FORECASTING TRENDS IN OUTDOOR RECREATION ACTIVITIES ON A MULTI-STATE BASIS[1]

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INTRODUCTION

Since a substantial amount of recreation planning takes place on a statewide basis, it is essential to have reliable information and forecasts of recreational needs on a state level. However, most of the recreation research over the last few years have used either national survey data, statewide data or site specific information. Each of these methodologies has severe limitations for projecting recreation participation on a statewide basis. Information based on national surveys, due to lack of a sufficient number of observations per state, can provide only limited information regarding recreational patterns for individual states. Alternatively, state survey efforts lack a uniform survey methodology by which results from several states can be compared. Thus, survey results from several states, unless the data were collected as part of a larger effort, can not be used to forecast the necessary interrelationships and travel patterns among neighboring states which are essential for understanding state recreational patterns. Finally, site specific data can only be used to forecast recreation at isolated sites, although such results have been used to project participation at similar sites.

Clearly, what is needed are methods for projecting recreational behavior on a regional basis so that planners from individual states, can take account of changing patterns and desires from neighboring states which will affect participation in their own states and vice versa. Only by incorporating the complex set of interactions among states can planners in any particular state obtain an accurate picture of recreational participation within his/her own state.

The research effort described below represents one of the few attempts at regional recreational modeling for the New England and New York region.[2] The states are, for the most part, geographically small. The area contains both heavily urbanized centers and rural areas. There are large topographical differences within easy traveling distance offering a wide variety of recreational activities within the region; these, and other reasons, imply that recreationists may easily travel among neighboring states. To accurately understand and project recreational trends within the region, and more importantly for individual states within the region, some form of regional model is essential. The model that was developed will be shown to be a flexible tool capable of forecasting several dimensions of recreational participation as well as spatially distributing participants throughout the region. This paper is divided into three sections: The first section describes the forecasting model; the second summarizes the steps and input data necessary to run the model; the last section presents results for 1985 for two recreation activities, Swimming in Salt Water and Hiking and Wilderness Camping.

DESCRIPTION OF THE FORECASTING MODEL

The model used to project recreation in the New England-New York area was developed by ABT Associates, Inc. under contract to the Commonwealth of Massachusetts to analyze current outdoor recreation patterns within the region and to advance the state-of-the-art in

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[1] Paper presented at the National Outdoor Recreation Trends Symposium, Durham, NH, April 20-23, 1980.

[2] Other regional models exist for the Pacific Northwest region.

regional recreational forecasting.[3] The model that was developed, while being a very flexible analytic tool, is specific to the New England-New York area, although the methodology is generalizable to all regions of the country.[4]

Overall, the model is capable of forecasting recreational participation for sixteen different activities;[5] for each activity the model can predict the number of user days of overnight trips and day trips. In addition, the model can also disaggregate activity days into the total number of participants, the frequency of participation and the duration of participation (duration of participation, in activity days applicable only for overnight trips). Finally, the model makes each of these projections by activity, for subregions within the New England-New York region and distributes the resulting participants from any given subregion to each of the remaining subregions within the entire area.

In total there are 79 regression equations in the forecasting model for the 16 different summer outdoor recreation activities. The forecasts for each activity are divided into forecasts for day trips and overnight trips. The distinction between overnight and day trips is stressed because it is felt that the underlying dynamics between the two types of trips are different. Day trips usually involve less travel than overnight trips and usually involve participation in fewer activities. In contrast, for overnight trips the primary goal is the participation in a recreational trip, rather than a single or few well-defined activities. Thus, there are far more combinations of activities engaged in during an overnight trip and it is more difficult to relate a single overnight outing to a single activity.

One of the important goals of the forecasting model was the ability to project recreational participation from subunits of the entire region and then allocate the participation from each subunit to the remaining areas. Thus, the whole study area was divided into 15 geographic subregions so that movements from origins to destinations could be analyzed.[6] Participation was, therefore, projected on a subregional basis for each activity and the resultant activity days originating in each subregion were distributed to all the 15 possible destinations. It is important to note that the 15 subregions are both potential origins and destinations for each activity (for both overnight and day trips). It is also important to note that the model is restricted to forecasting activity participation for only those participants originating from within the region; the model is capable of estimating the number of recreationists that leave the subregion but is not able to project the number and destination of participants that enter the region from elsewhere.

The actual structure of the model is described in Exhibit 1. The model is divided into a day trip model and an overnight trip model,[7] and is estimated for the most part separately for each activity. For both types of trips, day trips and overnight trips, the model is further disaggregated into seven equations, three equations for day trips and four equations for overnight trips, which separately estimate several parameters of participation and together determine total number of activity days at each possible destination within the subregion.[8]

Each of the main equations of the model provide different information thought to be important for recreational planning purposes. The are:

- the probability of participation in a given activity during a given summer

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[3] For a detailed description of the model, see the ABT Associates report <u>Analysis and Computer Modeling of Summer Outdoor Recreation Activities in the Northeast</u>. Only a general overview of the model is presented in this paper.

[4] Eastern New York was combined with New England to comprise a region because there is obviously a great deal of travel between New York and New England.

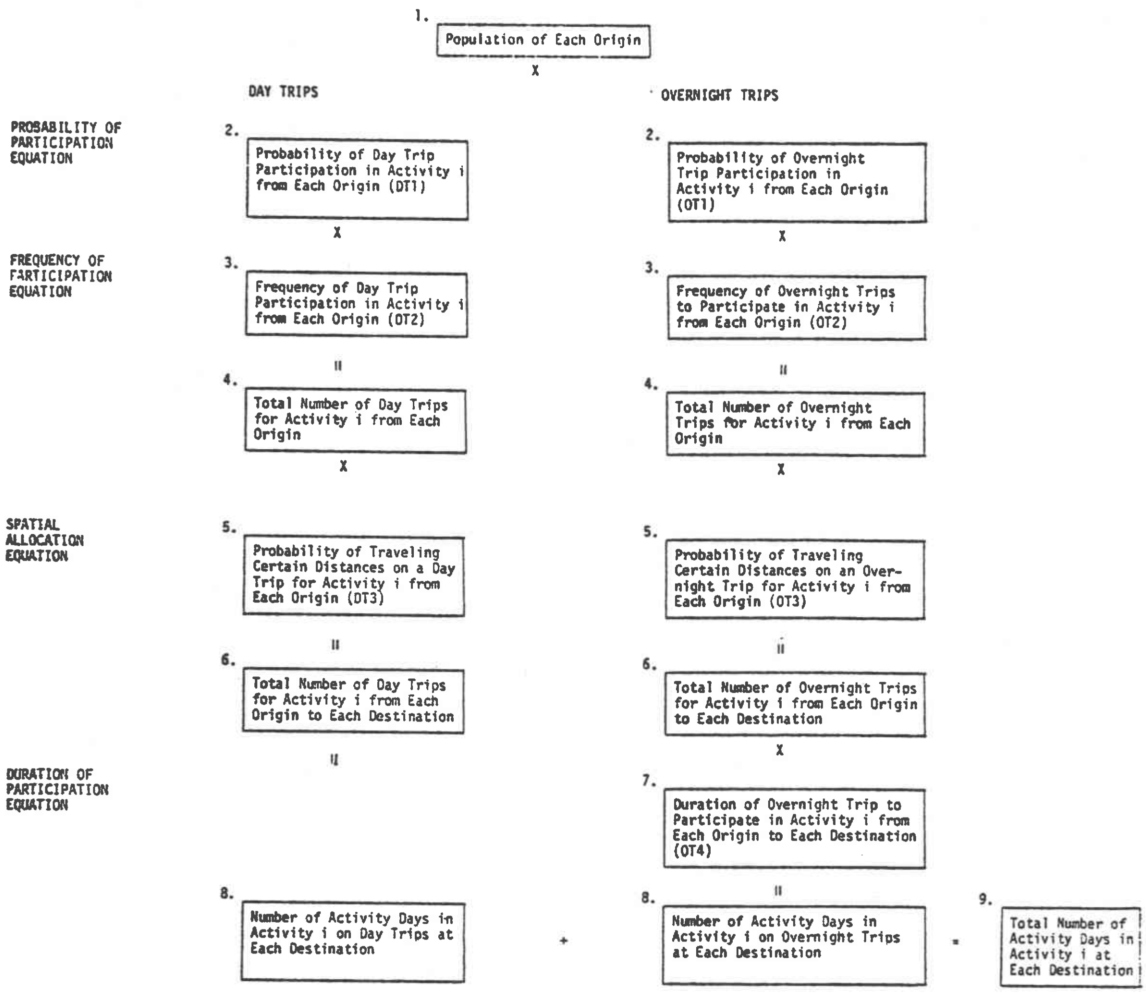
[5] The sixteen activities are Swimming in Outdoor Pools, Swimming in Fresh Water, Swimming in Salt Water, Hiking and Wilderness Camping, Campground Camping, Tennis, Golfing, Bicycling (for pleasure), Canoeing, Sailing, Power Boating, Nature Walks, Fishing, Sightseeing (by motor vehicle), Visiting Fairs, Zoos and Amusement Parks, and Watching Outdoor Sports.

[6] The breakdown of the entire region was done by state, with representatives from the individual states determining the subregions which best suited their needs.

[7] For the most part the equations for day trips and overnight trips are estimated separately, although some linkages do exist since day trip variables are used in the overnight equations.

[8] It is important to realize that the output of the model is measured in activity days. An activity day is defined as the occurrence of participation, by an individual, in a given activity during a single day. Thus, it is possible that several activity days can occur in a single 24 hour period. The model, therefore, does not project the actual amount of time engaged in for an activity. Rather, it predicts the number of occurrences, measured as an activity day, of participation.

EXHIBIT 1: OVERVIEW OF THE MODEL



- the frequency (the number of separate occurrences) of participation within a given season for a given activity

- the spatial allocation between where a recreation trip originates and where it culminates

- the duration (measured in activity days) spent participating in particular activity (applicable only to overnight trips).

The first three equations are estimated separately for day trips and overnight trips; the fourth equation is applicable only to overnight trips. All equations are activity specific, except the last two overnight trip equations which are trip specific since it was found to be impossible to separate out the individual influences of specific activities from the decision to take an entire trip.

Again referring to Exhibit 1 the linkages can be described.

The first output of the model is the determination of the total number of trips originating at each origin (Box 4). This is accomplished in two steps. The first step estimates the probability of a person, at a specific origin, participating in a given recreational activity (Box 2). The second equation, using only those who have participated in a given activity, determines the number of trips they take (Box 3).

These equations are used to predict total trips from each origin. If values of the independent variables from each origin are inserted into the two equations, the probability and frequency of participation from each origin can be predicted. This information is combined with the population of each origin, and total number of trips from each origin is obtained by multiplying the three values.

Once estimates of the total number of trips from each origin are obtained, the second part of the model allocates the total trips among the various destinations (Box 6).[9] The last equation of the model, applying only to overnight trips, estimates total number of activity days per overnight trip at a given destination.

The output at this stage is an equation predicting total number of activity days for a given activity (Box 7). When the total number of activity days from day trips is combined with the total activity days on overnight trips, the total number of activity days for a given activity has been estimated for a particular destination (Box 9).

Once the population is known, multiplying the first equation by population determines total number of participants in that activity for day trips and overnight trips. Multiplying that quantity by the output of the second equation determines the total number of activity trips for that activity and type of trip. The third equation takes the total number of activity trips and distributes them among the various destinations. Finally, the last equation predicts the number of days of participation for each activity on overnight trips.

In summary, using all the equations, the model can predict the total number of activity days from a given origin to any number of destinations for day trips and overnight trips. Taken individually, recreational planners can use any of the equations to predict a given component of total participation; either the probability of participation, frequency, spatial allocation or duration.

The equations of the model were estimated using various regression techniques using two types of data; primary survey data which contains socio-demographic data and trip specific data obtained via a telephone survey conducted by ABT Associates in 1977 and secondary data describing characteristics of each subregion and the supply information for each activity.[10] The primary data obtained via ABT Associates' Summer Activities Survey provided the key participants and non-participants for each activity. The survey was conducted during the September of 1977 using a multi-stage stratified random sample of individuals 12 years or older, living in the New England-New York region. The entire region was stratified into 15 geographic subregions -- corresponding to the subregional breakdown used to determine the spatial allocation of participation--and separate samples were drawn from each stratum. In total there were 1541 completed interviews, or approximately 100 interviews from each subregion.

Information regarding the aggregate characteristics of each subregion and supply data relevant for individual activities was obtained from the Commonwealth of Massachusetts. Unfortunately, the secondary data proved to be far less consistent or reliable than the primary data and therefore its usefulness was limited.[11] It was originally felt that such supply information would be valuable determinants of participation, especially when accounting for differences in participation among the various subregions. Thus, these secondary data were originally intended to be used as independent variables in each of the forecasting equations. However, due to data inconsistencies and a great deal of missing information, an alternative formulation was developed whereby a separate supply model was developed and

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[9] The spatial allocation portion of the model is a relatively complex algorithm which projects the distribution of participation on the basis of the probability of traveling a given distance from an origin of known characteristics to a destination of known characteristics. The basis for these estimates is a multi-nomial logit model which was used to project the probability of traveling certain distances for each activity by day and overnight trip, based on the characteristics of the individual origin and destination. For a more detailed description see Volumes 2 and 5 of ABT's report, Analysis and Computer Modeling of Summer Outdoor Recreation Activities in the Northeast and Documentation for the Summer Outdoor Recreation Forecasting Model respectively.

[10] Supply data refers to physical characteristics associated with each subregion that is necessary for participation in the various activities. Thus, number of ocean beaches would be a supply variable for Swimming in Salt Water while number of 18 hole golf courses in a subregion would be a supply variable for Golfing.

[11] The problems with the supply data were lack of consistent definition or method of collection across subregions and, most importantly, too many missing observations. In fact, there were a sufficient number of missing observations that it was not possible to use the supply data directly in the model.

linked to the main forecasting model.[12]

The dependent variables in each equation were taken from the primary data collected by ABT Associates. For the first equation, the probability of participation, respondents were categorized into two groups for each activity, and for overnight and day trips, and the dependent variable was whether or not they were in the group participating in that particular activity. For the second equation the number of different instances of participation of those respondents who participated in a given activity, separately for overnight and day trips, was used as the dependent variable. For the spatial allocation component of the model the probability of traveling a specified distance for a given activity was estimated and used as part of a more complex spatial allocation algorithm. Finally, for the fourth equation, which was estimated only for overnight trips, the number of different activity days of participation on a given trip over all activities was used as the dependent variable.

Most of the key independent variables of each equation were general socio-demographic information and specific activity trip information.[13] For the most part both types of data were obtained from the ABT Summer Activities Survey. In using the model to make predictions the user must only estimate values for the independent variables that are expected to change over time, input them into the model, and assuming that a number of other underlying relationships will be maintained over time, the model will predict the various components of recreation discussed above.

Finally, it should be noted that the entire model has been installed as a self-contained, user operated computer model. The computer model has built into it a great number of adjustments that must be made before the output of the individual equations can be used to obtain the desired projections.[14] In addition, the computer model restricts many of the independent variables, primarily the trip specific variables, to default values otained from ABT's Summer Survey. For other variables, unless the user specifies changes, the computer will default to average values used in estimating the model. The user need only specify changes in certain independent variables and the model will print out projections of participation by activity for each subregion in the New England-New York region. An example of the output of the model for one activity and one subregion are presented in Exhibit 2. If total participation for any activity within the region is required then it is a simple matter of aggregating the distribution of participation from each origin.

FORECAST RESULTS

This section presents results of implementing the model to forecast the expected number of activity days to be spent in each subregion in 1985 for two activities--Swimming in Salt Water and Hiking and Wilderness Camping. For this example, 1985 values for population, age, and income were used in the model. All other variables were assumed to remain constant at their 1977 levels.

PROJECTIONS OF EXOGENOUS VARIABLES

Table 1 presents the values of population, age, and income for 1977 and 1985 for each of the 15 subregions. The 1977 population estimates were provided by the states, themselves. The 1977 age and income estimates are the sample means of the ABT survey data. Subregional projections of population, age and income were derived using state estimates published by the National Planning Association (NPA).[15]

The subregional population estimates

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[12] For each activity a proxy for the subregional supply characteristics was created based on the survey data. That proxy, which was an index relating activity participation within a subregion to the whole region, was then used as an independent variable in the forecasting model. In addition, a separate supply model was developed which related the actual supply variables to the proxy supply variables. Within the supply model changes in actual supply variables could be used to change the proxy values which would then be changed in the main forecasting model. This indirect technique allows inclusion of supply variables in the forecasting model without the problems of the actual supply variables. Thus, a recreation planner can still determine the effect of changes in a supply variable, for example of golf courses, on participation.

[13] Examples of the independent variables used to estimate the equations are age, income, sex, race, distance travelled, number of people on a trip and other respondent and participant characteristics.

[14] Many of the adjustments convert values in logarithms and back again, make adjustments that were necessary to calibrate the model and in general ease the process of inputing variables into the model.

[15] Scara, Timothy B., David W. Fay, and Joe Won Lee, State and Metropolitan Growth Patterns, 1960-1990, Washington: National Planning Association, Report Number 77-R-1, 1977.

EXHIBIT 2

ACTIVITY = HIKING

ORIGIN= W CONN

POPULATION= 1758.00 (THOUSANDS)

ALL ACTIVITY DAYS ARE REPORTED IN THOUSANDS

DAY TRIPS

PROBABILITY OF PARTICIPATION-------> 0.0493

MULTIPLIED BY

FREQUENCY OF PARTICIPATION-----> 10.76364

EQUALS TOTAL # OF DAY TRIPS-----> 932.97

OVERNIGHT TRIPS

PROBABILITY OF PARTICIPATION-------> 0.0697

MULTIPLIED BY

FREQUENCY OF PARTICIPATION-----> 2.93648

EQUALS TOTAL # OF OVERNIGHT TRIPS-----> 359.91

PROBABILITY OF MAKING DAY TRIPS TO THE FOLLOWING DESTINATIONS:

W_CONN	E_CONN	W_MAINE	E_MAINE	MA-CAPE	EAST_MA	WEST_MA	NO_NH	SO_NH	SO_NY	MID_NY	NO_NY	R_I	NO_VT	SO_VT
0.74962	0.20979	0.0	0.0	0.00195	0.00468	0.00092	0.0	0.00195	0.0	0.00029	0.0	0.0	0.0	0.0

MULTIPLIED BY THE TOTAL # OF DAY TRIPS MINUS 28.7 ACTIVITY DAYS OUTSIDE THE NY/NEW ENGLAND AREA EQUALS DAY TRIP ACTIVITY DAYS TO

W_CONN	E_CONN	W_MAINE	E_MAINE	MA-CAPE	EAST_MA	WEST_MA	NO_NH	SO_NH	SO_NY	MID_NY	NO_NY	R_I	NO_VT	SO_VT
699.4	195.7	0.0	0.0	1.8	4.4	0.9	0.0	1.8	0.0	0.3	0.0	0.0	0.0	0.0

PROBABILITY OF MAKING OVERNIGHT TRIPS TO THE FOLLOWING DESTINATIONS:

W_CONN	E_CONN	W_MAINE	E_MAINE	MA-CAPE	EAST_MA	WEST_MA	NO_NH	SO_NH	SO_NY	MID_NY	NO_NY	R_I	NO_VT	SO_VT
0.18210	0.06030	0.02686	0.01794	0.02989	0.14747	0.05916	0.02888	0.02781	0.07070	0.03454	0.01810	0.03208	0.01818	0.02729

DURATION OF PARTICIPATION IN ACTIVITY ON OVERNIGHT TRIPS IS 2.95 DAYS, MULTIPLIED BY THE ABOVE PROBABILITIES MINUS 232.4 ACTIVITY DAYS OUTSIDE THE NY/NEW ENGLAND AREA, GIVES THE NUMBER OF OVERNIGHT TRIP ACTIVITY DAYS AT DESTINATION :

W_CONN	E_CONN	W_MAINE	E_MAINE	MA-CAPE	EAST_MA	WEST_MA	NO_NH	SO_NH	SO_NY	MID_NY	NO_NY	R_I	NO_VT	SO_VT
193.5	64.1	28.6	19.1	31.8	156.7	62.9	30.7	29.6	75.1	36.7	19.2	34.1	19.3	29.0

ADDING DAY TRIP ACTIVITY DAYS TO OVERNIGHT ACTIVITY DAYS GIVES THE TOTAL ACTIVITY DAYS AT :

W_CONN	E_CONN	W_MAINE	E_MAINE	MA-CAPE	EAST_MA	WEST_MA	NO_NH	SO_NH	SO_NY	MID_NY	NO_NY	R_I	NO_VT	SO_VT
892.9	259.8	28.6	19.1	33.6	161.1	63.7	30.7	31.4	75.1	37.0	19.2	34.1	19.3	29.0

TABLE 1. VALUES OF EXOGENOUS VARIABLES - 1977 AND 1985

SUBREGION	POPULATION (in thousands) 1977	1985	MEAN AGE OF POPULATION 12 years and over 1977	1985	MEAN INCOME OF THE POPULATION (in thousands of 1977 dollars) 1977	1985
WEST CONNECTICUT	1758.0	1802.0	39.4	39.5	17.391	19.974
EAST CONNECTICUT	1405.0	1440.0	41.8	41.9	15.000	17.430
WEST MAINE	698.0	802.0	43.7	41.8	10.999	12.853
EAST MAINE	300.0	346.0	40.8	39.0	11.627	13.679
CAPE MASSACHUSETTS	990.0	1059.0	41.2	41.1	13.211	15.752
EAST MASSACHUSETTS	3324.0	3555.0	41.6	41.5	16.347	18.750
WEST MASSACHUSETTS	1350.0	1444.0	41.2	41.1	13.327	15.595
NORTH NEW HAMPSHIRE	285.0	321.0	46.3	41.7	12.884	15.128
SOUTH NEW HAMPSHIRE	573.0	646.0	42.6	38.3	14.725	17.266
SOUTH NEW YORK	10447.0	10688.0	40.9	41.9	16.281	18.891
MID NEW YORK	4210.0	4307.0	37.9	38.8	16.947	19.275
NORTH NEW YORK	425.0	435.0	38.9	39.8	13.700	15.833
RHODE ISLAND	1016.0	931.3	40.9	41.0	13.972	16.372
NORTH VERMONT	175.0	182.0	38.9	36.8	13.419	15.930
SOUTH VERMONT	313.0	326.0	43.8	41.4	12.388	14.659

were calculated from the state values assuming that changes at the subregional level were proportional to those at the state level. That is, the distribution of population among subgroups within a given state loss held constant, at its 1977 value.

The NPA report does not publish the mean age of the population, per se. However, the report does include a breakdown of population by age cohort groups for each state. The mean age of the population 12 years old and over of each state was estimated by taking a population weighted average of the cohort groups, 12 years of age and over. Subregional estimates were then calculated assuming that the change for each subregion was proportional to that of its encompassing state.

Mean population income was derived assuming a constant rate of growth among subregions within a state over the 1977-1985 period. The growth rates were calculated based on the NPA's estimates of state per capita income for 1977 and 1985.[16]

FORECASTS OF RECREATION PARTICIPATION

The 1985 projections of population, age, and income were used in the model to derive forecasts of the number of activity days for Swimming in Salt Water and Hiking and Wilderness Camping at each destination in 1985. These forecasts, as well as the corresponding estimates for the baseline year-1977, are presented in Tables 2 and 3 for Swimming in Salt Water and Hiking and Wilderness Camping, respectively. For simplicity, the tables show only the number of activity days resulting from both day trips and overnight trips. Note that these estimates represent the total number of activity days to be expected at each destination by recreation participants originating in the Northeast region.

The forecasts for Swimming in Salt Water (Table 2) suggest that every subregion, except East Connecticut, will experience an increase in the number of activity days spent at that destination. The two subregions in Maine show the largest percentage increases, while Cape Cod in Massachusetts and South New York exhibit the largest absolute changes.

In general, increases in day trips contribute slightly more to increases in the total number of activity days than do changes in overnight trip activity days. In East Connecticut, where visitation is expected to fall (or remain relatively constant at its 1977 level),[17] day trips are estimated to

[16] The actual 1985 income estimates (in thousands of 1977 dollars) were about 5% greater than those shown in Table A. Values used in the model are constrained to $\pm$ 3 standard deviations of the mean. The figures in Table A reflect the upper bound of this constraint and were the values used in deriving the projections.

[17] Given the accuracy of this (or any) forecasting model, a change of 0.5% can not be considered significant.

TABLE 2

FORECAST OF ACTIVITY DAYS FOR SWIMMING IN SALT WATER,

1977 AND 1985 IN THOUSANDS

SUBREGION OF DESTINATION	1977		1985		CHANGE IN TOTAL ACTIVITY DAYS (1985 MINUS 1977)	
	DAY TRIP ACTIVITY DAYS	TOTAL ACTIVITY DAYS	DAY TRIP ACTIVITY DAYS	TOTAL ACTIVITY DAYS	ABSOLUTE	PERCENT*
WEST CONNECTICUT	11,471	22,193	11,655	22,951	758	3.4
EAST CONNECTICUT	11,907	16,491	11,551	16,407	-83	-0.5
WEST MAINE	3,142	9,816	3,643	10,764	948	9.7
EAST MAINE	58	3,195	81	3,427	268	8.4
CAPE MASSACHUSETTS	12,218	16,531	13,137	17,724	1,193	7.2
EAST MASSACHUSETTS	12,465	17,176	13,076	18,082	906	5.3
WEST MASSACHUSETTS	-0-	-0-	-0-	-0-	-	-
NORTH NEW HAMPSHIRE	-0-	-0-	-0-	-0-	-	-
SOUTH NEW HAMPSHIRE	4,713	8,805	5,101	9,478	673	7.6
SOUTH NEW YORK	62,379	69,083	64,206	71,999	2,916	4.2
MID NEW YORK	-0-	-0-	-0-	-0-	-	-
NORTH NEW YORK	-0-	-0-	-0-	-0-	-	-
RHODE ISLAND	10,979	17,342	11,147	17,869	527	3.0
NORTH VERMONT	-0-	-0-	-0-	-0-	-	-
SOUTH VERMONT	-0-	-0-	-0-	-0-	-	-

* Percent Change = (1985 data minus 1977 data/1977 data)

TABLE 3

FORECAST OF ACTIVITY DAYS FOR HIKING AND WILDERNESS CAMPING

1977 AND 1985 IN THOUSANDS

SUBREGION OF DESTINATION	1977		1985		CHANGE IN TOTAL ACTIVITY DAYS (1985 MINUS 1977)	
	DAY TRIP ACTIVITY DAYS	TOTAL ACTIVITY DAYS	DAY TRIP ACTIVITY DAYS	TOTAL ACTIVITY DAYS	ABSOLUTE	PERCENT*
WEST CONNECTICUT	968	3,406	851	3,348	-58	-1.7
EAST CONNECTICUT	679	1,225	666	1,226	1	0.1
WEST MAINE	358	1,514	399	1,637	123	8.1
EAST MAINE	137	636	147	675	39	6.1
CAPE MASSACHUSETTS	317	1,239	303	1,260	21	1.7
EAST MASSACHUSETTS	1,151	2,210	1,095	2,209	-1	-0.05
WEST MASSACHUSETTS	326	836	309	830	-6	-0.7
NORTH NEW HAMPSHIRE	776	1,819	844	1,936	117	6.4
SOUTH NEW HAMPSHIRE	870	1,790	905	1,879	89	5.0
SOUTH NEW YORK	197	1,471	34	1,307	-164	-11.1
MID NEW YORK	1,423	3,750	1,292	3,615	-135	-3.6
NORTH NEW YORK	503	912	476	893	-19	-2.1
RHODE ISLAND	233	1,226	213	1,240	14	1.1
NORTH VERMONT	179	521	180	533	12	2.3
SOUTH VERMONT	705	1,888	710	1,928	40	2.1

*Percent Change = (1985 data minus 1977 data/1977 data).

decline by 356 thousand in 1985; this decrease is partially offset by an increase in the number of overnight trip activity days.

The forecasts for Hiking and Wilderness Camping (Table 3) exhibit much smaller changes from the 1977 baseline than did swimming in Salt Water. Moreover, 6 of the 15 subregions are expected to experience a decline in visitation for Hiking and Wilderness Camping, although in several cases the decrease is too small to be considered significant.

The projections suggest that New York will be the greatest loser of activity days while Maine, New Hampshire and Vermont will be the largest gainers.

The 1985 forecasts suggest that day trips to 9 of the subregions will fall relative to their 1977 level. In three of these subregions--East Connecticut, Cape Massachusetts, and Rhode Island-- the increase in overnight trip activity days more than offsets the decline in day trips, resulting in increases in total activity days.

The differences in the magnitude and direction of the changes between the two activities stem from several sources. First, since population at each origin drives the model, increasing population and holding all variables constant at their 1977 values would result in an overall increase in the total number of activity days for both Swimming in Salt Water and Hiking and Wilderness Camping. However, when age and income are allowed to vary, the overall effect depends upon the signs and magnitude of their coefficients in the various regression equations.[18] Since the relative effects of age and income as measured by the regression coefficients are different for the two activities, changing these variables produce different results.

Secondly, participation in Swimming in Salt Water is very much constrained by natural resources. Only 9 of the 15 subregions have coastal area, limiting the number of possible destinations.

Other Uses of the Forecasting Model

The data generated by the forecasting model are amenable to other kinds of analysis as well. In particular, the model's forecasts can be analyzed in terms of recreationists' travel patterns among the sub-state regions to engage in various kinds of outdoor recreation. For a given activity, the model estimates the number of day trips which originate within each subregion, and also estimates the subregion in which the activity actually takes place, that is, the destination.[19]

For most outdoor recreation activities, some residents will remain in their own subregion to participate in the particular activity while other residents will travel to a different subregion. If a greater number of people leave a subregion than enter the subregion to engage in an activity, then that subregion is experiencing a net outflow of participants to other subregions. If more people come into the subregion than leave it, then that subregion is importing participants, that is, there is an inflow of participants for that recreation activity.

Discussion of Day Trip Recreation

Table 4 presents the net inflows and outflows for day trips to participate in Swimming in Salt Water during the summer of 1977. For each of the 15 subregions, the number of day trips (for Swimming in Salt Water) which originated in the subregion is subtracted from the total number of day trips which had that subregion as its destination.

As is noted on the left hand column, residents of West Connecticut took an estimated 11,599,000 day trips to go Swimming in Salt Water during the summer of 1977 (i.e., these day trips originated from this sub-region). Of all the Salt Water Swimming day trips in the New England-New York region, West Connecticut was the final destination for 11,471,000 of these trips. Thus, while most West Connecticut residents remained within their own subregion to participate in this activity, there was a net outflow of 128,000 day trips to places outside of West Connecticut because more people exited from this subregion than entered it from the other 14 subregions. In strong contrast is East Connecticut which experienced a substantial inflow into its subregion for Salt Water Swimming day trips from other parts of the New England-New York region.

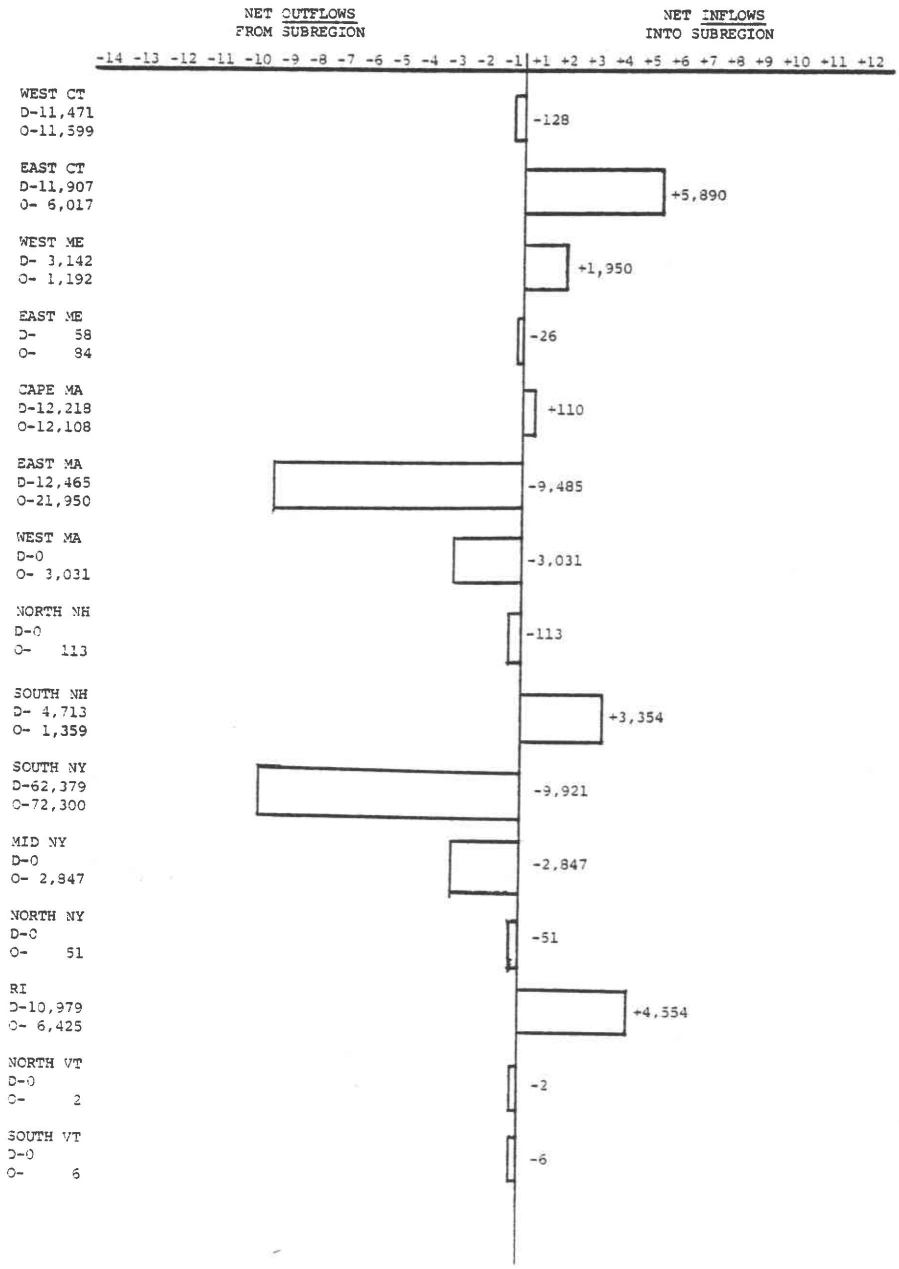
For some subregions, of course, there can be no inflow of recreationers to engage in Salt Water Swimming simply because the subregion lacks this natural resource. Thus, subregions such as West Massachusetts, North

[18] A detailed discussion of the equations is presented in Volume 2 of ABT's report, Analysis and Computer Modeling of Summer Outdoor Recreation Activities in the Northeast.

[19] Note that the model's estimates of recreation activity at each destination is based on travel from within the New England-New York region only. The model does not provide estimates of recreationists who enter the region from Canada, other parts of the U.S., etc.

TABLE 4

1977 DAY TRIPS (IN 000) FOR SALT WATER SWIMMING



and South Vermont, can only experience outflows to the subregions which have ocean beaches.

Overall, East Connecticut, West Maine, South New Hampshire, and Rhode Island enjoy substantial inflows of recreationers for Salt Water Swimming day trips. Interestingly, both East Massachusetts and South New York experience considerable outflows of day trips for Swimming in Salt Water, even though both these subregions have ocean beaches.

Table 5 presents model projections of day trip activity for Swimming in Salt Water for the year 1985,[20] based upon expected changes in the population, age, and income in the New England-New York region.[21] The data suggest that the subregions will likely continue to exhibit the same basic patterns of either importing or exporting day trip Salt Water Swimming participants for 1985 as they did in 1977, although the size of the inflows and outflows have changed. East Connecticut and Rhode Island are each likely to experience approximately 500,000 more day trips for this beach activity in 1985 as compared to the inflows into these subregions during 1977. Also, the outflow of day trip participants from South New York is likely to be considerably less in 1985; while only slightly more day trips will originate in this subregion, substantially more participants (than in 1977) will be destinating in South New York for Salt Water Swimming day trips.

A similar analysis is presented for day trips to engage in Hiking and Wilderness Camping during 1977. Table 6, which displays the net inflows and outflows for each of the 15 subregions, demonstrates very different patterns than was observed for Swimming in Salt Water. Immediately obvious is the fact that people take far fewer day trips to engage in this activity. East Massachusetts enjoys the largest inflow of day trip participants for Hiking and Wilderness Camping (in strong contrast to its substantial outflows of day trip participants for Swimming in Salt Water). Also noteworthy is the fact that although more day trips for Hiking and Wilderness Camping originate in the Mid New York subregion, it still experiences a strong outflow of such day trips.

Table 7 presents the forecasting model's estimates for 1985 day trips for Hiking and Wilderness Camping. Again, the basic patterns remain although there are slight changes in the magnitude of the inflows/outflows.

[20] Data based on NPA estimates.

[21] As with all forecasting models, the output should not be considered as absolute predictions, but is best utilized by analyzing the relative changes which are estimated under varying assumptions.

Discussion of Total Activity Days

Tables 8 and 9 display the net inflows and outflows in 1977 and 1985 for the total activity days in which people go Swimming in Salt Water. West Connecticut, which exhibited a slight outflow of day trips (see Table 4), now experiences as significant inflow of total activity days; the reversal in flows is accounted for by the fact that this subregion is a popular destination for overnight trips where recreationists participate in Salt Water Swimming. The other coastal subregions also enjoy substantial inflows of participants, with the notable exception of East Massachusetts and South New York which continue to export participants to other areas. A comparison of 1977 and 1985 forecasts (in Tables 8 and 9 respectively) indicate that the same basic patterns will obtain throughout this time period.

Forecasts of the total activity days for Hiking and Wilderness Camping in each subregion for 1977 and 1985 are presented in Tables 10 and 11. West Connecticut, North New Hampshire, and South Vermont have the largest number of total activity days destinating in the subregion (3,750,000 activity days); but considerably more activity days are originating from this part of the state (8,537,000), and thus this subregion experiences a significant outflow of participants.

The data for 1977 in Table 12 focuses on Mid New York and displays the net inflows into the other subregions for Hiking and Wilderness Camping activity days from Mid New York. While other parts of the state are getting some inflow from Mid New York, other subregions--West Connecticut and East Massachusetts, in particular--are the greatest gainers of the Hiking and Wilderness Camping activity days which are outflowing from Mid New York.

CONCLUSIONS

There is considerable travel from one substate region to other subregions in the New England-New York area to participate in various outdoor recreation activities. The total number of activity days originating and destinating in each subregion demonstrate significant flows of recreationists throughout the entire region; this is also true, though to a lesser degree, when day trip activity is analyzed.

Model projections of recreation activity in 1985--based on estimated changes in the average age, income, and population of each subregion--suggest that some changes in magnitude, but not of direction of the subregional inflows and outflows, of recreation activities will occur.

TABLE 5

1985 DAY TRIPS (IN 000) FOR SALT WATER SWIMMING

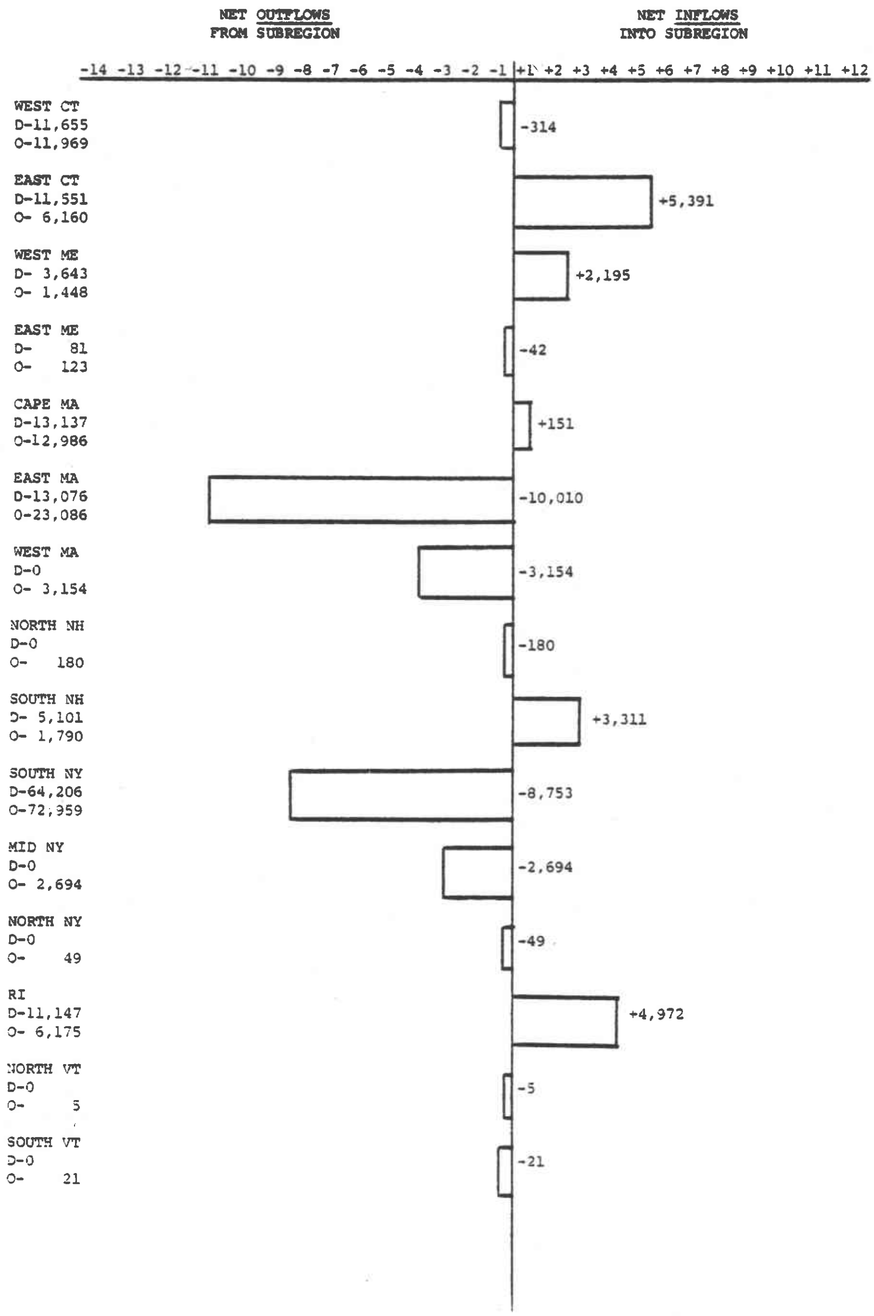


TABLE 6

1977 DAY TRIPS (IN 000) FOR HIKING & WILDERNESS CAMPING

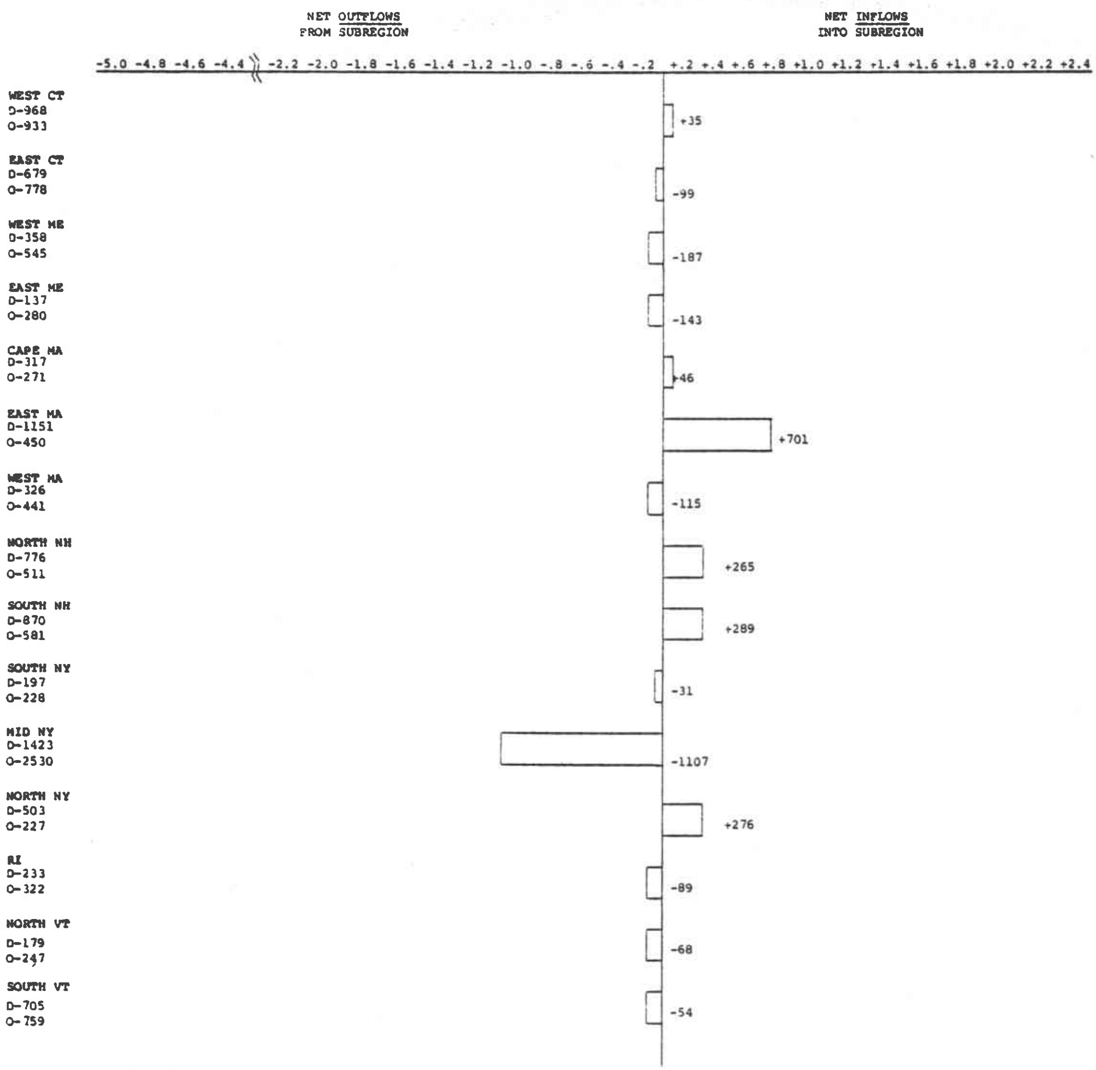


TABLE 7

1985 DAY TRIPS (IN 000) FOR HIKING & WILDERNESS CAMPING

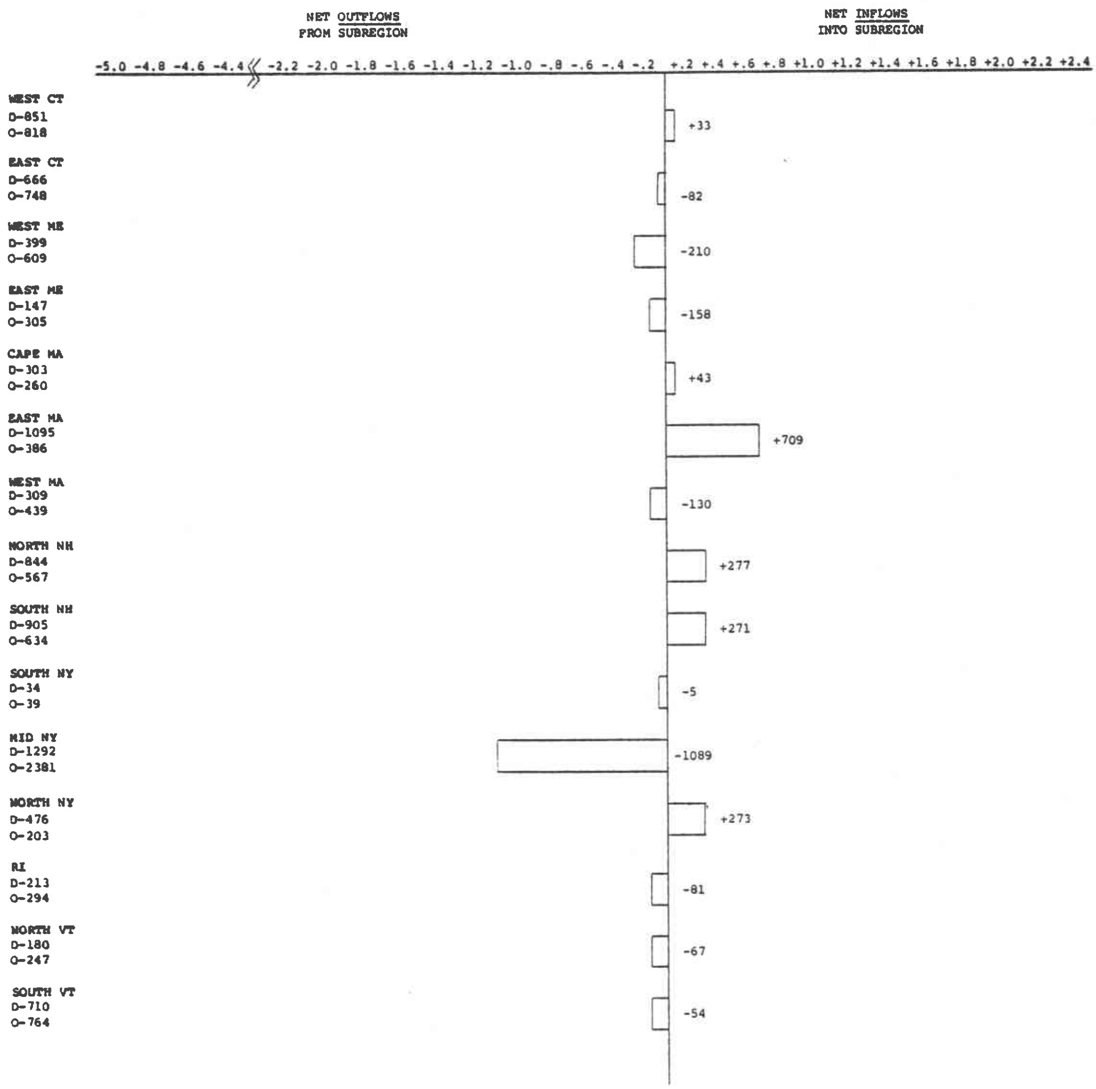


TABLE 8

1977 TOTAL ACTIVITY DAYS (IN 000) FOR SALT WATER SWIMMING

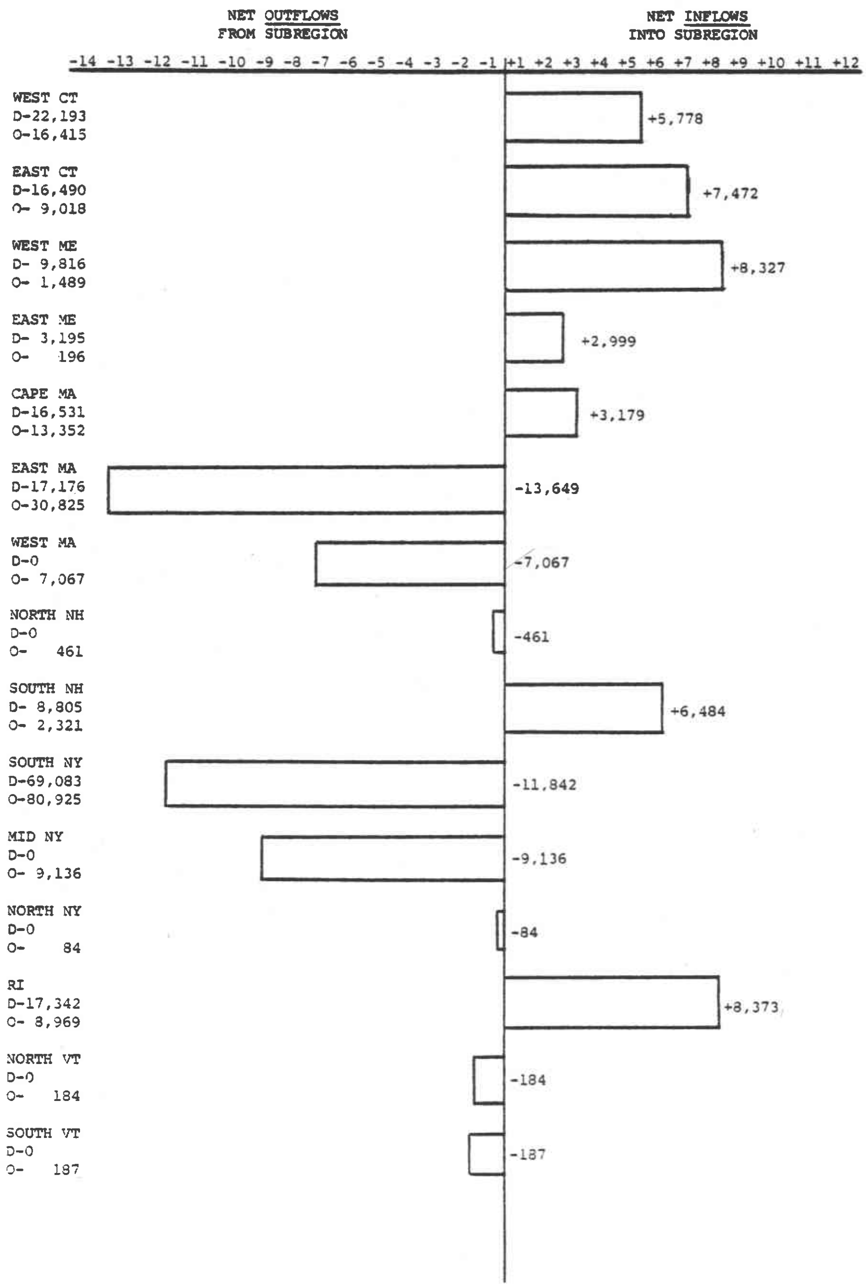


TABLE 9

1985 TOTAL ACTIVITY DAYS (IN 000) FOR SALT WATER SWIMMING

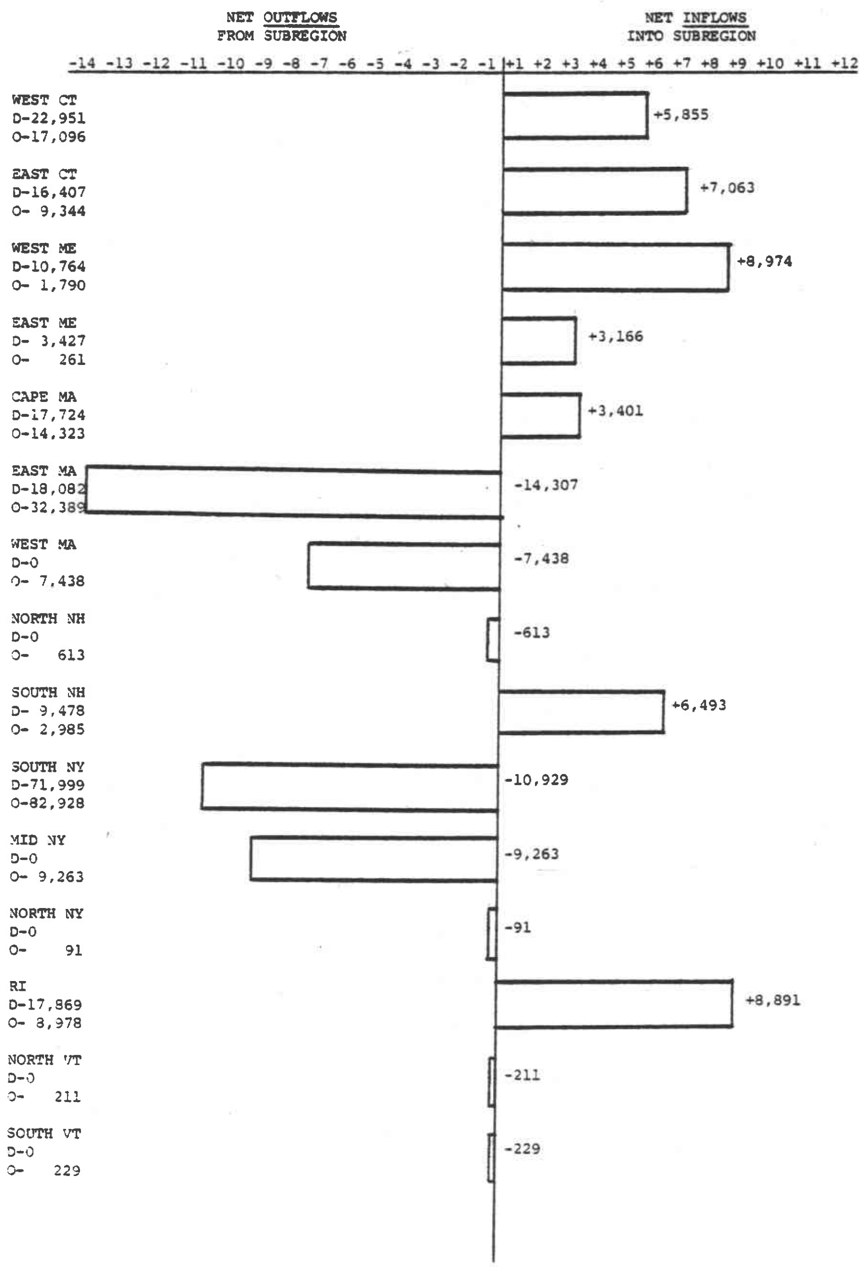


TABLE 10

1977 TOTAL ACTIVITY DAYS (IN 000) FOR HIKING & WILDERNESS CAMPING

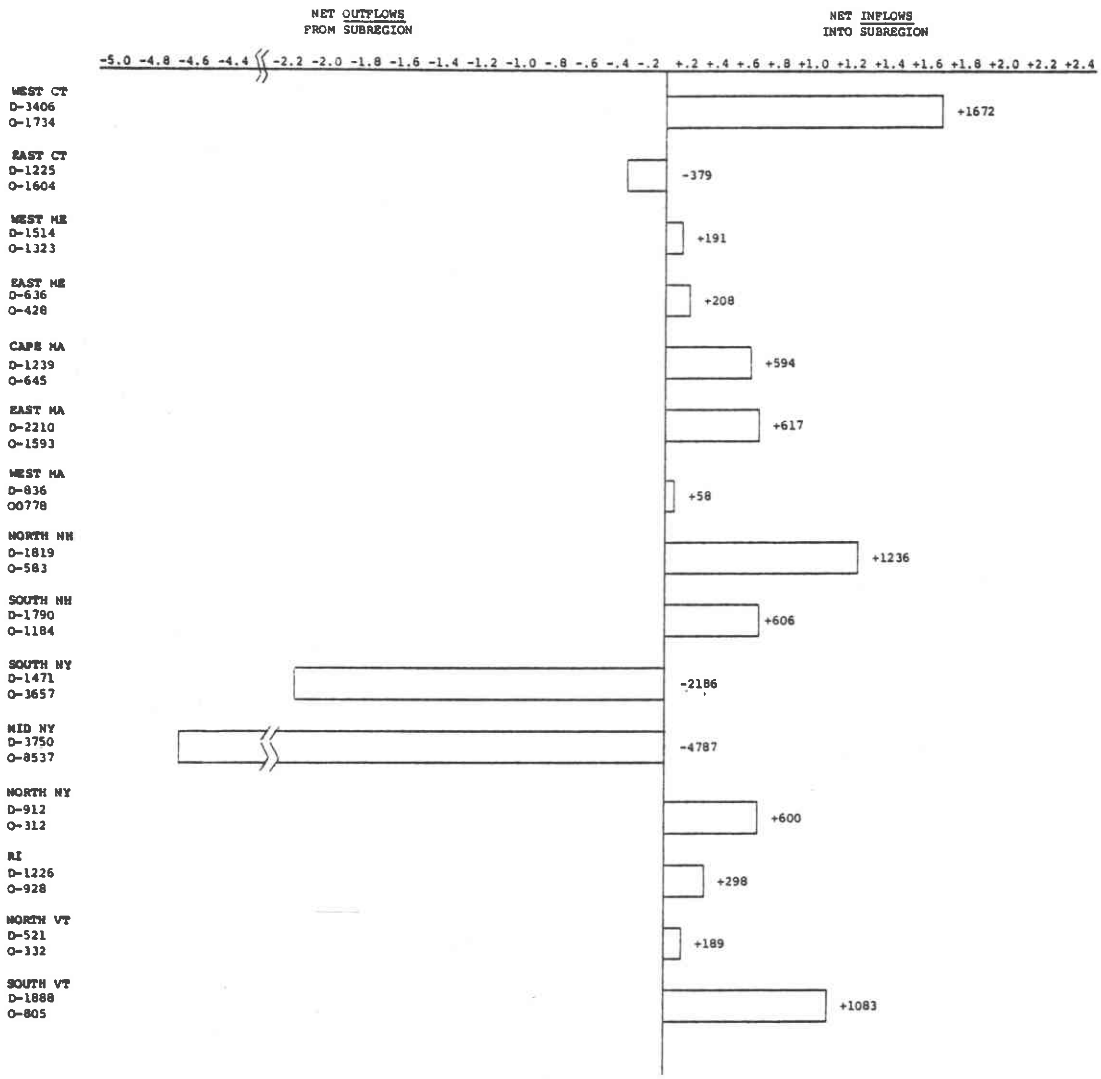


TABLE 11

1985 TOTAL ACTIVITY DAYS (IN 000) FOR HIKING & WILDERNESS CAMPING

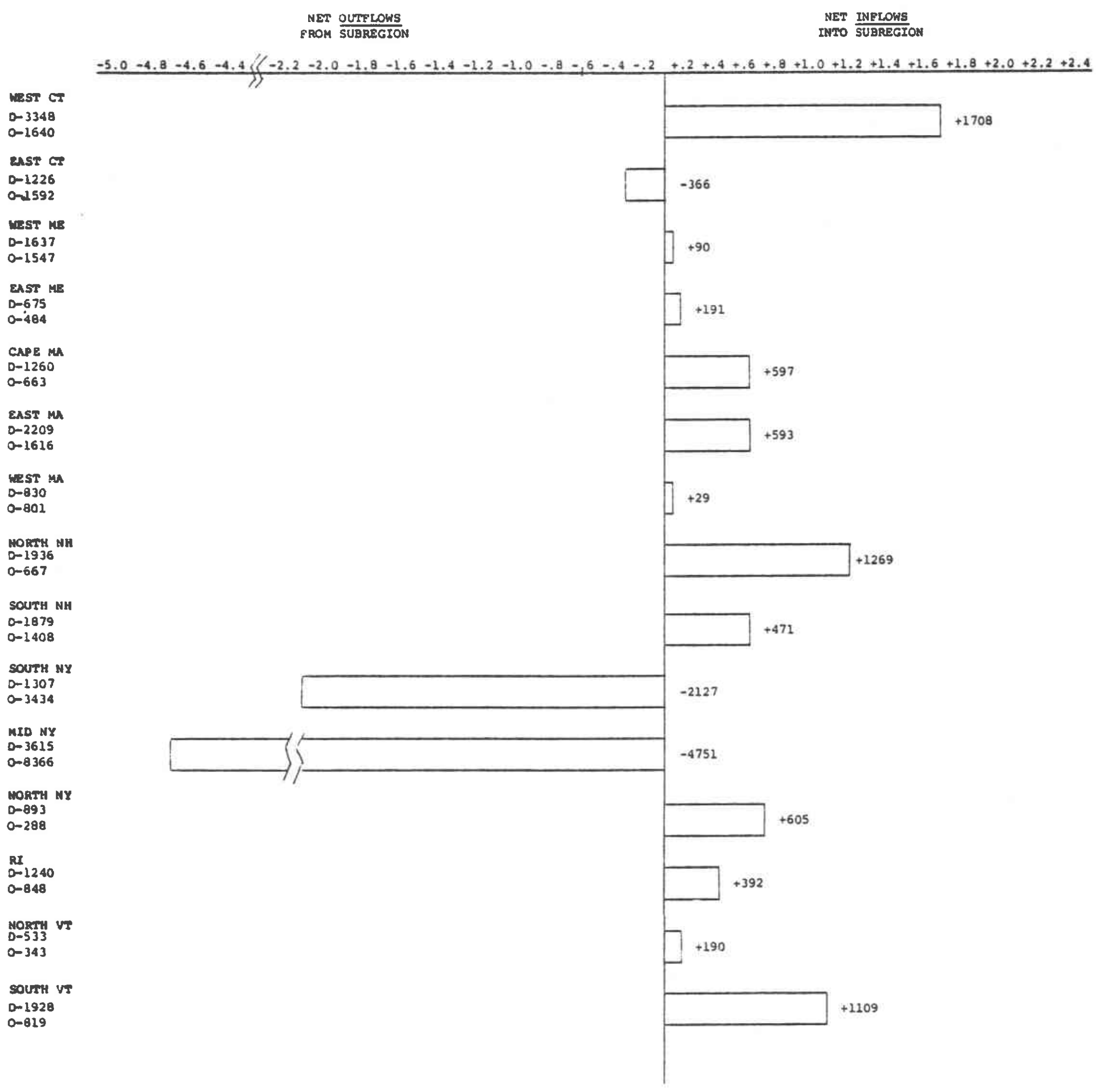


TABLE 12

NET INFLOWS IN OTHER SUBREGIONS FROM MID NEW YORK

(1977 TOTAL ACTIVITY DAYS -IN 000- FOR HIKING & WILDERNESS CAMPING)