TN 1: A MODEL FOR ESTIMATING DAY-USE OF PARKS

BY H. K. CHEUNG

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ABSTRACT

One aspect of rational park planning is developing site-specific models that give insights into the structure of relations that determine participation at a given park which is part of a system. This research was carried out to obtain a conceptually and structurally more meaningful site-specific model (often called travel model in the literature). The model developed is site-specific in that it deals directly with use of twelve individual sites in Saskatchewan. Alternative recreation opportunities and park attractivity are related to quantitative explanatory variables.

The alternative factor used is defined in terms of the location and the number of alternative sites available to the visitors to a particular site, while a site's attractivity is expressed as a function of the physical characteristics of its facilities and the services.

The data for this study were collected as part of the CORDS 1669 Park User Survey. The paper does not provide details about the survey but documentation on it is available elsewhere. (Documentation referred to is in the CORDS Data Documentation Volume.)

Step-wise multiple regression was used to derive a relationship between total season attendance (the dependent variable) and the explanatory variables - population, distance, alternative recreation opportunities and attractivity. The results indicate that a particular combination of the two variables population and distance explains a large amount of the variance in the Saskatchewan day-use data for the 12 parks considered.

An application of the model to determine a desirable location for a new park is given as an illustration of the usefulness of the model to planners and managers.

INTRODUCTION

During the past decade many investigations have been conducted into the use of outdoor recreation facilities to determine a quantitative relationship between park use and its key determinants. Much work has been done on determining, functions that best express the "inhibiting force" of distance and travel time. In their reservoir studies, Ullman and Volk (1962) found that per capita participation was related to distance raised to a power ranging from two to four. Other references to the investigation of the effect of distance on trip movement can be found in #References 21 and 33.

Studies considering the effect of intervening opportunities (for original formulations of the theory see #References 33 and 34) and site attractiveness are relatively rare. In the Texas reservoir study a number of explanatory variables, including a "gravity" variable, were incorporated into a double logarithmic regression equation and were found statistically significant in explaining the number of visitor days from a county of origin to a reservoir per unit time (`Grubb, H. and Goodwin 1968??`). The gravity variable, defined as the common logarithm of reservoir size divided by the distance between the reservoir and an origin, was designed to reflect the competitive effect of other reservoirs located within a 100 mile radius of the population center of each county. A modification of this approach was adopted for the model that is presented here.

Clawson and Knetsch (1963) suggested the possibility of developing specific, and rather objective, rating scales to measure the attractiveness of outdoor recreation areas. Van Doren (see #Reference 37) devised a camping attractiveness index for each of 59 Michigan state parks. His index was based on 55 variables related to (1) outdoor recreation activities, (2) natural environmental resources, and (3) camping facilities and services. Rather subjectively determined values were assigned to each of the variables. Factor analysis was employed to derive aggregate scores for the variables belonging to (2) and (3). The camping attraction index of a park was a weighted combination of its scores on the individual variables.

Another formulation of the attractiveness index (see #Reference 37) simply considered the type, quantity and quality of facilities offered and was defined as a sum of products. The "utility" of having an activity and the quality of the activity were multiplied and this product was added for a set of activities. This form of the attractiveness measurement does not require data as elaborate as that required by the Van Doren approach and thus is convenient in analyses where only limited data are available, as was the case in this study.

In California, Pankey and Johnston (1969) found that prediction precision was gained by estimating day-use and overnight-use separately and using the sum of these quantities as the prediction of the total use. The approach of disaggregating users was followed in this study. The study, however, deals exclusively with main-destination day visitors, defined as those who go to a park as their sole trip purpose and return home on the same day.

DATA COLLECTION

A visitor survey conducted in a number of Saskatchewan parks during the summer of 1969 are the data for this study. The survey methodology used to obtain the data was similar to that described by Crapo and Chubb (see #Reference 13). Handback questionnaires in card form were distributed according to a probability formula to visitors entering parks through access gates during daylight hours. These cards were distributed by either a special survey staff or park attendants. Retrieval of the cards was accomplished by voluntary deposit in collection boxes placed near the park exit gates. The overall return rate was about 56 percent.

The information gathered can be divided into three categories. The first class of data concerns user characteristics, such as party composition, family income, occupation, and education. The second deals with facilities used: examples of these are the picnic ground, the bathing beach, and the hiking trails. The third pertains to travel characteristics, chiefly visitor origins, purpose of trip, and length of stay in the park. Only the last class of information was utilized in this study.

The formula used to obtain day-use estimates is described in the version of of this article which appeared in the JOURNAL OF LEISURE RESEARCH.

SPECIFICATION OF THE MODEL

A generalized outdoor recreation travel flow model was assumed to have the form:

(1) $$V(i, j) = f (O(i) D(i, j), S(j))$$

WHERE

V(i,j) = number of "visits" from origin i to site j during some finite time period,

O(i) = characteristics of the origin such as the size and the socio-economic characteristics of the population,

D(i,j) = a variable to account for the effect of the spatial separation of origin i and site j

S(j) = the characteristics of site j, such as the natural features and the man-made facilities at the site.

For the sake of convenience and simplicity, linear repression was selected as the tool of analysis. An additive model and a multiplicative model fitted in logarithmic form were considered; the former was chosen even though the latter may have some desirable properties. The reasons were twofold. First, the dependent variable, which is to be defined later, contains zero values: the logarithm of zero is undefined. This problem with zeros can be overcome by adding a small constant to every observed value; yet there is no sound theoretical basis for this technique. Second, and more important, the magnitude of the error propagated in the inputs when an additive model is used is generally less than that when a multiplicative model is used (see #Reference 1). Hence, the generalized model is specified in the additive form:

(2) V(i,j) = C(0)+C(1)X(1,i,j)+C(2)X(2,i,j)++C(n)X(n,i,j)+U(i,j)

WHERE V(i,j) is defined as in Equation 1

C(.) are regression coefficients

X(.,i,j) are explanatory variables, and

U(i,j) is an error term assumed to have zero mean and constant variance.

THE VARIABLES

The dependent variable for this study was the number of day-visiting parties traveling to a park during the 1969 season (May to October) from a given area of origin. The area surrounding each park to be studied was divided into a number of origin areas which are referred to as observation units. Each observation unit consists of a cluster of contiguous census subdivisions. The number of observation units for a particular park varies from 13 to 24. A total of 231 observation units were defined.

Based on the research findings cited earlier, it was felt that four explanatory variables would be adequate to explain the variance in the data. It is well known that the number of day-visits made to a park tends to vary directly as the size of population of an area of origin. The population for each observation unit P(i), is taken to be the total population residing in all the census subdivisions comprising the unit.

To examine the effect of accessibility on recreation opportunities, an impedance factor, denoted by D(i,J), was defined in terms of actual road miles from the largest population centre in observation unit i to the entrance of park j. Population centres that were more than 200 miles from the park under consideration were excluded, since an examination of the data revealed that day-visitors whose origins are more distant are insignificant in number. If there was more than one route available, the shortest route to the given park was used.

To reflect the competitive effect of alternate parks available to people residing in different observation units, a variable called the "alternative factor" was constructed for each of the 231 observation units. This factor was used to test the hypothesis that fewer visitors would be expected to go to a park at a given location from an origin that has many proximate alternate parks than from an origin with few close alternatives. The alternative factor used in this study reflects the existence of alternate parks within 100 actual road miles of an origin, since most of the main destination day-visitors recorded in the survey traveled under 100 miles to a park.

In the construction of an alternative factor three elements are usually taken into account. These are the number of, the locations of, and some physical properties of the alternative sites. An alternative factor which has been used (see, for example, #Reference 19) is of the form:

(3) $A(i) = \Sigma_k T(k)^a / D(i,k)^b$

WHERE the summation is over all alternative sites, k,

A(i) = alternative factor for i,

T(k) = a variable reflecting some characteristics of the alternative site k,

D(i,k) = distance between i and alternative site k, and

a, b = constants to be estimated.

Since data on the characteristics of most of the alternative parks, which were largely local and regional parks, were lacking, T(k) was assumed constant. Different values of b were considered. In particular, b was tested at 1/2, 1, 3/2, and 2. The value of b finally selected was 1/2, since $\Sigma_k 1/D(i,k)^{1/2}$ explained more variance in the dependent variable than the other three forms (see Table 1).

This resulted in the use of the following form:

(4) $A(i) = \Sigma_k (1/D(i,k))^{1/2}$,

WHERE k= 1 to number of qualifying alternatives

To measure site attraction, an "attractiveness factor" was derived. It is a function of the degree of popularity of a selected list of day-use activities and the quantity and quality of their associated recreation facilities. Its derivation assumes that the capacity of all parks is essentially infinite. (Park planners in Saskatchewan remarked that crowding did not appear to influence the day-users in most of the Saskatchewan parks). In deriving a numerical value of attractiveness for each of the twelve parks under consideration, two sets of CORDS data were utilized. The first set of information was a 1969 survey in which approximately 3,000 individuals throughout Canada were interviewed. Information gathered included frequency of participation in 26 outdoor recreation activities, location of participation and reasons for nonparticipation. The second set of information was a set of inventory data which contain site characteristic information such as the length of a bathing beach, number of showers, number of picnic tables, etc. (See CORDS Data Documentation Volume.)

TABLE 1: A COMPARISON OF THE EFFECTS OF THE DIFFERENT FORMS OF THE ALTERNATIVE FACTOR USED IN A REGRESSION EQUATION

Alternative Factor*	Regression Coefficient	Standard Error	Increase In R^2	F—Level To Enter	Overall R2**
$\Sigma_k (1/D_{i,k})^{1/2}$	-36.60	3.12	0.06	143.79	0.91
$\Sigma_k (1/D_{i,k})$	-102.48	11.27	0.04	85.35	0.89
$\Sigma_k (1/D_{i,k})^{3/2}$	-157.20	26.15	0.02	36.38	0.87
$\Sigma_k (1/D_{i,k})^2$	-198.13	47.59	0.01	17.56	0.86

*** The alternative factor is multiplied by $P_i/g(D_{i,k}$) as described in the text.**

**** This R^2 value is the value obtained using Equation (7).**

TABLE 2: DEFINITIONS AND ASSOCIATED FACILITIES FOR DAY-USE ACTIVITIES

ACTIVITY	DEFINITION	FACILITIES
Swimming	Swimming at *a* bathing beach	Bathing beach Water quality # of showers
Boating	Recreation use of boats with or without motors	# of boat ramps # of boat piers # of boats for rent
Horse riding	Riding for recreation	# of horses for rent
Hiking	Walking a natural trail	# of traits
Picnicking	Preparation and/or eating a meal outdoors	# of picnic tables Quality of shade
Golfing	Playing Golf	Golf Course

TABLE 3A: POPULARITY RATINGS OF SOME DAY-USE ACTIVITIES

Activity	Saskatchewan Participation Rates X(e)%	Relative Popularity Rating S(e)=X(e)/29*
Swimming	32	1.10
Boating	23	0.79
Horse Riding	10	0.35
Hiking	29	1.00
Picnicking	69	2.39
Golfing	17	0.58

*** The choice of 29 as reference for S(e) is arbitrary. S(e) = relative popularity rating of activity e with Σ_e S(e) sum over e.**

Table 2 presents the activities used in calculating the attractiveness factor, as well as the operational definitions of activities and the facilities for a given activity. The attractiveness function is defined as:

(5) $T(j) = (\Sigma\, S(e))\,(\Sigma\, R(m)Q(m))$

WHERE T(j) = attractiveness of park , j,
the other terms and sums are as defined
and the sums are for variable values in relation to j.

TABLE 3B: IMPORTANCE RATINGS OF SOME DAY—USE FACILITIES

Activity	Associated Facility	Importance Rating of Facility Y(m)	Relative Importance Rating of Facility R(m)=Y(m)/0.31*
Swimming	Bathing Beach	0.58	1.88
	Water Quality	0.16	0.52
	Showers	0.45	1.45
Boating	Boat ramp	0.31	1.00
	Boat pier	0.33	0.94
	Boat rental	0.19	0.61
Horse Riding	Horse rental	0.20	0.65
Hiking	Trails	0.11	0.36
Picnicking	Picnic tables	0.63	2.01
	Shade	0.18	0.58
Golfing	Golf course	0.41	1.32

NOTE: The choice of 0.31 as reference point for R(m) is arbitary. R(m) = relative importance rating of facility m; O(m) = score of facility m, according to its quantity or quality. and Σ_m R(m)Q(m) the sum over m.

As mentioned before, a 1969 household interview survey provides a set of participation rates for 26 outdoor recreation activities which may be used to assess attractiveness. The participation rates relevant to the day-use activities considered in this study are presented in Table 3A. The term S(e), which is used to take into account the fact that not all outdoor recreation activities are equally popular, is defined as the participation rate X(e), of activity e, divided by the participation rate of hiking (the choice of the participation rate of hiking as a reference point is arbitrary). Thus defined, swimming is seen to be 1.10 times, while boating is only 0.79 times, as popular as hiking (see Tables 3A & 3B).

Accepting the scale as showing that not all outdoor recreation activities are equally popular leads to the consideration that not all outdoor recreation facilities are equally important in drawing attendance to a park. To evaluate the relative importance of the facilities, rank correlation coefficients between total day-use at the 12 parks considered in this study and each of the facilities listed in Table 2 were obtained using Spearman's rank correlation coefficient. The resultant coefficients are denoted by Y(m) in Table 3B. The relative importance rating R(m), for facility m, is obtained by dividing Y(m) by the rank correlation coefficient for a boat ramp. So, a bathing beach is assumed to be 1.88 times as important as a boat ramp, etc. (see Table3A & 3B).

To account for the quantity or quality of the facilities, rank numerical values were assigned. The ranks, denoted by O(m), range from 1 to 12. For instance, when the number of picnic tables in each of the twelve parks considered in this study are ranked, and the quality of shade at the picnic grounds in these same parks are ranked, one obtains:

# Picnic Tables	Rank Value	Quality Of Shade	Rank Value
38	1	P	1
58	2	F	3.5
81	3	F	3.5
100	4.5	F	3.5
100	4.5	F	3.5
105	6	G	9
107	7	G	9
140	8	G	9
147	9	G	9
149	10	G	9
163	11	G	9
270	12	G	9

Note: P denotes poor; F. fair; and G, good.

TABLE 4: RANK SCORES* OF FACILITIES BASED ON GIVEN QUALITY OR QUANTITY

FACILITY	RANK VALUE. Q(m)
Bathing Beach	Fair - 4, Good - 9
Water Quality	Poor - 3.5, Fair - 5, Good - 9
Showers	6 -8 , 10.5
Boat Camps	1 - 5, 2 - 8.5, 3 - 10, 5 - 11, 8 - 12, 1 - 7.5
Boat Piers	1 - 7.5
Rental Boats	8 - 7, 10 - 8, 14 - 9, 16 - 10, 30 - 11, 140 - 12
Rental Horses	10 - 6, 12 - 7.5, 17 - 9, 22 - 10.5, 30 - 12
Trails	1-6, 2 - 7.5, 4 - 9, 6- 10, 12 - 11, 21-12
Picnic Tables	.38 - 1, 58 - 2, 81 - 3, 100 - 4.5, 105 - 6, 107 - 7, 140 - 8, 147 - 9, 148 - 10, 163 - 11, 270 - 12
Quality of Shade	Poor - 1, Fair - 3.5, Good - 9
Golf Course	9 Hole - 8.5, 18 Hole - 11

*** The word before a dash refers to the quantity of the facility. The number after the dash is the score of the facility.**

Hence, it may be seen that "100 picnic" tables received 4.5 points while "10 horses for rent" received 6 points and so on (see Table 4).

With the S(e), R(m), and Q(m) values calculated in the way discussed, it is possible to use Equation 5 to calculate various attractiveness values. The attractiveness values, T(j) of the twelve parks are listed in Table 5.

TABLE 5: ATTRACTIVENESS RATINGS

Park	**Attractiveness T(j)**
Buffalo Pound	96.12
Cypress Hill	45.26
Duck Mountain	126.40
Echo Valley	112.05
Good Spirit	76.56
Green Water	61.46
Prince Albert	88.75
Moose Mountain	113.11
Pike Lake	96.10
Rowan's Ravine	59.01
Battleford's	104.28
Besant	26.60

THE HYPOTHESIS TO BE TESTED

It was expected that population size, accessibility, alternative recreation opportunities, and attractiveness would interact to produce the observed differences on park use. To capture the interaction effects among the explanatory variables, four regressors were hypothesized to be necessary in an additive model. These were P(i)/a(D(i,j)), T(j)/g(D(i,j)) and 1/g(D(i,j)) where g(D(i,j)), which varies with D(i,j) was defined as follows:

$$(6)\ g(D(i\ j)) = \begin{cases} D(i,j)/2 & \text{when } 0 < D(i,j) < 20, \\ D(i,j) & \text{when } 20 \le D(j) < 55, \\ D(i,j)^{1/2} & \text{when } 55 \le D(j) \end{cases}$$

With the four regressors included, Equation 2 takes the following form:

$$(7)\ V(i,j) = C_0 + (C_1P(i) + C_2P(i)A(i) + C_3T(j) + C_4)/g(D(i,j))$$

WHERE

V(i,j) = the number of vehicles in hundreds estimated to be traveling to park j from observation unit i per season,

P(i) = population, in thousands, of observation unit 1,

D(i,j) = road distance in miles, from the largest population center in observation unit i to park j,

A(i) = alternative factor for i

T(j) = attractiveness of park j,

$C_0, ..., C_4$ = parameters to be estimated, and

g(D(i,j)) is defined by Equation 6.

The distance function g(D(i,j)) has also been replaced by continuous functions of the form: (D(i, j)) = D(i,j)x, 0 < D(i,j), where x = 1/2, 1, 3/2, 2, 5/2, and 3. Results showed that g(D(i,j)) gives a higher R^2 value than the other forms used (see Table 6).

TABLE 6: A COMPARISON OF THE EFFECTS OF THE DIFFERENT FORMS OF THE DISTANCE FUNCTION USED IN A REGRESSION EQUATION

Distance Function	Overall R^2*
$D(i,j)^{1/2}$	0.64
$D(i,j)$	0.84
$D(i,j))^{3/2}$	0.90
$D(i,j)^2$	0.90
$D(i,j)^{5/2}$	0.89
$D(i,j)^3$	0.87
g(D(i,j)	0.91

*** This R^2 value is the value obtained using Equation 7.**

REGRESSION RESULTS

To estimate the parameters of the model described in Equation 7, stepwise multiple regression techniques was applied to data which consisted of the 231 observations (one for each observation unit). The equation obtained was as follows:

(8) V(i ,j) = 1.33 + (120.31 P(i) - 36.60 P(i)A( ) +1.25 T(j) - 104.56)/g(D(j)).

The analysis of variance table for the regression is presented in Table 7. The coefficients, their standard errors, F-values, and the R^2 value at each step of the regression are presented in Table 8.

TABLE 7

THE ANALYSIS OF VARIANCE FOR THE STEPS IN FITTING THE VISITATION EQUATION (EQUATION 8)

Degree of Freedom Sum of Squares

Step	Degrees of Freedom		Sum of Squares		Mean Square		Over-all
No.	Regression	Residual	Regression	Residual	Regression	Residual	F*
1	1	229	120074	22594	120074	98.67	1216.97
2	2	228	128813	13856	64406	60.77	1059.79
3	3	227	129088	13580	43029	59.83	719.2
4	4	226	129656	13013	32414	57.58	562.9

* **These values are all significant at the 0.1 per cent probability level.**

The equation determined is a reasonably good predictor since the overall F = 562.93 for regression is much more than 4 times the tabulated F = (4,266,0.999) = 4.62 with a 0.1 percent probability; as it is suggested it should be by Draper and Smith (1966). The term P(i)/g(D(i,j)) was the first to go into the equation and it explained a substantial amount (84%) of the variation of the dependent variable. Therefore, the equation should be very sensitive to a population or distance change. The term 1/g(D(i,j)) serves as a correction term of P(i)/g(D(i,j)) since some of the largest residuals were found for observations which were at short distances from a park. The term P(i)A(i)/g(D(i,j)) was the second to go into the equation and it explained six percent of the total variation of the dependent variable. Of all regressors, T(j)/g(D(i,j)) contributed least in increasing the R^2 value. Nevertheless, the precision of the estimate of the dependent variable was increased, even considering the loss of one degree of freedom. (It may be noted that the addition of a new regressor will generally increase the R^2 value (and never lower it) but it will not necessarily increase the precision of the estimate of the dependent variable, see #Reference 16.)

In more practical terms it is important to reflect on the applied significance of the regression coefficients. It is interesting to note that the P(i)/g(D(i,j)) term, which first entered the equation and explained 84 percent of the variance, suggests an equation of the following form (when the constant term 1.33 is ignored):

$$V(i,j) = kP(i)/g(D(i,j)).$$

Given that this gravity model has explained so much of the variance, it is clear that it is an excellent first approximation to the way people behave. This means that at best the pattern of alternatives and different site attractiveness can only explain some of the remaining 16 percent of the variance.

TABLE 8: STATISTICS ON THE REGRESSION COEFFICIENTS OF THE VISITATION EQUATION*

Regression Coefficient	Value	Standard Error	F-Value	R^2
C0	1.33			
C1	120.31	5.8	429.80	0.8416
C2	-36.60	3.1	137.81	0.9029
C3	-104.56	27.30	14.63	0.9048
C4	1.25	0.4	9.85	0.9068

* **All regression coefficients are significant at the one per cent probability level and all have the expected signs.**

Both attractiveness and the alternative factor are introduced in a rather ad hoc way in this analysis. The kinds of arguments used suggest a change in participation would result from changes in an index reflecting a number of alternatives or in another index reflecting the quantity and quality of facilities. The fact, however, that the given indexes should be related to usage by Equation 8 rather than by some similar form has no sound theoretical basis. Yet, one can at least hope that a model. which explains part of the lb percent of the remaining variance after a "sample" gravity model is used will be a guide to a more "structurally" sound model leading to improvement in one's understanding of outdoor recreation phenomenon and thus to a better theory.

In particular, the fact that the regressor involving attractiveness goes into the equation with a low explanatory power leads one to suspect that the functional form of Equation 8 is is a poor approximation to reality in some respect or that the attractiveness measure itself is unsound. (See TN 9 and TN 28.) It is suspected that the problem has more to do with the error in the functional form than with the unsoundness of the attractiveness measure adopted. Still a computer run using V(i,j)/P(i) as the dependent variable and 1/g(D(i,j)), A(i)/g(D(i,j)), T(j)/g(D(i,j)) as regressors resulted in T(j)/g(D(i,j)) entering first into the equation and explaining 69 percent of the variance in the first step of the step-wise regression.

The coefficient of the alternative factor term is of more immediate practical interest than that of the attractiveness term. The value of A(i) for the various observation units in Saskatchewan ranges from 0 to 2.59 with an average of 1.48. One may regard the site for which there is no alternative as an "isolated site" and call the attendance figure of this site its "isolated site potential." Compared with isolated site potential, the average and maximum reduction in attendance due to alternatives, when other terms in Equation 8 are held constant, are thus (1.48 x 36.60/120.31) x 100% =54% and (2.59 x 36.60/120.31) x 100% = 79%, respectively. Of course, the model is meaningless beyond certain limits. If attractiveness is ignored, a negative number of visitors would result when A(i) is greater than 3.28. This limitation on the model strongly suggests that it will predict poorly for an origin having dense clusters of alternatives at short distances from the "origin. Other than this, no undue difficulties will likely arise as a result of the alternative factor formulation when the model is applied.

APPLICATION OF THE MODEL

One of the main objectives of developing the day-use model was to predict the number of day-use visits to a park with a certain level of development. Because of the consideration of population size, accessibility, alternative recreation opportunities, and attractiveness it is reasonable to suggest that the model enables the planner to choose among alternative sites in deciding where a proposed park should be built (for an application, see TN 7). Intuitively, given certain assumptions regarding reaching a new usage equilibrium, the introduction of a new park will draw visitors away from existing parks and possibly induce new usage. On the other hand, the removal of an existing park from the system can be studied in a similar way. It is the pattern of change in use which results with a change in a system of parks that is of concern here.

To illustrate the planning use of the model, use estimates have been derived for a hypothetical park about thirty miles south of Rosetown in Saskatchewan. The location of the park, the observation units, and the corresponding population centres are shown in Figure 1. It is assumed that the facilities which the new park will contain are: a good beach with good water quality, eight showers, five boat ramps, one boat pier, 30 boats, 17 horses for rent, six trails, and 140 picnic tables with good shade. The characteristics of the observation units used for the calculations used to determine total use figures for the new site are listed in Table 9.

On the basis of the assumed characteristics and available census data, a total of 9,372 vehicles from the 15 observation units could be expected to come to the new park for a day-use visit during a given season. Total use may of course be related to the demand on projected facilities, the need for staff, and the required budget for operation.

CONCLUSION

The model (Equation 8), developed in this paper, explains a reasonably large percentage (91%) of the variability in the dependent variable, and the regression coefficients are all significant at the one percent probability level. So, the example of the application of the model to planning seems appropriate.

Improvements in the precision of the equation can perhaps be expected by using traveling time or combination of traveling time and distance to formulate a new accessibility variable. Further research on attractiveness and the alternative factor to refine present methodologies and develop new methodologies for the measurement of these factors also seems appropriate (see TN 2, TN 3, TN 4, TN 9, and TN 28).

Figure 1: Observation Areas of a Hypothetical Park

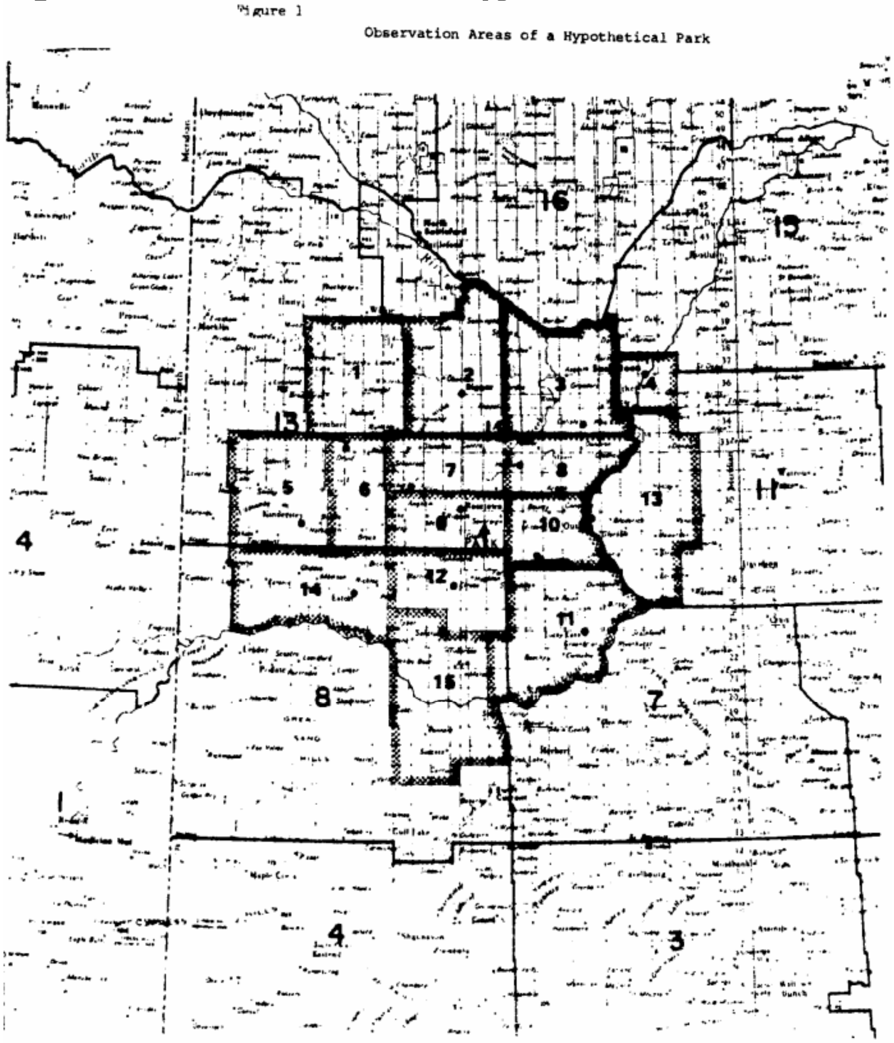

TABLE 9: PREDICTED MAIN-DESTINATION DAY-USE OF A HYPOTHETICAL PARK FROM OBSERVATION UNITS HAVING GIVEN CHARACTERISTICS*

Observation Unit	Population in Thousands, 1966	Population Center
1	3.96	Scott
2	5.53	Biggar
3	5.68	Delisle
4	117.41	Saskatoon
5	7.84	Kindersley
6	1.36	Dodsland
7	1.74	Herschel
8	1.63	Harris
9	4.18	Rosetown
10	2.85	Dinsmore
11	3.81	Lucky Lake
12	1.78	Elrose
13	7.48	Outlook
14	5.18	Eston
15	4.98	Cabri
TOTAL	175.41	

Observation Unit	Distance. in Miles, From Population Center To the Park	Alternative Factor	Est. Vehc. (100's)
1	124	0.73	1.61
2	66	0.44	2.52
3	71	0.48	2.30
4	102	0.63	12.54
5	82	1.31	2.10
6	83	0.55	1.56
7	51	0.29	5.71
8	53	0.40	5.20
9	30	0.55	16.41
10	29	0.76	11.65
11	66	1.09	1.92
12	24	0.60	10.30
13	51	0.68	16.10
14	58	1.25	2.20
15	106	1.50	1.60
		TOTAL	93.72

* **The attractiveness rating, by Equation 5, for the hypothetical park is 119.33.**