Measuring the economic benefits of riparian areas

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Measuring the economic benefits of riparian areas

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MEASURING THE ECONOMIC BENEFITS OF RIPARIAN AREAS

by

Kristine Birke Crandall

A Thesis Submitted to the Faculty of the

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BG Colby — 6/25/91

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ABSTRACT

In an attempt to identify the net benefits of different allocations of western water resources, resource economists have developed several techniques to value nonconsumptive water uses -- uses which are not well-represented in the marketplace. The application of these techniques to sites with flowing streams and riparian ecosystems is the topic of this thesis.

A survey incorporating the travel cost method, the contingent valuation method, and local economic impact analysis was used to assess the benefits of the Hassayampa River Preserve near Wickenburg, Arizona. Wildlife viewing is the primary visitor activity at this site, and is fully dependent on the availability of water in the Hassayampa River. This riparian site produces economic benefits that, while previously unmeasured and unaccounted for, should be included in future water allocation decisions.

CHAPTER 1.

INTRODUCTION

In today's society, many decisions require making tradeoffs between consumptive uses of natural resources and environmental preservation-- tradeoffs which are fueled by political, social, ecological, and economic factors. The well-documented juxtaposition of the natural environment to human activities focused on development and growth has created a stronger environmental awareness -- as has an increased interest in outdoor recreational activities and enjoyment of our natural areas. Looking at the economic factors that go into social decision-making, the question is one of determining which combination of natural resource uses provides the greatest net economic benefit to society.

The issue of water resource allocation in the arid state of Arizona furnishes an ideal setting in which to explore economic tradeoffs between consumptive and instream water uses. There is undoubtedly a perceived scarcity of water in Arizona, not only for growing domestic and industrial demands, but also for nonconsumptive water uses like recreation and wildlife preservation which are dependent upon flowing streams. How does one value

This inquiry looks specifically at riparian areas, whose ecologic and economic qualities are fully dependent on the adequate and regular availability of water instream. Protection of riparian areas is an important issue. Ninety percent of Arizona's desert riparian areas have disappeared primarily due to the diversion of water for other uses. Public support for preserving environmentally sensitive areas has been increasing in Arizona, and this, along with attempts to develop effective instream flow legislation, make the topic of this thesis a timely issue.

The specific site evaluated is the Hassayampa River Preserve near Wickenburg, Arizona. It lures birders, nature lovers, and escapees of the desert heat to its lush, moist riparian habitat. It also supports several rare and threatened species of wildlife.

Techniques commonly used by economists to value "nonmarket" goods such as riparian areas include local economic impact analysis, the Travel Cost Method, and the Contingent Valuation Method. A survey was administered to visitors of the Preserve in the spring of 1990. It contained questions pertaining to each of these three approaches, and provided a majority of the data used in the analysis.

In summary, this thesis uses and compares several approaches to assess the value of the Hassayampa River

Preserve -- a site characterized by perennial streamflow, a riparian ecosystem, and visitors partaking in nonconsumptive uses of the area, its stream, and its bird and other wildlife species. The remainder of the thesis is organized as follows. Chapter 2 proceeds with a discussion of the legal history of instream flow rights, how this has affected water allocation decisions in the past, and the evolution of present policies. It also examines the unique economic characteristics of environmental amenities, which are recognized as public goods. Chapter 3 represents the heart of the economic literature review. Local economic impact analysis, the Travel Cost Method, and the Contingent Valuation Method are explored from a theoretical point of view, and some past studies that have used these methods are cited.

A detailed description of the site and the survey instrument is presented in Chapter 4, the methodology chapter. Chapter 5 describes statistical analysis of the data and the results. Analyses were carried out for each technique, and an integrated approach was also undertaken. Finally, Chapter 6 contains a summary and discussion of the conclusions and implications of this work.

CHAPTER 2.

THE ECONOMIC AND LEGAL CHARACTERISTICS OF RIPARIAN AREAS

2.1.History of Western Water Use

Since the arrival of the first settlers in the arid western United States, survival and growth have been inextricably tied to the nourishing, vital resource of water. In a trend that has become more dramatic every year, many different users are putting increased pressure on limited ground and surface water resources. This is sure to continue in the West as populations in urban areas grow; demand for outdoor recreational opportunities becomes greater; irrigators, mining companies and cities attempt to maintain or enlarge their current water use; and environmental concerns push for more preservation of riparian ecosystems.

In the midst of these often polarized interests has emerged a patchwork of water use policies, regulations, and traditions --which attempts to sort out who gets which water for what purpose. The adage "whiskey is for drinking, water is for fighting over" succinctly summarizes the squabbles over western water, reflecting the controversies that arise when deciding how much water to set aside for riparian corridors and wetland areas.

doctrine of prior appropriation

In order to better understand how riparian areas and instream flow fit into the western water picture, one must look at the complex economic and legal framework that has traditionally governed water use. The foundation of western water policy is provided by the doctrine of prior appropriation. According to this doctrine, water use rights go to the individual or party who first established beneficial use. Water rights are separate from rights to land, and can therefore be transferred among different parties. This contrasts with the riparian doctrine, under which the landowners along the watercourse have the right to the water, and first or interrupted use does not influence who holds the water rights (Wiley, 1990).

"beneficial use" and instream flow benefits

Western states each have their own set of laws about water rights, though all are based generally on the doctrine of prior appropriation. A significant economic element of the doctrine is its emphasis on "beneficial use," which in terms of settlement of the west, has usually meant diversion of the water for consumptive offstream use. Water for irrigation, mining, municipal purposes, livestock, etc. has a recognizable economic purpose -- all of the above activities yield marketable outputs that signify settlement and growth. In

addition, the time and money invested in the construction of diversion facilities demonstrates the intent of the water user to achieve economically beneficial results. Instream flow maintenance, which does not generate these kinds of marketable outputs, historically not recognized as a beneficial use of water. Rather, it was seen as a waste since the water was lost to users further downstream (Loomis, 1987).

Instream flows do generate economic benefits which have only fairly recently been recognized, partly because of the interpretation of "beneficial use" and partly because of the difficulty involved in measuring the economic values of a flowing stream. Outdoor recreation, wildlife habitat protection, local economic development, and improved water quality all can be linked to instream flow, and all have values associated with them (Colby, 1990).

The Travel Cost Method (TCM) and Contingent Valuation Method (CVM), both implemented in this study, are two ways to measure the economic benefits of areas characterized by flowing streams. Another effective tool also included in this study is local economic impact analysis. The values generated by these approaches can be compared with other traditionally recognized "beneficial uses" of water, which allows policymakers to make better comparisons among the benefits generated by water in different uses, thus leading to a more efficient allocation of water resources.

2.2.Economic Characteristics of Instream Flow and Riparian Areas

Economic and political arguments for public intervention to protect streams and wetlands are based on the public goods aspect of instream flows, which also create difficulties in valuing instream flow, and as described later, in providing adequate streamflows through market acquisitions. Unlike water that is put to consumptive uses with instream flow, there generally is no directly observable price for instream flow water and the activities that it supports. Two main economic characteristics of instream flow come into play here.

public good characteristics

First, because of the physical nature of flowing streams, streamflows are a public good, an economic characteristic that sets them apart from a private good. As a public good, streamflows are non-rival or jointly consumed, meaning that one individual's consumption and enjoyment of water in the stream does not necessarily reduce another's and that many different users can benefit simultaneously from the same stream. This leads to the problem of trying to translate collective benefits into dollar values per individual (Colby, 1990).

The optimal provision of a public good is summarized by the Samuelson condition, which states that the optimal allocation of resources in the production of private (X) and public goods (G) is:

$$\Sigma_{i=A,B} MRS^{i}_{GX} = MRT_{GX} \qquad [2.1]$$

where

$\Sigma_{i=A,B} MRS^{i}_{GX}$ = the sum of marginal rates of substitution of the private good for the public good for individuals A and B

MRT_{GX} = the marginal rate of transformation between production of private goods and production of public goods

As Boadway and Wildasin (1984) mention, this relationship makes intuitive sense because it states that at the optimum, the sum of all the marginal benefits to users of the public good equals the marginal cost of supplying the last unit of the public good, as measured in foregone amounts of the private good. Equation 2.1 leads to the definition that the optimal quantity produced of a public good is at the point where:

$$\Sigma_{i=A,B} MB^{i}_{G} = MC_{G} \qquad [2.2]$$

where

$\Sigma_{i=A,B} MB^{i}_{G}$ = the sum of marginal benefits provided by the public good to individuals A and B

MC_{G} = the marginal cost of producing the public good

This relationship is displayed in terms of the optimal level of streamflow in Figure 2.1, which occurs at Q_{*}.

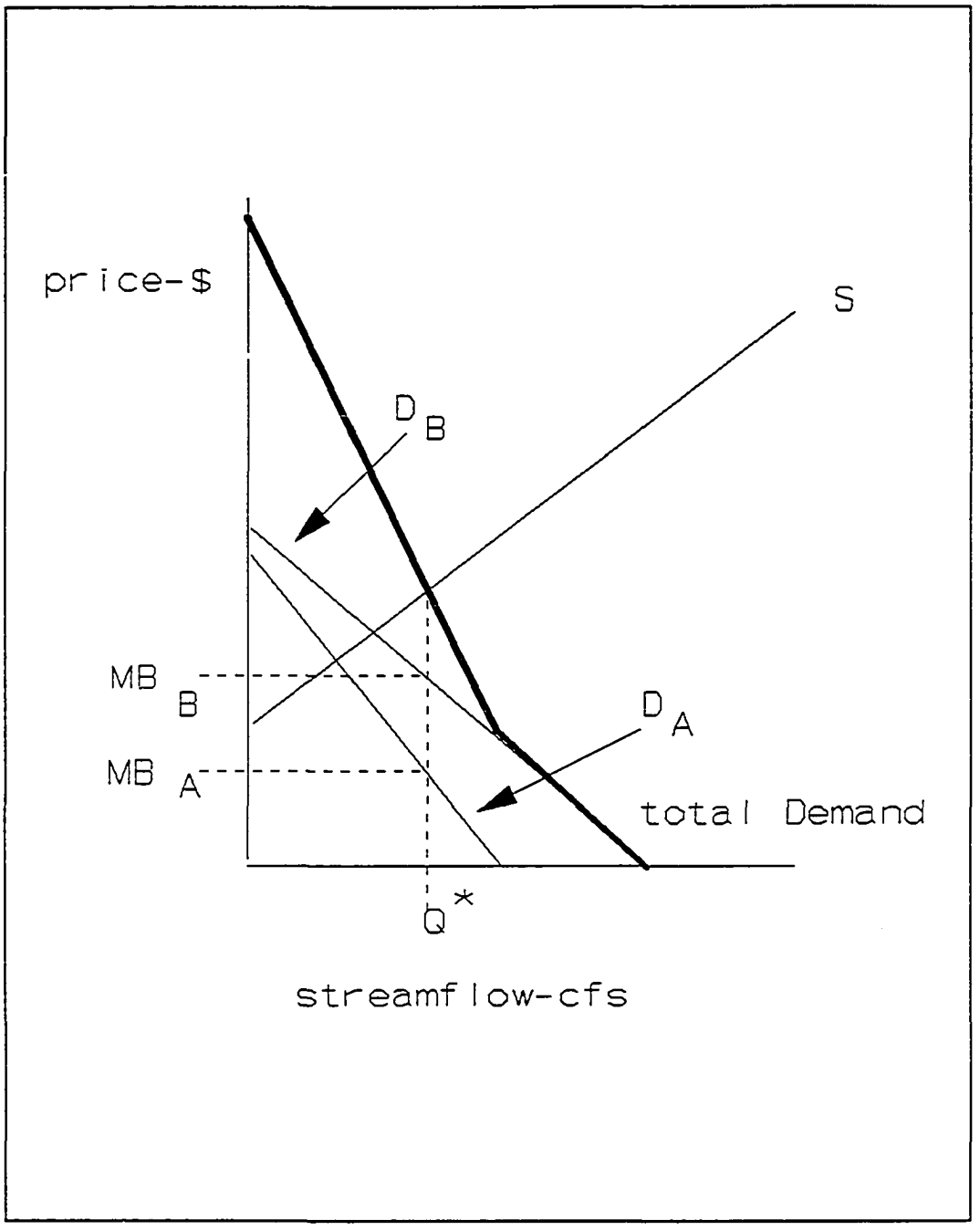


Figure 2.1
Optimal Provision of a Public Good

Some economists have suggested that each individual should be charged according to his or her willingness to pay (WTP) for the good. This approach is known as Lindahl pricing or benefit pricing. Given demand curves for two users of an instream flow resource, an angler (A) and a birder (B), Figure 2.1 defines the appropriate Lindahl prices for each as MB_A and MB_B.

The demand function of each user is necessary in order to proceed with this approach -- information which is extremely difficult to get because users will tend to behave as free-riders when asked about their WTP for the public good. Additionally, it should be noted that this pricing scheme plays no allocative role in the production of a public good. It simply determines who will bear the costs of financing the public good -- thus it deals primarily with equity issues (Boadway and Wildasin, 1984).

Instream flow also possesses the public good characteristic of being nonexcludable. It is difficult (or very expensive) to exclude individuals who do not pay from enjoying the benefits of the flowing stream. Stated another way, private landowners are unable (or must go to considerable expense) to capture the revenues stemming from the benefits realized by consumers of this particular resource (Loomis, 1987). While some landowners do charge fees for recreation on streams flowing through their property, they must incur

significant monitoring and enforcement expenses to prevent free-riders from enjoying the resource without paying. Commonly, recreationists become accustomed to enjoying the resource without paying. Trying to physically exclude them, however, is not necessarily economically desirable considering the potentially large loss in benefits that would result if use of the stream is truly non-rival.

externalities

The second economic characteristic of instream flow is the presence of externalities. This is also a consequence of the physical characteristics of water. Water is a fugitive resource -- it seeps, flows, and evapotranspires. It is stochastically supplied by nature and how water is used at an upstream diversion point or at a groundwater well affects all other users of the stream or aquifer.

A user downstream from an instream flow area enjoys a dependable level of streamflow (as well as the benefits that come with this -- e.g. improved water quality) when a certain minimum flow level is maintained. This is a good example of a positive externality. It would appear in the downstream user's utility function, but is not voluntarily chosen by him or her. The presence of this external economy would need to be included in benefits estimated for the instream flow.

Water transfers or new diversions of water can significantly effect the integrity of stretches of instream flow. The beneficiaries of the instream flow are not typically compensated for their loss because they do not hold property rights to the streamflow under many states' water laws. Therefore the diversion of water away from the stream induces negative externalities.

assignment of property rights

In addition to these pure economic considerations, which focus on public goods and economic efficiency, there is another intriguing factor to consider: the property rights structure and distributional effects that instream flow protection might have. What has been neglected until now is one of the most crucial questions: who loses and who gains from the protection of instream flows? Distributional issues are often as important, if not more so than efficiency arguments, especially when certain interests stand to lose their entitlements. According to the "use it or lose it" philosophy, instream flow proponents have traditionally found themselves in a "no right" position. However, as the next section on instream flow protection demonstrates, the recognition of public benefits can cause transformations in the property rights structure.

Economic decision-making requires tradeoffs. Alan A. Schmid (1978) notes that one party's opportunities create another's costs; one party's freedom is another's limitation. It is the structure of rights, or choice domains, as Schmid terms them, that reveals so much about the recipient of the stream of benefits. Bromley, in his analysis of institutional structures, states that "it remains obvious that any optimality we might derive is an artifact of the structure of entitlements taken for granted when the analysis is done" (Bromley, 1986, p.56). The point is that economic efficiency, as evaluated from the perspective of the status quo distribution of rights, may not represent an efficient outcome as new values for different uses of water arise and water policies and property rights are updated. Distributional questions are inextricably linked to efficiency and should receive equal consideration. Many efficient outcomes are possible, following Bromley, depending on the initial allocation of property rights.

Many rivers in the West are already "overallocated", and instream flow protection necessarily implies less water available for other consumptive water rights holders. But water rights for instream uses must receive attention because of their own equity issues (i.e. preventing "irreversible" damage to natural riparian habitat -- thus addressing needs of future generations), and because they have been neglected

until recently. Likewise, traditional water users' needs must be considered in cases when they stand to incur losses, even though the overall redistribution of water to instream uses may represent a potential Pareto improvement.

Before moving on it should be mentioned that the discussion has been limited to surface water, namely streams and rivers and the riparian areas that they support. While this thesis will focus on surface water, it is important to note that groundwater has an important connection to surface water resources. Groundwater basins are not easily identified or fully described, and their levels are difficult to monitor. This fact has hindered development of water policies that consider the amount pumped, or that define groundwater use within a property rights structure. The interrelationship between surface and ground water resources and different uses of water is shown in Figure 2.2.

In some areas of the West, any party with access to the overlying land can pump without limits from underground aquifers and basins, although Arizona has developed a relatively sophisticated management code for groundwater located in active management areas of the state. With regard to protecting streamflows, the amount of water in streams and rivers can be depleted where groundwater pumping is uncontrolled, throwing another complexity into the allocation of water for instream purposes, and the protection of streams

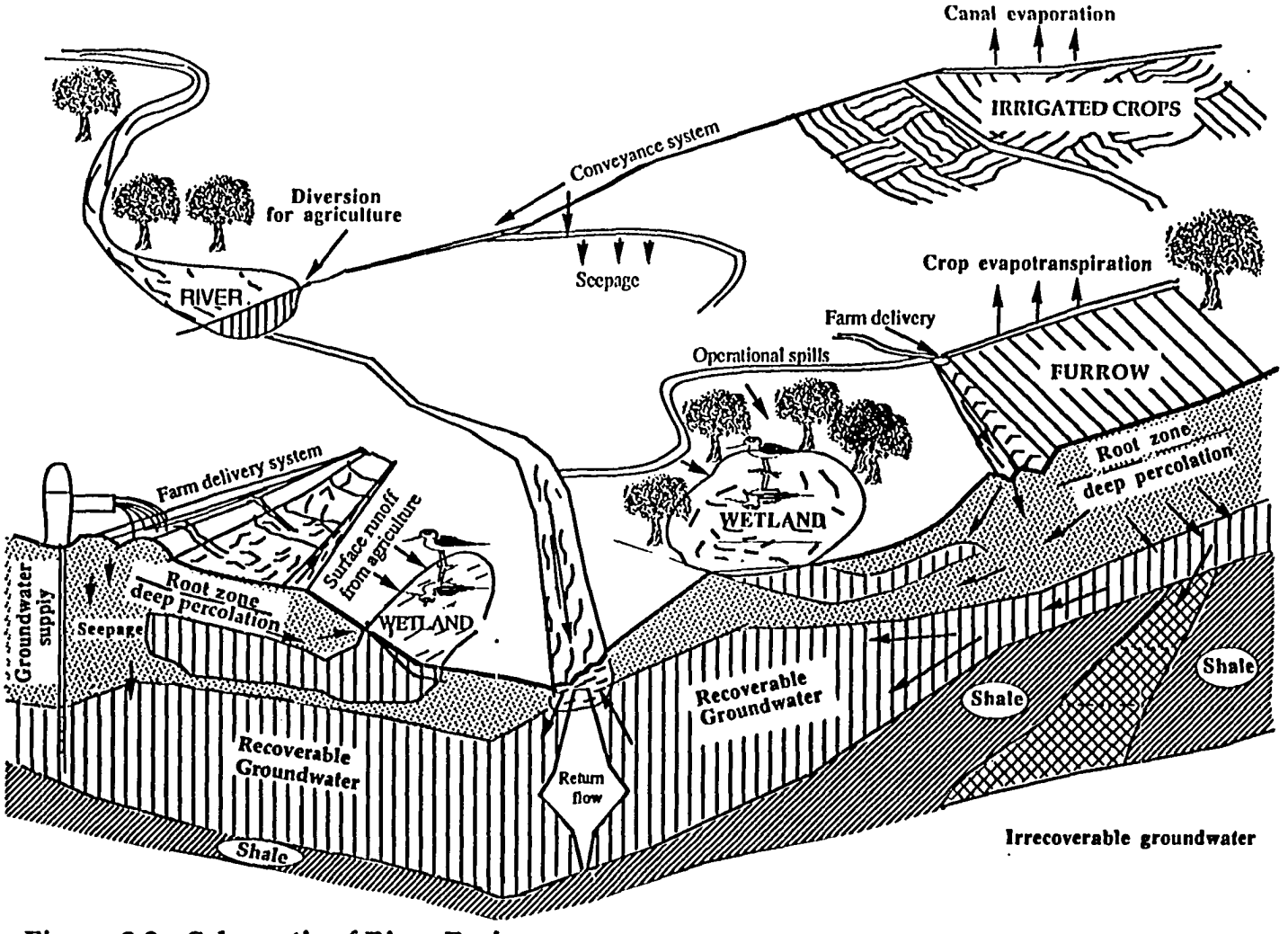


Figure 2.2 Schematic of River Basin

and riparian areas.

2.3.Instream Flow Protection

state programs and laws

The preservation of riparian areas and their related benefits is most directly achieved through instream flow protection. Different levels of government, with states assuming the primary role, have addressed this issue. Most western states have enacted statutory laws recognizing instream flow as a beneficial use, and created methods for its appropriation. This represents the key step toward bridging the gap between "offstream" and "instream" use of water, and thus provides the context within which to look at the benefits of instream flow and riparian areas.

Statutory laws describe the purposes that instream flow entitlements can serve. For example, Colorado's law is designed for the broad purpose of protecting the natural environment, while Alaska's legislation refers to fish, wildlife, water quality, recreation, and navigation as purposes for which instream flow may specifically be established (Shupe, 1988). Also, in some states laws authorize a state agency to appropriate and acquire water rights for instream flow, and to regulate and condition other water rights holders. The Utah legislature can deny water use

permits and/or set up certain conditions if the permit "will unreasonably affect public recreation or the natural stream environment" (Shupe, 1988). Utah, Colorado, and Wyoming all have forms of legislation allowing them to acquire senior instream rights through purchase, transfer, or gift.

Three western states still do not have specific legislation addressing instream flow protection: Nevada, New Mexico, and Arizona. In a 1988 court case, Nevada v. Morros, it was determined that outdoor recreation is a beneficial use of instream flow in Nevada. Following this ruling, Nevada's state engineer approved an instream flow right filed by the Bureau of Land Management (BLM) to protect important recreational streams. New Mexico also relegates any decisions about instream flow designation to the state engineer. Although no permits have been approved, a statute exists proclaiming that no diversion shall lessen streamflows such that fish populations are jeopardized (Colby, 1990).

Arizona instream flow legislation

In 1976, an Arizona Court of Appeals decision (McClellan v. Jantzen) concluded that an earlier statute recognizing recreation and protection of fish and wildlife as beneficial uses of water implied the legitimacy of instream flow water rights. Since then, five instream permits have been issued in Arizona, three to TNC and one to the BLM. The Arizona

Department of Water Resources (ADWR) serves as the grantor of permits, and had over 40 applications pending as of 1990.

Applying for a permit is an involved process that begins with the submission by the applicant of basic information to ADWR. Such information should cover the amount of water requested, proposed use, land location, total water available, and other such background. The applicant also is responsible for letting any potentially affected parties know about the application. The ADWR then reviews the application, during which time all protests must be resolved and all procedural requirements satisfied. If the application successfully passes this stage, it is given "candidate" status.

In the past, the review process has lasted several years for some permits, primarily because the ADWR follows no set guidelines, and often requests additional documentation. Once a permit is given, the conditions stipulated by the permit are monitored. Modifications may result if ADWR feels the amount of flow is inappropriate for the use. The final step is issuance of a certificate. This occurs only when all aspects of the permit are in order, and as of this writing only TNC's Ramsey Canyon instream flow right had been certified (pers. comm., Patten, TNC, May 16, 1991).

TNC received the first Arizona instream flow permit in 1983 for its Ramsey Canyon Preserve. The Preserve serves to maintain species' diversity (TNC's primary mission), and

attracts about 30,000 visitors per year, who come to hike in the cool canyon, birdwatch, enjoy the changing leaves in the fall, and learn about nature. Up to 15,000 visitors stay in nearby Sierra Vista annually in connection with their visit to Ramsey Canyon, augmenting its tourism industry (Kulakowski and Tellman, 1990). One must keep in mind that without the instream flow permit, the Canyon would not be guaranteed adequate streamflow, and its purpose and benefits would be gravely threatened by other impending consumptive water uses.

Aravaipa Creek, which flows through a wilderness area, has also received instream flow protection. The creek supports Arizona's most diverse native fishery, including twenty endangered or threatened species. In 1989, a permit was given to the BLM for requested recreational and wildlife purposes. The permit specifies monthly average flows of between 9 cubic-feet-per-second (cfs) and 25 cfs for the defined stretch of Aravaipa Creek, depending on the time of year (Kulakowski and Tellman, 1990). The HRP, the site of this study, is another area in Arizona characterized by a perennial stretch of stream. In 1990, TNC received an instream flow permit which, depending on the month, varies from 3.1 to 7.9 cfs (pers. comm., Richter, HRP, May 29, 1991).

In March of 1991, an instream flow protection bill was introduced in Arizona's state legislature. The bill, formally called the Riparian Protection Act, would require ADWR to

consider potential impacts of new water rights applications or requests for transfer on riparian values before granting them. The bill would also allow any public agency or private group or citizen to appropriate water rights for instream flow purposes. The bill was debated in a subcommittee hearing, where opposition was voiced by agricultural, industrial, and municipal interests, including Arizona's mining industry and the City of Phoenix.

An amendment to the bill narrowed its purpose to the development of an instream flow program and a study committee on protection of riparian values. A main point of contention of the bill was that state agencies would be able to own instream flow rights even if they did not own the adjacent land. As of this writing, the amended version was still being discussed in the legislature.

holders of instream flow rights

The situation in Arizona brings up another intriguing aspect of the programs and legislation concerning instream flow: namely that of public vs. private holding of instream flow rights. Only two states, Alaska and Arizona, legally allow (the former) or implicitly accept (the latter) both public and private parties to own such rights (Shupe, 1988).

The hesitancy to allow private parties to acquire instream flow rights stems partially from the belief that

these rights will affect the flexibility and transferability of other private water rights. The "no-injury rule" in western water law could conceivably prevent the transfer of a pre-existing water right if it impaired a newer instream flow right. Arizona, as described above, has allowed new appropriations of instream flow rights to go to TNC. As of this writing, Alaska had denied all permits requested by private parties, commonly because of insufficient documentation of the use and need of the instream flow (Shupe, 1988).

Given the public nature of the resource, some states view instream flow protection as a matter solely for government intervention and management. In Colorado, for instance, the Colorado Water Conservation Board is the only entity that can hold instream flow rights, although other government agencies and private groups can participate in the negotiating procedures to acquire and dedicate instream flow. Some states allow only state agencies to acquire and hold instream flow water rights, including Montana's State Fish, Wildlife & Parks Department and Utah's State Division of Wildlife Resources.

court rulings and federal laws

Court cases in several western states have facilitated instream flow protection. One such example involves the

public trust doctrine, which has the fundamental purpose of guaranteeing public access to navigable waters, thus excluding private ownership of such water sources. Various court rulings have expanded this law, with implications for instream flow. A 1983 California Supreme Court decision, National Audubon Society v. Superior Court of Alpine County, halted water diversion from Mono Lake and the Owens Valley by the City of Los Angeles, because of the threat such diversions pose to critical bird habitat and the scenic qualities of the area. Pursuant to this court ruling based on the doctrine, California water users may not undermine public values by allowing diversions that threaten the natural integrity of public resources such as water courses and wetlands (Western States Water Council, 1986).

Approaches to instream flow protection that are based on federal law include the efforts by Indian tribes to have their senior water rights, which were guaranteed in a 1908 Supreme Court Decision, Winters v. United States, recognized as valid if put to instream uses. This has been a major controversy in the Wind River Basin of Wyoming, where the Shoshone and Arapahoe tribes have dedicated a portion of their water rights to instream flows. The 1989 court decision Wyoming v. United States gave the tribes the legal right to put their "Winters" rights to instream flow uses.

Certain federal acts affect instream flow and wetlands preservation, and must be considered as water rights decisions are made on federal lands. The Endangered Species Act and Clean Water Act are two good examples of legislation that can influence proposed diversions of water, depending on potential impacts they may have on the habitat of endangered species and water quality.

marketing of instream flow rights

The emergence of water markets has also contributed to the protection of instream flow. Water markets have several distinct qualities which make them effective means for transferring water among competing uses: they have evolved under the notion that water has a value distinct from the land on which it is used, that transactions are voluntary and arise through the self-interest of the buyers and sellers, and that the resulting price for a water right is negotiated rather than being controlled by sources outside the market (Colby, 1990). A situation thus exists where interested parties can enter the market and bid for or sell water rights in an effort to realize economic gains.

The City of Boulder's Open Space Program recently purchased rights from an irrigator to augment flows in South Boulder Creek (Water Intelligence Monthly, Feb. 1991). Other examples include the leasing of water by the Upper Snake Water

Bank in Idaho from irrigators to protect valuable trumpeter swan habitat; and California's Department of Fish and Game and Grasslands Water District purchase of water rights to preserve fish and wildlife habitat in the San Joaquin River Basin (Water Market Update, volume 3, number 9, 1989).

While water markets exist in many areas of the West, a private market approach will not necessarily provide an efficient amount of streamflow. Instream flow is a collective good which benefits many different consumers. This makes it extremely difficult to organize a constituency of all the beneficiaries, and obtain contributions from them in order to bid for flow rights. Some will behave as free-riders and not financially support such a cause because they feel the streamflow will be provided whether they do so or not. In addition, parties interested in appropriating or purchasing flow rights are at a disadvantage because they do not have the same legal access to water rights that consumptive users do. Transactions costs for market purchases or exchanges involving flow rights are generally higher because they tend to produce more protests and procedural complexities than do transactions involving diversion rights (Colby, 1990). These factors affect the ability of the market to efficiently allocate water rights for instream flow uses.

Clearly, from the present discussion, there is no single and comprehensive plan that provides for instream flows in the

West. Instead there exists a broad array of state and federal laws and procedures that affect instream flow protection. Most have been legislated by the state governments to address the public's interest in recreational opportunities, fish and wildlife management, water quality, navigability, and other benefits related to flowing streams and riparian areas.

summary

The economic and legal framework of western water use provides the basis for examining instream flow, riparian areas, and the potential benefits they provide. It has explained why water left instream is a potentially valuable but controversial use of water, how western states have adapted to protect it, the kinds of benefits it is capable of producing, and why such benefits are often difficult to measure. The following section explores in depth the valuation techniques used in this study to quantify the benefits of the Hassayampa River Preserve.

CHAPTER 3.

THE VALUATION TECHNIQUES

Economists have confronted the issue of valuing non-market commodities like riparian areas using several different methods. One set of methodologies, including the Travel Cost Method and Hedonic Pricing, gathers economic data from actual market behavior, and then infers a value for the non-market resource using a "market proxy" for the good. This can be thought of as an indirect or inferential approach. In contrast, a direct approach formulates a hypothetical or contingent market which is used to elicit benefit information for the valuation exercise.

The Travel Cost Method (TCM) and Hedonic Pricing (HP) are two commonly applied methods that rely on actual market transactions to indirectly infer values for nonmarket goods. TCM accomplishes this by relating travel expenditures and travel time values to the economic benefits of recreation areas. HP entails disaggregating the overall price of a market good into various components or characteristics contributing to its value. Such components often include environmental amenities, and can be used, for example, to estimate the value of air or water quality as a function of housing prices.

The Contingent Valuation Method (CVM) is the major hypothetical or direct technique. It requires the creation of a hypothetical market for an environmental amenity -- a setting in which individuals reveal their values for the good being studied. The ability of this method to elicit accurate values for the environmental good hinges on a well-described, realistic, and non-threatening hypothetical market scenario. Alternatively, successful results from TCM and HP depend on the appropriate linking of actual market transactions to the value of the nonmarket good.

Evaluating the economic impacts that a natural area has on the local community presents another avenue for exploring the benefits of environmental amenities. Economists rely on various kinds of expenditure information and regional economic models to produce assessments of local economic impacts. This inquiry into the benefits of the Hassayampa River Preserve (HRP) utilizes and compares three different approaches: TCM, CVM, and local economic impact analysis. The next section explores the economic motives of individuals -- outdoor recreationists in particular, and the remainder of this chapter takes a more detailed look at each of these techniques through a review of the literature.

3.1.A Theoretical Model

Before exploring the depths of the various methodologies, some mention should be given to the general theoretical underpinnings that describe economic behavior. In this study, individuals are assumed to purchase and pursue outdoor recreational experiences in order to enhance their total utility or satisfaction. As Stoll (1983) has indicated, recreation should not be conceptualized as a homogeneous and unidimensional commodity. Rather, as he states: "Recreational activities are multifaceted experiences produced by households using market commodities, nonmarket amenities, and time (1983, p.121)."

This type of an activity is well represented by the household production model, which looks at a household as incorporating production technology to create a recreational experience (Becker, 1965). Such a model would appear as:

$$z_j = z_j(x_{j1}, \ldots\ldots\ldots, x_{jn}) \qquad [3.1]$$

where

z_j = quantity of the j^{th} activity produced

x_{jn} = the n^{th} input to the household's production process for the j^{th} activity

Recreational activities also have desired characteristics associated with them, which are consumed by a household. This

concept fits the model of the "new theory of demand" originated by Lancaster (1971), and can be shown as follows:

$$c_j = (c_{j1}, c_{j2}, \ldots\ldots\ldots, c_{jm}) \qquad [3.2]$$

where

c_j = the set of characteristics provided by the j^{th} activity or experience

c_{jm} = quantity of the m^{th} characteristic provided by the j^{th} activity or experience

The linkage between the production and consumption is represented by:

$$c_m = c_m(z_1, z_2, \ldots\ldots\ldots, z_j) \qquad [3.3]$$

and, finally a utility function can be formulated:

$$U = U(c_1, c_2, \ldots\ldots\ldots, c_m) \qquad [3.4]$$

where

c_m = total quantity of the m^{th} characteristic consumed

These relationships lay a framework for the economic behavior behind outdoor recreational activities, which do not represent normal commodities. Visitors to recreation sites like the HRP are assumed to be maximizing utility subject to budget and time constraints. Each individual's optimal consumption bundle of "characteristics" is dependent on their production of the experience and their resulting consumption of a certain set of characteristics.

3.2.The Travel Cost Method

The TCM is the most well-developed method for assessing the value of nonmarket goods, specifically recreation resources. In a 1947 letter to the National Park Service, Hotelling first proposed relating visitors' travel expenses to their willingness to pay (WTP) for recreational services. The principle behind this is that visitors think of their travel costs as entry fees to recreation areas. Clawson and Knetsch (1966) officially formulated the approach, applying its benefit measures to recreation resources, particularly resource-based areas such as national parks.

the zonal method

The traditional TCM model, following Clawson and Knetsch, is based on the zonal method. This approach constructs the various distance zones from which visitors come to a particular recreation site. The visitation rates for each zone are calculated with the expectation that the farther away the zone of origin, the greater the visitor's travel costs. By assessing a certain cost per mile and adding a value for travel time, zonal distances can be translated into travel costs. Visitation rates are then regressed on travel costs, income, and other socioeconomic variables that are in the form of zonal averages. Estimating the number of visits for higher

travel costs leads to a demand function for the site, which is much like a WTP function (Freeman, 1979).

The zonal approach requires assumptions about visitor and visit homogeneity within zones, constant unit costs of travel across zones, and linearity between the distance of zones from the site and travel time (Duffield, 1984). To improve on the accuracy of parameter estimations for travel cost models, another method has developed whereby travel costs and visitor frequency are taken from individual observations, rather than from zonal averages.

individual observation approach

Brown and Nawas (1973), and Gum and Martin (1975) described the procedure of collecting data from individual visitors to estimate demand functions for recreation sites. Some of the assumptions required by the zonal method can be avoided, and this individual observation approach has several other advantages. The individual effects of variables such as income, presence of substitute sites, and quality indexes can best be measured via this approach since using zonal averages results in severe aggregation and corresponding statistically inefficient estimators (Brown and Nawas, 1973).

Gum (1986) points out that a model for multiple recreation sites can be constructed by gathering data from a random sample of households instead of just from

recreationists. This more accurately estimates benefits when changes in recreation sites may attract new visitors who wouldn't be accounted for in the Clawson-Knetsch site specific model.

consumer surplus benefit measures

The travel cost WTP function measures consumer surplus, or a change in consumer surplus related to provision of the recreation site. Samuelson, in his work on welfare economics (1947), identified consumer surplus as the difference between the consumer's WTP for a certain good, and his or her actual expenditure for the good. This difference represents a benefit measure which has long served as the basis for measuring consumer welfare. An example of a TCM final stage demand curve and the area corresponding to consumer surplus is given in Figure 3.1.

With a change in price, the change in consumer surplus measure affords the economist a way to evaluate the change in the consumer's welfare (assuming that utility functions are an appropriate measure of welfare). However, as Just et al. (1982) demonstrate, consumer surplus measures are not necessarily unique, and require stringent assumptions about the constant marginal utility of income.

Hicks (1943) developed welfare measures which, by holding utility constant as price changes, are theoretically more

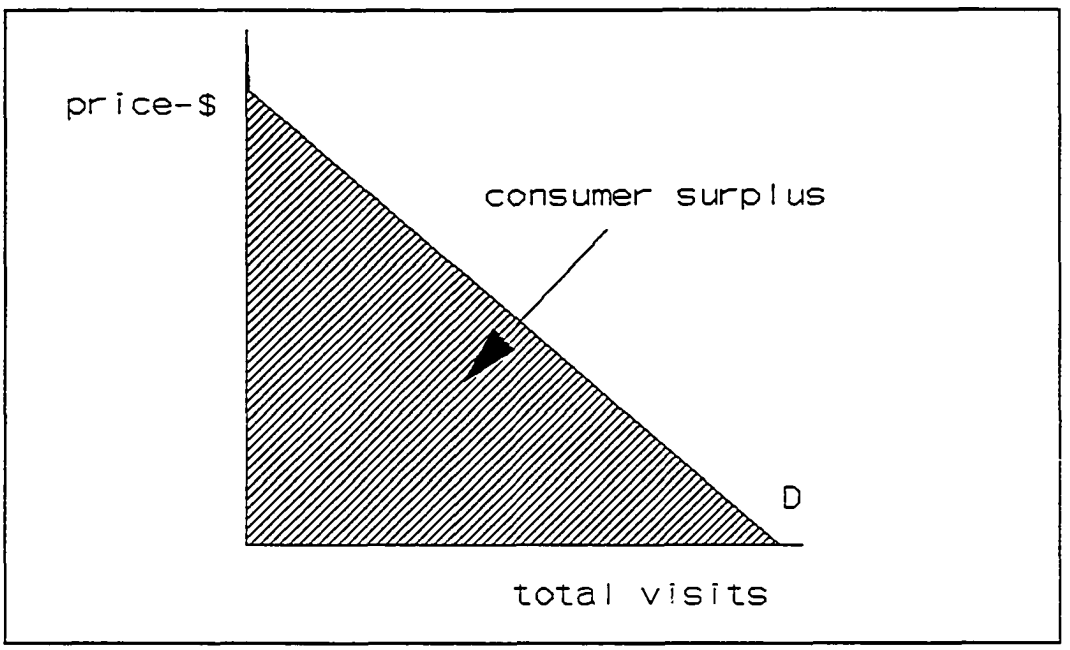


Figure 3.1
TCM Aggregate Demand Curve

attractive to economists than the simpler consumer surplus measures. These measures receive more attention later in the CVM section of the chapter. With consumer surplus, taken from the Marshallian demand curve, utility changes in response to the price change given a constant level of income. TCM, because of its focus on observed travel expenses in inferring willingness to pay, can only unearth these more easily estimated but less theoretically rigorous measures of change in well-being.

assumptions of TCM

Since its inception, TCM has been widely used, and applied in different ways to measure the benefits of environmental amenities. Although it appears regularly in the academic literature and in applied studies, it must be noted, that there are a number of theoretical and empirical problems with the method. For each study, certain assumptions must be made about how to treat time, multi-purpose trips, substitute sites and durable goods; all recognized stumbling blocks of TCM.

Determining the value to assign to travel and on-site time has been a problematic issue throughout TCM's development. Cesario (1976) incorporated the tradeoff between work and leisure time whereby he established the convention of valuing travel time at 25-50 percent of the wage rate. The fact that travel time is often enjoyed by visitors represents another factor that should be present in recreationists' utility functions.

Wilman (1980) included this element in a study by asking respondents the "value of time saved," thus accounting for visitors' perceived value of travel time. The two extreme possibilities for this situation are valuing travel time at the full wage rate or at zero. In terms of the result, demand elasticity will be overstated, and benefit estimates understated if the shadow price for travel time is lower than it should be.

McConnell (1975) and Smith et al. (1983) discuss the importance of on-site time valuation, since individuals also account for on-site time when making their decisions, and this component may be relevant to the opportunity cost of travel time. Ignoring on-site time costs may produce underestimates of the true elasticity of demand, and an overestimate of the benefits for the site (Freeman, 1979).

Multi-purpose trips and destinations pose difficulty in separating out the travel costs and time for the site of interest. If this is not done accurately, consumer surplus estimates may be greatly overstated. Presently, many studies relegate the task of apportioning expenses for the specific site to the respondent, and the validity of the results in following this procedure remains questionable (Duffield, 1984). For cases where most visitors have several destinations, Haspell and Johnson (1982) offer an approach which establishes an average distance between the alternative locations on the itinerary and the recreation site under investigation, thereby reducing the bias that this problem can induce.

According to economic theory, a fundamental factor affecting demand for a good is the availability of substitutes. Earlier TCM studies viewed the specific site as the only one to choose from, thus ignoring the presence of substitute recreation areas. In general, however, this is not

realistic and TCM analysis should identify appropriate substitute sites that play a role in the demand for recreation areas.

This undertaking may not be a trivial task, and the literature includes various opinions on how own and cross-elasticities should be implemented to avoid misspecification of the demand function. One such idea is put forth by Caulkins et al. (1985) state that the sign and degree of correlation between travel costs among differing sites is the relationship worth noting. A strong complementary relationship between the sites of interest would warrant the inclusion of alternative or substitute sites in the TCM model specification.

Another debatable issue has been whether and how to include capital goods expenditures among travel costs. Capital goods may be purchased for certain recreation activities, but can be used many times before they wear out. Some feel that a depreciation value for such goods should be added to the variable travel costs, while others acknowledge the difficulty in determining these values, proposing that such costs be left out.

Car depreciation poses the greatest question because some degree of wear and tear on the car results with any recreation trip. Most studies assign a value per mile to account for car depreciation. Misspecifications of certain elements

described here and the subsequent effects that they have on the demand function are presented in Figure 3.2.

It can be seen that the kinds of assumptions made about capital goods, time value, substitute sites, and multi-purpose trips can cause consumer surplus estimates for recreation sites to vary greatly. However, with continued research on these issues a consensus about which procedures are more acceptable may emerge.

travel cost studies for water-based recreation

A multitude of studies have implemented TCM to estimate the benefits of recreation sites. Because of the extent of the TCM literature and the focus of this study, this section reviews only studies that address the benefits of streamflow and the associated water-based recreation.

Ward (1987) used TCM to estimate whitewater boating and angling benefits on the Rio Chama River for the 1982 summer season. Anglers' and boaters' benefits increased as streamflow increased up to the point of diminishing returns to increased flow, and optimal flow levels for these uses were established. The value of the water instream was estimated to be $27 per acre foot, a result obtained from the consumer surplus estimates of several different demand functions corresponding to different streamflows. As Loomis (1987) noted, this value would compare to the marginal value of water

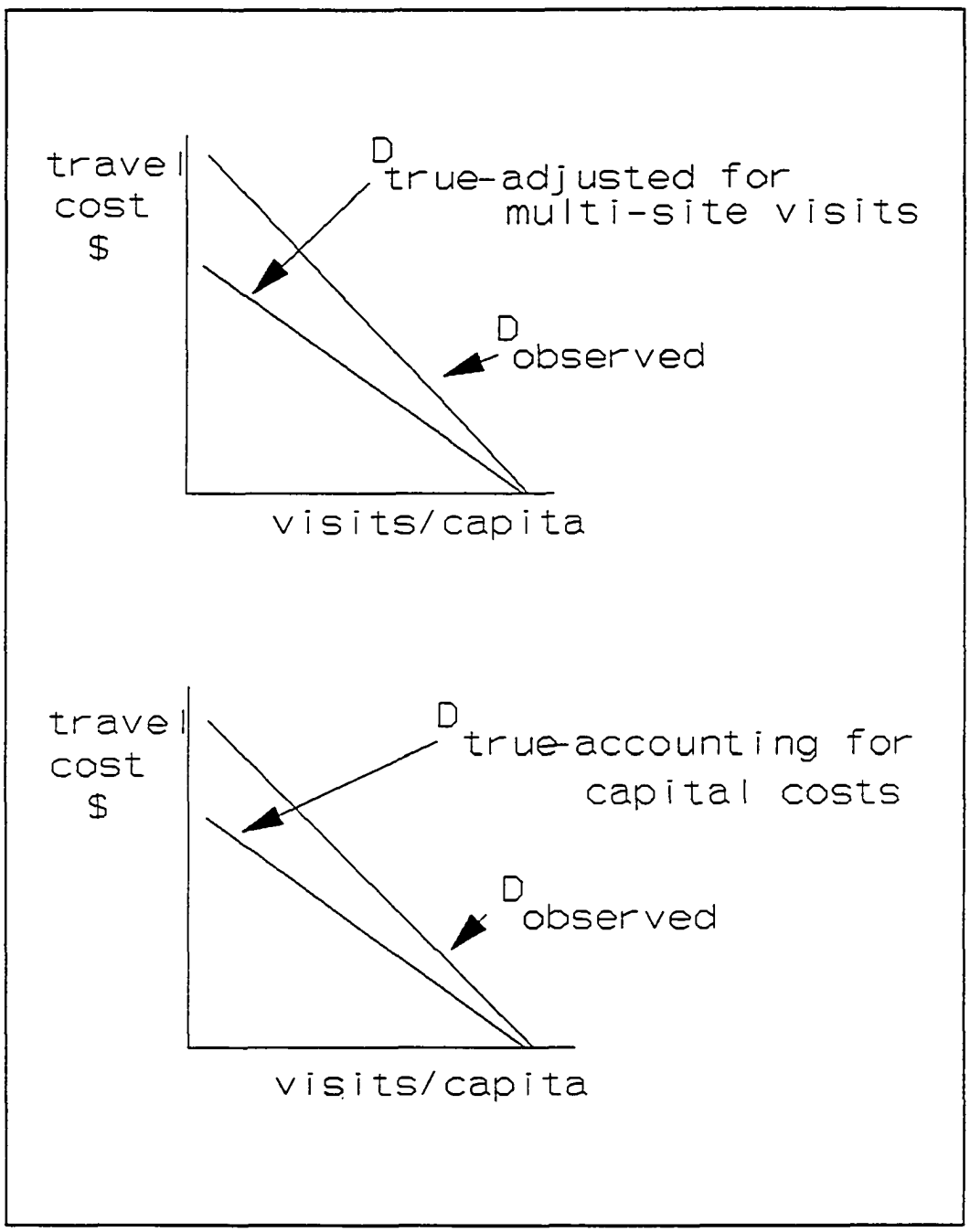


Figure 3.2
Examples of Misspecifications of TCM Demand Functions

in municipal or irrigation purposes, uses that divert water from the stream.

Loomis and Cooper (1990) recently completed a zonal TCM study looking at the economic benefits of instream flow specifically for anglers on California's Feather River. The authors' tried a new procedure: observing both changes in instream flow and recreation benefits using actual travel cost data. The availability of five years of data allowed them to do this. Empirical results were estimated for four incremental streamflow levels. Total annual consumer surplus was $108,465 with initial flow, $109,923 for a 20 cfs increase, $114,137 for a 100 cfs increase, and 117,605 for a 200 cfs increase.

These two studies take TCM consumer surplus estimates and relate them to changing streamflow levels, thus providing a measure of the economic value of water left instream. TCM studies have also examined river and stream recreation by measuring consumer surplus changes associated with varying degrees of water quality. Miller and Hay (1984) used the individual observation method to value freshwater fishing in several states. The demand specification included explanatory variables expressing boat ownership, and years fished -- in addition to the travel cost variable which set the opportunity cost of travel time at 1/3 of the predicted wage. The mean consumer surplus value per freshwater fishing daytrip varied

from $23 in Maine to $35 in Arizona. The authors noted that results were similar across states, and that the TCM demand specifications were quite stable from state to state.

3.3.Local Economic Impacts of Outdoor Recreation

This section describes methods of estimating one form of benefits of a recreation area, specifically the economic impacts of a recreation site to the local and/or regional economy. Just as foreign countries benefit from exporting goods and services via international trade, or industrial cities thrive on the economic inflows that their products generate, local economies with recreation sites can be thought of as "exporting" recreational opportunities and activities. The community of Wickenburg and the nearby Hassayampa River Preserve provides a good example.

While local economic effects do represent important measures of the value of a certain activity, care must be taken not to equate them with economic benefits. There are several reasons for this, the first being that focusing on economic inflows does not account for the various production and operating costs incurred by the specific industry or recreation area of interest. Therefore, the economic contributions to the community are not on a "net" basis.

Secondly, the issue of distribution of local economic

impacts arises. If a recreation site were created and attracted visitors to a certain community, the economic expenditures of these visitors would at least in part be shifting from other areas with recreational opportunities to this particular one. It is difficult to view these economic impacts as benefits -- rather they should be viewed as measures of economic activity which are distributed and redistributed among regions and among industries.

direct and indirect impacts

Economic inflows arise from visitor expenditures in the local community and are both direct and indirect in nature. Direct impacts represent the increased revenues that accrue to the gas stations, restaurants, hotels, gift shops, and other businesses from recreationists' expenditures. Indirect impacts, as described by Cordell et al. (1990) include the secondary purchases in intermediate sectors resulting from the initial expenditures. Induced effects are a part of these indirect impacts, and materialize when increased incomes within the community promote additional economic activity (Cordell et al., 1990). Figure 3.3 summarizes these local effects. A brief discussion of the most-frequently used approach for measuring recreational impacts follows.

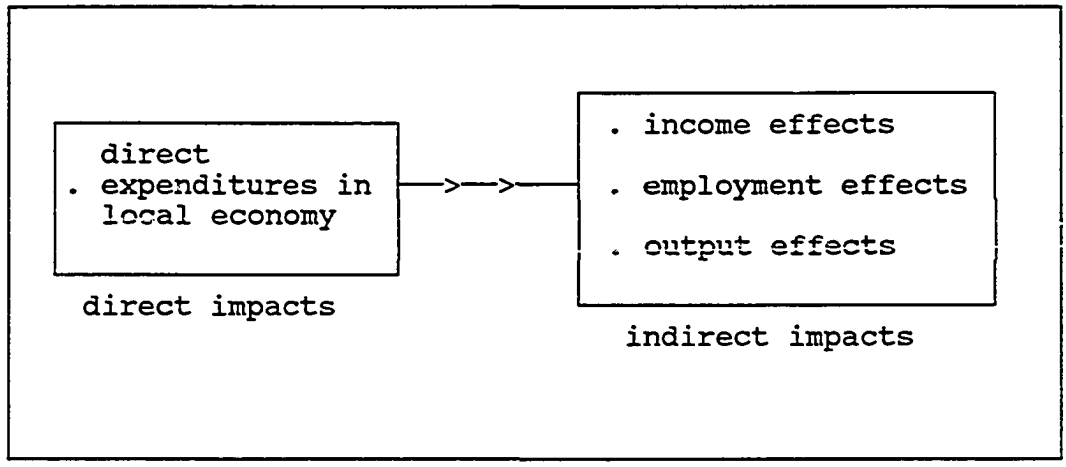


Figure 3.3
Direct and Indirect Local Economic Impacts

input-output models

The most elaborate and comprehensive studies of economic impacts of outdoor recreation are performed through the use of input-output (I-O) models. Such models begin by identifying the impact region itself, which for recreation is composed of several areas. The area within closest proximity to the recreation site is where a majority of the economic transactions occur, and is termed the support area. Extending out, other areas include the travel corridors through which the recreationists travel to the site, the locations of origin for recreationists or consumers, and finally the extended region which indicates the origin of capital (Stevens and Rose, 1985).

Supplementing this spatial view is a structural breakdown. I-O models take a detailed look at the economic sectors of the different areas, looking both at production and consumption patterns. This requires that extensive information be gathered from surveying all economic establishments in the area. This expensive and detailed approach seeks to obtain information about revenue sources, the functions of the establishments, and employee residential patterns (Gibson and Worden, 1981).

More often, however, due to financial and time constraints data is taken from secondary sources such as county, state, and national economic tables; information gleaned by agencies; and surveys like the National Travel Data Survey, The Survey of Fishing, Hunting, and Wildlife-Associated Recreation, and the Public Area Recreation Visitor Survey (Alward, 1986). A study which collects data for TCM can also provide helpful secondary data for regional benefit estimates.

Once data is collected, regional accounts for the inputs and outputs are set up, allowing for analysis of the various economic interactions. After the model has been constructed, it is possible to measure the direct impacts of outdoor recreation by summarizing the activity in those relevant economic sectors. By holding all other sectors constant, the overall impact on the economy caused by the changes in the

economic sectors of interest can be estimated. This procedure tallies up the indirect impacts.

multipliers

Multipliers obtained from detailed input-output models are needed to evaluate the indirect impacts of recreation. Stevens and Rose (1985) define a multiplier as the ratio of higher-order effects and direct effects. In other words, multiplying $1 of visitor spending by the appropriate multiplier gives the total direct and indirect benefits accruing to the community or specified region.

There are several kinds of multipliers ranging from comprehensive economic base multipliers to job multipliers (where dollars spent are related to new job creation). Multipliers for specific trade sectors can also be calculated. Because recreation expenditures cover many different economic sectors, it is more difficult to assess their total economic impacts than to do this for a manufacturing industry where, for example, changes in just one sector (i.e. demand disturbances) can be measured in relation to the others (Stevens and Rose, 1985).

river recreation studies

The literature on local economic impacts of riparian areas is somewhat limited, however there have been a few

published studies addressing the economic impacts of river recreation. Boyle and Bishop (1984) conducted a study on the Lower Wisconsin River, a prime canoeing area, and asked visitors about their expenditures for canoe rental, camping fees, sporting supplies, grocery/retail, gas, restaurants, and lodging.

The authors derived multipliers for the various sectors by averaging the necessary data from United States Forest Service I-O models for several counties. The two multipliers used were the business activity and income multipliers which describe the economic ramifications that an initial dollar spent has on total sales and on household income, respectively. Total purchases by recreationists during the summer of 1983 were estimated at $401,000. The "ripple effect" or total business activity from this initial figure was $860,000, $439,000 of which went to local households as increased income.

Cordell et al. (1990) looked at local economic impacts for three recreational river sites in the eastern United States by using the USFS I-O model IMPLAN. The results included three regional multipliers: total gross output, total income, and employment. These varied from 1.57 to 2.36, and the authors concluded that the three sites contribute substantial economic benefits to the regional economies.

It is clear that recreation has become a key contributor to economic growth in many communities, especially given the relative increases in income and available leisure time in the United States, and the decline of certain other industries (such as mining and logging) in some rural areas. Such activities are especially attractive since, in addition to enhancing local economies with business dollars, they usually do not deplete natural resources or seriously degrade natural amenities or environmental quality. The paucity of studies and articles on this subject suggests a definite need to focus more effort on regional and community economics and how it relates to outdoor recreation opportunities, wildlife habitat preservation, and the environment.

3.4.Contingent Valuation

CVM has become a popular method for valuing environmental amenities. It is a survey method that creates a hypothetical market scenario for which respondents are asked their WTP. It first appeared in the literature with Davis' (1964) hypothetical survey of recreation benefits in the Maine woods. It has since been researched and refined on many fronts, and in 1979 the Water Resources Council approved its use in valuing environmental quality changes for cost-benefit

analysis. The hypothetical element gives the approach its flexibility, but likewise many concerns have been voiced about bias and the influence it has on the accuracy of benefit estimates. The following subsections deal with the structural components of a CVM study, the form that benefit measures take, and the various kinds of bias that should be considered when using this method.

All CVM surveys have certain parts in common, which are needed to formulate and generate the desired result. Mitchell and Carson (1989) give an overview of the CVM method which breaks the survey down into three key components: a detailed description of the environmental good and the proposed change, the elicitation of the WTP bid, and respondent characteristics.

scenario presentation

The detailed description of the good and the changes that are proposed in the hypothetical scenario is the most basic and important step of a CVM study. The scenario must be plausible and well-described to prompt the respondent to undertake the same thought process that he or she would in a market setting when settling on a bid for the hypothetical change in the good's provision. Mitchell and Carson (1989, p. 120) sum this up succinctly: "the principle challenge facing the designer of a CVM study is to make the scenario

sufficiently understandable, plausible, and meaningful to respondents so that they can and will give valid and reliable values despite their lack of experience with one or more of the scenario's dimensions."

elicitation techniques

The next function of the survey is to elicit the respondent's WTP. It is here that CVM has blossomed as the researcher has several options to choose from. The approach that the first CVM surveys implemented was iterative bidding. It resembles an auction because the respondent is asked whether he or she would be willing to pay a certain amount for the change. Examples of starting amounts include randomly selected values, actual trip expenditures, current water bill amounts, or entry fees. Depending on the response to the initial amount, this number is revised either upward or downward following a predetermined pattern, until the maximum WTP is reached.

This process requires a monetary amount from which to start the bidding, and many feel this starting point can introduce bias by swaying the final responses. Boyle et al. (1985) concluded that starting point bias does exist in CVM studies primarily because the respondents' unfamiliarity with the nonmarket goods being valued causes them to treat the

starting value as a piece of market information upon which they can base their decision.

The presence of starting point bias as a function of the respondent's familiarity with the good is addressed by Silberman and Klock (1989). Measuring the recreation value of several beach sites was the subject of the study. The total sample was divided up, with one half answering iterative bidding questions about the beach the recreationist had in fact visited that day, and was thus assumed to be quite familiar with. The remaining beach visitors were asked such questions about a beach site they had never seen. Significant starting bias existed in both subsamples, indicating that it is a problem in CVM surveys that supersedes the degree to which the respondent is familiar with the commodity.

Asking one open-ended question, instead of using several to narrow down the response (like iterative bidding does), is the simplest elicitation procedure. In this case, the respondent is simply asked to state his or her WTP for the environmental amenity in the hypothetical scenario. This can prove extremely difficult for respondents, who must pull numbers out of the air. Loomis (1990) conducted a study comparing the reliability of the open-ended method to the widely favored approach of dichotomous choice. Loomis performed a "test-retest" procedure for a CVM study valuing the benefits of the preservation of Mono Lake. The results

from the two CVM elicitation methods were not significantly different, providing support for the conclusion that open-ended questions are reliable.

The payment card attempts to circumvent starting point bias and yet provide respondents with a variety of possible values. Mitchell and Carson (1989) developed the payment card, which shows a range of values that are incrementally spaced. The respondent then indicates which value corresponds (most closely) to his or her WTP. An interesting feature of most payment cards is the inclusion of benchmark values, or values of actual expenditures that provide a frame of reference for the respondent's decision. Benchmarks add some market flavor to the process because they resemble opportunity costs; however, they also may induce bias depending on how the respondent interprets their meaning.

Mitchell and Carson (1989) mention the need to avoid having goods directly related to the good being valued as benchmarks. The respondent may pay sole attention to these benchmarks when responding to valuation questions. In their study examining the benefits of water quality improvements, they included benchmarks in the form of average annual tax expenditures on public programs such as the space program, public education, roads and highways, and defense on their payment card.

A final way of eliciting responses is through the dichotomous choice or "take-it-or-leave-it" approach. In this case, the respondent is presented with a value, which she then accepts or rejects as her maximum WTP. Different questionnaires contain different amounts so the researcher can gather yes and no answers for these various values. A dichotomous choice with follow-up approach has also been developed, which adds a follow-up question with a randomly selected amount to the yes/no WTP question. The follow-up question's value depends on the response to the first question's offer.

This approach is much easier on the respondent, who must only decide whether to take or leave the offer, rather than pinpoint an exact value. Many market decisions involve this type of decision-making, which also makes dichotomous choice attractive. The one drawback is that because of its indirect form of attack (it doesn't elicit an actual value), a large sample size is needed to obtain enough responses to formulate a valuation function (often estimated with a logit model). A schematic of these various elicitation procedures is provided in Figure 3.4.

the payment vehicle

Once the elicitation technique has been established, the survey provides the respondent with a payment vehicle with

Response type:	Actual WTP response	Discrete indicator of WTP
Question type:		
1.Single question	-Open-ended/ Direct	-Dichotomous choice
2.Iterated series of questions	-Bidding game	-Dichotomous choice with follow-up

Figure 3.4
CVM Elicitation Techniques

which to actually make the bid. More commonly used payment vehicles are taxes, entry fees, utility bills, and donations to non-profit organizations. Anderson and Bishop (1987) point out that, like the hypothetical market scenario itself, these proposed means of payment should be realistic and neutral. Unfortunately, these two qualities often do not coincide and the researcher must pay careful attention to avoid using a form of payment that could itself strongly influence the outcome. Behavioral tendencies by respondents may introduce such payment vehicle bias, especially through aversions to certain payment vehicles such as taxes or increased entrance fees.

Greenley et al. (1982) tested for vehicle bias by comparing sales tax and residential sewer bill increases in their study of water quality and recreation on Colorado's

South Platte River. Hunting license fees and utility bills provided the bidding vehicles in a wildlife valuation study by Brookshire et al. (1980). The results indicated a significant number of protest bids and negative respondent comments when utility bills were used.

With any of these elicitation techniques, there is the possibility that an extremely high or low (zero) value is given in protest. Distinguishing such responses is very important, thus a follow-up question should specifically ask the reason for such a response. The most common protest response is zero. While some respondents may sincerely be willing to pay nothing for the amenity being valued, others answer this way because something precludes them from answering accurately.

respondent characteristics

A final group of CVM questions pertain to the respondent's background. Such questions most often address demographics, preferences for the environmental amenity in question, and the respondents' use patterns for the amenity. This information, which is also commonly collected for TCM studies, helps more closely define the valuation function, and allows the researcher to check the consistency of the values according to some of these background variables.

bias

In the preceding description of the components of a CVM survey, allusions were made to different types of biases that may exist with certain CVM survey designs. Mitchell and Carson (1989) place these systematic biases into the broader category of measurement bias. Another example of this sort is misspecification bias, which occurs when the respondent does not correctly perceive the environmental amenity and/or scenario change that he or she is being asked to value (Mitchell and Carson, 1989, p.246). Measurement bias can significantly influence CVM results by leading respondents to misrepresent their WTP, and researchers should design surveys to avoid or minimize this occurrence.

Other biases often identified with CVM in the literature include strategic bias and hypothetical bias. Strategic bias is a manifestation of strategic behavior, and can be related directly to the respondent's perceived payment obligation. According to this phenomenon, if the respondent feels that his or her answer will be linked to future payments for the good that is being evaluated, the response will understate the respondent's actual WTP. This is the classic example of free-rider behavior which occurs with the provision of public goods. Conversely, if the respondent believes that his or her response has no bearing on future payments for the

environmental amenity, the WTP will very likely be an overstatement.

Randall et al. (1983) conclude that strategic bids can be avoided when the scenario clearly emphasizes the hypothetical nature of the question, and is presented in a non-threatening manner. Bohm (1972) conducted experiments to test for strategic bias, and failed to find its presence in CVM response values.

While strategic bias addresses whether the respondent will respond honestly, hypothetical bias is concerned with whether respondents can answer meaningfully. Since respondents don't normally place values on public goods and environmental amenities in a market setting, and given the hypothetical nature of the questions, arriving at a meaningful value is no easy task. In the literature, hypothetical bias is often cited as CVM's "Achilles Heel," as the saying goes: "ask a hypothetical question, get a hypothetical answer (Scott, 1965, p.37)."

Mitchell and Carson describe this as a reliability problem rather than bias. In their view, CVM's hypothetical element does not bias responses in any certain way (1989, p.233). A goose hunting study done by Bishop and Heberlein (1979), which is discussed in more detail later in the chapter, provides convincing evidence that hypothetical bias does affect CVM results. Among other things, they compare WTP

and willingness to accept payment (WTAP) responses for hunting permits to the result obtained via a market simulation technique. The latter actually reimbursed hunters for the amount they chose in exchange for their permits. It creates a proxy for a "true" market value, and differed significantly from the CVM measures.

welfare measures

As has already been shown TCM studies generate estimates of consumer surplus, which have been widely accepted from a practical standpoint. CVM's direct WTP/WTAP measures are intended to represent the changes in income needed to maintain the respondent's same level of utility, or compensating and equivalent variation. Following Just et al. (1982, p.85), the following definitions apply:

> compensating variation: the amount of income which must be taken away from a consumer (possibly negative) after a price and/or income change to restore the consumer's original welfare level.
>
> equivalent variation: the amount of income that must be given to a consumer (again possibly negative) in lieu of price and income changes to leave the consumer as well off as with the change.

The ability to estimate these Hicksian welfare measures makes CVM a theoretically attractive approach.

willingness to pay vs. willingness to accept payment

Thus far, CVM has been offered as a means to elicit WTP values. However, asking about WTAP is an alternative approach, and a clear distinction should be made between the two. The property rights arrangement within the scenario dictates whether the respondent is asked his or her WTP or WTAP. For a favorable change where the respondent has the initial property right, say the right to an instream flow, the value of interest is the WTP which represents compensating variation. This is usually easier to measure because people are comfortable with the way things are now. Alternatively, if the scenario is set up such that the respondent does not have the right to the current provision of streamflow, the appropriate measure is the WTAP which represents equivalent variation. It is more difficult to elicit the respondent's WTAP in lieu of a favorable change.

Referring once again to conventional welfare theory, one would expect these two to give similar results if income effects are small. In fact, some economists, including Freeman (1979) have argued that the difference between the two measures is trivial. This potentially trivial difference would manifest itself such that the minimum WTAP by the consumer of a good would be greater than his or her maximum WTP to avoid the proposed change ---- thus clarifying which measure represents the upper and lower bound of consumer

surplus (Figure 3.5). But the question is, are the differences in fact trivial?

The results of many studies have indicated a large divergence between WTP and WTAP measures, which has cast an uneasy shadow over CVM and the reliability of some of its measures. Because WTP scenarios seem to be more familiar to respondents than those involving compensation, WTP measures have dominated CVM studies. In Bishop and Heberlein's goose hunting study (1979), WTP and WTAP values tended to behave as lower and upper bounds respectively around the simulated market value. The Water Resources Council (1983) has established guidelines requiring that WTP measures be used in cost-benefit analyses of water projects. Rather than criticizing CVM's reliability, Gregory (1986) has argued that differences can be attributed to certain factors outside of welfare theory, including the endowment effect and prospect theory. He also considers respondents' perceptions and behavior as influential factors.

Brookshire et al. (1980) organized their study on elk hunting to compare WTP and WTAP measures and conclude that WTP to obtain a preferred level of the good represents the most effective approach. A clear correspondence is assumed to exist between the respondent's initial welfare level and his or her reference welfare level -- whereas the idea of compensation payments is not normally a familiar one to

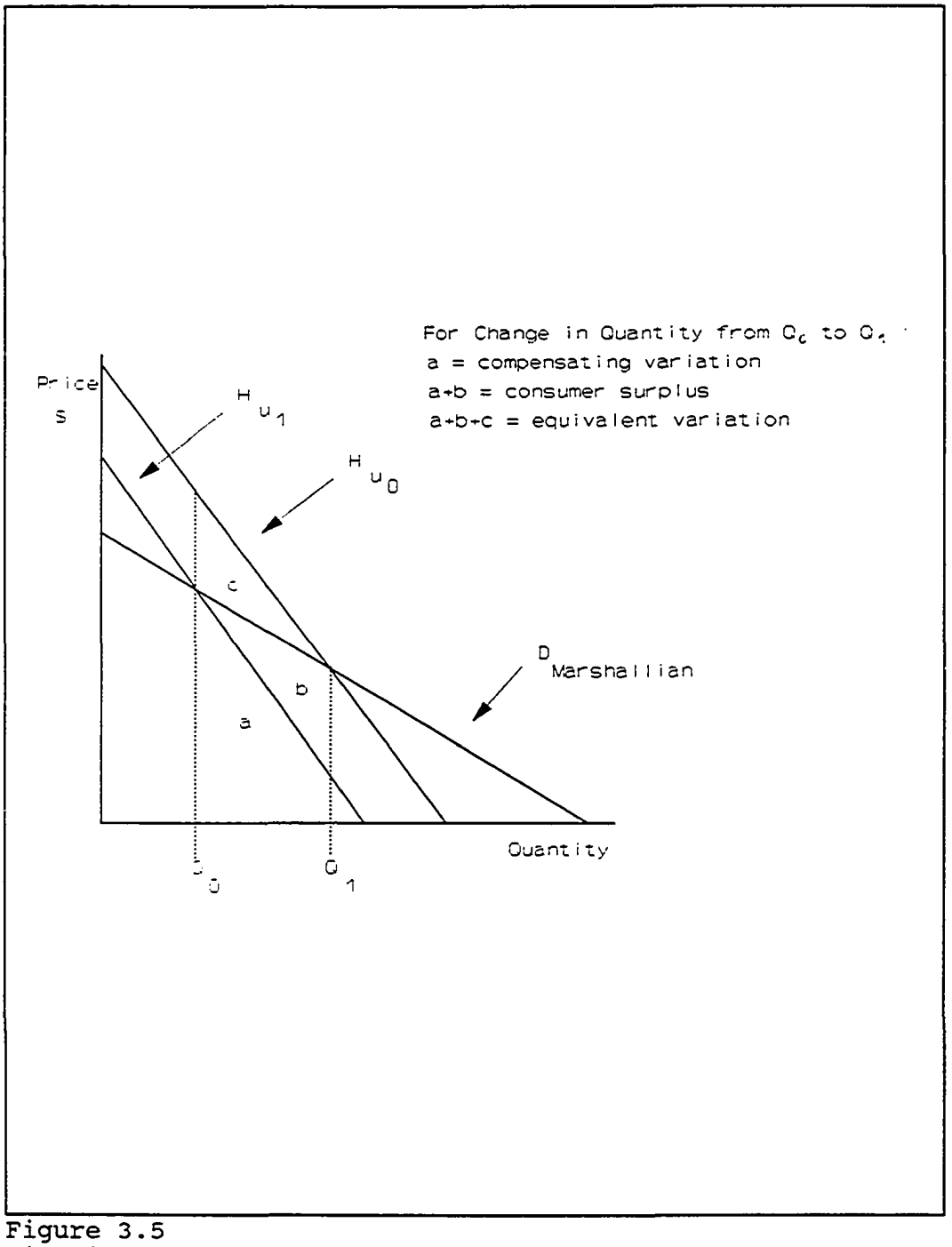


Figure 3.5
Hicksian and Consumer Surplus Welfare Measures

respondents, and as the authors showed is an unreliable strategy.

Knetsch (1990) believes that the preoccupation of applied studies with WTP measures has caused understatement of economic losses, and implies that many policies and projects have been selected without fully accounting for environmental impacts. Because of the asymmetry that exists between payment and compensation measures, the assignment of property rights does appear to matter, something that researchers must appraise in their CVM analyses.

CVM instream flow studies

As with TCM, numerous studies have been done using CVM to look at the economic benefits of wetlands, riparian areas, and instream flow. Daubert and Young (1981) undertook a study on northern Colorado's Cache la Poudre River where color photographs of various levels of streamflow were displayed to establish hypothetical scenarios. The respondents were asked to give their WTP in the form of increased county sales tax or entrance fees.

Fishing, white-water boating, and shoreline activities were the uses that the study evaluated, and the analysis produced flow values and marginal benefit functions for each. The authors demonstrate the clear relationship between flow and benefits. For fishing activities, individual WTP per day

increased from $11.67 for 100 cfs of water to a peak of $30.35 for 500 cfs after which point the total values decreased. The shoreline activity maximum WTP of $10 occurred at 700 cfs, while rafting values increased throughout the entire range of flow amounts.

A CVM study on nine western Colorado rivers was done by Walsh et al. (1980). Fishing, kayaking, and rafting comprised the uses for which benefits were estimated. Increased benefits were once again a function of flow, with WTP questions asked for the stream channels at 20, 40, 60 and 80% of their full capacity. The authors integrated congestion effects into the WTP values, noting that WTP also was a function of flow because increased flow allowed for more dispersed recreation (less congestion). At 35% of bankful, marginal values of instream flow for the three activities together reached a high of $19.04 per-acre-foot on the Crystal River.

Sanders et al. (1990) engaged CVM in a study to estimate the total value of eleven rivers in Colorado's Rocky Mountains. Expectedly, household WTP for increments in river protection increased as the number of rivers to be included in the hypothetical scenario was increased. Recreational use values, one component of the WTP response, ranged from $7.54 for the protection of three rivers (the Poudre, White, and Colorado) to $19.16 for all eleven.

In addition to recreation use values, preservation or non-user values were sought -- values which, as will be seen in the next section, can only be estimated with CVM. The payment vehicle was a hypothetical river protection fund which respondents used to answer WTP questions about the study rivers most important to them. The preservation values exceeded recreation values by over three times in the final analysis, as they went from $32.26 for three rivers to $81.96 for the eleven. The authors stress that inclusion of preservation values in such studies may lead to the economically efficient decision to prevent irreversible developments on rivers.

Bishop et al. (1989) conducted an economic evaluation of the effect of the operations of Glen Canyon Dam on recreational activities in the Grand Canyon. A CVM survey focused on the amount as well as the stability of the flow of the Colorado River in the canyon. Anglers and white-water boaters were surveyed using the dichotomous choice format about their WTP in trip expenses given specified flow conditions (scenarios described constant flow and fluctuating flow) in the canyon.

The authors concluded that dam operations have a significant effect on the benefits realized by these two user groups. For example, the value of boating trips rose as flow increased, and the average maximum consumer surplus for both

private and commercial boaters was $800 per trip at approximately 31,000 cfs of flow. This represents a dramatic increase in consumer surplus from the low of $20 per trip at 5000 cfs, and signifies the lost benefits that occur when dam operations cause great fluctuations in river flow.

3.5.Comparing TCM and CVM Results

As nonmarket valuation becomes increasingly pertinent in today's resource allocation decisions, the more viable tools available for this purpose the better. Thus, it is natural that the indirect, actual market behavior techniques like TCM have been used to monitor the consistency and accuracy of CVM results. Davis and Knetsch (1965) did just this by comparing the hypothetical study on recreation benefits in Maine with TCM results. The zonal TCM benefit estimate was $70,000 while CVM yielded $72,000, giving an optimistic perspective on consistency between the different approaches.

There are reasons to expect certain divergences between TCM and CVM outcomes; however, comparing them has also raised questions about each methods's reliability in measuring benefits. The remainder of this chapter describes the relationship between the results of the two methods, according to the literature and several comparative studies that have been done.

theoretical expectations

Theory leads us to anticipate some difference between TCM's consumer surplus estimates, and CVM's welfare estimates. Given relatively small income elasticities and budget shares, consumer surplus and Hicksian measures should be relatively close together (Just et al., 1982). For recreational activities, one would expect this to often be the case. Willig (1976) comments that this supposed proximity makes consumer surplus a perfectly fine measure of welfare change, a conclusion with which many economists disagree, since changes in consumer surplus ignore changes in purchasing power.

Willig, in addition to claiming that the difference existing between compensating variation (CV) or equivalent variation (EV) measures and those of consumer surplus is generally trivial, devised a formula that calculates the two boundary welfare measures directly from the consumer surplus value. If income elasticities and budget shares for the environmental amenities in question are small, the following formulas can be used:

$$EV = \Delta CS + N/2M\ (\Delta CS)^2 \quad \text{and} \quad [3.5]$$

$$CV = \Delta CS - N/2M\ (\Delta CS)^2 \quad [3.6]$$

where

EV = equivalent variation approximation

CV = compensating variation approximation

ΔCS = change in consumer surplus

N = income elasticity

M = consumer's income

The above two equations were adapted from Willig by Just et al. (1982, pp.99-100). They appear to address gaps that might exist between TCM and CVM benefit measures, and shed some light on expected differences between WTP and WTAP measures. However, Bockstael and McConnell (1980) cast doubt on the use of ΔCS as a proxy for WTP or WTAP by noting that in many cases with natural resources, the change entails either the removal or introduction of the good, rather than an incremental increase or decrease. The result is a dramatic price change, a situation not consistent with Willig's approximation formulas.

Riparian areas most certainly can exhibit this tendency, as Arizona has demonstrated with the complete drying up of once perennial streams and the destruction of streamside vegetation by uncontrolled livestock grazing. Some cases involving environmental amenities require "all or nothing" decisions with the difference in net benefits between having and not having the amenity being the measure of interest.

user vs. nonuser values

A few comments have already been made about CVM's flexibility which allows it to assess nonuser values as well as user values. Herein lies another possible explanation for differences between TCM and CVM results. Individuals or consumers who haven't visited a particular outdoor recreation area may have certain "nonuser" values for the resource, values that should be estimated. TCM is unable to track these values because it is restricted to inferring travel costs from actual visitors in its estimation of the demand function. CVM is not hindered in this way, because a properly designed CVM survey can be administered to consumers away from the environmental amenity of interest as long as the respondent understands the good and its hypothetical scenario (e.g. different levels of streamflow). Actual visitors may also have "use" values for the resource, thus their response will be made up of both user and nonuser values.

These intangible values enhance a consumer's utility from a resource for reasons other than personal use, and have generally been divided into three categories: existence value, bequest value, and option value. Existence value and bequest value were first suggested by Krutilla (1967) and delineate values that individuals might hold in knowing that a certain natural environment exists in its preserved state, or that such a resource could be endowed to future generations for their use and enjoyment, respectively. Weisbrod (1964)

formulated the concept of option value, which represents a kind of insurance premium that reserves the possibility of visiting a recreational site sometime in the future. A schematic of what is included in the "total value" of an environmental amenity is given in Figure 3.6

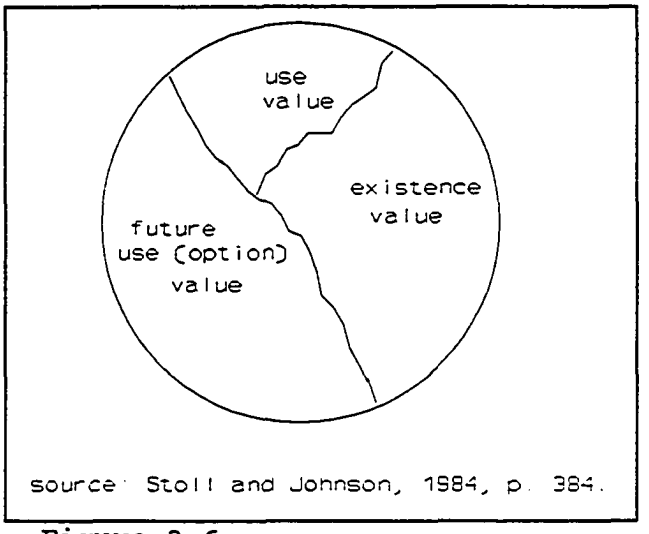


Figure 3.6
Total Value Paradigm

As Duffield (1984) explains in his comparative study, the inclusion of such nonuser values in CVM studies produces potentially large divergences between CVM and TCM results. Mitchell and Carson (1989) categorize them a little differently, recognizing vicarious consumption benefits and stewardship benefits. These encompass existence and bequest values, and are classified by the authors as essential components, together with use benefits, of the total benefits an environmental amenity may offer. Given this added dimension that CVM can take in evaluating benefits, one would presume CVM results to be higher than the solely direct use estimates of TCM. Thinking of TCM as representing a minimum

benefit measure is another way this relationship is often posited.

comparative studies

Keeping these thoughts on welfare theory and different kinds of values in mind, it is interesting to examine studies which compare the two methods. They make some important connections between TCM and CVM and raise some challenging questions about their abilities to value nonmarket goods.

Bishop and Heberlein (1979), in their well known Wisconsin goose hunting permit study, produced some very interesting benefit measures that, in addition to comparing CVM with TCM, also probed for the presence of bias in each of these method's results by comparing them to a simulated market value. Three kinds of surveys were sent to a sample of Wisconsin goose hunters who had permits.

The first type contained an actual cash offer for the hunter's permit, thus generating a simulated market result, which Bishop and Heberlein used as the most accurate benefit estimate, since actual tradeoffs were made between cash and a hunting permit. However, it is important to keep in mind that this measured WTAP. Another survey asked about travel cost information, following the TCM approach. A third asked hunters about their WTP or WTAP for their permit. The results are summarized in Table 3.1.

The simulated market or actual cash offer approach yielded $63 per permit, to which other WTAP measures can be compared. The average WTAP from the CVM part of the study was $101. The average WTP measure for a goose permit was $21. TCM estimates were $11 per permit with time value equal to 0, $28 for a time value at 1/4 the median wage rate, and $45 with time valued at 1/2 the median wage rate. These three TCM estimates point to the pronounced effect that time value assumptions can have on consumer surplus measures.

The authors referred to the actual cash offer of $63 as a benchmark, and argued that on theoretical grounds the WTP and WTAP measures should be similar. While the average WTP can be thought of as a lower bound and WTAP as an upper bound, there is a large difference between them. One explanation for this is the "all-or-nothing" nature of the hypothetical scenarios, which involve either the gaining or loss of a goose hunting permit rather than incremental changes. Bishop and Heberlein conclude by noting that both WTP and WTAP are biased -- but in opposite directions. They also comment on the troublesome aspect of time value in TCM studies.

Environmental benefit estimates concentrating on changes in water quality were compared and contrasted by Desvousges et al. (1983). An extensive study was done involving sites along the Monongahela, as well as Army Corps of Engineer sites. The authors examined benefit estimates for direct (CVM) and

Table 3.1
Summary of Comparative Study Results

Bishop and Heberlein Goose Hunting Study

valuation technique	net benefit per permit	theoretical basis
TCM:		
time value=0	$11	Δ CS
time value=1/4 median wage	$28	
time value=1/2 median wage	$45	
CVM:		
willingness to pay	$21	WTP
willingness to sell	$101	WTAP
Actual Cash Offer:	$63	WTAP

source: Bishop and Heberlein (1979),p.929.

Desvousges, Smith and McGivney Water Quality Study

valuation technique	user value
Water Quality Improvement: Δ = Boatable to Swimmable	
generalized TCM:	$14.71
CVM: (all represent WTP)	
open ended format	$31.18
payment card	$51.18
iterative bidding ($25)	$10.53
iterative bidding ($125)	$48.75

source: Cummings, et al. (1986), p.77.

indirect (TCM) valuation techniques given loss of the water-based recreation area from water pollution, change in water quality from "boatable" to "fishable," and change from "boatable" to "swimmable." The TCM model and various CVM strategies including open-ended, payment card, and iterative

bidding question formats provided the basis for comparative analysis.

Results from regressions indicated the change in water quality from "boatable" to "swimmable" produced CVM values significantly higher than the generalized TCM result. The mean benefit estimates for users ranged from $10.53 per household per year to $48.75, depending on the CVM strategy (see Table 3.1), while the TCM consumer surplus estimate was $14.71. Similar large discrepancies held for the other incremental levels of water quality. In the water quality loss case, the authors found that CVM measures were much less (average household values ranged from $6.58 to $36.25) than the TCM result of $82.65 -- a relationship opposite to that found in the water quality improvement cases. This raises concern about ambiguity among CVM and TCM results.

Cummings et al. (1986), who reviewed the Desvousges et al. study, note the authors' "curious" argument that these differences between the CVM and TCM results were not substantial. The authors also concluded that in the case of loss of water quality, CVM and TCM measures basically were consistent with one another.

Recreation benefits at Kootenai Falls in Montana provided the backdrop for a comparative study done by Duffield (1984). Both CVM and TCM surveys were undertaken at the site, with the CVM hypothetical scenario proposing the loss of the site as a

recreation area. Again, just as in the previously described studies, different measures within each technique were taken. Duffield separated the TCM sample into main-destination and multiple-destination subgroups, and included both log-linear and semilog estimates. The CVM surveys included two different payment vehicles, as well as a WTAP segment.

Interestingly enough, the theoretical relationship where WTAP > CS > WTP is not fully realized in this study. Only when the entrance fee WTP measure is taken, does it hold true. The author, however, makes note that nonuser or indirect values might explain why WTP estimates for the utility bill payment vehicle exceeds the TCM results. He also introduces the issue of interpreting the responses on an individual vs. group basis. While most studies try to break down values by individual, this is not always easy, and the household unit must be taken instead. In this study, the monthly utility bill payment vehicle could cause the respondent to think at the level of the household rather than as an individual, which would cause an increase in the benefit measures.

conclusion

From a comparative viewpoint, an important thing to remember about CVM is the flexibility it offers. This flexibility comes into play in the survey itself, which can be creatively tailored to evaluate interesting scenarios dealing

with environmental amenities such as changes in the quality of air, scenic vistas, wildlife sightings, or changes in the availability of a particular amenity. For example, one of the first comprehensive CVM studies, done by Randall et al. (1974), assessed the value of hypothetical changes in air quality in the West's Four Corners area. TCM's dependence on actual visitor behavior would require gathering the travel cost data from visitors to the site for each of the different air quality conditions, which means waiting until the environmental amenity deteriorates. Obtaining economic information on the amenity before potentially irreversible damage occurs, which CVM is capable of doing, is much preferable.

Searching for consistency between TCM and CVM benefit estimates is, as the cited studies have shown, an interesting and sometimes futile pursuit. The expected connections between consumer surplus and Hicksian welfare measures don't always materialize, and the validity of both TCM and CVM has been questioned through these kinds of studies. However, as in the Bishop and Heberlein, Desvousges et al., and Duffield studies, certain outcomes do make sense, and the question then becomes one of which of the two methods gives the most comprehensive and accurate assessment of benefits.

Testing TCM and CVM results against each other is an eye-opening experience. It helps resource economists gain a

better picture of nonmarket good valuation and welfare economics in general, and helps further refine each of the techniques and clarify their relationships to one another. By comparing TCM and CVM in the evaluation of the "nonconsumptive" benefits of a riparian area, this study provides a different perspective and additional information with which to take on the challenging and important task of mastering nonmarket good valuation.

CHAPTER 4.

THE STUDY SITE AND THE SURVEY

4.1.Overview

The twc previous chapters have provided the context within which this particular study falls, and a literature review of the techniques available for measuring the benefits of a resource like the Hassayampa River Preserve (HRP). What follow are descriptions of the study site and of the survey instrument, which generated the bulk of the data.

the Hassayampa River Preserve

Located 4 miles southeast of Wickenburg and approximately 50 miles northwest of Phoenix (Figure 4.1), the HRP is a 340 acre parcel of land that encompasses a five-mile stretch along the Hassayampa River. It was purchased by The Nature Conservancy (TNC) in 1987 and opened for visitor use in 1988. TNC's sole mission is to preserve areas containing habitat critical to the survival of threatened plant and animal species. The HRP's goal is to safeguard one of the few remaining extensive willow-cottonwood forests and mesquite bosques in Arizona. This habitat supports such rare and threatened species as the Gilbert Arizona Skink (Eumeces

g i l b e r t i arizonensis), the Lowland Leopard F r o g (R a n a yavapaiensis), and the Zone-tailed H a w k (B u t e o albonotatus). A s shown in Figure 4.2, there are two designated trails within the Preserve to which visitors are restricted.

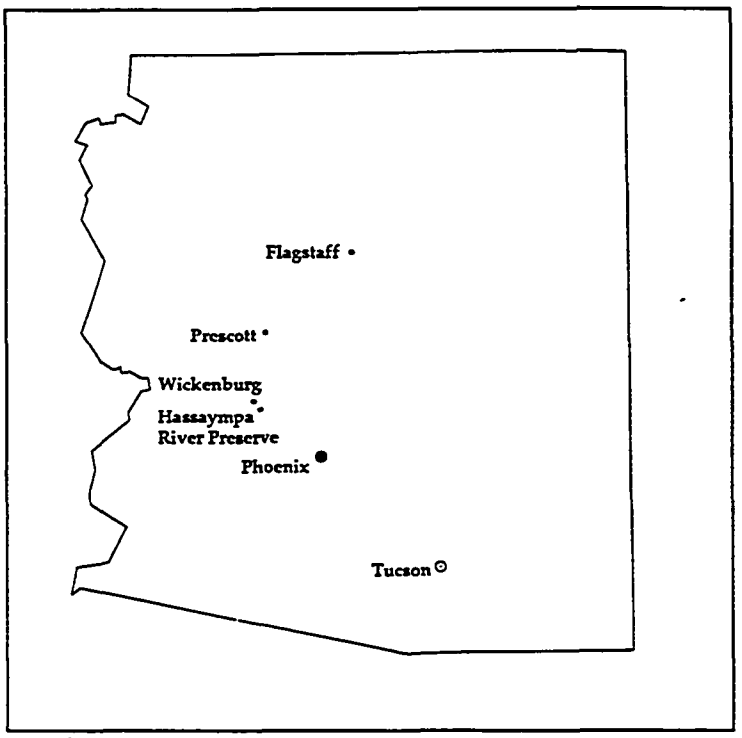


Figure 4.1
Location of the HRP

The River Trail goes along a stretch of the river, providing excellent opportunities to observe birds and wildlife within the lush streamside environment of Fremont Cottonwood, Goodings Willow, and Screwbean, Honey, and Velvet Mesquite groves. The Palm Lake Trail takes a loop around Palm Lake, a manmade pond which has become a haven for waterfowl, herons, and other marsh birds. Palm Lake is a crucial site for TNC's endangered fish recovery project, which is attempting to enhance and reintroduce populations of the native Gila Topminnow (Poeciliopsis occidentalis) and Desert Pupfish (Cyprinodon macularius).

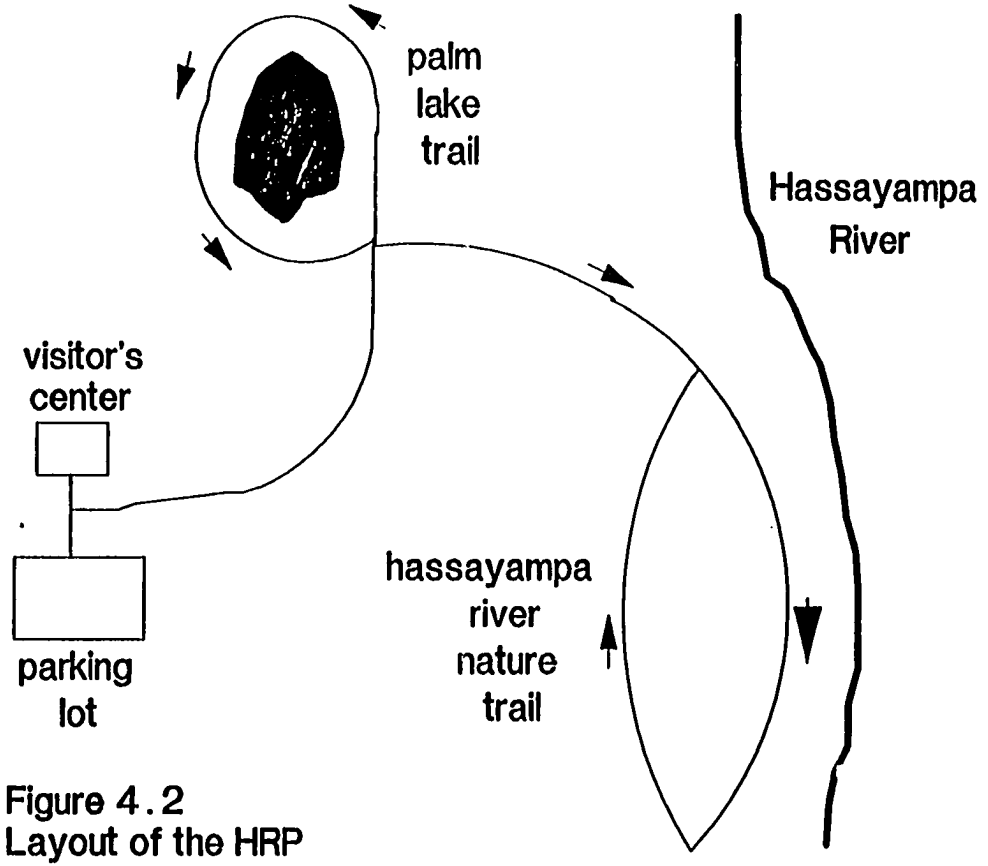


Figure 4.2
Layout of the HRP

evolution of the survey

The choice of the survey technique was the first major consideration of the study, since it dictated how the questions would be designed and presented. The Preserve's layout played a large role in the choice to use an on-site person-to-person survey rather than some form of mail or telephone questionnaire. As noted in Chapter 3, this approach has its own advantages and disadvantages. The prospect of obtaining complete questionnaires and having direct interaction with the respondents were seen as desirable aspects of this approach. Most importantly, the person-to-person survey was within a reasonable travel distance for university researchers, and TNC was willing to accommodate the surveying of its visitors.

Once the form of administering the survey instrument had been identified, the questionnaire went through many transformations before becoming finalized. During this process the question order, framing of the CVM (Contingent Valuation Method) questions, detail of the TCM (Travel Cost Method) section, and overall length were experimented with. The survey began as a written collection of questions on printed forms upon which interviewers recorded answers. Eventually, a computer version was created allowing most answers to be inputed directly into a portable laptop computer.

Two pretests of the questionnaire provided helpful guidance in ironing out format problems and in refining the questions. The first pretest took place in November 1989 and used the printed form version of the survey. The fundamental structure of the survey and a majority of the questions were already established on this questionnaire. The second pretest was done in February 1990 using laptop computers to prompt interviewers and enter responses. After interviewing several visitors, it was clear that some adjustments still needed to be made to assure proper branching of the more complex sets of questions, to provide useful prompts to the interviewer before certain questions, and to make the survey as streamlined as possible. Several University of Arizona researchers were involved in this development phase of the survey, and outside professionals were asked to critique and comment on the successive improvements in the questionnaire.

conducting the survey

All visitors are instructed by signs at the entry to the HRP to stop at the visitor center before going on the trails. This made it possible to keep track of visitors who were entering and exiting. The spacious visitor center and the availability of outdoor locations provided comfortable, unobtrusive places to administer the survey. Many of the surveys were administered in the visitor center, at one end of

the building away from disturbances. Some interviews were conducted outside using benches located in shady areas near the beginning of the Preserve's trails.

Individuals were randomly selected to participate in the survey. Every party possible was approached by interviewers, with no criteria to eliminate potential respondents a priori. Visitors often came back into the visitor center after their walk to browse in the bookstore, use the restroom, get a drink of water, and sit down for a rest. This is when the interviewers usually introduced themselves, and asked the visitor to participate in the survey. Interviewers also approached visitors outside as they completed their walks through the Preserve, or asked visitors when they first arrived if they wouldn't mind stopping back to complete the survey after their walk through the Preserve.

Sample size and random selection is an important issue for any survey study. Given the person-to-person survey technique there were limits on how many surveys could be administered in a day. Since each survey at the HRP took a minimum of twenty minutes and visitors tended to complete walks in clusters, some parties were not approached with a request to participate. There usually were two interviewers available and when both were busy with respondents, other visitors left the Preserve without having been approached. It was rare to get more than a total of fifteen surveys in one

day, and often the result was far fewer.

The Preserve experiences two busy seasons, fall and spring, as visitor numbers are greatly influenced by the seasonal weather (i.e. agreeable temperatures) and bird migrations. The greatest number of visitors show up from September through November, and than again from February through April. Given the timeframe of the study and the fixed availability of resources (interviewers, time, and funds), it was decided to implement the survey during the spring season. Surveying took place on the weekends stretching from March 3rd through April 22nd of 1990. Visitor numbers during March and April totaled 3319 (pers. comm., Staples, HRP, Feb. 25, 1991).

Most visitors were willing to take time for the survey. Refusals most often cropped up because the visitor (or another member of his or her party) had a time schedule and was unable to stay any longer. Some potential respondents had come to the Preserve with their children and felt the need to attend to them or move onward. Only a few respondents appeared uninterested and/or unwilling to sit down and answer the questions. Out of the 147 visitors who were asked to participate in the study, 29 declined for one of the reasons described above, resulting in a response rate of .803.

4.2.The Hassayampa River Preserve Survey

The questions in the survey fall into several rough categories, with each designed to gather specific kinds of data both for economic analysis and for descriptive purposes to help TNC with its preserve management. The vital sections include the first part of the survey which proceeds with TCM-related questions combined with a CVM willingness-to-pay follow-up; a section on attitudes toward and preferences for riparian areas; a CVM scenario with a referendum question about willingness-to-pay for alternative levels of streamflow plus a series of protest questions; and finally a section for sociodemographic information. The complete questionnaire can be found in Appendix A. The following subsections will concentrate on those questions that are central to the analysis and results.

the travel cost section

The questionnaire begins with a few lead-in questions about how the respondent first heard about the HRP, and the frequency of visits. This introduction leads to the inquiry into travel costs, travel and on-site time, and how the HRP visit fit into the respondent's overall travel plans. Determining the main reason for the respondent's trip to the Wickenburg area, and if the visit to the Preserve was planned ahead or a spur of the moment decision are key questions in this section because they indicate whether the respondent is

a legitimate destination visitor that can be used in the TCM analysis (see Questions 19 and 21). A natural progression is made in asking about the starting and ending destinations of the trip, as well as other destinations along the way -- primarily to aid in calculating mileage for the HRP visit.

Travel and on-site time are important ingredients of a TCM analysis, and visitors to the HRP were required to make decisions about time and its relationship to their visit. Respondents were asked directly how much time they anticipated they would spend traveling to and from the HRP, and how long their visit at the Preserve was (see Questions 27 and 29). A series of questions attempted to assess indirect time values based on the respondent's work status, type of work, whether vacation days were taken for the visit, and if these days were paid or unpaid. As was seen in Chapter 3, analyzing how visitors value their time on a recreational outing is extremely difficult. This survey's approach is simple and looks primarily at gathering data on the wage rate and at any possible lost wages incurred by the visit.

The heart of the travel cost section is composed of questions addressing gas; car rental; food, beverage, and restaurant service; lodging; film; visitor donation; and other expenses for the visit to the HRP. Respondents were asked to give their total expenditures for each category, as well as the amount that was spent in Wickenburg alone (see Questions

43 through 63). While the former allows establishment of a cumulative expense value for TCM analysis, the latter information is necessary to determine the direct economic impacts of HRP visitors on Wickenburg. The relevant expenses were only those that could be attributed to the visit to the HRP.

During this stage of the survey some crucial decisions had to be made by the interviewer about how to count expenses of multi-purpose trips. Consistency was the ultimate objective when handling the occurrence of multi-purpose trips. In an effort to achieve this, the interviewer received computer prompts and guidelines to include only those expenses representing the HRP portion of the entire trip. For example, an individual who travels to the Wickenburg area to visit relatives, and then decides to go by the HRP on the way home, is deemed a multi-purpose visitor. Her travel costs, outside of any visitor donations at the Preserve, will not be included by the interviewer in the visit's expense tally.

Much thought was given to the inclusion of a question about visitor donations within the expense framework (see Questions 60 and 61). Visitors who are not members of TNC are asked to give a suggested donation of $3 per person. This request is made verbally by TNC staff at the visitor center, and signs are also displayed at the Preserve's entrance to this effect. While it can be awkward to ask about the giving

of donations, in this case it seemed more like an entrance fee, and as HRP personnel have mentioned, most visitors are happy to oblige with the request.

From this point of view, the visitor donation was treated as a reasonable proxy for an entrance fee. The main reason for its inclusion is that it provides a starting point for the subsequent CVM iterative questions when a visit involves no other expenses. Unfortunately, it was not a consistent expense since some non-member visitors paid an amount different from $3 and most members did not pay anything. A few non-members also chose not to pay the donation.

Interviewers were reminded not to include purchases of durable items among the relevant travel expenses. As noted in Chapter 3, it is very difficult to assess the value that a new bird guide, for instance, has for the particular visit given that it will last for many visits as well as other purposes. Along these same lines, TNC memberships that happened to be purchased on the day of the visit were disregarded since they provide benefits throughout a year's time.

willingness to pay follow-up

Once the total travel costs for the visit have been established, the survey progresses with a willingness to pay (WTP) segment, which provides information for a direct comparison of the TCM and CVM. The iterative bidding

technique was chosen, mainly because the person-to-person format allows adjustment of bids during the interview. The travel expense total provides the starting point for the iterative bidding technique, which thus differs for each respondent. This starting point is theoretically tractable since the visitor must be willing to pay at least what he or she actually paid, if not more. The amount exceeding what actually was paid would represent consumer surplus. The iterations provided a consistent mechanism to help narrow the respondent to a final WTP response.

This is the most complicated part of the questionnaire, and a simplified schematic of the questions is presented in Figure 4.3 (also see Questions 64 through 80). The interviewer tells the respondents how much they spent on their visit to the HRP, and the question is asked: "Is this trip to the Preserve worth more than you have actually spent?" At this point, the questionnaire branches off, depending on the answer given. If the respondent says the visit is worth more than he or she actually paid, the questions take an incremental path where the interviewer doubles the expense total, asks about the WTP for this new amount, then -- depending on this outcome -- triples or halves the original expense total, asking the WTP question once again for this new amount. As with totalling the expenses, the interviewer was responsible for calculating the iteration values.

In an effort to simplify the entire procedure and to avoid respondent fatigue, the number of possible iterations is left at two before the respondent is asked to state his or her maximum WTP for the visit. Because individual WTP is the ultimate objective of this set of questions, a question asks whether the maximum WTP response is on an individual or group basis. If it is for the group the respondent came with, the group size is ascertained and a question specifically about WTP as an individual is asked.

Going back to the question that starts this iterative series, if the respondent says that the visit <u>is not</u> worth more than he or she spent (Question 65) the computer chooses another route for the interviewer to follow. The respondent is asked if the cumulative expense total is the most he or she is willing to pay (Question 67 or 68), which represents a double check -- if no is the resulting response, the survey continues with the maximum WTP question before proceeding with the individual WTP questions, which it does in either case.

Inquiries are made about purchases of merchandise in Wickenburg, which were included more as an interesting sidelight about consumer behavior and visitor contributions to the local economy. Such purchases were not used in expense totals given their durable nature and questionable linkage to the HRP visit.

Mention should also be made of certain subtleties in

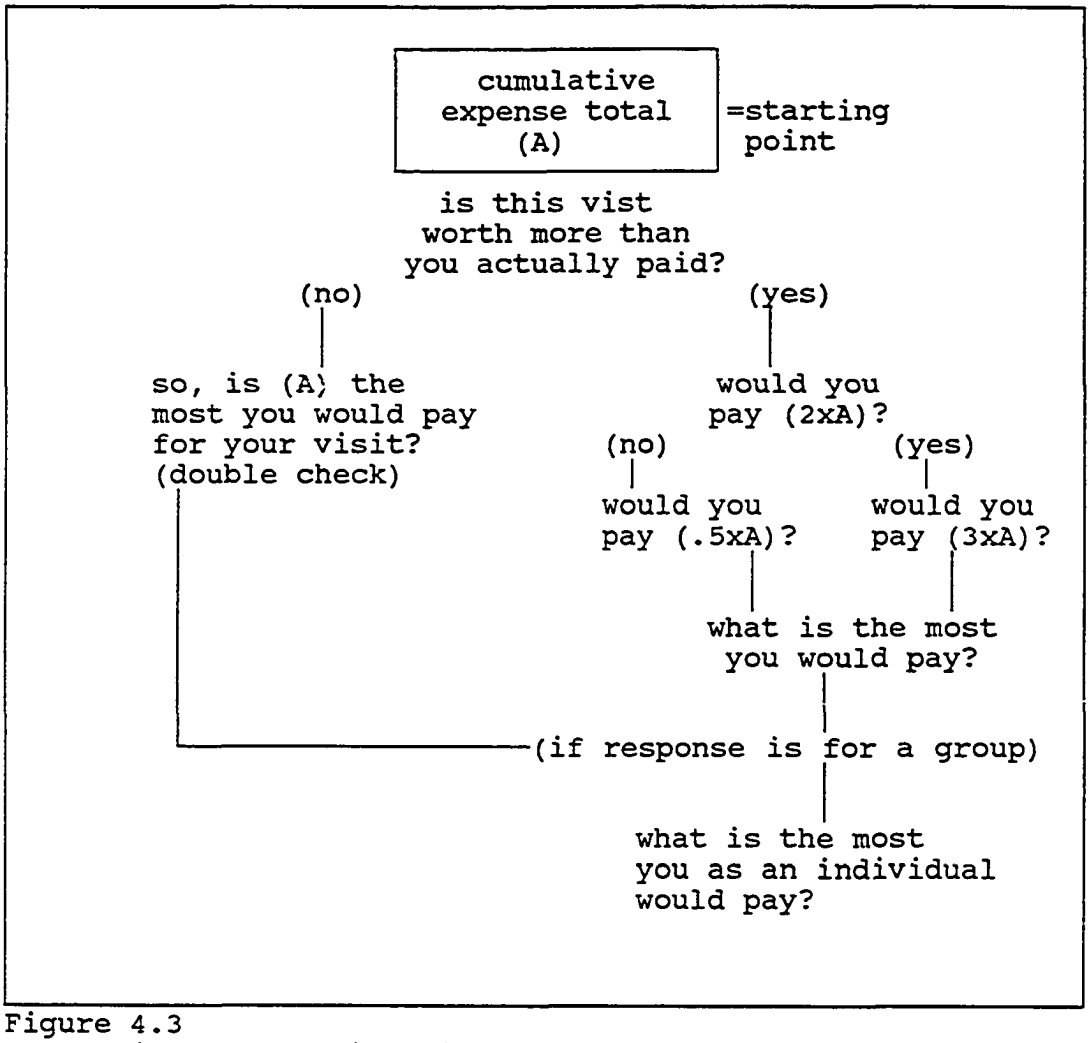


Figure 4.3
Schematic of Iterative Bidding Approach

wording that distinguish multi-purpose trips from main destination trips. The interviewer was asked by the computer twice within this section (in Questions 66 and 74) if the respondent was on a multi-purpose trip (information that is already known from earlier responses to survey questions). This practice enabled the branching to slightly differently

worded questions when asking about maximum willingness to pay.

The key for multi-purpose trips was the inclusion of the statement "given that you had several reasons for your trip to the Wickenburg area, what is the most you would be willing to pay for your visit to the Preserve?" -- which was lacking in the WTP questions directed at destination visitors. The goal was to emphasize the need on the part of the respondents to think solely about the HRP part of their trip.

attitudes and preferences

The written portion of the survey begins with this section, which examines respondents attitudes about certain attractions and potential distractions at the Preserve, and their preferences about streamflow level and crowding. All of these questions provide useful information for TNC. Those specifically dealing with streamflow and its associated riparian habitat add interesting background on HRP visitors, and in the data analysis stage, have potential as explanatory variables for the travel cost and WTP responses.

A five-point scale was used in the attractions section (see Sheet 1 in Appendix A), with "very important" and "doesn't matter to me" representing the two extremes. Included here are the riparian qualities of the Preserve, and a reference is also made to the chance to be away from the city, conceivably an influential factor with the continued

growth of urban areas in the Southwest.

Distractions include factors that are not presently found at the HRP, most of which are human-induced activities or consequences of human activities (see Sheet 2). The presence of a dry streambed as one of the distractions helps relay how respondents feel about a condition that has become a common sight in Arizona. A five-point scale once again furnishes the choices, ranging from "very bothered" to "doesn't bother me." In order to discover which ones visitors adamantly oppose, the respondent was also asked to circle any distraction that would prevent him or her from coming to the Preserve again. Also presented is a question about streamflow preferences within the Preserve, and one about how crowded the respondent perceived the Preserve to be.

Within this category of attitudes and preferences falls one other set of questions (see Sheet 1). Using the computer prompts, interviewers first asked respondents if they had walked by the river during their visit. This establishes whether or not they actually saw the stream. Because there are two trails at the HRP, one which goes only to Palm Lake, the possibility arose that the visitor did not walk along the main river trail. If they did, they were then asked whether they would ever return if the stream were completely dry. Again, an attempt is being made to establish how critical streamflow levels are to visitors.

the CVM referendum

In addition to the CVM section that followed travel cost questions, which has already been described, the survey contains a CVM hypothetical scenario of a riparian area like the HRP, about which referendum-type questions are asked. Three stages each representing a different streamflow level and riparian habitat condition are specified. The two questions focus on the respondent's WTP in the form of additional taxes to achieve specified incremental changes in this scenario.

The three levels were presented visually on a laminated posterboard with a photograph for each along a ladder. To begin, the interviewer introduced this new set of questions as one dealing with different water levels in streams, and states the fact that many Arizona streams have dried up during the past few decades. The interviewer directed the respondent's attention to the board and explains, in wording also given next to each photograph, what level A, B, and C represent (ladder shown in Figure 4.4). A crucial link was made to the respondent's experience at the HRP with the statement that "the Preserve, as you have seen it today, is a good example of a stream at level A because of its adequate, regular streamflow." Thus, the respondent was assumed to be familiar with level A of this riparian area scenario.

The photographs depicted different riparian ecosystems

which are a function of streamflow. The photo for level A was of the Hassayampa River just below the boundary of the HRP; level B's photo was taken along Cienega Creek southeast of Tucson; and the one for level C is of Tanque Verde Creek near Tucson. The scenario was presented in this generalized fashion so that it could be applied to riparian areas in southern Arizona.

Much thought was given to this hypothetical scenario and the characteristics of the payment mechanism. Because the major goal of this study was to assess the value of riparian areas, this particular CVM referendum approached the task by establishing different increments of quality as dependent on level of streamflow. Although certain physical attributes of each photograph varied, such as streambed width, season, and terrain; emphasis was placed on the constancy and relative amount of streamflow in each case, and how this effected the abundance and diversity of plant, wildlife, and fish species. The written descriptions on the board and the verbal descriptions given to the respondent maintained this emphasis consistently.

Once the respondent was familiarized with the scenario containing these three stream levels and their associated riparian ecosystems, he or she was asked to pretend that the hypothetical riparian area had never received special protection, and that its status was at level B. The status

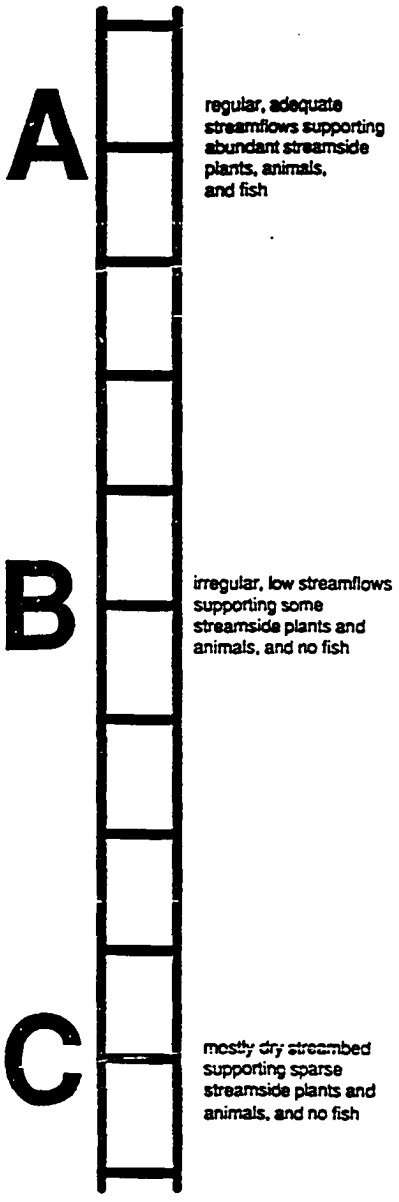


Figure 4.4
CVM Referendum Ladder

quo, albeit a hypothetical situation, was thus established at level B. The interviewer also stated that this area was open to the public for walking and wildlife viewing, just as the HRP presently is, and asked the respondent to assume that a public fund by U. S. taxpayers had been created specifically with the purpose of restoring this area from level B to level A.

The proposed method of payment presented somewhat of a difficult problem. Because the HRP already functions via the giving of donations to TNC, the use of this payment vehicle in the survey was not acceptable to TNC. The use of an entry fee would have created some other problems even it were acceptable to TNC. It connotes actual use of the area, which wouldn't allow payment by those individuals who were interested more in preserving riparian areas than in actually using them.

Most recreation-oriented areas are on public lands and are supported by taxes, so a fund created from taxes seemed a plausible alternative. The main problem with using taxes is that they tend to be unpopular and therefore may generate a number of protest responses. Nonetheless, this was seen as the most appropriate form of payment vehicle, given that entry fees could not be used.

Some comments should also be made about the proposed public fund for <u>this one</u> hypothetical riparian area. A fund for riparian areas in general or perhaps for Arizona would

have broadened the fund's purpose; however, at the same time it would make the scenario more ambiguous to the respondent. To ensure that the respondent knew exactly what he or she was paying for, the fund was limited to enhancement and preservation of one hypothetical site.

The scenario also indicated that the fund would be supported by U.S. taxpayers, although the hypothetical riparian area was presented as being located in Arizona. Under the assumption that many respondents would be from out-of-state, this specification was made so that they would not be precluded from answering the question. The potential for free-ridership was recognized with such a setup, however maintenance of a realistic payment vehicle (it would be difficult for non-residents to relate to a state-supported fund) and of a larger sample size was of greater concern.

The final piece of the CVM referendum question was presented to the respondent in the form of a payment card divided into two sections. This payment card was the actual means which the respondent used to answer the two WTP referendum questions that followed. To allow privacy and visual recognition of the dollar amounts, the payment card was provided as a printed form attached to a clipboard (see Sheet 3 in Appendix A).

Examples of various types of expenditures were pointed out at the top of the payment card. These benchmarks were

intended to provide points of reference for the respondent. The first part had information on average spending per U.S. taxpayer (with income between $30,000 and $39,999) on several diverse federal programs, spanning a wide range of values.

The middle section was based on the one-time expense of certain recreation-oriented activities. The information was gathered from around area: the basketball ticket is for a Phoenix Suns game; the round of golf for one of the resorts in the Phoenix or Tucson area; and the ski pass for large, popular areas like Alta or Vail. The last section had average annual expenditures on entertainment, again dealing with activities pursued in one's leisure time. Care must be taken, as Chapter 3 indicates, not to introduce bias in the form of these benchmarks. Having made the effort to clearly define the scenario, these benchmarks were included simply to give respondents some general information about tax-related expenditures and recreation-related expenditures that might be useful when gauging their WTP values.

The range on the payment card increased incrementally, and as the values become larger, the increments became larger. This created quite a few values to choose from, and at the same time spanned a substantial range. Ranges that are narrow or that do not provide an adequate number of alternatives for the respondent may inject bias into the result.

Now the ground had been laid for the two WTP questions.

For the next two questions, please pretend that the streamside area you walked through today had never walked through today had never received any special protection, and that it had deteriorated from level A to level B due to a lack of adequate, regular streamflow. Pretend the area is open to the public for walking and wildlife viewing, as it is today. Suppose a public fund supported by U.S. taxpayers, including yourself, was created specifically to restore this area that is now at level B to level A.

Q1. Assuming that the public fund will be able to restore the streamside area from level B to level A, circle the amount on the left side representing the most you would be willing to pay in additional taxes per year for restoring the streamside are to level A.

Q2. Now let's think about just maintaining the streamside area at level B, thereby preventing deterioration to level C. On the right side of the sheet please circle the amount you would be willing to pay in additional taxes per year specifically to maintain this streamside area at level B.

Figure 4.5
The CVM Referendum Questions

A WTP rather than willingness-to-accept-payment (WTAP) approach was chosen because it is more understood among researchers, and with the tax payments it made the most sense. Figure 4.5 displays the wording of questions, with the first one targeting restoration from level A to level B, and the second addressing prevention of deterioration of the riparian

area from level B to level C. For each case, the respondent was asked to circle the amount on the payment card representing their maximum willingness-to-pay in additional taxes per year. The number of household members the response was for was also asked in order to allow calculation of individual WTP.

Following the WTP questions are a series of statements presented on the next printed sheet (see Sheet 4). These are designed to help explain certain answers to the WTP questions, especially zero (possible protest responses) or extremely high values. With the hypothetical set-up, it is helpful to know how well respondents understood what they were asked to do, and what their feelings were about the subject matter. The statements are accompanied by a five-point scale going from "strongly agree" to "strongly disagree."

sociodemographic information

One more page containing questions to be answered by the respondent covers questions about basic sociodemographic characteristics including address, age, sex, household size, education, income, and community size (see Sheet 5). One question asks if the respondent is a TNC member, which along with all of the other questions, provide useful information for the analysis of the results. A good representation of the kinds of people visiting Arizona riparian areas like the HRP

can also be recovered from the questions in this section.

4.3.Questionnaire Programming Language

The questionnaire was developed using the computer software Questionnaire Programming Language (QPL). As its name implies, this software package writes a questionnaire for use on a computer. Each question appears alone on the screen, and the interviewer simply enters the answers directly with the keyboard. QPL is composed of several mini-programs that create the final product in written and computer form.

Four types of responses can be accommodated by QPL: date, numeric, string, and comment. For each question the format type must be specified during the programming process. Branching commands help organize the question order, and provide for a smooth-flowing survey, where only the appropriate questions are asked depending on the responses to previous questions.

With the HRP questionnaire, some limitations of QPL affected the survey's implementation and results. For the TCM section, the 1990 version of QPL didn't allow cumulative addition which forced interviewers to add expenses on a hand-held calculator. The iterative WTP values had to be calculated by hand in the same way. This proved to be an inconvenience, and it introduced the possibility of

interviewer error as these calculations were made.
In addition, only whole numbers could be entered for each expense question and for the iterative bidding sequences, thus interviewers rounded off expenses to the whole dollar.

QPL facilitated the computerized version of the questionnaire, and has proven to be quite user friendly and well-received by both interviewers and respondents. In addition, since data are entered during the interview, it is an efficient method of compiling the survey responses. The data file that is made for each completed questionnaire displays numbers, blank spaces, and text answers (depending on the specified question type) in a Fortran format file. This can be exported into the next software of choice, which for this study, was dBASE III PLUS. The next chapter describes the analytical procedures used and their results.

CHAPTER 5.

STATISTICAL ANALYSIS AND RESULTS

Statistical analysis of the responses from the survey was done in stages, paralleling the different categories of the questions as presented in Chapter 4. Because each of the methodologies requires its own modeling structure and procedures, separate econometric analyses were done for the Travel Cost Method (TCM) and the Contingent Valuation Method (CVM) parts. In addition a comparative examination of the two methods was conducted. The local economic impact analysis consisted primarily of calculation of relevant summary statistics.

5.1. Zonal TCM Analysis

The survey was set up so that sufficient data about individual travel costs would allow the individual observation method to be used in the TCM analysis. However, the dependent variable, which would be the individual's number of visits per year, did not vary enough to make this approach feasible. Most visitors came only once a year, and since the Hassayampa River Preserve (HRP) only began operation in 1988, many were learning about it for the first time. Therefore, the zonal

TCM, which utilizes the number of visits per zone of origin as the dependent variable, was used for analysis purposes.

As already discussed in Chapter 3, the zonal method attempts to explain the number of visits according to travel costs (which are a function of the distance of the zone from the site) and other average population characteristics of the zone.

From the total sample size of 116, 65 observations were incorporated into the analysis. A decision was made to use only Arizona residents because no out-of-state residents made a trip to Arizona solely to visit the HRP. Similarly, Arizona visitors were narrowed down to only those that had planned ahead of time to visit the HRP because the TCM requires a clear definition of travel costs as they relate to visiting a particular site. The criteria of primary destination and planning ahead produced the sample subset most appropriate for zonal TCM analysis, based on respondents' answers to survey Questions 19 and 21.

The zonal unit of choice was zip code because it was the most disaggregated unit for which census data was available. The sample consisted of 39 zip code zones for which mileages were calculated from the center of each zone to the HRP (Phoenix Mapping Service, 1985 and 1990). In addition, 1990 census demographic figures were located for each zone (CACI Marketing Systems, 1990). Other important variables

calculated for each zone included number of visits per capita, and travel cost, which was composed of a car operation/ownership expense of $0.33 per mile (American Automobile Association, 1990) and a travel time value. Because of the lack of consensus on travel time valuation, travel time was assessed at both 50% and 75% of the average wage, giving two equations whose results can be compared. A summary of the data for each zone is displayed in Table 5.1.

model specification

Regression analysis was done to estimate a zonal TCM final trip demand function. During the initial analysis, which involved 42 observations (based on zones), it became apparent from the residuals that there were three outliers. Upon closer scrutiny, these three observations were deleted from the TCM subsample. All three zones had very small population sizes, and were relatively far from the HRP. Thus their visits per capita were greatly overstated, and disproportionately affected the regression results. These three observations are delineated in Table 5.1. What follows are two model specifications: One for travel time valued at 50% of the average wage (whose travel cost variable will subsequently be noted as TC1), and one for travel time valued at 75% of the wage rate (whose travel cost variable will subsequently be noted as TC2).

Table 5.1
Zonal TCM Data

COMMUNITY	ZIP CODE	ONE WAY MILEAGE TO HRP (miles)	VISITS PER 1000	TRAVEL COST 1 ($)	TRAVEL COST 2 ($)	POPULATION	MEDIAN AGE (years)	MEDIAN EDUCATION (years)	AVERAGE PER CAPITA INCOME ($)	AVERAGE HOUSEHOLD INCOME ($)
SCOTTSDALE*	85259	72.25	1.3038	60.56	67.00	767	32.9	14.5	17821	53657
DEWEY*	86327	78.00	0.8842	58.87	62.56	1131	45	12.3	9469	20943
COCHISE*	85606	242.00	0.8299	181.33	192.13	1205	31.1	12.3	8928	22960
SUN CITY	85374	30.00	0.4537	21.46	22.30	2204	22.3	7.3	5548	21138
YOUNGTOWN	85363	32.50	0.3207	25.65	27.77	3118	73.7	12.3	12954	20418
COTTONWOOD	86326	105.00	0.3107	79.35	84.38	3219	36	12.5	9576	23053
CHANDLER	85226	87.00	0.4361	66.81	71.50	4586	26.5	12.5	10790	35142
SUN CITY	85373	32.50	0.1577	28.31	31.73	6340	73.9	12.9	21097	36939
WICKENBURG	85358	4.00	0.4478	3.23	3.53	**6700	55.3	12.5	14865	31365
SUN CITY WEST	85375	29.50	0.1210	23.62	25.69	8264	59	12.6	14054	32424
PHOENIX	85034	72.00	0.0942	52.72	55.33	10618	28.5	8.9	7228	19431
PRESCOTT	86303	65.00	0.0938	49.93	53.45	10666	36.7	12.7	10817	25985
PHOENIX	85044	83.50	0.0733	70.20	77.75	13634	35.7	13	18075	45285
PHOENIX	85024	54.50	0.0542	43.14	46.73	18453	27.3	12.7	13159	37234
SCOTTSDALE	85258	70.50	0.0532	61.95	69.66	18782	38.6	15	21871	53936
GLENDALE	85308	55.00	0.1015	44.53	48.65	19697	30.5	12.8	14967	40277
PHOENIX	85013	63.50	0.1003	52.33	57.54	19938	39.4	13.2	16407	32147
FLAGSTAFF	86001	154.00	0.0952	118.90	127.53	21001	31	13.3	11209	32055
PHOENIX	85019	62.75	0.0857	50.45	54.64	23330	33.5	12.6	13137	34576
CAVE CREEK	85331	55.00	0.0840	44.15	48.08	23814	31.2	12.7	14280	41374
PHOENIX	85014	65.25	0.0796	52.82	57.69	25116	38	12.9	14943	28751
TEMPE	85306	57.50	0.0392	45.63	49.47	25526	29.4	12.9	13353	42363
PHOENIX	85006	69.00	0.0383	51.86	55.02	25140	31.9	12.2	9160	21791
PHOENIX	85028	63.50	0.0373	52.86	58.33	26809	33.6	14	17237	51208
TUCSON	85715	173.00	0.0348	147.83	164.66	28756	37.6	14.9	19453	49009
PHOENIX	85022	57.50	0.0337	45.78	49.69	29674	30.3	12.6	13611	30776
MESA	85204	88.50	0.0301	68.67	73.80	33203	26.3	12.7	11593	35380
SUN CITY	85351	33.50	0.1770	28.33	31.45	33303	75.2	12.8	18579	30560
PHOENIX	85015	62.75	0.1176	50.56	55.14	34025	36.3	12.8	14580	29928
SCOTTSDALE	85251	74.25	0.0289	61.60	67.90	34630	40.8	13.2	16966	36114
PHOENIX	85016	66.75	0.0574	55.29	60.91	34818	39.5	12.9	16832	33373
SCOTTSDALE	85253	69.25	0.0829	59.67	66.65	36207	41.9	14.5	20165	50505
PHOENIX	85018	70.50	0.0269	59.11	65.39	37137	40.8	13.4	17839	38820
PHOENIX	85021	59.00	0.0259	47.87	52.34	38632	39.7	12.8	15140	34131
PHOENIX	85009	67.00	0.0257	50.70	53.94	38932	27.7	11.3	9673	24623
PEORIA	85345	36.50	0.0250	28.36	30.49	39931	30.2	12.4	11697	31629
PHOENIX	85033	69.00	0.0236	53.35	57.26	42382	27.5	12.5	11326	36332
PHOENIX	85032	60.50	0.0463	48.01	52.04	43209	31.1	12.7	13348	35592
CHANDLER	85224	90.50	0.0186	70.92	76.52	53879	27.4	12.7	12369	35406
TEMPE	85282	80.00	0.0181	65.16	71.34	55231	33.2	14	15446	41311
TUCSON	85705	165.00	0.0176	126.82	135.78	56714	34.8	12.4	10859	22988
PHOENIX	85023	53.50	0.1025	43.37	47.39	58536	30.3	12.9	15059	42403

* outliers deleted from main analysis
** source: Wickenburg Chamber of Commerce

$$\underline{VISIT}=1.24-.075\ln(\underline{TC1})+.074\ln(\underline{AGE})-.41\ln(\underline{EDUC})-.08\underline{PHX} \quad [5.1]$$
$$(3.6)\quad(-2.45)\quad(1.14)\quad(-2.75)\quad(-2.05)$$

$$\underline{VISIT}=1.22-.075\ln(\underline{TC2})+.076\ln(\underline{AGE})-.40\ln(\underline{EDUC})-.08\underline{PHX} \quad [5.2]$$
$$(3.56)\quad(-2.47)\quad(1.18)\quad(-2.68)\quad(-2.03)$$

N=39
F-statistic=7.59
R-squared=.47

where t statistics are given below the coefficients, and:

VISIT = visits to HRP per 1000 residents in zone

TC1 and TC2 = $0.33/mile car depreciation expense + 50%(75%) of the zonal wage rate (average per capita/250*8) x. travel time (round trip mileage to the HRP/50mph)

AGE1 = median zonal age in years

EDUC1 = median zonal education in years

PHX = dummy variable for zones in the Phoenix-metropolitan area

The coefficients on the TC variables are significant and negative which is expected and consistent with TCM's assumption about visitor behavior. The dummy variable PHX is significant and negative, a result which possibly indicates the wide number of Phoenix area zones that yielded visitors to the HRP. Visitors from the Phoenix area are distributed throughout 33 of the 39 zones, a phenomenon which causes fewer visits per capita from these zones.

The AGE coefficient is positive, although not significant -- denoting the large number of older visitors that tend to visit the HRP. Finally, the other significant variable, EDUC, is negatively related to visits. Finding a conclusive

Table 5.2
Zonal Census vs. HRP Survey Data

data:	zonal	HRP survey
variable:		
AGE		
-mean	37.5	48.6
-st.deviation	12.9	13.5
INCOME		
-mean	34507	43000
-st.deviation	8660	NA
TRAVEL TIME		
-mean	2.75	2.50
-st.deviation	1.34	1.15
TRAVEL COST 1		
-mean	55.16	75.88
-st.deviation	27.25	42.57

explanation for this is not necessary since the zonal TCM is simply using given information to fit a model. However, it should be noted that the presence of multicollinearity between EDUC and INC influences the coefficient value on EDUC, possibly inducing bias, which makes interpretation of a single coefficient more uncertain.

The information that the HRP survey collected about the visitors' demographic characteristics and travel time differed significantly from that of the census data (Table 5.2). The survey could be thought of as "better" specific data than the highly aggregated zonal averages used in the above analysis. Thinking along these lines, a regression was run using the survey results for mean zonal age, income,

education, and travel time for the 39 zones. The resulting equation follows:

$$\underline{VISIT} = .47 - .09\ln(\underline{TC3}) + .03\ln(\underline{AGE2}) - .02(\underline{EDUC2} - .06(\underline{PHX}) \quad [5.3]$$
$$(1.66)\ (-3.4)\qquad (.54)\qquad (-.56)\qquad (-1.3)$$

N=39
F-statistic=4.48
R-squared=.35

where

VISIT = same as in previous analysis

TC3 = calculated as in previous analysis, but travel time and average wage rate came from survey data

AGE2 = age in years from survey data

EDUC2 = dummy variable for average zonal education level of college degree or higher -- from survey data

PHX = same as in previous analysis

Because the variables in Equation 5.3, with the exception of TC3, are not at all significant, the R-squared and F-statistic are lower for this model. One would expect, with more specific data, that this specification would have provided a better fit than the original analysis; however, although TC3 is more significant, the overall regression is less convincing than those given by Equations. 5.1 and 5.2.

A possible reason for this result is that, first of all, travel time value was the largest component of travel cost in both regressions, making it the key influential factor. The survey's question about travel time produced highly variable responses for proximal zones, and did so even among visitors

from the same zone. It makes sense that some visitors drove faster than others, made more stops, and did more sightseeing along the way. Accuracy was also hampered by the Questionnaire Programming Language format, because responses were rounded up to the nearest hour. These factors most likely contributed to this less compelling relationship between visits per capita and travel costs.

consumer surplus estimates

The final step of the TCM analysis involves translating the final trip demand function (Equations 5.1 and 5.2) into an aggregate demand function relating price to total visits. Incremental price increases were added to each zone's travel cost, visits per capita were re-estimated, and total visits over all zones calculated for each price increase.

In order to generalize the result to all HRP visitors, the proportion of each zone's visitors in the sample was applied to the HRP's annual estimated visitation of 8000 visitors per year. This approach assumes that the visitors in the sample provide a good representation of where HRP visitors come from, an assumption that appears reasonable given the sampling approach. The aggregate demand function for travel time valued at 50% of the average wage rate is displayed in Figure 5.1. The area under this curve is consumer surplus for the HRP -- and amounts to $1,100,000

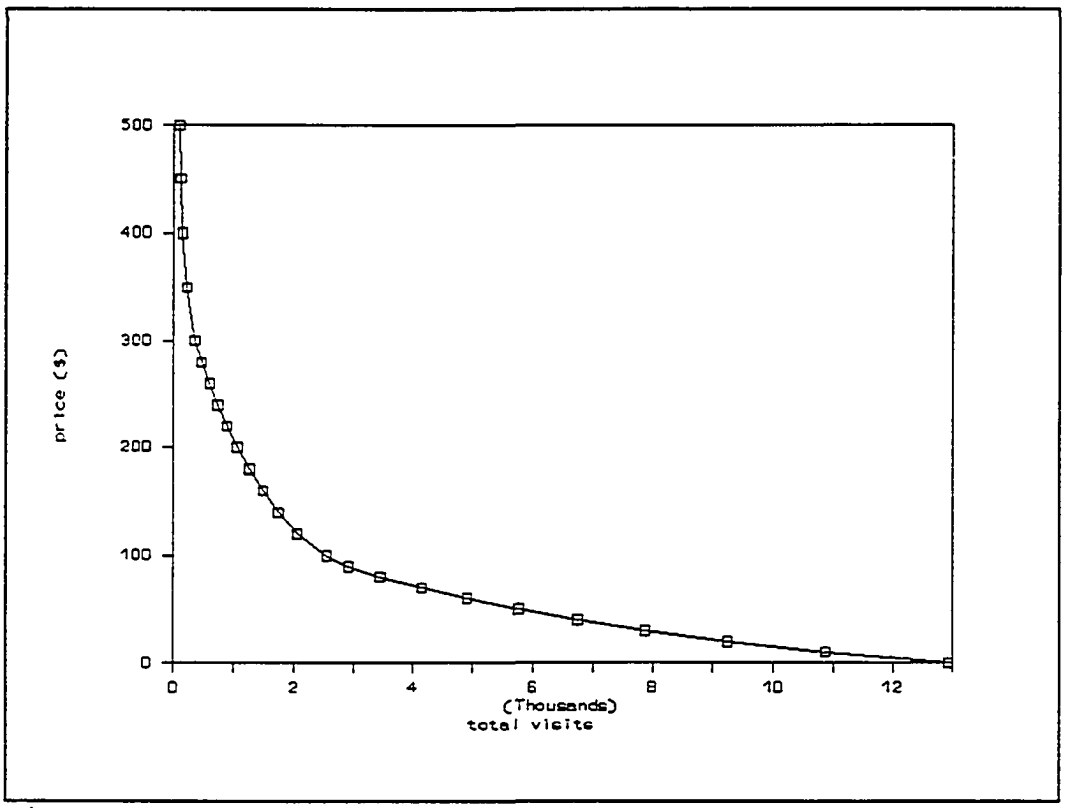


Figure 5.1
Aggregate Demand Function with Travel Time = 50% of Average Wage Rate

annually. The same process was followed for travel costs that had travel time valued at 75% of the average wage rate, and the resulting consumer surplus was $977,325.

5.2.CVM Referendum

The Contingent Valuation Method (CVM) referendum part of the study involved regression techniques similar to the TCM analysis. As is done generally with CVM studies, responses

that were confirmed by the protest questions and interviewer observations to be protest zeros were dropped from the analysis. Two responses fell into this category. Responses from two visitors who did not walk by the stream on the day of the visit, and who had never visited the HRP before were also deleted, given that they did not observe the condition of a riparian area depicted as level A in the hypothetical scenario. Finally, four respondents failed to indicate their income level, which was an important variable in the analysis. These observations were also excluded, leaving a CVM referendum sample size of 110.

The mean individual willingness to pay (WTP), (the actual response divided by the number of household members represented) for restoration from level B to level A was $66. The "maintain" question, asking about the respondent's WTP to avoid deterioration from level B to level C, had a mean individual value of $53. This is counterintuitive since marginal incremental values would normally decrease for successive improvements in riparian habitat. Methodologically, this is necessary to establish a CVM marginal bid function.

In this study, the marginal values increase on average, a relationship which generates a positively sloped marginal benefit curve (at least over a certain range). The inconsistency most likely arose due to problems within the

survey specifically related to the framing of the questions, and to the different sets of property rights that were implied in each question -- which relates to prospect theory. More will be said on this subject in Chapter 6.

Out of the 110 respondents, 48 had WTP values greater for restore than maintain; 56 answered the same for both; and only 6 provided WTP values for maintain that were less than those for restore. The responses to the "maintain" question were not used in the remainder of the CVM analysis. Applying the $66 average restore value across all visitors to the HRP, total WTP for restoration of a riparian site whose condition is at level B to level A is $528,000 per year.

model specification

The marginal bid curves that CVM studies set out to estimate compile information for several changes in the environmental amenity of interest, which is necessary in order to specify the functional relationship. Unfortunately, without accurate information on the WTP from level B to level C, the WTP values for restoration provide only one point on the curve. Nonetheless, looking at the WTP for restoration in the form of a regression equation provides interesting economic information about important variables in the model, and their interrelationships. The regression equation using semilog functional form is as follows:

$$\underline{WTP} = -153.98 + 21.96(\ln)\underline{INC} - 1.64\underline{EDUC} + 34.28\underline{TNC} + 22.42\underline{RET} \quad [5.4]$$
$$(-1.63)\ (2.25)\qquad (-2.25)\ (2.75)\ (1.6)$$

N=110
F-statistic=4.63
R-squared=.15

where t statistics are given below the coefficients, and:

WTP = the WTP response given for restoration divided by household number.

INC = individual income

EDUC = dummy variable for those with a college degree

TNC = dummy variable for members of The Nature Conservancy

RET = dummy variable for retired respondents

To check whether the TNC dummy variable represented two subpopulations with different variances, a Goldfeldt-Quandt test was done. The two separate regressions for members and nonmembers produced similar standard errors and an insignificant F-statistic, suggesting that heteroskedasticity is not a problem.

As should be the case, INC is significant and positive. The positive significant coefficient on the TNC dummy variable recognizes the generally higher WTP values of TNC members, who tend to be more aware of ecologically important riparian areas. RET, although not significant, reveals the tendency for retired visitors to express higher WTP for restoration values. With more free time to pursue recreational pursuits,

this shows their appreciation for riparian areas like the HRP.

The sign on EDUC is not intuitive at first glance, but the most plausible explanation for its significant negative coefficient is that the more highly educated visitors (i.e. those with at least a college degree) thought more realistically of what they were being asked to do in the CVM referendum, which meant considering their other tax expenses before answering and therefore lead to lower values than those with a lower education level revealed. Also, the presence of multicollinearity between EDUC and INC makes the coefficient value more suspect and its interpretation more difficult.

comparison of TCM and CVM benefit results

Although not enough information is available for Equation 5.3 to construct marginal benefit curves for different quality levels of riparian habitat, the zonal TCM provided information on total benefits at level A, the level experienced by visitors to the HRP. Conceptually, then, the zonal aggregate demand curve represents level A, and the shifting downward of this curve by the zonal average WTP for restoration (from the CVM referendum responses) could produce the marginal benefit curve for level B. This "mixing" of methods provides an interesting way of assessing the benefits involved in going from one quality level to another.

The individual WTP restore values were transformed into averages for those zones that made up the TCM analysis. One zone's WTP value was a protest zero, therefore this zone was omitted, leaving 38 zones with which to aggregate total visits according to changes in price. The zonal WTP restore values ranged from $2.50 to $250, and the average was $67. Zones with relatively small average WTP restore values appear not to place much value on a difference in the riparian habitat between level B and level A. This leads to the assumption that individuals from these zones would visit a site at level B more often (holding original travel costs and demographic variables constant) than those expressing higher WTP restore values.

Re-estimation using these "heterogenous" zonal WTP averages produces an aggregate demand curve much like the ones from the straight zonal TCM analysis used in section 5.1, but the demand curve represents the site at level B. In other words, visitors attach value to the qualitative condition of the recreation sites they visit, and the magnitude of this value may determine the frequency of their visits to the site if it were at a lower quality level, such as that of level B presented here.

The goal of doing this is to assess the change in consumer surplus that would result if a riparian area at level A were to deteriorate to level B. This can be done by

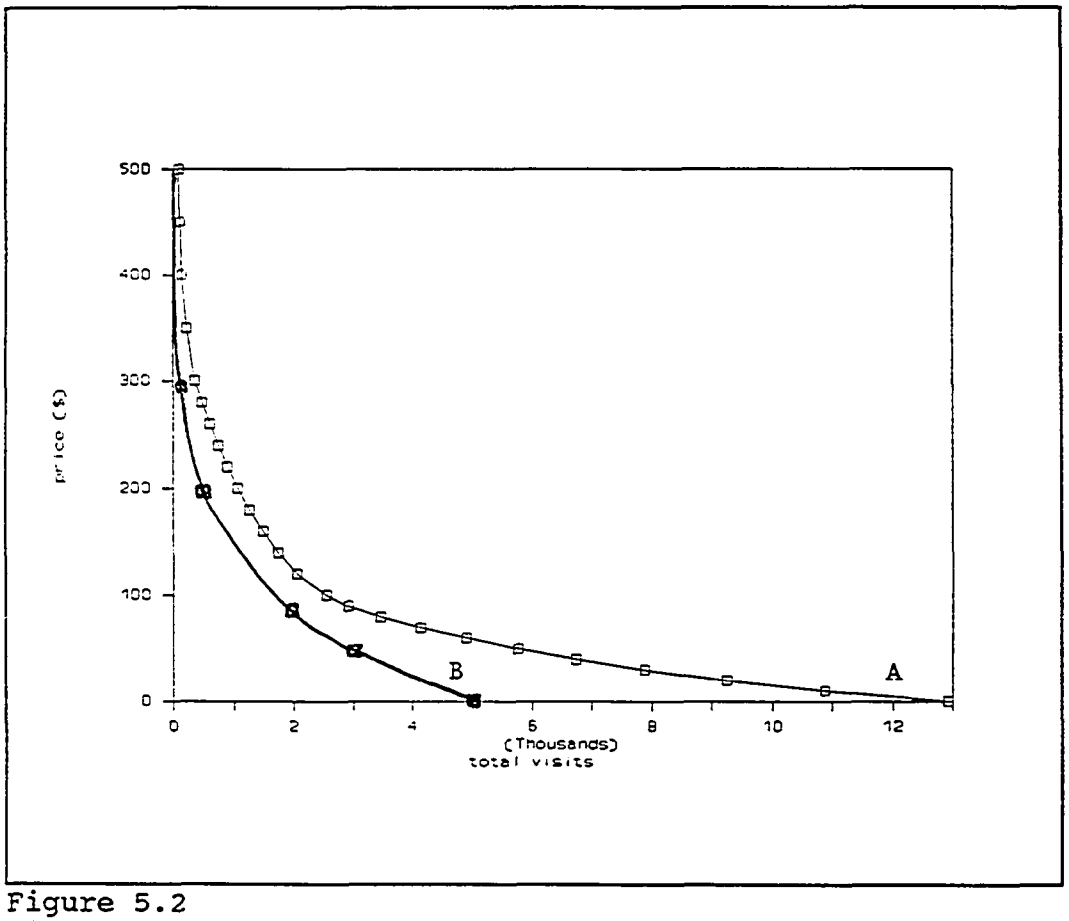


Figure 5.2
Riparian Habitat Quality Level A and Level B Demand Functions

subtracting the consumer surplus for the HRP ($1,100,000 for travel time valued at 50% of average wage) from the consumer surplus indicated by the aggregate demand curve at level B, which is $544,700 (see Figure 5.2). The change in consumer surplus is $555,300. A "short-cut" procedure was also tried, where the zonal aggregate demand curve was shifted down by the average WTP restore value over all visits in the zonal subsample, an amount of $66. In contrast to the

"heterogenous" approach, this practice can be thought of as shifting the curve by the "homogenous" average. The resulting change in consumer surplus was estimated to be $678,200. A summary of the different consumer surplus results is given in Table 5.3.

Table 5.3
Changes in Consumer Surplus from Level A to Level B

measure	total consumer surplus	Δ in consumer surplus*
1. LEVEL A_0: zonal TCM aggregate demand curve with TC1	1,100,000	
2. LEVEL A_1: zonal TCM aggregate demand curve with TC2	977,325	
3. LEVEL B_0: from CVM referendum with "heterogenous" average adjustment		555,300
4. LEVEL B_1: from CVM referendum with "homogenous" average adjustment		678,000
5. LEVEL B_2: from CVM iterative bidding		200,000

* LEVEL A_0 was chosen as starting point

5.3.Actual Travel Costs vs. WTP

One intention of the study was to compare the TCM and some CVM responses which were elicited in the travel cost section of the survey. A maximum WTP response (Question 79) is compared to the respondent's actual travel costs (Question 64). The use of the zonal TCM precluded the actual travel costs from being brought into the analysis -- making a rigorous result comparison between the two methods difficult. However, some things can be learned from examination of the summary statistics for actual travel costs and the maximum WTP in travel costs for the visit.

Table 5.4
Summary Statistics for Cumulative Travel Expenses and Maximum WTP

	Mean	St.Deviation	Maximum	Minimum
VARIABLE				
CUMEXP	13.11	14.77	72	.50
WTP	38.50	43.38	300	1.60

	Covariance	Correlation
CUMEXP,WTP	424.45	.668

As Table 5.4 shows, there is a large gap between the average actual trip travel expenses, and the maximum WTP in travel expenses. There was a relatively high correlation between the two values, which one would expect: visitors are willing to pay more for their visit than they actually paid (and this WTP is related to actual travel costs). Of the 118 respondents, 94 said the visit was worth more than they had actually paid.

One interesting albeit rough result here is the difference between the mean values of the two variables, which is about $25 and reflects a form of individual consumer surplus for visiting the site. The annual estimated "consumer surplus" using this information is $200,000 -- a much smaller number than the other analyses shown in Table 5.3. have given.

Further study of the detailed technical relationships that may exist between these two variables is left for the future. However, some attention should be paid to the survey's implementation and responses throughout this iterative line of questioning. One of the survey's weak points was its tendency to elicit inconsistent responses during the iterative questions dealing with maximum WTP for the visit to the HRP (Questions 65 through 79).

The inconsistencies that resulted fell into two classes: those where a yes/no or value response contradicted another

such response from a previous or subsequent question; and those where individual WTP values were less than what was actually spent. Typically, a respondent would affirm that he or she would pay a specific amount presented in the iterative process, but when asked for the maximum WTP would give an amount less than indicated by this earlier response. One other problem was the presence of missing values to the question asking specifically about WTP in travel expenses if the respondent were to come by him/herself (Question 79). The question proved problematic because several respondents said they would never visit the HRP on their own, and thus could not respond to the question.

To allow the inconsistent responses to be used for analysis purposes, they were interpreted in several different ways to see which provided the most reasonable approach. The first such interpretation involved the two survey questions which asked for the respondent's maximum WTP for the visit, and his or her WTP on an individual basis, respectively (Questions 78 and 79). The proportion of the individual to the general WTP was then applied to the value that actually represented the maximum in the iterative process.

Other avenues included taking the highest value, and taking the individual response even though it failed to agree with previous answers. All three methods were tried, and their mean results differed only by $1.25. The proportional

iterative approach gave the middle average, and accounted for the most information -- thus it was used in calculating statistics.

For those observations where individual WTP was less than actual individual travel expenses, the actual travel expense value was used. Although care was taken via the questionnaire to avoid this inconsistency, some respondents indicated they would be willing to pay more for their visit, but then provided a WTP value less than their travel cost starting point. Finally, missing values were estimated by dividing the overall WTP value, which all respondents provided, by the group number. The fact that about one in five respondents had difficulty with this particular set of CVM questions shows that it was quite possibly too complex and tedious.

5.4.Local Economic Impact Analysis

direct expenditures

Of the expenses that visitors were asked about in the travel cost portion of the survey, only three were relevant to purchases made in Wickenburg: gas, food/beverage and restaurant services, and lodging. The expense figures given by respondents were assumed to be for the group, therefore the average amount for each type of expense was calculated and then divided by the average group size of 2.11. The breakdown

is presented in Figure 5.3. Annual visitation to the HRP in 1990 was 7970 visitors (pers. comm., Staples, HRP, Feb. 25, 1991). Rounding this to 8000, total estimated annual direct economic inflows into the Wickenburg economy is $51,840.

expense:	
gas:	.40
lodging:	3.42
food/ restaurant:	2.66
total	$6.48

Figure 5.3
Per Visitor Expenditures in Wickenburg

indirect impacts

As the initial expenditures by HRP visitors in Wickenburg are respent within the economy, they produce indirect impacts. These were estimated using IMPLAN, the input-output model that has been developed by the United States Forest Service. IMPLAN estimates multipliers at the county level for specific economic sectors (or industries) as well as an aggregation of sectors.

Wickenburg sits in the northwestern edge of Maricopa county, whose economic makeup is greatly influenced by metropolitan Phoenix. An IMPLAN model for neighboring Yavapai county was thus used because it better represented the rural tourist-oriented flavor of Wickenburg. Of the three types of businesses that received HRP visitor dollars, the food/beverage and restaurant services, and lodging sectors were available choices in IMPLAN. A gas services sector was

not broken out in IMPLAN, and since gas purchases were by far the smallest of the three, they were left out of the estimation of indirect impacts.

IMPLAN's Type III output multipliers provided the tool with which to calculate total impacts of the HRP on Wickenburg's economy, including direct, indirect, and induced effects. The multipliers were 1.89 for the lodging sector and 1.59 for the food/beverage and restaurant service sector. Multiplying these by their respective direct expenditure components, and adding the direct gas expenditures puts total impacts at $82,800 annually.

CHAPTER 6.

CONCLUSIONS AND IMPLICATIONS

The challenge of valuing an ecologically rich and aesthetically pleasing area like the Hassayampa River Preserve (HRP) has produced a number of interesting observations. The three methodologies described in earlier parts of this thesis were implemented and they each succeeded in generating value estimates. But some real questions remain: What do these numbers mean? How did the methods perform and how do they compare to one another? What are the policy and research implications of these results? The remaining sections explore these questions in more detail.

6.1.Conclusions about Economic Benefits

local expenditures

The outcome of the local economic impact analysis is a dollar figure which represents how much economic activity is stimulated in Wickenburg's economy by expenditures of HRP visitors. The analysis followed primary visitor expenditures as they stayed within the community and were respent. The natural question is: are these results significant? It is safe to say that $82,500 is a small part of Wickenburg's

tourism industry, which includes some fairly exclusive and high priced resorts. The number is "relatively" small because the HRP is a day-use site, and is new enough to still be developing a visitor base.

It is also important to note that this economic activity cannot be accurately classified as a "benefit" of the HRP because the costs of supplying these goods and services to visitors have not been accounted for. Additionally, as these tourist dollars are coming into Wickenburg, they are being displaced from other communities with recreational opportunities, making the chosen accounting stance a very important consideration. Nevertheless, additional local economic activity is thought to be desirable by local governments and chambers of commerce, and by The Nature Conservancy itself -- and so was included as a component of this study.

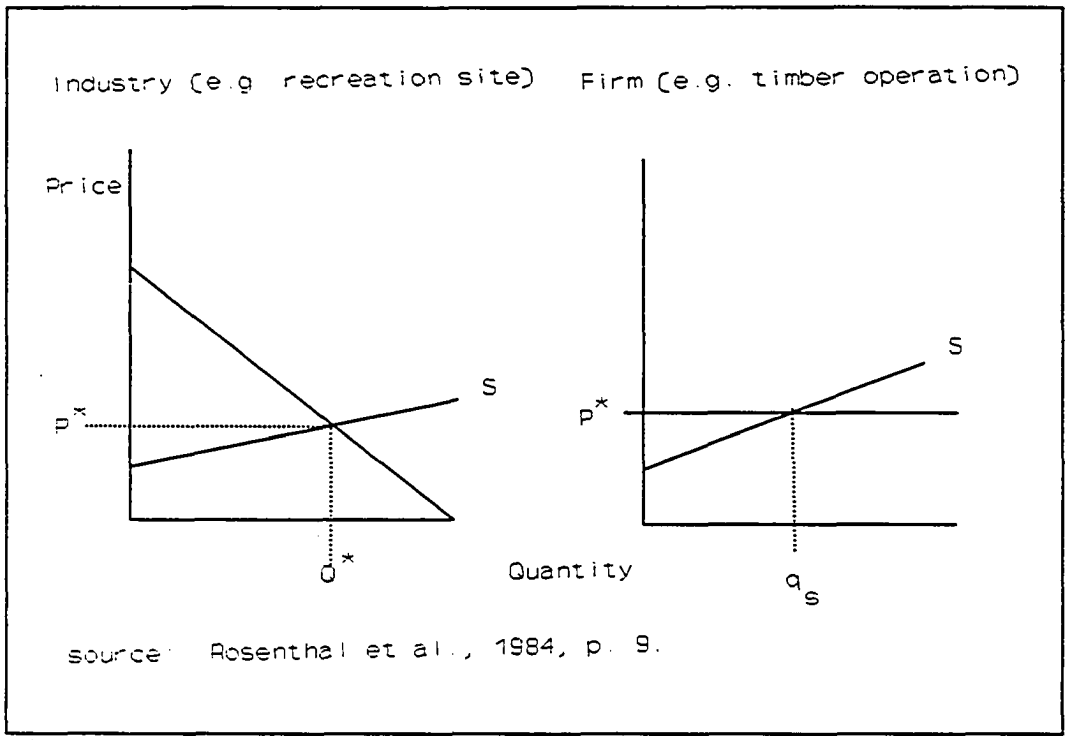
As rural communities in Arizona struggle to achieve a more diverse, stable and less environmentally damaging set of industries than they have had in the past, the importance of outdoor recreation as a key industry will increase. The HRP is a good example of an area that has been preserved in its natural state, thus it adds aesthetic appeal to the community of Wickenburg, and at the same time attracts visitors -- enhancing the local tourism industry.

consumer surplus

The Travel Cost Method (TCM) and Contingent Valuation Method (CVM) produced estimates of consumer surplus, an economic benefit measure that is different from local economic impacts. Among non-economists, consumer surplus is not a widely known concept and can be difficult to explain as a measure of benefits from preserving a site. However, it is a crucial benefit measure in the case of public goods, where a consumer partakes in an activity without being charged a price reflecting the worth of that experience. Consumer surplus is an attempt to relate such goods back to the marketplace by establishing demand or willingness to pay (WTP) functions representing the net benefits that consumers receive.

Private goods are measured in terms of market prices, making consumer surplus results from nonmarket good valuation less easily comparable with private good alternatives. Rosenthal et al. (1984) address this issue by comparing the consumer surplus of an outdoor recreation site and the value of stumpage produced from a certain timber stand (see Figure 6.1.). Assuming that the stumpage market is competitive, it has a horizontal demand curve, and its total benefits can be estimated by multiplying the price times quantity (P^* x. q_s).

On the other hand, the recreation site's demand curve is assumed to be downward sloping, more like an industry demand curve, which requires that total benefits be statistically



source: Rosenthal et al., 1984, p. 9.

Figure 6.1
Industry vs. Firm Demand

estimated. Measuring the change in consumer surplus (by looking at the area under the demand curve and above the price line) is the only available means to do this. As the authors point out, the market structure and pricing scheme are very different for these two goods and yet their total benefits can be estimated and compared.

The zonal TCM successfully produced first and final stage demand functions for the HRP. The TCM consumer surplus estimate is $1,100,000 with travel time set at 50% of the average wage and $977,325 for travel time at 75% of the average wage. The difference is minimal because travel time

to the HRP was relatively short. Given that the surveys were conducted on weekends when the opportunity cost of travel time is arguably less, and that it is unclear how visitors perceive the value of their travel time, emphasis has been placed on the result with travel time valued at 50% of the average wage.

The CVM referendum analysis, although it did not generate a marginal bid function, was successfully implemented by fitting WTP restore values to an economic model. It gave some interesting results, especially when combined with the zonal TCM final stage demand function to estimate the change in consumer surplus from a qualitative change in the riparian area.

Many CVM studies report the average individual WTP for the specified incremental change and multiply this by total visitors to estimate total WTP. This can be seen in some of the studies reviewed in Chapter 3. Another good example of this practice is found in a study by Stoll and Johnson (1984) which dealt with valuing Whooping Cranes and one of their key habitat areas, the Aransas National Wildlife Refuge in Texas. Taking a similar approach in this study, the total annual WTP for restoration of a riparian site from level B to level A (a condition represented by the HRP) was estimated to be $528,000.

Interestingly enough, by combining the zonal TCM results, which apply to the HRP at level A, with the incremental WTP

restore values for the zones, a level B aggregate demand curve for the site was calculated which represented a change in consumer surplus of $555,300. As discussed in Chapter 5, such a level B aggregate demand curve was also estimated using the straight or "homogeneous" average. However, the estimated change in consumer surplus from this quicker procedure was quite a bit larger ($678,000), indicating that it is worthwhile to re-estimate using the more disaggregated or "heterogeneous" zonal WTP averages.

This result differs only slightly from the $528,000 multiplication result above, and may imply the ability to "mix" methods under certain circumstances. Care must be taken not to over-generalize the significance of this finding, but it is comforting to note that the TCM framework appears to have provided a reasonable estimate of the change in consumer surplus -- as verified by the alternative CVM estimate of benefits.

In addition, the procedure produces sufficient information to determine how depletion of a riparian site would affect the original consumer surplus. For the "hypothetical" riparian site, consumer surplus would be increased by about 50% if it were improved from level B to level A, a far from trivial difference. The total consumer surplus measure of $1,100,000 at level A is difficult to interpret; however, the estimated change in surplus from level

A to level B can be viewed in relative terms to be quite meaningful. Depending on the costs involved in restoration efforts, such a restoration may or may not be worthwhile. The HRP is already in a preserved state, but were its instream flow rights or riparian characteristics threatened in some way, we now have an idea of what this might cost in terms of decreased visits and the attendant change in consumer surplus.

Some mention should also be made of the preliminary results that were given for those questions attempting to directly compare TCM and CVM by looking at travel costs. From the responses to the iterative bidding questions, the average maximum WTP amount (the response to the iterative bidding question) for the visit in travel expenses ($38.50) was about three times the actual average travel cost amount ($13.11). If the average difference were taken as a rough estimate of net benefits for the site, then the result would be $200,000, an amount much smaller than the zonal TCM gives.

However, it should be noted that the actual travel costs do not incorporate travel time, which constitutes a majority of the travel costs in this zonal TCM analysis, and in most other zonal TCM studies. Addition of a travel time value to the starting point travel expense amount would certainly have boosted the magnitude of the WTP responses. This would likely have brought this CVM consumer surplus estimate closer to that of the zonal analysis. A clearer understanding of possible

relationships between the actual and CVM WTP data would require further research.

As mentioned in Chapter 5, the starting point of actual travel costs influenced the maximum WTP values (their correlation was .668) -- but starting point bias seems less problematic here, since conceptually the maximum WTP should always be greater than actual travel costs. In other words, the payment vehicle of increased travel costs is a logical one, although travel time costs were not brought into the determination of a starting point.

6.2.Conclusions about the Methodologies

Before discussing how the two economic valuation techniques (TCM and CVM) worked in this particular study, a few words should be said about the survey technique. The person-to-person technique enabled interviewers to get fully completed surveys, a luxury that researchers using mail questionnaires do not have. It also gave interviewers the opportunity to make sure respondents fully understood the questions, an especially helpful tool when it came to the CVM referendum presentation and questions.

The disadvantage of the person-to-person format was that it was labor intensive, and required large amounts of time considering the number of sample observations that were

obtained. In general, the smaller possible sample size with person-to-person surveys is a drawback -- however, the excellent quality of the survey responses helps to balance this out. Actually interviewing visitors certainly brings the researcher a closer understanding of the subject being studied, and allows possible problems with the survey as well as any helpful visitor opinions to be identified and corrected more easily than they would with other survey methods.

zonal TCM

A few problems came to light as the zonal TCM analysis was being undertaken. Most of them have to do with the suitability of the HRP site for a Travel Cost study. The main issue that affected the performance of the methodology and the analysis was the fact that so many visitors came from the Phoenix-metropolitan area. This created similar travel costs across all of the Phoenix area zones, because both car depreciation expense and travel time assessment, the components of the travel costs, were a function of mileage to the site. The lack of variation in this key independent variable makes regression analysis less effective in estimating a good model.

The tendency for many visitors to be on multi-purpose trips while visiting the HRP was another problem that arose. Because the HRP is a small day-use site, it receives many

visitors who are just passing through on their way to some other primary destination. This characteristic of the site makes the TCM much more difficult to apply. In the zonal analysis, all visitors whose main purpose in coming to the area was other than to visit the HRP had to be deleted, which significantly reduced the sample size.

A final drawback of the TCM in this study was the inability to use the individual observation method, a more detailed valuation approach (see Chapter 3). While a few respondents visit the HRP many times during the year, most had only experienced their first visit when they were surveyed. This is to be expected with a new site like the HRP, which opened in 1989. A few years down the road, this problem may no longer exist as visitors who have become familiar with the HRP (especially avid birders) return several times a year.

CVM referendum

The CVM scenario presented in this study displays the flexibility of the methodology to assess values associated with changes in environmental quality. Different riparian habitat conditions exist throughout Arizona, and depend on the regularity and amount of streamflow. CVM is able to provide information needed to establish the incremental values for different levels of site quality.

The fact that the marginal WTP for "maintenance" at level B was higher than the WTP for "restoration" to level A is not a particularly surprising result. Possible explanations of this outcome include the framing of the CVM scenario, and the presence of economic behavior based on prospect theory. Framing relates to the presentation of the questions. Since WTP for restoration was asked first, it tended to cause these answers to be the highest.

Prospect theory (Kahneman and Tversky, 1979) maintains that consumers behave differently depending on whether they are faced with losing or gaining a certain property right. The consumer is a risk taker in the former case, and is risk averse in the latter, implying a utility function whose slope changes. With the CVM scenario's hypothetical status quo at level B, the WTP for maintenance question has a subtle implication of a loss of property rights, since the respondent is asked his or her WTP to prevent a loss in the quality of the riparian area. The WTP for restoration entails an improvement from the status quo.

According to prospect theory, an inconsistent presentation of the property right, as in this scenario, would produce an uncertain relationship between the "maintain" and "restore" results, because the positioning and shape of the utility function is unknown. In the end, as has been noted, the second WTP question provided a marginal value not

consistent with CVM's marginal benefit analysis, and the "maintain" question was not used in further analysis.

The hypothetical status quo should have been established at level C, and questions about WTP for each subsequent incremental improvement then asked. This approach more closely resembles the theoretical relationships that would be expected to emerge as site quality is varied. It also would keep the property right well-established at entitlement to level C with WTP values elicited only for improvements. This study's analysis proceeded with the WTP for restoration values because this increment from B to A was properly set up in the survey.

This study's CVM referendum could be thought to represent both user and nonuser values, with the latter perhaps consisting of a combination of existence, option, and bequest values. As Chapter 3 mentions, CVM's general ability to measure these nonuser values is one of its major advantages. By interviewing only visitors, this study is limited to measuring only those values held by users -- who incidentally may have expressed a WTP for restoration value containing both user and nonuser elements. Ideally, this portion of the survey should also be administered to people who have never seen the HRP in order to assess nonuser values. Such a practice would produce a more comprehensive incremental net benefit value than was achieved in this study.

The other CVM portion of the survey involving maximum WTP for the visit seemed to suffer most from the iterative approach. Inconsistent responses were discussed in Chapter 5. While the iterations are helpful in narrowing down a WTP value, this particular approach contained too many opportunities for inconsistent responses to arise. In addition to the "yes/no" responses to iterative bidding questions, there were two final maximum WTP questions: a general one and one for the respondent's WTP as an individual. It would be wise to simplify the iterative process as much as possible in future studies.

Psychology and perceptions also played a role here. Respondents were often surprised by how much they had spent for their visit when the interviewers gave them their total travel costs for the CVM starting point. A few respondents had difficulty with this series of questions, because some could not or did not want to place a dollar value on their visit. Although the use of travel expenses was mentioned earlier as a theoretically viable payment vehicle, these observations indicate that the presentation of such a scenario must be done in a fashion that respondents can relate to. An example would be to present the hypothetical situation that the price of certain travel-related goods, such as gas, had increased.

6.3.Implications

policy implications

The policy implications of this study relate primarily to future decisions that will affect riparian areas. Clearly, riparian areas and instream flows create economic benefits. These benefits come in different kinds -- the two of importance in this study are increases in local economic impact activity and the standard measure of consumer welfare, consumer surplus. This study did not attempt to calculate a value per acre-foot of flowing stream, a direct approach to comparing alternative uses of water. Since the HRP did not allow swimming, boating, fishing or other activities directly dependent on flow levels, this was not an appropriate site at which to attempt to measure incremental values associated with stream flows. This study does value a recreation site whose attraction is its riparian character. This new economic information will prove helpful in future land and water use decisions, because it suggests that these areas possess important values to visitors and make contributions to local economies.

Economic decisions should incorporate costs as well as benefits, thus the cost of preserving a riparian area (including the opportunity cost(s) of foregone uses of the area) must be considered alongside the benefits of

preservation. Valuation studies for different specific sites are helpful because they can identify which ones are most valuable, and should thus receive the most preservation effort.

A policy situation in which benefit measures can be useful, is Arizona's proposed instream flow legislation already described in Chapter 2. Up to this point, no facilitative program exists in the state, making the acquisition of flow rights extremely difficult. By opening up the water rights arena to any party who might gain benefits from water left instream, outdoor recreationists, state agencies, and environmental groups can attempt to collectivize their interests into a bid for water rights. This practice will more effectively and efficiently account for all beneficiaries of the water resource.

A procedure mandating conditional review of all requests for water transfers and new applications for water rights is another important element of the proposed bill. For example, if a proposed transfer would harm the riparian ecosystem by drying up a stream, then it would not be granted by the Arizona Department of Water Resources. This requirement would help prevent further depletion of flowing streams and riparian areas in Arizona. In the future, when the interconnections between groundwater sources and surface water becomes legally recognized in Arizona, conditional review

should be developed for all types of water transfers.

Economic support for the bill includes the local economic impacts and net benefits that flowing streams and their associated riparian areas contribute. These positive economic benefits are documented by this study, and speak to the point that, in certain areas, water may be most valuable (i.e. most efficiently allocated) when left instream.

One other policy implication that emerges from this study relates to the increasing concern that people have for the natural environment. Lately, this has been expressed in Arizona through several votes and opinion polls, indicating a willingness to pay to protect the environment. The CVM referendum results are indicative of a definite willingness to pay by the survey's respondents to protect riparian areas through increased taxes.

These results appear to be supported by the recent creation of the Arizona Heritage Fund in 1990, when Arizona voters supported a referendum to transfer lottery funds for enhancement of recreation areas, environmental education, and acquisition of open space. In addition, a poll conducted by the Arizona Tax Research Association found that 90% of those surveyed favored an increase in state funds for environmental protection (High Country News, May 1990). Looking at Americans in general, the results from a 1990 CNN/TIME poll indicate that 70% of those polled would be willing to pay $200

more in taxes to clean up the environment, and 44% would be willing to pay $500 more (Time, Dec. 1990).

This trend signifies a potentially important tool for policy makers in the future: a willingness by citizens to pay for environmental programs. Much of what happens to the allocation of water resources and to the management of public lands involves political decision-making. Pressure continues to mount to maintain the integrity of the natural environment, a policy which will most likely be supported financially by some willing (and some unwilling!) taxpayers.

research implications

The findings of this study lead to several suggestions for future research. These recommendations fall into two categories: research to improve certain aspects of the valuation techniques, and applied studies that focus on evaluating specific kinds of land and water use.

As this study pointed out, there are recreation sites that do not possess the ideal characteristics for a TCM study -- especially the quality of being a destination area that draws visitors from a large variety of distances. While national parks are good examples of sites suited to zonal TCM, the HRP is less suited because of its location, small size, and day-use nature. Although it draws 8000 visitors per year, a large proportion come from one metropolitan area - Phoenix.

Research efforts must be made to develop clear and consistent ways of handling multi-destination visitors. While these visitors may have another site as the main goal of their trip, they still expend time, effort, and money to visit "sidetrip" areas like the HRP. Zonal TCM studies that do not include multi-site visitors are likely to be underestimating consumer surplus -- but the trick is to find a technique that effectively accounts only for the relevant portion of the trip travel costs, otherwise surplus estimates will be overstated.

Another TCM issue that has been problematic since the methodology's inception is that of travel time valuation. This study used two travel time values: 50% and 75% of the average per capita wage rate, which did not produce greatly different results. However, in both of these cases the travel time contributed the most to the zonal travel cost variable, signifying its importance in the consumer surplus estimates. For such a potentially influential factor, it still is not clear how to determine if travel time is enjoyed by visitors or perceived as an opportunity cost.

Assessing the value of time at a fraction of the wage rate assumes that it is an opportunity cost. Certainly the real value of travel time varies from site to site, depending on how far visitors travel, which day(s) visitors tend to visit the site, how many visitors are retired, etc. Continued research on what represents an appropriate measure of travel

time value is essential in order to make TCM results more consistent among studies, and to avoid speculation about the validity of benefit measures.

This study produced interesting behavioral traits in its CVM referendum series of questions, which as already briefly mentioned, are related in part to psychological factors based on prospect theory. Opportunities exist to further research how consumers perceive and respond to scenarios representing different status quo levels and property right setups. Better understanding of such consumer tendencies will greatly aid resource economists in interpreting CVM willingness to pay or willingness to accept payment responses.

Also, CVM's ability to address the total value paradigm (see Figure 3.6) should be utilized when possible. Accounting for existence and option values in addition to use values provides a complete picture of the benefits of an environmental amenity. This is especially true for areas like the HRP that possess unique and rare habitats and plant and animal species, and thus have potentially large nonuser values associated with them.

One follow up to the HRP study would be to survey individuals who had never seen the HRP before, such as shoppers in a Phoenix mall, to establish the values they may hold for Arizona riparian areas. This practice should be done

in future CVM studies whenever possible so that "nonuser" values become well-documented and more widely accepted. Surveying non-users would also provide information on values held by average Arizonans, values which may differ from the relatively well-educated high income visitors of the HRP.

Finally, in addition to methodological research there is a definite need to continue applying the valuation techniques used here to sites characterized by nonconsumptive uses of water, like the HRP. Very few past studies have looked at areas where the main activities are nonconsumptive such as birdwatching and walking. To get a clearer picture of the economic contributions of flowing streams and riparian areas in Arizona, more of these studies should be done. This will help determine which sites are the most valuable, and should be preserved. As a complement to this study, it would be especially informative to look at riparian sites on public lands, because these tend to draw a different set of visitors than do preserves run by The Nature Conservancy (TNC).

Good sites for future studies include the San Pedro Riparian National Conservation Area, which is managed by the Bureau of Land Management (BLM). This site would provide the opportunity to value a variety of uses ranging from hiking and birding to fishing and boating. It also could have direct policy implications with regard to future management and allocation of the San Pedro River, which is an important water

source for a large part of southeastern Arizona. Another possibility is TNC's Ramsey Canyon Preserve, which attracts about 20,000 visitors per year, and is one of the most popular birding areas in the United States.

summary

The study described in this thesis is one part of a larger effort to understand the economic importance of riparian areas. In Arizona, such areas are becoming more valuable because there are fewer of them and at the same time there is a growing demand for the recreational uses and ecologic benefits they provide. The legal complexities surrounding water rights, which have greatly affected the status of instream flows, and the public good characteristics of riparian areas make this valuation exercise a challenging task.

It is hoped that the reader has become familiar with the valuation techniques covered in this thesis, how they can be applied to a site like the HRP, and the types of economic values they measure. Quite a bit has been learned about the value of the HRP to the community of Wickenburg and to its visitors, about the performance of the various methodologies, and about what this information means to society and to economic researchers. Hopefully, such economic information will aid in Arizona's future water allocation decisions, since

it represents a more comprehensive view of the uses supported by water than was available before.

APPENDIX A

APPENDIX A

HASSAYMAPA RIVER PRESERVE SURVEY

1. Interviewer's initials?
   |__|__|__|

2. Current Date?
   |__|__|-|__|__|-|__|__|
   Year Month Day

3. Time questionnaire began.
   |__|__|__|__|__|

4. How many refusals have you had since your last interview?
   |__|__|

   IF (#4 = 0) GO TO QUESTION 6
   IF (#4 > 0) GO TO QUESTION 5

5. Reasons for refusals and other comments about the individuals.

   _____

6. Temperature?
   Press ENTER if you don't know
   |__|__|__| degrees

7. Sky Conditions?
   |__| 1. clear
   |__| 2. patchy clouds
   |__| 3. overcast

8. Wind Conditions?
   |__| 1. calm
   |__| 2. light
   |__| 3. gusty

9. Did you walk through the Preserve today?
   |__| 1. Yes
   |__| 2. No (GO TO QUESTION 113)

10. I am from the University of Arizona and we want to find out how visitors feel about the Hassayampa River Preserve and stream-side settings. The questions I will be asking you will take about 15 minutes to answer and will provide valuable information for our study. Would you be willing to participate?
    |__| 1. yes
    |__| 2. no (GO TO QUESTION 113)

11. We do not represent the Nature Conservancy, but they have given us permission to conduct this survey on their Preserve.
    Press ENTER to continue...

12. How did you hear about the Hassayampa River Preserve?
    |__| 1. the national magazine (GO TO QUESTION 14)
    |__| 2. the state newsletter (GO TO QUESTION 14)
    |__| 3. the AAA tour book (GO TO QUESTION 14)
    |__| 4. friends (GO TO QUESTION 14)
    |__| 5. family (GO TO QUESTION 14)
    |__| 6. newspaper article (GO TO QUESTION 14)
    |__| 7. visiting other Conservancy Preserves (GO TO QUESTION 14)
    |__| 8. other

13. other source?
    _____

14. Have you ever visited the Hassyampa River Preserve before?
    |__| 1. yes (GO TO QUESTION 15)
    |__| 2. no (GO TO QUESTION 16)

15. How many times?
    |__|__| times

16. Did you see any interesting birds or wildlife today?
    |__| 1. yes (GO TO QUESTION 17)
    |__| 2. no (GO TO QUESTION 18)

17. What were they?
    _____

18. The following questions will help us to better understand the value people place on streamside settings like the Hassayampa Preserve.
PRESS ENTER TO CONTINUE

19. Is your visit to the Hassayampa Preserve the main reason for your trip to the Wickenburg area?
|__| 1. yes (GO TO QUESTION 24)
|__| 2. no (GO TO QUESTION 20)

20. What are your main reasons for visiting this area?
_____

21. Before coming to the Wickenburg area, had you planned ahead To visit the Preserve, or was it a spur of the moment decision?
|__| 1. planned ahead (GO TO QUESTION 24)
|__| 2. spur of the moment (GO TO QUESTION 22)

22. Interviewer: Find out if the respondent spent an extra day to visit the Preserve. If so, include this in getting the expenses.
Press RETURN to continue

23. Where were you before you came to the Preserve?
_____

PLEASE SKIP TO QUESTION 25

24. Where were you before you came to the Wickenburg area?
_____

25. Where do you live?
(Interviewer: if from Phoenix, please specify where)
_____

26. What is your next destination after you leave the Preserve?
_____

27. How much time will you spend traveling to and from the Preserve?
|__|__| hours

28. (Interviewer, please enter any additional comments about their trip)
_____

29. How much time did you spend in the Preserve during your visit?
    |__|__| hours

30. Do you work?
    |__| 1. yes (GO TO QUESTION 31)
    |__| 2. no (GO TO QUESTION 38)

31. What type of work do you do?

    _____

32. Did you take any days off work to travel to and visit the Preserve?
    |__| 1. yes (GO TO QUESTION 34)
    |__| 2. no (GO TO QUESTION 40)
    |__| 3. no, its the weekend, holiday (GO TO Q. 40)
    |__| 4. no, other (GO TO QUESTION 33)

33. What types of days were these that you took off?

    _____

34. How many vacation days did you take to travel to and visit the Preserve?
    |__|__| days

35. Were these paid vacation days or did you take unpaid leave?
    |__| 1. paid (GO TO QUESTION 37)
    |__| 2. unpaid (GO TO QUESTION 36)

36. (Interviewer: Please note any comments about wages lost.)

    _____

    PLEASE SKIP TO QUESTION 40

37. How many paid vacation days do you get each year?
    |__|__| DAYS

    PLEASE SKIP TO QUESTION 40

38. Are you
    |__| 1. retired? (GO TO QUESTION 40)
    |__| 2. other? (GO TO QUESTION 39)

39. Please specify
    |__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|

40. About how many miles per gallon does the car you drove to the Preserve get?
(If they are not sure, press ENTER)
|__|__| M.P.G.

IF (#40 = MISSING) GO TO QUESTION 41
IF (#40 > 0) GO TO QUESTION 43

41. What is the make and model of the car you drove to the Preserve?

_____

42. (Interviewer: When getting expenses for multi-purpose trips, get the portion that can be attributed to this visit to the Preserve. Also, durable items should not be added into trip expense.)
Press RETURN to continue...

43. Would you please tell me what expenses you have had related to your visit to the Preserve for the following: (Interviewer: turn on calculator or get scratch pad ready)
Press RETURN to continue...

44. How much do you expect your total gas expenses for this visit to the Preserve will be?
|__|__|__|__|$

45. Of these expenses, how much did you or will you spend in Wickenburg?
|__|__|__|__|$

46. Have you had any other car expenses related to your visit to the Preserve, such as car rental?
|__| 1. yes
|__| 2. no (GO TO QUESTION 50)

47. How much were your other car expenses for this visit?
|__|__|__|__|$

48. Of these expenses, how much did you spend in Wickenburg?
|__|__|__|__|$

49. What were these expenses for?

_____

50. Did you bring food and beverages with you or purchase any, including restaurant services?
|__| 1. yes (GO TO QUESTION 51)
|__| 2. no (GO TO QUESTION 53)

51. How much were your total food/beverage and restaurant expenses?
|__|__|__|__|$

52. Of these expenses, how much did you spend in Wickenburg?
|__|__|__|__|$

53. Did you or will you incur lodging expenses related to your visit to the Preserve?
|__| 1. yes
|__| 2. no (GO TO QUESTION 57)

54. How much do you expect your lodging expenses for this visit to be?
|__|__|__|__|$

55. Of these expenses, how much did you or will you spend in Wickenburg?
|__|__|__|__|$

IF (#55 > 0) GO TO QUESTION 56
IF (#55 = 0) GO TO QUESTION 57

56. Where did you or will you stay in Wickenburg?
_____

57. Did you buy any film for this visit including film brought from home?
|__| 1. yes (GO TO QUESTION 58)
|__| 2. no (GO TO QUESTION 60)

58. How much are your total film expenses, including film you brought with you?
|__|__|__|__|$

59. Of these expenses, how much did you spend in Wickenburg?
|__|__|__|__|$

60. Have you paid any visitor donations for this visit to the Preserve?
|__| 1. yes (GO TO QUESTION 61)
|__| 2. no (GO TO QUESTION 63)

61. How much were they?
|__|__|__|__|$

62. (Interviewer, please note any other expenses they mentioned that are directly related to their visit to the Preserve.)

_____

63. (Interviewer: please input the cumulative expense total. Remember: do not add durable items (gifts, books, etc.) into this total.)
|__|__|__|__|$

64. The total amount you spent for this visit to the Hassayampa Preserve is #63. (Interviewer: please input CUMEXP*2.)
|__|__|__|__|$

65. Is this trip to the Preserve worth more than you have actually spent?
|__| 1. yes (GO TO QUESTION 69)
|__| 2. no (GO TO QUESTION 66)

66. (Interviewer: Is this a multi-purpose trip?)
|__| 1. yes (GO TO QUESTION 67)
|__| 2. no (GO TO QUESTION 68)

67. Given that you had several reasons for your visit to the Wickenburg area, is #63 the most you would be willing to pay just for your visit to the Preserve?
|__| 1. yes (GO TO QUESTION 77)
|__| 2. no (GO TO QUESTION 76)

68. So, is #63 the most you are willing to pay for this visit?
|__| 1. yes (GO TO QUESTION 77)
|__| 2. no (GO TO QUESTION 76)

69. Would you still visit the Preserve if your expenses were #64?
|__| 1. yes (GO TO QUESTION 72)
|__| 2. no

70. (Interviewer: please enter CUMEXP*1.5)
|__|__|__|__|$

71. Would you still visit the Preserve if your expenses were #70?
    |__| 1. yes (GO TO QUESTION 74)
    |__| 2. no (GO TO QUESTION 74)

72. (Interviewer: please enter CUMEXP*3)
    |__|__|__|__|$

73. If they were #72?
    |__| 1. yes (GO TO QUESTION 74)
    |__| 2. no

74. (Interviewer: is this a multipurpose trip?)
    |__| 1. yes (GO TO QUESTION 75)
    |__| 2. no (GO TO QUESTION 76)

75. Given that you had several reasons for this visit to the Wickenburg area, what is the most in trip expenses that you would be willing to pay just for your visit to the Preserve?
    |__|__|__|__|$

76. What is the most in trip expenses that you would be willing to pay for your visit to the Preserve?
    |__|__|__|__|$

77. Does this amount refer to you alone or the group you came with?
    |__| 1. alone (GO TO QUESTION 80)
    |__| 2. group (GO TO QUESTION 78)

78. How many are in your group?
    |__|__|

79. What is the most that you as an individual would be willing to pay for this visit?
    |__|__|__|__|$

80. (Interviewer: please input the most the respondant would be willing to pay.)
    |__|__|__|__|$

81. Have you purchased any merchandise in the Wickenburg area?
    |__| 1. yes (GO TO QUESTION 82)
    |__| 2. no (GO TO QUESTION 84)

82. How much did you spend?
    |__|__|__|__|$

83. What things did you buy?

_____

84. The following group of questions will help us better understand what it is about the Hassayampa that is most important to you.
Press ENTER to continue...

85. (Interviewer -- HAND THE RESPONDANT THE CLIPBOARD.) Take a look at the yellow sheet on your clipboard. We have listed some things that people may enjoy about the Hassayampa Preserve. Please tell us how important these things are to you on a scale from one to five, with a one representing those things that are really important to you, and a five those that don't matter at all.
Press ENTER to continue...

86. There are also a couple of questions about the stream level and the presence of other visitors at the Preserve.
Press ENTER to continue...

87. Did you walk by the river during your visit?
|__| 1. yes (GO TO QUESTION 88)
|__| 2. no (GO TO QUESTION 91)

88. Would you ever come back if the river were dry all the time?
|__| 1. yes (GO TO QUESTION 91)
|__| 2. no (GO TO QUESTION 89)
|__| 3. maybe (GO TO QUESTION 90)
|__| 4. don't know (GO TO QUESTION 90)

89. Why not?

_____

PLEASE SKIP TO QUESTION 91

90. What would influence your decision?

_____

91. We are interested in finding out what would detract from your enjoyment of the Hassayampa Preserve. Turn to the blue sheet. Please indicate how much the things listed would bother you during your visit to the Hassayampa Preserve on a scale from one to five.
Press ENTER to continue...

92. Would the presence of any of these factors keep you from visiting the area again?
    |__| 1. yes (GO TO QUESTION 93)
    |__| 2. no (GO TO QUESTION 94)

93. Please circle those factors on the blue sheet which would keep you from visiting the Hassayampa again.
    Press RETURN to continue...

94. Now lets switch gears. These last two questions focus on different water levels in streams. As a result of water use by farms, businesses, and growing cities,many Arizona streams have less water than they used to, and some have dried up completely.
    PRESS RETURN TO CONTINUE

95. On the poster, the ladder describes three water levels and the plants and animals supported by each. At the bottom, level C represents a mostly dry streambed. It supports sparse streamside plants and animals, and no fish. On the middle rung, level B describes an area with low, irregular streamflow which supports some streamside plants and animals, and no fish. At the top, level A describes a stream that has adequate, regular streamflow to support abundant streamside plants, animals, and fish. The Preserve, as you have seen it today, is a good example of a stream at level A because of its adequate, regular streamflow.
    Press RETURN to continue...

96. Now for the next two questions, please pretend that the streamside area you walked through today had never received any special protection, and that it had deteriorated from level A to level B due to a lack of adequate, regular streamflow. Pretend the area is open to the public for walking and wildlife viewing, as it is today. Suppose a public fund supported by U.S. taxpayers, including yourself, was created specifically to restore this area that is now at level B to level A.
    Press RETURN to continue...

97. Please take a look at the green sheet. At the top, we have provided some examples of various types of expenditures for your information. Assuming that the public fund will be able to restore the streamside area from level B to level A, circle the

amount on the left side of the green sheet representing the most you would be willing to pay in additional taxes per year for restoring the streamside area to level A.
Press ENTER to continue...

98. Now let's think about just maintaining the streamside area at level B, thereby preventing deterioration to level C. On the right side of the green sheet, please circle the amount you would be willing to pay in additional taxes per year specifically to maintain this streamside area at level B?
Press RETURN to continue...

99. Are the amounts that you circled for:
|__| 1. yourself, as an individual (GO TO Q. 101)
|__| 2. your household (GO TO QUESTION 100)
|__| 3. you and your spouse (GO TO QUESTION 101)

100. How many people are in your household?
|__|__|

101. On the light pink sheet, please respond to the following questions on a scale from one to five.
Press ENTER to continue...

102. On the white sheet, please answer the questions about you which will help us in our research. All answers are confidential and no attempt will be made to identify or contact you. If you would like to obtain a copy of our completed study, please complete the address form on the last sheet in your clipboard and put it into the box.
Please include any comments about the questionnaire at the bottom of this last sheet.
Press ENTER to continue...

103. Thankyou for taking time to participate in this study.

SHEET 1

ATTRACTIONS

MOIST ENVIRONMENT
VERY IMPORTANT 1 2 3 4 5 DOESN'T MATTER TO ME

ABUNDANT VEGETATION
VERY IMPORTANT 1 2 3 4 5 DOESN'T MATTER TO ME

FLOWING STREAM
VERY IMPORTANT 1 2 3 4 5 DOESN'T MATTER TO ME

CHANCE TO SEE WILDLIFE
VERY IMPORTANT 1 2 3 4 5 DOESN'T MATTER TO ME

CHANCE TO SEE BIRDS
VERY IMPORTANT 1 2 3 4 5 DOESN'T MATTER TO ME

CHANCE TO BE AWAY FROM THE CITY
VERY IMPORTANT 1 2 3 4 5 DOESN'T MATTER TO ME

STREAM FLOW LEVEL

Was the amount of water in the stream today: (check one)

__ I don't know, I didn't walk by the stream today
__ More than I prefer
__ At the level I prefer
__ Less than I prefer
__ I didn't notice the amount of water in the stream
__ I have no opinion about the amount of water in the stream

PRESENCE OF OTHER VISITORS ON TRAILS

About how many other people did you see out on the Preserve trails today? _____

Would you describe the Preserve as (check one)
____ not at all crowded
____ a little crowded
____ unpleasantly crowded

SHEET 2

DISTRACTIONS

OFF ROAD VEHICLES

VERY BOTHERED 1 2 3 4 5 DOESN'T BOTHER ME

DRY STREAMBED

VERY BOTHERED 1 2 3 4 5 DOESN'T BOTHER ME

LIVESTOCK

VERY BOTHERED 1 2 3 4 5 DOESN'T BOTHER ME

CONCRETE STREAM BANKS

VERY BOTHERED 1 2 3 4 5 DOESN'T BOTHER ME

TRASH ALONG THE RIVERBANK

VERY BOTHERED 1 2 3 4 5 DOESN'T BOTHER ME

POLLUTED WATER

VERY BOTHERED 1 2 3 4 5 DOESN'T BOTHER ME

SHEET 3

FOR YOUR INFORMATION:

Average Annual Spending per U.S. Taxpayer On Various Federal Programs ($30,000-$39,000 income level)

Transportation	$86
Medicare	$346
Social Security	$867
Defense	$1127

Cost of Various Leisure Activities

Movie Ticket	$6
Pro Basketball Game	$19
Daily Ski Pass	$35
Round of Golf	$75

Average Annual Spending per U.S. Household on Entertainment ($30,000-$39,000 income level)

Reading	$ 173
Entertainment fees and admissions	$ 363
Television, radio, sound equipment	$ 496

RESTORE			MAINTAIN		
$ 0	$150	$750	$ 0	$150	$750
$ 5	$175	$800	$ 5	$175	$800
$ 10	$200	$850	$ 10	$200	$850
$ 15	$225	$900	$ 15	$225	$900
$ 20	$250	$950	$ 20	$250	$950
$ 25	$275	$1000	$ 25	$275	$1000
$ 30	$300	$1100	$ 30	$300	$1100
$ 40	$350	$1200	$ 40	$350	$1200
$ 50	$400	$1300	$ 50	$400	$1300
$ 60	$450	$1400	$ 60	$450	$1400
$ 70	$500	$1500	$ 70	$500	$1500
$ 80	$550	$1600	$ 80	$550	$1600
$ 90	$600	$1700	$ 90	$600	$1700
$100	$650	$1800	$100	$650	$1800
$125	$700	$2000	$125	$700	$2000

SHEET 4

I could not come up with a realistic dollar value for the last two questions.
STRONGLY AGREE 1 2 3 4 5 STRONGLY DISAGREE

I am not willing to pay more taxes.
STRONGLY AGREE 1 2 3 4 5 STRONGLY DISAGREE

I am not concerned about preserving streamside areas.
STRONGLY AGREE 1 2 3 4 5 STRONGLY DISAGREE

It is not the government's job to preserve streamside areas.
STRONGLY AGREE 1 2 3 4 5 STRONGLY DISAGREE

I object to placing a dollar value on streamside areas.
STRONGLY AGREE 1 2 3 4 5 STRONGLY DISAGREE

I think people who do not live near this streamside area should not have to pay to preserve it.
STRONGLY AGREE 1 2 3 4 5 STRONGLY DISAGREE

SHEET 5

ABOUT YOU

Age: _____years

Sex: _____male _____female

Address: City _____
State _____
Zip Code _____
Do you live at this address year round? If not please list other residence
City_____ State_____ Zip_____

How many people live in your household? _____ adults
_____ children (under 18)

Are you a Nature Conservancy member? _____yes _____no

What is your highest level of education?
_____grade school
_____some high school
_____high school graduate
_____trade school
_____some college
_____college graduate
_____some graduate work
_____a graduate degree

Which of the following best describes your racial or ethnic background:
_____White
_____Hispanic
_____Black
_____Asian
_____Native American
_____other,
please specify_____

Which of these broad categories describes your total household income before taxes?
_____under $10,000
_____$10,000-$19,999
_____$20,000-$29,999
_____$30,000-$39,999
_____$40,000-$49,999
_____$50,000-$74,999
_____$75,000-$99,999
_____$100,000 or more

Which of the following best describes your home community?
____ (a) large metropolitan area, over 1,000,000 people
____ (b) large city, 100,000 to 1,000,000 people
____ (c) medium sized city, 25,000 to 100,000 people
____ (d) small city, 5,000 to 25,000 people
____ (e) town, less than 5,000 people
____ (f) rural area, non-farm,
____ (g) rural area, farm

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