PREDICTING QUANTITATIVE AND QUALITATIVE VALUES OF RECREATION PARTICIPATION

by ELWOOD L. SHAFER, JR., *and* GEORGE MOELLER, *respectively Director, Pinchot Institute, Northeastern Forest Experiment Station, Forest Service, U. S. Department of Agriculture, Upper Darby, Pa.; and Project Leader, Recreation Research, Northeastern Forest Experiment Station, Syracuse, N. Y.*

ABSTRACT. If future recreation consumption and associated intangible values can be predicted, the problem of rapid decision-making in recreation-resource management can be reduced, and the problems of implementing those decisions can be anticipated. Management and research responsibilities for meeting recreation demand are discussed, and proved methods for forecasting recreation use and associated qualitative values are presented. The best approach for developing recreation-participation rate equations may be to include a distance factor, recreation-supply variables, socio-economic measurements of users and non-users, and qualitative measures of recreation environments – all in the same model. The effects of technological progress on values and behavior patterns are described; and methods for forecasting relevant technological advances are outlined.

AMERICANS, with more time on their hands and more money to spend than ever before, boomed leisure into an 83-billion-dollar business in 1969. *(U. S. News and World Report 1969)*. That figure tops the total outlay for national defense during the same year. The money going into outdoor recreation activities and equipment reaches into almost every aspect of the Nation's economy. Today, pleasure *is* business. And it's the fastest-growing business in the land.

Behind the scenes, serving the ever-increasing demand for the trappings of leisure, are the muscle and sinew of American technology. But the responsibilities of meeting the quantitative and qualitative aspects of outdoor recreation demand for forests, mountains, lakes, and streams on public and private lands rests squarely on the shoulders of recreation resource planners and managers.

This paper deals with the problems of forecasting the quantitative and qualitative aspects of outdoor recreation participation. At times this objective seems almost insolvable, for this is a dangerous corner in the research arena where natural sciences and social philosophies collide with a resounding crash.

In America, the dominant school of thought in resource management has been preoccupied with the *quantity* of things—volume of output, reduction of costs, creation of plenty. This is the trademark of our industrial-technological system: the ability to produce large quantities for large numbers of consumers. But the pendulum is swinging back. Today, many foresters are deeply concerned with matters of *quality* – especially quality of forest environments as they relate to the leisure-time enjoyment of our society.

However, it is one thing to point out the need for forest-recreation resource planning and management to include both the tangible and intangible values of outdoor recreation. It is quite another thing to make profound institutional changes that pervade all society, in order to carry through such recommendations. It's still another thing—the most difficult of all—to make those changes *fast*.

Institutional changes and related changes in political and social values become even more important if resource managers try to meet recreation demand *over the next decade*. This means that institutional changes must happen rapidly if they are to be effective during the next decade, and they will have to occur pervasively.

In many cases, forecasts of quantitative and qualitative aspects of recreation use will need to be conducted quickly, before managers have the knowledge needed to act. Otherwise predicting recreation consumption and relating it to supply will continue to be what Chubb *(1967)* called "the Achilles heel" of recreation planners and managers. Thus there is an urgent need to analyze the problems of forecasting quantitative and qualitative values of forest-recreation participation, and to recommend the necessary research studies and costs required to solve those problems.

The major reasons for forecasting the quantitative and qualitative values of outdoor-recreation consumption are:

- To recognize possible implications of long-term recreation-management commitments made today.
- To prepare now for related commitments that will have to be made rapidly, economically, and with minimum disruption sometime in the future *(Warren 1966)*.

If future recreation consumption can be predicted, the problem of rapid decision-making can be reduced, and the problems of implementing those decisions can be anticipated.

PRELIMINARY CONSIDERATIONS

Management Responsibilities

Recreation-resource managers are almost certain to face disaster as a profession if they do not plan for quantitative and qualitative recreation values of outdoor recreation in carrying out their management responsibilities. On the other hand, managers are most certain to increase the likelihood of having a more respected profession if they plan for these values. Even if managers increase their understanding of the recreation-consumption phenomena, they are likely to face deep trouble because even the best plans will be developed and fostered by people with limited knowledge, sometimes unaware of the extent of their own limitations.

To better understand the relationships among recreation-consumption patterns, recreation-supply variables, user characteristics, management procedures, technological advances, and intangible recreation values, recreation-resource managers and researchers must be willing to change some of their present attitudes and research approaches.

The resource manager will have to accept and use research results or models that involve many variables. These variables will be related probabilistically and will describe cause-and-effect demand-relationships over long time periods (5 to 10 years). In some circles, this suggestion may be a difficult pill for managers (and researchers) to swallow. It is not unfair to say that a minority of managers will absolutely refuse to accept this premise; consequently, some future research will be designed according to the way these same managers perceive the problem of forecasting recreation values. Such research will undoubtedly produce nothing more than sugar pills to cope with the problems of forecasting recreation values.

In recent years some managers have remarked, "Give me a method for forecasting recreation consumption that's fast, inexpensive, easy to apply, and easy to understand." Given adequate funding, research can provide management with equations, or formulas, or models that predict tangible and intangible values of recreation participation. These models can be quick, easy, and inexpensive to use. However, there is no guarantee that management or researchers will fully understand why these equations work. Herein lies one of the most difficult problems in the use of formulas for forecasting recreation demand and intangible values—accepting prediction procedures that are not fully understood.

With the responsibility for making recreation-management decisions that involve thousands, and sometimes millions of dollars, recreation-resource decision-makers usually want answers—not estimates—about recreation consumption. To be sure, these same decision-makers recognize that recreation-consumption forecasts are statistical estimates that sometimes may be nothing more than carefully formulated guesses. At the same time, managers may rebel at the idea of receiving these guesses in a form that emphasizes uncertainty. For example, a researcher may publish the statement: "On the average, a certain recreation activity will increase by X percent by the year Y, with 95 percent probability". There does not seem to be any easy way to work around the problem of uncertainty or probability, or to directly relate the "average" results of a recreation-user survey to a particular recreation-management situation that usually is not "average".

If this problem of uncertainty and variability is to be met, it must be met head-on. One way of doing this is to develop forecasts in light of what may be expected under best, worst, and most likely future recreation-behavior and supply conditions. Forecasts from such an approach reflect the impossibility of precise prediction, and should logically lead to the development of management plans designed to cope with *alternative* future conditions *(Warren 1966)*.

Research Responsibilities

Many of today's recreation researchers need to reorient their thinking in forecasting recreation demand and in measuring associated intangible values. Researchers must realize that to apply common sense to what is visible on the surface concerning man's social enjoyment of the forest may not always be correct, and may lead to about as good an idea of true causes and effects as that afforded by the Ptolemaic system that proclaimed that the universe rotated around the earth. A true grasp of even the simplest interaction of man and nature requires special knowledge and the ability to use abstractions, which like the Copernican system is at odds with commonsense impressions as one gazes at the universe on a starry night.

Today's recreation-resource planners and managers do not have the time or inclination to delve into the many details of forecasting quantitative and qualitative values of recreation use. Therefore the researcher's responsibility is to eventually produce results that are meaningful to the recreation-management process.

At the same time, researchers need to help recreation-resource managers emerge from a stage of conventional wisdom to a state where managers understand *how* recreation consumption will occur. For instance, if researchers do not explain the process by which recreation consumption occurs, such an explanation is as meaningful to management as the Apparition's proclamation in Shakespeare, that Macbeth would "never be vanquished until Great Birnam wood" came to "Dunsinane Hill", or that Macbeth would not be harmed "by man born of woman" *(Clark 1936)*. Unfortunately Macbeth never heard of camouflage or cesarean birth.

Similarly, recreation researchers should not be content to proclaim, for example, that, as family income drops, recreation consumption also drops. A decrease in income could be caused by reduction in the work force (which may have a negative effect on recreation consumption); or a decrease in income could be caused by workers taking longer vacation periods (which may very likely have a positive effect on recreation consumption). Methods developed to forecast recreation consumption are most likely to be accepted if research shows management *how* recreation consumption takes place, rather than just provide management with an equation that forecasts consumption based on past or present data.

Furthermore, sufficient time should be

available in the research schedule to allow for updating research communications between management and research. This can be accomplished once or twice a year by researchers and interested recreation resource managers hibernating in some secluded spot and asking each other such unaskable questions and rethinking such overall problems as: Are we really conducting relevant research in this area? For whom? What changes are needed to more effectively provide the necessary demand models? What are managers going to do with the research results when they have them? Why do we want to know the answer to that question regarding intangible values? If I could give you the answer to that question right now, how would it change management operations? Are we really asking the right questions? In what form would research results be most useful? Are there better ways to get the answers you want? Are you willing to pay the cost required to obtain the information?

These kinds of discussions will be hard work, but more needed research changes and reorientation of key problems will come out of such meetings than out of a group of year-round recreation researchers working behind closed doors.

Prediction Model Characteristics

Forecasting was once an honorable occupation for seers and magicians. Over the last 10 to 20 years science has attempted to take forecasting of recreation-use and intangible values out of the area of conjecture, and to develop equations that make accurate prediction possible *(Duhl 1967)*. In fact, equations for predicting certain types of recreation values have already been developed for specific management purposes. In most cases, research is needed to improve the reliability of these equations, but the toughest part of the problem—methodology—has already been solved. Surprisingly, very few managers have adopted these methodologies to their particular recreation-management problems. Why? For some of the reasons already discussed under the professional responsibilities of management and research. Therefore, before reviewing various equations that predict quantitative and qualitative values of outdoor recreation, we must discuss certain general features of these equations (or models).

The equation to determine the area of a circle is

$$A = \pi R^2 \tag{1}$$

To find A, one simply measures the radius of any given circle, squares it, and multiplies it by the constant π.

Here is another equation:

$$U = 3409 - 0.0183 X_1 + 0.1757 X_2 (X_3 \bullet X_2^2) \tag{2}$$

which is as simple to use as $A = \pi R^2$, except that it forecasts quite accurately the average annual use intensity (U) a manager can expect at any given campground in the Adirondacks *(Shafer and Thompson 1968)*. The numbers in the equation, such as 3409 or 0.0183, are constants, just like π in the first equation. Except now, instead of measuring the radius of any circle to find its area, one measures the items (or variables) designated as X_1, X_2, and X_3 for any given or planned campground:

X_1 is the total square feet of land and water area at the campground's swimming beach.

X_2 is the total number of campsites in the campground.

X_3 is the total number of islands accessible by motorboat from the campground.

Insert these three values in the equation, perform the necessary calculations, and you can determine the total average annual visitor-days that can be expected at a particular Adirondack campground. The time required to measure the three X values from topography maps, or site-design layouts, is approximately 5 minutes.

Predictive recreation-consumption formulas have also been developed that involve other kinds of variables (X values). However, the overall approach to forecasting tangible, and even intangible, values of outdoor recreation is the same. The major problem is to define the variables that you think are important in influencing demand, and then to mathematically find the relationship between those variables and some measure of behavior, or attitude, or participation in a given recreation activity.

But how does one decide what equation or methodology to use when forecasting recreation values? If a recreation-resource manager adapts results of previous research to solve his particular forecasting problem, such research should be closely related to the scope of the problem at hand; otherwise, a new forecasting equation should be developed through additional research.

In evaluating an equation that forecasts recreation participation or amenity values, an important consideration is the R^2—multiple correlation coefficient squared. An R^2 value, which can vary from 0 to 1, describes what percent of variation for the value being predicted is explained by the equation. The closer R^2 comes to 1, the better the equation. Based on past research efforts, one way to evaluate how useful an equation may be for forecasting recreation use or amenity values is as follows:

If the R^2 value of an equation is ——	*Usefulness of the equation for management purposes* — —
0 - 0.20	Poor
0.21 - .40	So-so
.41 - .60	Pretty good
.61 - .80	Very good
.81 - 1.00	Really great

Now we will examine how the R^2 value of various predictive equations found in past research change according to the types of variables used, and the area or size of the recreation attraction involved. Results of this literature review will help to justify the selection of future research studies, and to pinpoint the variables that should be studied when forecasting future recreation values.

EFFECTS OF QUANTITATIVE VALUES ON PARTICIPATION

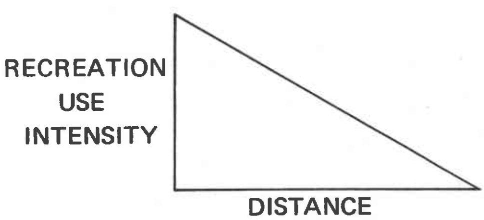
Economic Demand and Distance Measurements

Attempts to use economic-demand curves for assigning monetary values to recreation benefits are in response to a need felt by administrators who want to justify recreation-facility developments. At the same time, considerable opposition to the economic approach has arisen. Wilderness users, sportsmen, welfare workers, and others have argued that intangible recreation benefits cannot be valued quantitatively, and that any attempt to do so misses the qualitative essence of such experiences.

Economic-demand curves for recreation participation *do not* measure the diminishing marginal utility of recreation facilities. Statistical economic-demand curves are simply a convenient way of summarizing a set of empirical observations in a functional statement. Any attempt to squeeze connotations regarding utility or welfare out of such data is at best a dubious practice, and at worst simply a *non sequitor*. The slope and position of statistical economic-demand curves is largely a function of income distribution *(Seckler 1966)*. In estimating recreation benefits, we are dealing with a vague utility function. We are attempting to estimate marginal utilities in a context where we cannot quantify prices, and cannot operate within the rules of the market.

Some of the first research attempts to forecast recreation participation involved gravity models, as developed by Clawson *(1959)* and later described by Cesario *(1969)*. A gravity model stipulates that as distance from a recreation facility increases, the use of that facility decreases according to some mathematical function (fig. 1). Going one step further, some researchers suggest that the expenditures incurred in traveling to and from a facility, plus on-site expenditures, reflect the value of the recreation experience. Therefore, travel and on-site costs incurred throughout a range of distances from a facility provide an estimate of economic demand for that facility. Thus the gravity model is nothing more than the first step of a two-step procedure

Figure 1.



for developing an economic-demand curve for a recreation complex or region.

Using this method, Allen and Whaley *(1968)* developed a model that predicted overnight occupancy of campgrounds in the Cache National Forest in northern Utah. The gravity-model phase of the experiment predicted use of a total camping complex on the Forest per 100,000 population residing as various origins from the complex. The number of competing camping alternatives within a 75-mile drive of each population origin was also included as a variable in the model. The resulting equation explained 57 percent of the variation ($R^2 = 0.57$) in camping use within the camping region studied. In the same study, 74 percent of the variation in fishing-use intensity of two streams in the Uintah Mountains of Utah was explained by using round-trip distance (in miles) between a stream and a given county of residence, plus two additional socio-economic variables.

A study by Smith and Kavanagh *(1969)* in England showed how the number of visits per 10,000 population from urban areas within an 80-mile radius of a 1,570-acre reservoir were estimated quite reliably ($R^2 = 0.69$) by knowing the distance of a given urban population-density zone from the reservoir. When population density in both urban and rural areas around the reservoir was included, the resulting model explained 90 percent of the variation in reservoir use.

Wennergren and Nielsen *(1968)* determined the relationship between the number of boating trips taken by a sample of 9.2 percent of the boaters in two northern Utah counties, and the travel distance between a respondent's residence and a given lake. The resulting equation explained 80 percent of the variation in the probability that a given recreationist would visit any one of 22 alternative water-recreation sites.

Influence of On-Site Characteristics

Methodologies have been devised that depend largely on the physical site characteristics of a particular recreation area, such as lake size, size of swimming area, miles of ski trails, number of campsites, number of parking places, amount of money that management spends on advertising, or distance from population centers (the gravity-model effect) to determine the amount of recreation use to expect at a specific recreation area.

For example, average annual visitor-days per campground, for 24 Adirondack campgrounds, was described by a model that used four on-site variables. The model had an R^2 of 0.98. A visitor-day was defined as one camping party using one tent or trailer site at a campsite in a given campground for one day *(Shafer and Thompson 1968)*.

In another study, total recreation visits at any one of 154 outdoor recreation sites in the Appalachian Region throughout six Northeastern States was forecast with a model that contained four supply variables and one management-procedure variable (fee vs. no fee). The R^2 was 0.74 *(Seneca and Cicchetti (1969)*.

An equation that explained 71 percent of the variation in total visitor-days per ski area for 26 ski resorts in northern New England and New York used three site variables plus a distance measurement (a gravity-model feature) from major northeastern metropolitan areas. One visitor-day was defined as one skier visiting a ski resort during any part of one day. The same study described how, during a winter season of comparatively poor snow accumulation, money spent on various types of advertising significantly described ($R^2 = 0.83$) the number of visitors a ski-lodge manager could expect *(Echelberger and Shafer 1970)*.

The essential point of these and similar studies has been to show how supply-oriented variables can be used to estimate quite reliably (based on R^2) the amount of use an outdoor-recreation facility may receive. However, there are several important underlying assumptions that need to be considered in judging the usefulness of equations that result from this type of research approach.

For instance Seneca et al *(1968)* argued that supply variables, rather than socio-economic characteristics of recreationists, should be used in the development of recreation-consumption models because the growth in income and leisure time, together with changing attitudes of the population, have reduced the relative importance of the traditional constraints of travel cost and distance. Seneca *et al. (1968)* pointed out:

> The "costs" of a 200-mile trip to the head of a family who owns his car, a two-week paid vacation, and a desire to get out of the city, are not nearly as important in his decision to travel as is his knowledge that when he arrives at the site both the *natural environment* and the *physical facilities* he desires to use are in fact present and obtainable.

The inference here is reinforced later when we discuss the influences of user characteristics on recreation participation and examine how R^2 values resulting from prediction models generally are much lower than for supply-oriented prediction models.

Also, some sites used in the development of supply-oriented equations will be overused—as indicated by the use-intensity at overflow areas—while other sites will be at or below capacity (regardless of quality of the recreation experience). Accordingly, the resulting estimated user-response equation implicitly will reflect an *average* quality of a recreation-day based on the actual use conditions at the number of sites examined at a particular point in time. Seneca and Cicchetti *(1970)* explain that estimated use from a supply-oriented equation does not necessarily imply the actual capacity of the sites. Capacity cannot be determined without defining explicit *quality* criteria. Obviously there is a research need for better understanding of recreation capacity in relation to the problem of a quality experience. More about this later.

When using an equation that relates recreation use-intensity to recreation-supply variables, one should not confuse the predicted recreation use with economic demand; and also, one should not assume that supply of facilities will generate the associated economic demand. More explicitly, a use-prediction equation that involves supply variables will yield quantitative indications of the number of recreation visits that could be accommodated within the bounds of present supply conditions. Such an equation can also provide some knowledge of the substitution possibilities among the various recreation-supply alternatives available to the recreation planner.

Furthermore, in an equation that relates use intensity to on-site supply characteristics, the amount of user-days generated by the equation is conditional on the presence of demand. Therefore a model that predicts use on the basis of supply variables is *not* equivalent to an economic-demand function. When supply-oriented prediction models are developed, the question remains as to whether economic conditions are such that the predicted amount of recreation will still occur if additional supply conditions are developed according to the combination of supply variables specified in the model. In this regard, perhaps an independent recreation-use-pattern study is needed for the geographic area and user population being considered. The results of this kind of study should then be combined with results from supply models for the same geographic region. (The supply model indicates the availability of recreation opportunity, given certain supply conditions.) An allocation of the projected future demand can then be made to determine whether and where shortages exist in recreation supply.

A further difficulty remains, however, if shortages in recreation opportunities are detected for a given geographic area—which is usually the case in this era of increasing recreation demand. From an economic standpoint, this crucial problem requires the *valuation* of a recreation experience, and the subsequent justification of increased recreation supply.

The valuation of a recreation experience is an important but thorny problem. Valid objections exist in the literature for *all* the economic-valuation methods of recreation-participation patterns. In this regard, recreation-resource managers would be well advised not to worry about the peculiarities of an economic valuation approach to justifying recreation expenditures, but rather to concentrate on the more fundamental problems of justifying their decisions on the basis of how use-intensity is influenced by the quantitative values of recreation supply, consumer characteristics, and qualitative aspects of the recreation experience.

Influence of User Characteristics

Another kind of equation for forecasting recreation consumption utilizes socio-economic characteristics of a given population. These variables include such items as annual family income, education of household head, and occupation.

For instance, a recreation activity-scale value) which reflects user participation in 11 different kinds of outdoor recreation activities throughout the United States) can be predicted by using nine socio-economic variables. This model has an R^2 of 0.30 *(Mueller and Gurin 1962)*.

In a comprehensive study of socio-economic data collected by the Outdoor Recreation Resources Review Commission (ORRRC), Kalter and Gosse *(1969)* developed recreation-participant demand functions for residents of 12 planning regions in New York State. Thirteen socio-economic variables were involved in the models, which examined overall participation, vacation trips, and outing participation in the five recreation activities for 1960 and 1965.

The range of R^2 values for the 74 resulting recreation-demand models were:

R^2 range	*Number of models with R^2 in this range*
0.01 - 0.10	9
.11 - .20	12
.21 - .30	13
.31 - .40	10
.41 - .50	11
.51 - .60	10
.61 - .70	5
.71 - .80	4

Variables that did not explain a significant proportion of total recreation participation were retained in the models when the authors considered such variables as important. This procedure may have accounted for some improvement in R^2 values.

Cicchetti *et al. (1969)*, also using ORRRC National Survey data, developed recreation-use participation models for 24 types of activities in 1960 and 1965. Most of the independent variables used in the models were socio-economic characteristics of the American public, plus a few supply variables (including landscape-classification standards). The range of R^2 values for the 79 resulting models were:

R^2 range	*Number of models with R^2 in this range*
0.01 - 0.10	27
.11 - .20	20
.21 - .30	2
.31 - .40	1

One of the most successful recreation-participation models involving socio-economic characteristics was developed by Gillespie and Brewer *(1969)*. Using 17 socio-economic variables that can be measured from United States Census data, their model explained 62 percent of the variation in annual water-oriented outdoor recreation-days per family for residents of St. Louis, Missouri.

What Prediction Method to Use

Gravity models seem most appropriate for forecasting demand for relatively small homogeneous regions where vegetation, terrain, and water-recreation resources are fairly uniform. The general form of this kind of equation is:

$$U = f\ (\text{Distance})$$

and it is read, use (U) is a function (f) of distance. That is, the number of people (U) from a series of population centers who will use a given recreation area can be predicted by knowing the distance from the recreation area to a population center.

The economic-demand model, a byproduct of the gravity model, may be useful for forecasting economic demand for recreation activities where a realistic entrance, or participation, fee is involved—such as commercial campgrounds, ski resorts, snowmobile developments, or commercial hunting-fishing enterprises. An economic-demand model can also be useful for predicting the change in demand for public facilities that may result from fee changes. The general form of this model is:

$$U = f\ (\text{Costs})$$

In other words, use at a specific facility is related to costs incurred in traveling to and from the facility, plus on-site admission costs.

Use-prediction equations that involve measurements of on-site supply characteristics at recreation facilities generally result in higher R^2 values than gravity models (except when gravity models are limited to small homogeneous recreation complexes). Recreation-supply characteristics used in such models should be contained within the same physiographic area—such as the Adirondacks or the Appalachian Region. Including travel distance with on-site characteristics in the same model seems to increase the resulting R^2 value. The general form of this equation is:

$$U = f\ (\text{Supply})$$

Specifically, use of a recreation facility is related to on-site characteristics of that facility.

Equations that employ recreation-user characteristics to predict recreation-use patterns seem most useful for management and planning purposes when a homogeneous population of users and a fixed supply condition are involved. When a travel distance variable is included with the socio-economic valuables, the R^2 value seems to improve slightly. One distinct advantage of the socio-economic model is that the data necessary to develop the model may be obtained quickly and inexpensively from U. S. Census tracts; and future data for the equation can be obtained periodically thereafter to determine any shifts in the values of independent variables. For example, the socio-economic model may be useful for forecasting consumption of National Forest recreation opportunities that surround a given urban-suburban area. A separate model can be developed for each city. The general form for the model is:

$$U = f\ (\text{User Characteristics})$$

In this case, use or participation in a given activity for people living in a specific population center is related to their socio-economic characteristics.

In summary, the best approach to developing predictive recreation-use models may be to include distance, supply, and socio-economic variables in the same equation:

$$U = f\ (\text{Distance, Supply, User Characteristics, Qualitative Values of the Environment})$$

The inference drawn from such an equation, if it works, would be that recreation use (U) expected at any one of a number of recreation environments, and emanating from any one of several population centers, is related to distance from the environment to the population centers, supply characteristics of the environments, and user characteristics in the population centers surrounding the environments. If the *qualitative* values of an environment are inserted in this last equation, the predictability of the equation may be improved. The problem here, of course, is to quantify these so-called intangibles. That's the next subject.

EFFECTS OF QUALITATIVE VALUES ON PARTICIPATION

When considering qualitative values of recreation participation, management is playing in an unfamiliar ball park. Essentially, the name of the game (meeting the needs of outdoor recreationists) hasn't changed, but in this ball park the base lines are not clearly marked, and managers need to be extremely careful not to hit a foul ball and think it's a home run. One of the most difficult problems in outdoor recreation management is not one of forecasting and accommodating sheer *quantities* of visitors, but of allocating resources and funds that can accommodate recreational experiences of varying *qualities (Schoenfeld 1968)*. Qualitative recreation values involve such intangibles as security, beauty, pleasant feelings, health, freedom from stress, and self satisfaction.

The Best Recreation Environment

Webb *(1967)* pointed out, when discussing the qualitative values of wildlife, that "citizens are seeking ways to challenge their intellectual curiosity and utilize their creative energy" through recreational experiences; and in this regard, resource managers should "no longer be forced to play the cost-benefit game" of providing the intangible benefits of such experiences. Webb's inferences seem appropriate to the management and enjoyment of all natural recreation resources.

But how can recreation environments be developed to provide maximum intangible benefits for man? In the case of animals there are at least some guidelines. In an optimal environment, a wildlife species maintains its balance of births and deaths and does not destroy its environment. Recreation-resource managers cannot control man's birth rate, but they can obviously exert pressures to insure that man does not destroy his forest-recreation environments.

Determining the best forest-recreation environment for man—such as stipulating optimum tent-site spacing, defining how many acres of water are needed to enjoy a day's fishing, or determining how large an area of undisturbed wildland environment is required for one man to contemplate the values of nature—will not be an easy task. These kinds of challenges call for value judgments as to what is meant by an environment being *the best for man (Osmond 1965).*

The Need for Territory and Status

One might begin to explain what is best for man by examining how the anthropological nature of man relates to his leisure behavior patterns. Certainly, a principal cause of today's recreation-demand explosion is the affluent combination of more money and more leisure time in which to spend it. But an even more basic factor contributing to man's search for a place in the great outdoors probably is related to his biological makeup.

From our ape ancestors on the African veldt, Ardrey *(1966)* suggests, man has acquired an imperative need for "territory". Man, Ardrey proclaims, is as much a territorial animal as a "mockingbird singing in the clear California night". Ardrey implies that man acts as he does for reasons of his *evolutionary* past—*not* his cultural present—and that his behavior (including leisure) is as much a mark of his species as "the shape of a human thigh bone or the configuration of nerves in a corner of the human brain".

For instance, if certain segments of the public defend the aesthetic quality of a forest environment against development because they feel the forest is part of their heritage; or vice versa, if public or private managers claim the right to develop that same forest in the manner of their choosing because they own or manage it, individuals in each instance react the way they do, Ardrey argues, for reasons no different, no less innate, no less ineradicable, than do lower animals. As Ardrey points out, "the dog barking at you from behind his master's fence acts for a motive indistinguishable from that of his master when the fence was built". Ring-tailed lemurs, prairie dogs, robins, tigers, and Atlantic salmon, fence lizards, herring gulls, monkeys, and man—all of us will give everything we have for a place of our own, or to maintain what we already have. This theory applies particularly to the territory man uses for leisure-time enjoyment; including the shade from a tree in his own back yard to the majestic snow-capped peak of a distant mountain.

Thus the clamor of certain groups for preservation of forest environments, the ringing condemnation of resource managers by other recreationists for not building more recreation areas, or reciprocal reactions from some forest owners or managers to defend their rights to develop their forest as they please, involves a force far greater than a mere social reaction of our times.

Territory in the evolving world of animals, whether that territory be one's favorite hiking train, campground, boating area, fishing spot, or one's silvicultural responsibility, is "a force perhaps older than sex" *(Ardrey 1966).* It is well to keep this point in mind when weighing the pros and cons of management and research efforts designed to help solve the almost overwhelming problem of meeting the qualitative aspects of recreation demands and values.

The Need for Recognition

Considerations other than an imperative territorial need may influence man's intangible outdoor-recreation values. For instance, Morris *(1969)* described how the need to be recognized as a member of the leisure class also influences behavior patterns and value systems of recreationists.

In relating how man inevitably tries to establish a status among his fellow man that is somewhat above the average, particularly where leisure behavior patterns are concerned, Morris *(1969)* uses an analogy between man and insects. For example, Morris points out that many kinds of insects are poisonous; so larger animals learn to avoid eating them. It is in the interests of poisonous insects to show a warning flag of some kind, such as the way a wasp displays black and yellow bands on its body. Predators know these markings and avoid wasps. Other harmless and unrelated nonpoisonous insect species "have taken advantage of this system by developing color patterns similar to those of the warning club" and . . ."by becoming fake members of the warning club they reap the benefits (underlining ours) without having to possess any real poison" *(Morris 1969)*.

This insect example can be used as a crude analogy to help us understand what has happened to the human status seeker. Simply by "wearing the flag" of dominance, certain individuals say they could be in a certain status level if they wanted to. It follows, naturally enough, that harmless subordinates can join the "dominance club" and enjoy its benefits if only they can display the same flags, or at least create an illusion of dominance.

The system works like this in outdoor recreation. At any particular moment in recent history there has always been a highly functional costume to go with the high-status sport of the day. To wear ski apparel, for example, indicates that you can afford the time and money to indulge in this expensive sport. This status display can be enhanced by wearing stretch pants and a ski jacket—with several lift-tickets stapled to the collar—as ordinary day clothes—even when not actively participating in the sport. The wearer is emanating signals that say, "I am very leisured"; and such signals can say this almost as well for a non-skier. However, when the attire is accepted as everyday wear, it loses its impact, Then a new sport, preferably a dangerous one, has to be raided for its unusual costume.

The illusion of dominance is not constrained to wearing apparel. Some other obvious examples in outdoor recreation behavior patterns include: the sportsman who has a variety of decals on his field jacket; the fisherman who simply must have a fly for every occasion; the camera buff who must have a variety of cameras dangling around his neck; the hunter who has a series of rifles or stuffed big-game heads hanging in his den; the camper who has a mirage of decals sticking on his trailer; or the wilderness hiker who simply must have the 2½ ounce (rather than the 3½ ounce) sub-zero sleeping bag in his pack. Such examples are almost endless.

These are some of the intangible values that are an important part of recreation behavior, but that are very difficult to examine, let alone measure. Nonetheless, such values play an important role in man's leisure-time behavior and participation patterns. Herein lies an exciting challenge to research, in terms of basic methodology and comprehensive experimental design, that can lead to improved understanding of intangible recreation values. These values are key elements in understanding man's relation to his recreation resource. A few examples of recent research that should be helpful in formulating new methods of measuring intangible values include studies by Lansing and Morans *(1969)*, Kasmar *(1970)*, Neulinger and Breit *(1969)*, and Bultena and Klessig *(1969)*. A thorough literature review—an important prerequisite to any research—undoubtedly will uncover many more important references.

Amenities

As yet, research has not really predicted with any reasonable accuracy the effects of different recreation use-intensities on the qualitative values of a given recreation experience—although it is now possible to begin to observe and measure certain kinds of recreation amenity values, or at least some indicators of those values.

As more and more people cluster into outdoor recreation facilities and environments—in much the same way that they are clustering into urban regions—their effect on the natural environment becomes an increasingly important factor to consider in forecasting future recreation-participation patterns. In a sense, the most important recreation values that forest resources can provide for society, and the individual, are virtually being loved to death in some of this Nation's most scenic areas. Recreationists inadvertently are destroying, through overuse, some of the most scenic resources they seek to enjoy. In these kinds of resource-management environments the major problem is not to forecast future *increases* in use, but rather to predict how certain management regulations and procedures can *limit*, or even *decrease*, recreation use-intensity. Much of the concern for predictions of this type are centered around the idea of amenity resources, a concept that requires clarification and better understanding.

In discussing amenity resources for urban living, Atkinson and Robinson *(1969)* defined amenities as "those stimuli which lead to feelings of comfort, pleasure, or joy", a description that can also apply to amenities in outdoor-recreation participation. Atkinson and Robinson *(1969)* went on to explain that amenities "make up one of the outputs derived from man's environmental system; that these outputs can be managed; and that decision criteria and management systems can be developed to accomplish this task in a rational and socially responsible manner". Although Atkisson and Robinson used an urban example to show the several components involved in any amenity-response system, the components of their system can just as easily be used to describe outdoor-recreation amenity values:

Component in the system	*Example of Output*
Amenity stimulus generator (or participant)	Lake shoreline in undistributed wildland area.
Respondent	Hiker walking along the shoreline.
Amenity values	The pleasure of the view evoked by the lake and the surrounding mountains. Cool breezes. Sound of waves breaking on the shore. Seclusion.
Response to amenity values	Support for maintaining environment in natural state. Frequent walks along the shore.
Potential disamenities	Motorboat noise. Recreational development of shoreline. Logging on surrounding hillsides.

But a problem arises when applying such amenity-response systems to management problems; the system does not describe human response to resource amenities in *quantitative* terms. In this regard, however, research techniques are already available that may prove useful in approaching this sticky problem.

Relevant Past Research Efforts

A few examples of quantitative-measurement techniques for assessing the value of environmental amenities include *(Craik 1968)*:

1. Adjective checklists for respondents to record their impressions.
2. Activity or mood checklists to be used by unobtrusive observers.
3. Q-sort decks, consisting of 50 or 100 statements, each on a separate card and each expressing an important characteristic, which are sorted by an observer into piles of specified numbers along a dimension ranging from "most characteristic" to "least characteristic" of the item being evaluated.
4. Rating scales, including preference ratings and semantic differential scales used by respondents.
5. Viewing time, or participation time.

A few recreation-research studies have used some of these techniques to quantify amenity values, and have resulted in equations somewhat like those discussed previously under the effects of quantitative values on recreation participation. In a study aimed at developing a quantitative preference score for visual characteristics in natural environments, Shafer *et al.* *(1969)* explained 66 percent of the variation in preference scores for a wide range of natural-resource environments depicted by black and white photographs. Preference scores for individual photos were obtained by having respondents rank the photographs. Six variables representing different quantitative features in the pictures were used in the final scenic-preference model developed from the field-interview data.

In a similar study, Peterson and Neumann *(1969)* determined preference weights for black and white photographs of a variety of swimming beaches in the Chicago area. A significant 94 to 98 percent of the variation in preference scores was explained by quantitative values derived from semantic-differential scale ratings that were obtained in personal interviews of beach users.

In examining preferences for visual appearance of residential neighborhoods in the northern half of the Chicago metropolitan area, Peterson *(1967)* used 23 projected color photographs of residential neighborhoods, and asked respondents to rate an appropriate scale for each of 10 variables. A resulting preference model included nine variables that explained 99 percent of the variance in preference scores for the scenes.

Shafer and Mietz *(1969)* computed an attitude scale that showed the relative quantitative value of each of five qualitative wilderness values. The scalar values computed in the study are a basic first step in quantitatively defining, for management decisions, the relative importance of "intangible" wilderness values.

The Right Units of Measure

In many respects, studying qualitative recreation values involves walking where angels fear to tread. There are many people who shudder at the thought of bringing a quantitative measuring instrument into the domain of intangible recreation values, such as aesthetics for example. It is necessary to draw a sharp distinction here between a study of the process of aesthetics as a kind of human reaction, and the *creation* of aesthetic environments. Whereas the latter should, and undoubtedly will, remain in the domain of the artist and landscape architect, the former is a perfectly legitimate area of scientific study, and any instruments or equations (quantitative or otherwise) that facilitate this type of research should be welcomed *(Osgood et al. 1957)*. The same reasoning applies to the quantification of other intangible recreation values as well.

But even among those who agree that research on this subject is necessary, some will argue that any description of qualitative values should be done with qualitative measurement devices, but there are inherent difficulties in this approach. Consider an experiment, for instance, where three respondents are asked which of two activities —fishing (F) or mountain climbing (C)— provides more pleasure. (The amenity value involved in this experiment could just as well be self-reliance, aesthetic enjoyment, exercise, or some other intangible value other than pleasure). Suppose the results of this inquiry were as follows:

Individual	*Fishing (F) or Mountain Climbing (C)*
1	F > C
2	F > C
3	C > F
	Conclusion: F > C

Note: The symbol (>) here means "is liked better than."

One concludes from the results that two out of three, or the majority of the respondents, derive more pleasure from fishing than from mountain climbing; that is F > C. But now suppose we introduce an additional activity into the experiment, such as swimming (S), and ask each respondent to rank the three activities—from the one that gives him the most pleasure to the one that gives him the least pleasure. Furthermore, in this second phase of the experiment, suppose none of the respondents changes their initial response. Now the results might look like this:

		Second experiment in so far as — —		
Individual	*First experiment*	*Climbing is concerned*	*Fishing is concerned*	*The remaining possibility is concerned*
1	F > C	C > S →	$\underline{F > C}$ →	F > S
2	F > C	$\underline{F > C}$ →	S > F →	S > C
3	C > F	$\underline{C > S}$ →	S > F →	$\underline{C > F}$
		C > S	S > F	
Conclusion: F > C		$\underbrace{\text{C > S} \quad \text{S > F}}_{\text{C > F}}$		

Note: The preferences in the first experiment are underlined in the second experiment.

The problem that we now encounter is that we directly contradict the conclusion of the first experiment involving a choice between C and F alone. (Obvious, isn't it?) Now C> F. Yet, none of the respondents changed his mind in the second experiment concerning C and F. The reason for this contradiction is easily given: the two statements "F> C" in the first experiment were split in the second experiment. This kind of paradox can result from almost any experiment where qualitative value scales are used to evaluate people's feelings, and the preferences are summarized for any one activity. In experiments of this type, it is important to use an appropriate measurement technique (or even invent a new one), and to include a control for all those variables that account for significant amounts of variation in whatever is being measured. Obviously the procedure presented in this example is not the best way to summarize the data.

The most critical research challenge lies not only in developing hypothetical models of human response to amenity stimuli as typified in Wagar *(1967)*—which is a step in the right direction—but more important, in *quantifying* the satisfaction values of those amenities.

In the real world of recreation participation, the number of variables that should be examined is probably much more complicated than described in the following example, but a simplified example will suffice to explain the necessary relationship that should exist between models that forecast expected quantities of recreation users, and models that describe associated qualitative values. *Both types of models should predict results that relate to the same units of measure.* Otherwise managers will be faced with the same old dilemma of trying to mix apples and oranges and come up with a decision. For instance, suppose research developed the equation:

Total maximum number of boats on a lake

= f (lake size in acres).

But presumably, recreation-resource managers should not make a meaningful decision about how many boats to allow on any given lake until they know the effect, if any, of varying degrees of boat-use intensity on user-satisfaction. In this respect, suppose research provides management with an additional equation that relates user-satisfaction to number of boats/acre on any given lake:

Degree of user-satisfaction =
f (number of boats/acre of lake).

Now the manager has the information to make a tentative decision. Assuming that total boat-use increases with lake size, a level of demand can be predicted for boating on a certain size lake. Using this consumption curve, the manager can calculate a boat/acre value for any projected total boat-use value (fig. 2). Now, assuming that user satisfaction decreases as boat-use intensity increases (fig. 3) the manager can determine the influence of any given level of boats/acre on user satisfaction; and the tradeoffs between boat density and user satisfaction can be evaluated in arriving at the final decision about how many boats per acre to allow on the lake.

This simplified example underscores the reason why research on amenity values and user-participation rates should proceed simultaneously in the same research study whenever possible.

It is imperative to mention here that in

Figure 2.

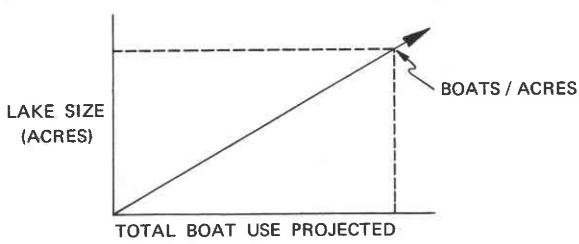
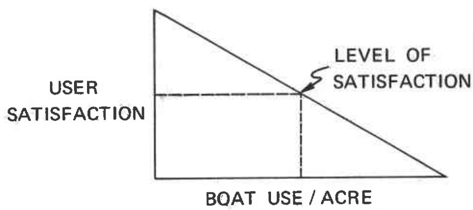


Figure 3.



addition to amenity values and participation-rate models, other information such as a forecast of technological advances that create new types of boating equipment, is needed in the previous example before management can make the *best* decision.

TECHNOLOGICAL IMPACTS ON *ALL* RECREATION VALUES

The quality of recreation experience depends largely on the quality of the recreation environment; but the quality of both the experience and the environment can be significantly affected by technology. A key management challenge is to predict potential management problems associated with technological developments as they relate to amenity values and use patterns of recreation resources.

In forecasting future demand patterns and their effect on the environment, recreation-resource decision-makers must inevitably be concerned with future technological developments in recreation-equipment design and environmental control. Current breakthroughs in technology are conditioning the quantitative participation rates and qualitative values of today's recreationists. Management's reactions to technological breakthroughs comprise one of the major problems in recreation-resource management—not just today or tomorrow, but continually.

Breakthroughs in Recreation Equipment

A simple and fairly typical example may help to illustrate the point by referring to a full-page advertisement that appeared in LOOK magazine a few years ago (10 October 1965: p. 12). On the upper half of the page was a picture of a moonlit evening in a campground, with a family happily watching a TV set outside their modern trailer. Under the picture was the caption:

> "Today, abundant electric service brings conveniences to the campsite . . . Wherever you look today, electric service makes good things happen."

The lower half of the page contained a picture of majestic mountains and lakes, with the same family as before, but this time they were zooming across the sky in a vehicle of the future. The caption read:

> "Flying mobile camper of the future may be electrically powered—plugging into any outlet for recharging . . . Imagine what (electric power will) do for your tomorrow . . . It's your desires and dreams that spur us on . . . You'll never outdream your possibilities."

Fascinating! Considering the fact that man just began to fly at the turn of the century and is now walking on the moon, such developments as a flying mobile camper are just around the corner in recreation-resource management.

When this type of equipment is sold commercially, who is going to be responsible for deciding where and how these flying mobile campers will be used in wildland areas? Who is going to provide the electric outlet for recharging it? Who is going to have to decide how many of these vehicles can be safely used in a given area at one time?

The recreation-resource manager, that's who—you better believe it!

But the manager cannot wait to start thinking about how to answer these questions until flying mobile campers, or other fascinating types of recreation equipment, are on the commercial market. There are too many other things to think about at one time when that occurs. We had better start thinking about such technological developments before they happen, so that the resulting problems can be solved in the light of recreation-activity mixes that satisfy demands for a multiplicity of recreation activities.

Breakthroughs in Other Fields

An example of how technology, even in a non-recreation field, may ultimately affect recreation travel patterns is illustrated by the present state of research development of the picture phone *(McHale 1969)*. Much of the airline business today is *business* travel that provides needed face-to-face contact between seller and buyer. In the not-too-distant future, airlines will compete with the picture phone for conducting business transactions. Present technological forecasts suggest that the cost of conducting business by picture phone will be much less expensive and just as effective as present air travel to accomplish the same purpose. As a result, airlines may appeal to the recreation market with all sorts of charter flights and special-rate flights to favorite recreation spots throughout the country and around the world. Imagine what effect this technological breakthrough in the picture phone will have on recreation-demand patterns!

Predicting the Future

How can technological progress that affects recreation demand be predicted? Several procedures have been compiled by Bright *(1968)*, Helmer *(1966)*, Stover *(1969)* and North and Pyke *(1969)*. Most of these techniques are based largely on trend extrapolation, on studying the effects of technical breakthroughs in one field of study on important changes in a seemingly unrelated area of management or science, or on the Delphi method—a survey procedure for obtaining a consensus of expert opinion.

From a recreation manager's standpoint, it would be ideal to have an estimate as to when relevant future technological events are likely to occur. Timber-production plans extend 50 to 60 years into the future, so why not probe 30 to 40 years into the future for possible shifts in recreation-demand patterns for the same resource environments? Some managers feel that "there are too many of today's recreation-management problems that need to be solved first". In recreation management, that type of philosophy is like having a chance to go on the maiden voyage of the Titanic, knowing the consequences, and then booking first-class passage. Today's revolution in recreation-equipment use and resulting changes in behavior patterns is merely the sputtering of a fuse of a much larger explosion that is about to come.

Technology will shape the future of recreation demand; it will create new possibilities for management to solve demand problems; it will alter the mix of choices available to meet recreation demand; it will influence individual and social values of recreation; and it will undoubtedly alter the conditions and patterns of present management practices. For these reasons, any overall approach to forecasting future recreation demand should include research on the effects of relevant technology.

A FEW LAST WORDS

The primary objectives of any study in this area of research should be:

- To develop a conceptual model (hopefully a mathematical equation) that permits estimates of probable tangible or intangible values of recreation use for a given facility, site, or piece of equipment.
- To apply the model to empirical data for the purpose of comparing actual and predicted values for one or more types of recreation activities.
- To illustrate the application of the probabilistic analysis in the development of statistical use estimates for outdoor recreation *(Wennergren and Nielsen 1968)*.

The central task lies in the exploration and methodological investigation of several ways to forecast recreation values. These approaches may range from evaluation of the past; to the study of human trends and needs in the present; to the projection, forecasting, and imaginative construction of several future individual and social patterns of recreation consumption.

There is no good answer to the question of how far recreation values should be projected into the future. It depends. The magnitude of any future projection is most often influenced by the reliability of the data, how far it extends into the past, the associated variation in the data, and the expected time interval between the beginning and the end of any research study. It makes little sense, for example, to do a 5-year recreation-demand forecast with data if the research study itself takes 3 years to complete.

Lenz *(1968)* offered a word of caution to those who attempt to forecast the future when he paraphrased Dante's warning in the *Divine Comedy:* "All forecasters must circle endlessly about the bottomless pit in Hell, with their heads turned backway on their shoulders, so that their copious tears will flow down the cleft of their buttocks, because they tried to look too far ahead."

So we must be careful!

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