish and wildlife purposes as well. Downstream from Richmond, another park is recommended in the vicinity of Hopewell, Virginia.

If developed, it would offer valuable water-based recreation opportunity; however, at this point the James is seriously polluted, and recreational use would depend upon pollution abatement.

Moving eastward, one State park area has been acquired and two more are proposed between Hopewell and Hampton Roads. Chippokes Plantation State Park (1862 acres), on the south bank of the James opposite Jamestown, includes a beach and other developments. A potential park development exists on the lower Chickahominy near its confluence with the James, and another is in Isle of Wright County. All these sites are water-oriented, and will provide opportunity for boating, fishing, camping, swimming, and picnicking.

Thus far discussion has centered on the James River itself, and upon six potential State park sites. The remainder of the basin, however, is rich in recreation potential, and this should be examined. Probably the greatest asset to southeast Virginia is the Atlantic Ocean shoreline and beach. Nearly six miles of ocean beach, sand dunes, and bayside marshes are being acquired for the new False Cape Refuge and the North Carolina State line. In the same vein, the State should be advised immediately should the Fort Story Army Reservation be declared excess to needs. Its importance, especially for its beach frontage, cannot be overemphasized. Inland, there are several streams which should be preserved. The Blackwater and Nottoway Rivers are two such streams. The Nottoway is unique in that its descent at the fall line from the Piedmont to the coastal plain offers a good opportunity for white water canoeing, a form of recreation rare in this portion of Virginia. Both streams have been recommended for inclusion in the State's Scenic Rivers Program.

Thus far we have considered meeting recreation needs solely by acquiring and developing new areas. It was pointed out in discussing the Potomac Basin that other devices exist, and that one such device often used is to upgrade and expand existing recreation facilities. It is conceivable, for instance, that camping and swimming capacities can be expanded at existing facilities, such as Pocohontas State Park, Holliday Lake State Recreation Area, Bear Creek Lake State Recreation Area, and at Seashore State Park. Conditions, of course, vary tremendously, but there are some facilities which lend themselves well to this kind of treatment. In other cases the technique works poorly, if at all.

Basin 21 is a fast growing recreation area, and regional and State planning should be executed in such a way that the base upon which tourism and the recreation industry rest is not jeopardized. The entire area is rich in historical buildings and battlegrounds, and an effort to develop parks and camping facilities near them appears worthwhile. Recreation planning should be oriented about the Environmental Quality Objective.

Summary. Subregion F, the most southern of the six major subregions, comprises three principal river systems: the Potomac; the Rappahannock; and the James. Land and water needs required to meet demands anticipated under various planning objectives for the three target years have been computed. Such needs are particularly large in the Potomac (Basin 19) and in the James (Basin 21).

Water pollution of various kinds exists throughout the subregion, and is especially troublesome in Basins 19 and 21. In the Potomac the greatest single recreation problem is the absence of broad water, and the resulting lack of opportunity for boating, water-skiing, and sailing. The inclusion of recreation boating opportunity at multiple-purpose impoundments will do much to alleviate this shortage. Flow regulation will be used to a great extent to combat other ills: poor water quality; low flow; and the threat of floods; but care must be exercised that areas of irreplaceable beauty and charm are not flooded out of existence, particularly when it is possible to locate the dam elsewhere, and still achieve its intended purpose.

It appears that recreation needs identified under the Environmental Quality Objective can and should be achieved. Although the recommended objective is the same throughout the subregion, the reasoning for it varies slightly from basin to basin. In Basin 19, the fact that the Potomac is the "Nation's River" leaves little room for any other choice. The strategic location of Basin 20, and the fact that the recreation situation is comparatively "good," would indicate that a maximum effort should be made to protect a resource that has not yet been despoiled. In Basin 21 tourism and recreation are important economic factors, and common sense indicates that with proper planning their importance can be maintained, and perhaps even strengthened.

It was mentioned that the recreation needs enumerated earlier can be provided for in a number of ways, including the creation of new recreation facilities, either singly or in conjunction with other public works, for example - the development of multiple-purpose reservoirs, by the expansion of existing facilities whenever it is feasible to do so, and the development of additional public parks on bays, estuaries, and the ocean shore.

In summary, the resource base required for quality recreation does exist in Subregion F. With proper care and coordinated development, these resources are capable of providing a broad selection of outstanding recreation opportunities.

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