1. Introduction

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This introductory chapter sets out to accomplish four objectives. The first is to explain why outdoor recreation is a relevant and interesting subject of study for economists. Second, the chapter provides a short history of this field of study. Third, we very briefly detail the main methods for estimating the demand for and value of outdoor recreation, and how demand may change when environmental conditions change. Fourth and finally, we preview the chapters that follow this one.

1. WHY AN ECONOMICS OF OUTDOOR RECREATION?

One of the first areas of study in the emerging discipline of environmental economics in the 1960s was that of outdoor recreation. Why? It seems to us that there are several possible reasons.

First, outdoor recreation was a fast-growing activity in the 1960s and remains so today. The great outdoors became more accessible as incomes grew, allowing households more leisure time, or at least easier access by automobiles. Accompanying this were interests in fitness and special activities such as fishing and hunting. This increasing demand for recreation brought with it its own pressures, such as congestion and potential environmental impacts. In addition, recreational activities were often in direct conflict with other demands on natural areas, such as mining, hydro-electric developments, farming, property development and afforestation. Economists were naturally interested in the relative costs and benefits of these different, often mutually-exclusive, land uses (for example Krutilla and Fisher, 1975). Perhaps what also helped stimulate economists to work on this issue was that outdoor recreation demands were often for activities on publicly-owned land, such as US Forest Service or UK Forestry Commission land. Such public agencies were interested in pursuing a wider set of objectives than simple timber production and, as such, demanded

information from academic economists on the non-market benefits of the resources. Much early work on the economics of outdoor recreation was funded by public agencies concerned with land management. Again, this remains true today. Economists, meanwhile, found that recreation demands could be brought within the paradigm of neo-classical welfare economics and demand theory with few modifications to the basic ideas.

Finally, recreation modeling offered a productive link between people (their preferences and behavior) and the environment, which was a useful coincidence during a period when government initiatives were raising environmental quality levels or at least reducing environmental degradation in most countries. In the United States much of this effort was tied to conflicts over development of enormous western water projects. Damming rivers and streams was being done at a furious pace in the Pacific Northwest, in the Colorado River Basin, and in several parts of California, and environmentalists cried out for help in preserving them. Hells Canyon, Idaho and the Mineral King Controversy were famous examples involving recreation losses and gains. Such preservation or quality increases were in most cases costly, but were the benefits of preserving a river at the expense of forgone benefits from development commensurable? Recreational demand modeling provided some answers.

The benefits of water quality improvements could be estimated by studying impacts on the demand for sport fishing, whether these improvements were due to reduced point source emissions to water from sewage works, from reduced non-point emissions from farmland, or from reduced acid rain depositions. The hypothesis was simply that better water quality could improve the fishery, which in turn could improve the angler's experience and lead to measurable economic benefits. The increasing desire to place environmental policy-making under the spotlight of cost-benefit analysis provided another driver for increased activity in such work.

These issues are still very much to the fore in environmental valuation work today, whilst additional motivating factors have emerged, such as natural resource damage assessment (for example Hausman et al., 1995). This need for work to calculate economic benefits, coupled with increasing technical refinements in recreational demand methods (see, for example, Herriges and Kling, 1999), has meant and will continue to mean a rising volume of work. But before we look at the methods currently available to recreational economists, it is worth looking back to see how we got to the point we are at today.

2. A BRIEF HISTORY

It is an interesting coincidence that perhaps the two most practiced non-market valuation tools we have today, the Contingent Valuation Method (CVM) and Travel Cost Models (TCM), were originally proposed the same year. In 1949, Harold Hotelling wrote a letter to the National Park Service, outlining a method where the park visitor's round trip distance could be used to proxy the recreation trip price, so that consumer's surplus estimates might be recovered. The idea was to obtain the net benefit for outdoor recreation for a particular geographic area. The CVM method was suggested in the same year in an article by Ciriacy-Wantrup, although the first actual application of the method (to deer hunting in Maine) was by Robert Davis in his Harvard PhD dissertation, in 1963.

Some time after Hotelling's letter was sent, Wood and Trice (1958) and Marion Clawson (1959), who was working at Resources for the Future (RFF), applied the travel cost modeling idea to some actual data. Early TCMs used distance from some zone of origin to the destination point, a recreational area. The total number of visitors from the origin zone was the dependent variable in such models, and the travel cost from the zone to the area was a key explanatory variable. These applications became known as zonal travel cost models, and the unit of observation became the zonal aggregate population. Some ideas were taken from the regional economics 'gravity' models, typically used to model commuting decisions.

While novel and practical, it soon became clear that there were statistical or econometric problems with these zonal models. In particular, large population zones had a better chance of having larger variations in visitors to a recreation destination, but this fact was not typically considered, at least early on (although later versions of the zonal approach switched to visits per capita as the dependent variable). Vaughan and Russell and several others recognized that the assumption of homoskedastic errors would be suspect, and recommended corrections in the zonal model for the presence of heteroskedasticity.

Concerns about these early recreation TCMs and their somewhat shaky links to microeconomic theory led to the introduction of the idea that an individual recreational user might be a better unit of observation than an entire zone's population (Brown and Nawas, 1973). An individual user's demand for a trip to a recreation destination allowed more careful consideration of underlying microeconomic theory, but also required that more extensive data be collected. Once individual-specific data collection was contemplated the door was open to collecting data on the individual's income, her labor market situation, the length of her stay at an area, and even more detail on the activities she engaged in at each area visited. The

limit, of course, would be dictated by the survey mechanism and amount of information collectible before exhausting the respondent. Suddenly, travel cost modeling took a huge leap from the days of collecting only the origin location off the license plate on the back of an automobile.

Another important breakthrough with individual survey data related to modeling trips to more than one destination. Once data could be collected on trips to multiple sites, a modeler could think of entire systems of demand equations, or at least partial (recreation) demand systems. Burt and Brewer's classic article, published in 1971, applied just this idea. And so, connections between individual-specific data, better adherence to microeconomic theory, and sophisticated econometric techniques launched the new wave of travel cost and recreation demand modeling. Thorny issues quickly emerged to complicate the modeling and data collection, but resolution of these details made the models' predictive ability stronger.

These difficult technical issues included how to treat the time spent in travel to and from the recreation destinations, the time spent on site, the length of a stay at the site, how to assign values to the time spent, whether more than one destination was visited on a single 'trip', whether and which substitute site trip costs should be included in the model, and how to model congestion or overcrowding at some destinations. Progress was made on most of these issues, but something was still missing.

Perhaps the next major development in travel cost modeling was to incorporate site characteristics to help explain variation in trip-taking behavior beyond the travel cost itself. Up to a point in history, the only feature of the recreation destination that uniquely mattered in the models was the cost of getting to it and back. Why would a potential visitor pay attention to only this one detail? Surely an angler would care about how good the fishing at a lake was, or a hunter would wish to know that the destination offered excellent opportunities for success. Thus emerged the need to introduce recreation site characteristics, which obviously only would work empirically with adequate variation in the data. Hypotheses quickly emerged: better fishing, better hunting, more beautiful scenery, all lead to more trips, *ceteris paribus*.

There were other modelers who suggested this application of Lancaster's basic idea, but the best known of these early characteristics studies is by Morey (1981), who considered features of ski slopes and how these would contribute to the skier's choice of ski areas. This modeling more carefully considered what features of a recreation destination were important to the potential visitor beyond the trip price or travel cost. Morey went further than many and also introduced the ability of the recreational user as a factor pertaining to the enjoyment of the ski area. Novice skiers would have little interest in double-black diamond (for experts only) ski terrain.

Extensions of the characteristics idea also allowed a great deal of focus on how to connect these models to the environment, considering welfare measures for specific water quality improvements and the like.

Finally, the falling cost of desktop computers with high performance allowed careful consideration of the data generation process underlying recreation destination choice and the trip data. Two important approaches provided impetus for years of research to follow. One avenue pursued discrete choice modeling and we have seen Michael Hanemann's and Peter Caulkin's PhD dissertations (at Harvard and the University of Wisconsin, respectively) cited as examples of pioneering work in this discrete choice modeling area. Nancy Bockstael, Ted McConnell, and their colleagues at Maryland were also major contributors in this regard, stemming from their work funded by the US EPA on marine recreation. This work on recreation issues carried on through several major contributors from Maryland, including Maryland graduates Doug Larson and Cathy Kling, and as seems true for nearly every idea in environmental economics, Kerry Smith dove into the pool as well.

The other main development in travel cost modeling recognized that if the respondent understood what it meant to take a 'trip' and reported it consistently in integer units, then the data followed a count data process. Trips cannot take negative values and unless the visitor reports taking something like 1.5, or 1.25 trips, cannot take anything but integer-reported trips. Count models are then logical for nonzero positive integer data, and can be developed to handle zero reported trips. The Poisson distribution and its variants were used to represent the distributions of these trips. Daniel Hellerstein worked to develop this approach in his PhD dissertation at Yale along with Rob Mendelsohn, and the count data approach has since been extensively applied (for example, Hellerstein, 1991; Englin et al., 1997; Shonkwiler and Shaw, 1996; Haab and McConnell, 2002).

This nearly brings us up to the present. In the past ten years or so there has been increasing sophistication, even involving some dabbling in travel cost modeling by an economist who has now won the Nobel Prize in economics, though naturally we understand that the prize was not given for this particular work (see Hausman et al., 1995). The highest compliment ever received by one of the authors after a seminar was in the form of a question something like: 'Recreation economics has all the challenges that labor supply economics does, but it is much harder because of all the issues and unobservables, isn't it?' Indeed today, recreation demand modeling often looks little different from the most advanced labor supply modeling at the individual level. This is for good reason, in that much of the micro-econometrics used in modeling an individual's labor supply is also used in modeling recreation demand, and of course because one might think of

recreation demand as a special case of the entire labor–leisure choice decision.

Despite application of interesting and promising econometrics, and more careful adherence to the microeconomic theory underlying welfare measures, many challenges remain. We still cannot identify any manuscript that adequately deals with congestion and overcrowding in an empirical model using revealed preference data. There are many good reasons for this and we are not suggesting recreation economists have been lazy in this regard: it may be that modeling congestion adequately will require development of game-theoretic empirical models. In addition, though some have made recent contributions on incorporating the role of time (for example Feather and Shaw, 1999), there is still no agreement on the best way of handling this difficult issue. Proper treatment of time suggests the need to model all of the individual's activities carefully, a task that even more general microeconomic theorists have failed to do. A few other challenges ahead that we can think of include handling corner solutions (taking zero trips, trips to site A, site B, sites A and B, and so on) with more than a small number of recreation destinations, dealing with potential survey and sampling bias, linking choice occasions together to allow patterns in behavior to be reflected, and more generally, handling dynamic aspects of decision making over time.

3. A QUICK OVERVIEW OF METHODOLOGICAL APPROACHES

In this section we look at two issues: what do we typically want to value, and how can we actually estimate these values?

3.1 What Do We Want to Value?

To begin, for the uninitiated, we want to dispel the notion that recreation economists wish to value coca-colas, sandwiches, sun hats, and locally purchased gasoline. Many, many times we recreation economists have had to spend time convincing the public that expenditures in areas where recreation destinations are located is *not* our primary focus. Their mistake is in thinking that more local expenditure means a highly valued recreation destination, and such may not be the case. It is the job of the regional economist to ascertain what impact, if any, recreational visitors have on local areas when they visit. But recreational and environmental economists are more interested in the value of a lake itself, which does not include the value of the soft drinks purchased while there.

Economic values are defined over some potential or actual change in prices or the quality or quantities of goods and services that affect utility. For recreational destinations the earliest focus was on the implied value of a recreational resource (forest, lake . . .), rather than do without it. As such, these early studies typically focused, at least implicitly, on price changes. What is found in many early studies is an estimate of ordinary consumers' surplus, calculated as the area under the estimated demand curve for the recreational resource. Perhaps without fully realizing it, the topic of interest was actually whether a site-charge or entry fee might lead to a loss in benefits to the visitors. These points can be made clearer with a quick and simple formal discussion.

Let utility be a function of the trip price (P), income (Y), and quality attributes of the sites (q). Demand for trips will be X . The usual utility maximization problem, subject to constraints, leads to an indirect utility function $V(P, q, Y)$. Most travel cost modeling uncovers the consumer's surplus measure, the maximum willingness to pay (WTP). Typically WTP is hoped to be a compensating variation (CV) measure to prevent a price increase or quality decrease. It is possible, as seen later in the book, to uncover an equivalent variation measure (EV) also, but doing so requires careful consideration of income effects. For a given price increase in a site price at a national park used for recreation, WTP is defined by:

$$V(\mathbf{P}_0, \mathbf{q}, Y - \text{WTP}) = V(\mathbf{P}_1, \mathbf{q}, Y) \quad (1.1)$$

where $\mathbf{P}$ is a price vector of all market goods, $\mathbf{q}$ is a vector of quality attributes or environmental goods, Y is income, and where the price is changing from P_0 to P_1 . WTP is the most income an individual would give up to prevent an undesirable change in P , and is defined by this indifference condition.

As stated, in early work by recreation economists, most emphasis was on price changes, in the sense that most modeling efforts were aimed at estimating WTP or consumers' surplus for recreational experiences from a baseline of current conditions. Sometimes the assumptions were not explicit. The modelers often simply estimated a linear or log-linear demand function for one or more sites, and then calculated the area under this demand function. The notion, whether done properly or not, was that the entire area under the supposed demand function is consumer's surplus. This is naturally true if the demand function is truly connected to some underlying utility function (that is, it 'IS' a demand function as we know it), and if the implicit goal is to examine the consumer's surplus related to a choke price, say P^* . P^* is assumed to be that trip price that forces demands to zero, that is it is that trip price where all, or at least most, visitors will no

longer visit the site. Another way of looking at the possible meaning of these estimates is that they reveal peoples' WTP to maintain access to a recreational site, and many assume that such a value is in fact the value of the recreational destination itself.

When averaged across a sample of individuals, the CS measure above yields the average WTP for the recreational area. Many early economists also reported such estimates after dividing by some number of reported or estimated trips, and such estimates became known as the value or CS per trips. A CS per trip measure that is logical does flow from count data models. However, in later years several economists, starting with Morey (1994), questioned the meaning of early CS per trip measures, showing that the derivation of these as well as the change being contemplated are of critical importance. One of Morey's points is that, for example, if we estimate the annual WTP to increase water quality at some lake and find this consumer's surplus to be an average of \$80, then does it make much sense to divide this by some number of trips, breaking the environmental quality change across trips? The reason that policy-makers today still cling to per-trip welfare measures in recreation is both their apparently simple information content (the value of an average trip), and that the data collected for a benefits transfer often lend themselves to doing back-of-the-envelope estimates with such values.

Contingent valuation methods have also been widely used to measure WTP to preserve the right to visit a recreation destination, such as a forest. Since values are only defined over changes, some change must be at least implicit in these types of calculation: the implicit change early on was once again the removal of the right to access these recreational areas. For example, the earliest use of contingent valuation in the UK to look at forest recreation values (Hanley, 1989) asked people their WTP to preserve the right to walk in the Queen Elizabeth Forest Park in Scotland (P_0 , above), versus not being able to walk in the woods in the future (P_1 , above).

Today, in the context of managing recreational resources, the earlier type of 'use as is' value may be of rather less policy relevance than it used to be. Rarely do we see the potential complete loss of a recreation destination, unless it relates to extinction of a resource, or to access restrictions.¹ The choke-price models and results do enable the non-market rate of return from such resources to be calculated, and to be compared across forest types (say), but a rather more useful focus from a management viewpoint is likely to be tied to quality changes within a recreational resource. Questions that arise today are, how does acid rain affect a lake or forest? How does non-point source pollution affect the value of recreation on a river? And, do toxins that lead to fish consumption advisories harm all anglers and their experiences, or some smaller group of those who actually eat fish they catch?

The above formal derivation of a WTP can be simply modified to produce the WTP to prevent such a quality decline from q_0 to q_1 , or to bring about an improvement in quality from some baseline point. In assessing the benefits of reducing pollution in a lake which will likely improve fishing conditions from 'fair' to 'good', it is best to have estimates of consumers' surplus for this change. If all we know is the value of consumers' surplus per fishing trip under current conditions, say \$25 per fishing trip, this may be of limited value to the researcher or policy-maker.

Attention has therefore increasingly focused on estimating the value of site quality changes. Applications have led to hundreds of travel cost studies too numerous to cite here. Water quality changes are probably the most common application, but travel cost studies of forest-based recreation and recreation tied to hunting and species habitat are growing in number.

Another recent focus of valuation has been to look at the welfare impacts of measures to limit access. For instance, if site managers are worried about increasing erosion of footpaths on a popular mountain site, they may introduce alternative measures to discourage visits, such as increasing access fees (if possible), or making access more difficult or more time consuming. Such actions can be expected to diminish the utility of a trip to those people who still visit the site, but also to displace visits to other, substitute sites. Some types of recreational demand models (for example, repeated nested logit models) can be used to study both of these potential impacts.²

Finally, although recreational demand studies have very much focussed on the welfare of people who actually visit sites (users), newer models allow recovery of values to those who do not currently use the recreation destinations. The 'non-users' fall into two groups: those who are potential users, but who do not visit the destination today, and those who are neither users now, nor will be in the future. Many travel cost models allow recovery of values for potential users (see Hellerstein's 1992 work on this, or the theoretical discussion by Shonkwiler and Shaw), but it is still true today that the stated preference methods are the only way to recover values for non-users. For instance, protecting woodland habitats for caribou which some people like to hunt might also increase utility for those who just like to know that caribou are benefiting from their habitat being protected. Many studies have tried to estimate what these non-use values might be for recreational resources (for example Adamowicz et al., 1998).

Having explained what types of value we might want to measure, we now want to briefly look at the range of empirical methods available for actually estimating these values.

3.2 Methods for Estimating Recreational Values

Methods for estimating environmental values are conventionally divided into *stated preference* and *revealed preference* approaches. In the former case, researchers make use of questionnaire surveys to directly question respondents about their WTP for the option to use recreational resources, or with regard to quality changes to these resources. Two types of stated approach are available. The first, and most widely used, is the *contingent valuation method* (CVM). In a CVM survey, respondents are asked their WTP to either obtain (for welfare-increasing changes) or avoid (for welfare-decreasing changes) an environmental change. For example, people might be asked their WTP for a program which improves water quality at a popular lake where swimming and fishing activities are pursued. WTP values may be obtained in a number of ways, for example as a referendum ('if the cost to you was \$y, would you approve the scheme?'), or using an iterative format ('would you pay £x? Yes? Well then, would you pay £2x?'). A full discussion of the method can be found in Bateman and Willis (1999), or in Bateman et al. (2002). CVM has proved very popular amongst both academic researchers and the policy community due to its very wide applicability, and its relative simplicity. Both use and non-use values can be estimated with the technique.

An alternative stated preference approach which is gaining increasing use in recreation economics is *choice modeling* (CM) (Adamowicz et al., 1994). Choice modeling, as used by economists, is based on Lancaster's attribute theory of value, and can be developed using random utility theory and the random utility model (RUM). The environmental resource in question is described in terms of its attributes. For example, suppose we want to estimate the value of increasing species diversity in forests used by walkers. Any particular forest might be described in terms of, say, four attributes: species diversity, the extent of trails, the proportion of forest as open space, and the age of the forest. Different forest management plans could be described in terms of differing levels of these attributes. In order to derive welfare measures, it is also necessary to include a cost attribute. Two 'forest profiles' might look as shown in Table 1.1. Respondents would be asked to make choices between pairs such as this, with a 'visit neither' option also being included. By making such choices, respondents reveal the marginal utility they place on each attribute: this is derived in some models from the estimated parameter for a given attribute in a probabilistic model describing actual choices (typically, a simple conditional multinomial logit model).

The parameter on the cost attribute in the simple MNL can be interpreted as the marginal utility of income: dividing any attribute parameter

Table 1.1 Attributes of hypothetical forests

	Forest A	Forest B
Species diversity	Low	High
Extent of trails	10km	10km
Proportion of forest as open space	5%	10%
Mean age	75 years	45 years
Travel cost per visit	\$5	\$9

by this value gives an ‘implicit price’, which can be interpreted as a marginal WTP value. Finally, welfare effects for changes in attributes (for instance, for a program which increases both species diversity and the extent of trails) can be calculated using a ‘log-sum’ expression:

$$-\left(\frac{1}{\beta_c}\right)\left[\ln \sum \exp(V_i^1) - \ln \sum \exp(V_i^2)\right] \quad (1.2)$$

where β_c is the parameter on the ‘price’ attribute (and thus $1/\beta_c$ can be interpreted as the marginal utility of income), and V^1 and V^2 are the indirect utility associated with pre- and post-change attribute bundles respectively. Such equations must be modified for different assumptions, including whether income effects are present. For a full account of the CM approach, see Bennett and Blamey (2001), Louviere et al. (2000), or Hanley et al. (2001). Like CVM, CM can measure both use and non-use values.

One common objection to stated preference approaches today is that they produce estimates of value that are not founded in actual behavior. People’s responses to both CVM and CM questions are not actually budget-constrained, no matter how ingenious the questionnaire design. A worry exists that stated preference estimates of value are thus somehow less ‘real’ than other economic values, or at the very least are biased upwards. It should thus be apparent that basing value estimates on actual behavior might be an attractive alternative.

Revealed preference approaches are based on actual behavior. Founded on pioneering theoretical work by Maler (1974), economists have been able to show how behavior in related markets can be used to estimate use values for non-market goods such as recreational resources. Unfortunately, non-use values cannot be so estimated, as they leave no ‘behavioral trail’ behind. The main related market of interest in our context is for travel. People are observed to spend money on fuel, cars and so on in order to be able to ‘consume’ outdoor recreational experiences. The idea is simply this. Although I pay no entrance fee to climb Ben Nevis (a popular mountain in Scotland), I do have to spend money on petrol in order to drive there from

where I live. By tracing out a relationship between such expenditures and visit rates (trips per annum, for example), economists can estimate demand curves for such sites. Another type of price recreational users pay in accessing outdoor sites is related to the use of their time. Time is a scarce commodity with an economic value (de Serpa, 1971), and people spend time both in accessing a site whilst actually going for a walk, going fishing, going canoeing, and so on. How exactly to include such time values in revealed preference models has, however, proved a tricky issue, as noted earlier.

Two or three basic approaches can be identified for the *travel cost* modeling (TCM) approach to recreational valuation. The first stems from the origin of the methods used by Wood and Trice and by Clawson and Knetsch (see the history lesson). The idea here is simply to estimate one or more demand equations, hopefully which are consistent with economic theory. The most popular approach is now referred to as *count modeling*.³ Far and away the most common in the literature is a single-site count model, however, actual site quality cannot be included in a single site model as it is a constant. Systems of demand equations allow variation in site quality, and are possible in the count framework, as Chapter 6 shows. Others develop systems of demand equations based on other empirical assumptions, as Chapter 14 shows.

In all such demand models whether to use objective or subjective measures of these characteristics has proved another tricky issue (Englin et al., 1997). Naturally economists do not wish to introduce endogeneity in the right-hand side variables, so one must be careful if the explanatory variable is constructed from subjective assessments of a recreation destination's characteristics. This is also a problem with modeling congestion, as what seems crowded to one person may not seem so to another (see the discussion in Jakus and Shaw, 1998).

Count models focus on predicting participation (trips) at sites, and on consumers' surplus per trip. The second approach to travel costs models takes a somewhat different approach. Random Utility Models (RUMs) are probabilistic in nature, and revolve around the allocation of a fixed quantity of trips across substitute sites within a 'choice set', as site qualities change. The welfare effects of such quality changes can again be calculated (for example, Morey et al., 1993). Haab and McConnell (2002) provide a good discussion of the econometric issues involved. One problem with site-choice RUMs is that total trips to all sites in the choice set are fixed by assumption. Two ways around this limitation have been developed. The first is to use a repeated RUM model, where both the number of trips and trip destination are modeled simultaneously. A limiting assumption with this approach is that the number of choice occasions has to be fixed. A second alternative is to combine RUM and count models, and estimate the

system simultaneously. One of the first efforts along these lines was undertaken by Yen and Adamowicz (1994). A discussion on alternative ways of approaching this task is given in Parsons et al. (1999) and theoretical considerations are in Shaw and Shonkwiler (2000).

Finally, it is possible to combine revealed and stated preference approaches (Bateman et al., 2002). For instance, suppose we constructed a CM approach to forest valuation based on the choice sets in Table 1.1. We could now also estimate a revealed preference RUM by sampling visitors to the forests, finding out their trips to each forest, and then obtaining measures of each attribute for each forest in the choice set. Two categories of observation now exist on peoples' preferences across different recreational forests, one based on stated preferences (the CM experiment), and one on actual behavior (the travel cost model). These can now be pooled together, and a joint model estimated (see, for example, Adamowicz et al. in Chapter 9). A second approach is to combine travel cost models of site visits with questions on how respondents' behavior would change should site characteristics change (for example species diversity is improved). This allows revealed preference models to 'look beyond' existing site quality levels using stated intentions. For examples of this type of approach, see Grijalva et al. (2002), Englin and Cameron (1996) and, most recently, Hanley, Bell and Alvarez-Farizo (2003).

The above discussion by no means exhausts the list of all of the important contributors to recreation demand modeling. To keep this chapter short we cannot provide a complete discussion, but we would be remiss in at least not mentioning the omitted names of Frank Cesario, Mike Creel, Ken Willis, John Loomis, and Guy Garrod and of course the newest contributors to the field of recreation modeling, too numerous now to specifically mention.

4. AN OUTLINE OF THE BOOK

We have divided the book into sections that relate to the resources being analysed. Part One of the book is concerned with the mountains. Mountains have been extremely important as recreational resources in Europe over the last 150 years, and are of growing importance in the United States and elsewhere. In Chapter 2, Therese Grijalva and Robert Berrens use contingent valuation to estimate the value of ensuring access to a particular type of rock climbing, known as 'bouldering', at Hueco Tanks Texas State Park. Hueco Tanks is a world-renowned bouldering site. Across varying levels of park access, a scope test is conducted on willingness to pay (WTP) to protect rock-climbing and bouldering access. This

means testing whether WTP estimates are sensitive to the quantity/quality of environmental good 'on offer'. Scope tests have become important as one way of assessing the validity of contingent valuation applications. The empirical results indicate that the WTP for protecting rock climbing and bouldering access is indeed sensitive to changes in scope.

A rather different approach to valuing changes in access to rock climbing sites is reported in Chapter 3, where Nick Hanley, Begona Alvarez-Farizo and Douglass Shaw use a repeated nested logit approach to value the welfare impacts of different policies to manage rock-climbing sites in Scotland. This approach also allows the authors to produce predictions of the change in the number of visits made to each climbing area when policies are introduced; the policies studied comprise car parking fees, and making access more time-consuming. Scottish rock-climbers are also the subject of Chapter 4, where Nick Hanley and Robert Wright use the choice experiment method to investigate which characteristics of climbing sites determine the demand for climbing. The chapter also investigates a methodological issue in choice experiments, namely the effects of changing choice task complexity.

In Chapter 5, Paul Jakus, Mary Riddell and Douglass Shaw investigate the fascinating subject of climbers' attitudes to risk. Most non-climbers probably view climbers as being off their heads, but the authors argue that climbers' actual choices show quite consistent and economically-rational decisions under risk. Italian mountaineers are the focus of Chapter 6, in which Riccardo Scarpa, Tiziano Tempesta and Mara Thiene apply a sophisticated system of count models to trips to the North-Eastern Alps. The method used here is particularly appealing in terms of the close relationship between econometric method and the classical theory of demand. Finally in this section, Geoff Riddington, Colin Sinclair and Nicola Milne apply a conventional Random Utility Model to the choice of sites by downhill skiers in Scotland. They find that two distinct groups of skiers exist: overnight stayers and daytrippers. For the former, the quality and price of the skiing is relatively unimportant. The key determinant in this market seems to be accommodation. For day-trippers snow cover, cost and, to a lesser extent, journey length, were the critical factors. Interestingly sites which for the day-tripper are competitors become, for the overnight customer, complementary.

Part Two of the book concerns forest recreation. In Chapter 8, George Hutchinson and co-authors use a regional travel cost model to estimate the spatial distribution of positive and negative welfare effects arising from the implementation of a number of policies for managing forest recreation in Northern Ireland. Using a travel cost model based on choice probability and count modeling, the chapter develops a method to estimate the welfare

effects of adjustments in charging and site quality, and of how these effects are distributed across the 26 district council areas in the region. This kind of distributional analysis is rather uncommon in travel cost models. In Chapter 9, Vic Adamowicz and colleagues employ a combined stated-revealed preference approach to study the preferences of moose hunters for forest sites in Alberta. This study compares perceptions with objective measures of site attributes. Results suggest that the model based on perceptions slightly outperforms the models based on objective attribute measures. However, issues such as the definition of the choice set and the measurement of welfare present significant challenges when using perceptions data.

Benefits transfer is an important area of research in environmental valuation, and in Chapter 10 Ian Bateman and friends report on an extensive programme of work at the University of East Anglia which investigates the use of Geographic Information Systems (GIS) in this context. They employ GIS techniques in an increasingly-sophisticated array of models to predict visitor numbers and consumers' surplus for public forests in the UK. This work is very important in terms of the wider use of environmental valuation in the management of natural resources. A rather different focus is provided by Peter Boxall, David Watson and Jeff Englin in Chapter 11. They study the recreational demands of backcountry recreationists, primarily canoeists, in Nopiming Provincial Park in eastern Manitoba. This work is undertaken in the context of a need to estimate the relative values of economic value of four forest ecosystems, fire-damaged forests and several park management features. One of their most interesting findings is that whilst park management variables play a role in determining recreation values, the ages and types of forests located at recreation sites are more important.

Part Three takes to the water. In Chapter 12, George Parsons and Matt Massey estimate a random utility site choice model for beaches in the Mid-Atlantic region of the US. They study the relative importance of site attributes such as travel cost, beach width and beach facilities on people's decisions as to which beaches to visit. Using the model estimates, they are able to estimate the economic loss associated with both beach closures and beach erosion in the region. The main focus of Shonkwiler and Shaw in Chapter 13 is to extend random utility modeling to allow for the analysis of income effects on demand. The case study they choose centers around reservoir recreation along the Columbia river. The conventional random utility model assumes that the marginal utility of income is constant. Income effects are therefore not present in the individual's choice among alternatives and this has strong implications for welfare measures; yet in many applications that require examination of rather large changes in

prices or attributes of the alternatives, allowing for income effects would seem desirable. The chapter therefore presents an important methodological advance for recreation demand modeling using the RUM approach. Methodological enhancements are also the focus of Larson and Shaikh in Chapter 14, this time in the context of a system of count models. They use whalewatching trips to three northern Californian sites as their empirical focus. Finally, Chapter 15 moves us back to random utility modeling, but now in the context of a motivation for environmental valuation which became increasingly important in the US in the 1990s: natural resource damage assessment. Morey, Breffle, Rowe and Waldman report on a natural resource damage assessment for the State of Montana. Mining wastes have caused significant reductions in trout stocks in a 145-mile stretch of Montana's Silver Bow Creek and Clark Fork River. To estimate economic damages from decreases in catch rates, the authors develop and estimate an individual-based utility-theoretic model of where and how often an angler will fish as a function of travel costs, catch rates, and other influential characteristics of the sites and individuals. The model includes resident and non-resident anglers who currently fish in Montana, and allows them to have different preferences. The chapter is an excellent example of the usefulness of recreational demand models for this type of damage assessment.

We hope you enjoy reading this book, and that you will find it useful as well. We have certainly enjoyed working on this project, and wish to thank all the authors for their contributions, as well as Maggie Dewar for her help in putting together the final version of the book. Douglass Shaw thanks the Colorado School of Mines for their hospitality during his sabbatical, and the girls for putting up with his hiding in the basement.

NOTES

1. One such example is when a lake dries up, as can happen in the arid western United States. At some point the lake becomes useless for recreational fishing, boating and other uses. Fadali and Shaw (1998) considered such a problem for a dying lake in Nevada.
2. Chapter 3 is an example of such a model.
3. For a discussion of the econometric issues involved in estimating such models, see Haab and McConnell (2002).

REFERENCES

- Adamowicz, W., J. Louviere and M. Williams (1994), 'Combining revealed and stated preference methods for valuing environmental amenities', *Journal of Environmental Economics and Management*, **26**: 271–92.

- Adamowicz, W., P. Boxall, M. Williams and J. Louviere (1998), 'Stated preference approaches for measuring passive use values: choice experiments and contingent valuation', *American Journal of Agricultural Economics*, **80**(1): 64–75.
- Bateman, I. and K. Willis (1999), *Valuing Environmental Preferences: Theory and Practice of the Contingent Valuation Method in the US, EU, and Developing Countries*, Oxford and New York: Oxford University Press.
- Bateman, I. et al. (2002), *Economic Valuation with Stated Preference Techniques*, Cheltenham: Edward Elgar.
- Bennet, J. and R. Blamey (2001), *The Choice Modeling Approach to Environmental Valuation*, Cheltenham: Edward Elgar.
- Bockstael, N.E., W.M. Hanemann and I.E. Strand Jr. (1987), *Measuring the Benefits of Water Quality Improvements using Recreation Demand Models*, Vol. III, Report to the U.S. EPA, Dept. of Agricultural and Resource Economics, University of Maryland.
- Brown, W.G. and F. Nawas (1973), 'Impact of aggregation on the estimation of outdoor recreation demand functions', *American Journal of Agricultural Economics*, **55**: 246–9.
- Burt, O. and D. Brewer (1971), 'Estimation of net social benefits from outdoor recreation', *Econometrica*, **39** (September): 813–28.
- Clawson, M. (1959), *Methods of Measuring the Demand for and the Value of Outdoor Recreation*, reprint No. 10, Washington DC: RFF.
- Davis, R. (1963), 'Big game hunting in the Maine woods', *Natural Resources Journal*, **3**: 239–49.
- De Serpa, A.C. (1971), 'The theory of the economics of time', *Economic Journal*, **81**: 828–46.
- Englin, J. and T.A. Cameron (1996), 'Augmenting travel cost models with contingent behavior data: Poisson regression analyses with individual panel data', *Environmental and Research Economics*, **7** (March): 133–47.
- Englin, J., D. Lambert and W.D. Shaw (1997), 'A structural equations approach to modeling consumptive recreation demand', *Journal of Environmental Economics and Management*, **33**: 33–43.
- Fadali, E. and W.D. Shaw (1998), 'Can recreation values for a lake constitute a market for banked agricultural water?', *Contemporary Economic Policy*, **16**(4): 433–41.
- Feather, P. and W.D. Shaw (1999), 'Estimating the cost of leisure time in recreation demand models', *Journal of Environmental Economics and Management*, **38**(1): 49–65.
- Grijalva, T., R. Berrens, A. Bohara and W.D. Shaw (2002), 'Testing the validity of contingent behavior trip responses', *American Journal of Agricultural Economics*, **84**(2) (May): 401–14.
- Haab, T. and K.E. McConnell (2002), *Valuing Environmental and Natural Resources: the econometrics of non-market valuation*, Cheltenham: Edward Elgar.
- Hanley, N.D. (1989), 'Valuing rural recreation benefits: an empirical comparison of two approaches', *Journal of Agricultural Economics*, September, 361–74.
- Hanley, N., D. Bell and B. Alvarez-Farizo (2003), 'Valuing the benefits of coastal water quality improvements using contingent and real behaviour', *Environmental and Resource Economics*, forthcoming.
- Hanley, N., S. Mourato and R. Wright (2001), 'Choice modelling: a superior alternative for environmental valuation?', *Journal of Economic Surveys*, **15**(3), 453–62.

- Hausman, J., G. Leonard and D. McFadden (1995), 'A utility-consistent, combined discrete choice and count data model: assessing recreational use losses due to natural resource damage', *Journal of Public Economics*, **56** (January): 1–30.
- Hellerstein, D. (1991), 'Using count data models in travel cost analysis with aggregate data', *American Journal of Agricultural Economics*, **73**: 860–67.
- Hellerstein, D. (1992), 'The treatment of nonparticipants in travel cost analysis and other demand models', *Water Resources Research*, **28**(8): 1999–2004.
- Herriges, J.A. and C. Kling (1999), *Valuing Recreation and the Environment*, Cheltenham: Edward Elgar.
- Hottel, Harold (1949), 'A Reply Letter to a U.S. Park Service Request in The Economics of Public Recreation', mimeograph, Roy A. Prewitt (ed.), Washington DC: National Park Service.
- Jakus, P.M. and W.D. Shaw (1998), 'Congestion at recreation areas: empirical evidence on perceptions, mitigating behavior, and management preferences', *Journal of Environmental Management*, **50**(4): 389–402.
- Krutilla, J.V. and A.C. Fisher (1975), *The Economics of Natural Environments*, Baltimore: Johns Hopkins University Press.
- Louviere, J., D. Hensher and J. Swait (2000), *Stated Choice Methods: Applications in Marketing, Transportation and Environmental Evaluation*, Cambridge: Cambridge University Press.
- Maler, K.G. (1974), *Environmental Economics: a theoretical enquiry*, Baltimore: Johns Hopkins Press.
- Morey, E.R. (1981), 'The demand for site-specific recreational activities: A characteristic approach', *Journal of Environmental Economics and Management*, **8** (December): 345–71.
- Morey, E.R. (1994), 'What is consumer's surplus per day of use, when is it a constant independent of the number of days of use, and what does it tell us about consumer's surplus?', *Journal of Environmental Economics and Management*, **27** (May): 257–70.
- Morey E., R. Rowe and M. Watson (1993), 'A repeated nested logit model of atlantic salmon fishing', *American Journal of Agricultural Economics*, **75**: 578–92.
- Parsons, G.R., P.M. Jakus and T. Tomasi (1999), 'A comparison of welfare estimates from four models for linking seasonal recreational trips to multinomial logit models of site choice', *Journal of Environmental Economics and Management*, **38**: 143–57.
- Shaw, W.D. and J.S. Shonkwiler (2000), 'Brand choice and total purchases revisited: an application to recreation behavior', *American Journal of Agricultural Economics*, **82** (August): 515–24.
- Shonkwiler, J.S. and W.D. Shaw (1996), 'Hurdle count data models for recreation demand analysis', *Journal of Agricultural and Resource Economics*, **21**(2): 210–19.
- Smith, V.K. (1989), 'Taking stock of progress with travel cost recreation demand methods: theory and implementation', *Marine Resource Economics*, **6**: 279–310.
- von Ciriacy-Wantrup, S. (1947), 'Capital returns from soil conservation practices', *Journal of Farm Economics*, **29**: 1181–96.
- Wood, S. and A. Trice (1958), 'Measurement of recreation benefits', *Land Economics*, **34**: 195–207.
- Yen, S.T. and W.L. Adamowicz (1994), 'Participation, trip frequency and site choice: a multinomial-Poisson hurdle model of recreation demand', *Canadian Journal of Agricultural Economics*, **42**: 65–76.