Chapter 2
Forest Ecosystem Services: Cultural Values

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WHAT ARE CULTURAL SERVICES?

How we define "culture" and societal well-being related to culture depends heavily on who is looking at it, but culture can be generally described as "the customs and beliefs of a particular group of people that are used to express their collectively held values" (Soulbury Commission 2012). In the context of forests, culturally derived norms, beliefs, and values help drive preferences for forested landscapes and forest-based benefits such as diversity and identity, justice, education, freedom, and spirituality (Farber and others 2002, Fisher and others 2009, Kellert 1996). Environmental policies and responsible forest management can enhance how forests help give rise to and support cultural ecosystem service values. Likewise, human components (e.g., customs and beliefs) determine how forests are to be culturally valued (fig. 2.1). This is somewhat different when compared to other types of services (e.g., regulating services) because human culture plays a central role in determining how people interact with forests and perceive their associated benefits. In other words, human culture gives important meanings to forests that are recognized as valuable, but the forests themselves do not inherently possess these meanings. Table 2.1 offers a topology of cultural ecosystem services and associated ecosystem and human components. However, our understanding of the many factors that give rise to cultural ecosystem services is still a matter of ongoing investigation.

There is good reason for investigating the cultural ecosystem service values associated with forests: they are critical to our understanding of the value of forest land and the benefits of forest conservation. The U.S. South is expected to lose 30-43 million forest acres to urbanization between 1997 and 2060 (Wear and Greis 2002), and structural changes in southeastern ecosystems are expected to impact the provision of a wide range of cultural ecosystem service benefits (Bowker and others 2013). Concurrently, social trends also suggest that youth are spending less time outdoors compared to previous generations (Louv 2008). This means that the customs and beliefs held by future generations and how future generations value forests will likely be different compared to previous generations. To help maintain the forest estate, we may need to actively cultivate cultural ecosystem service values through outreach programs that encourage different population groups (i.e., younger and non-white populations) to take up new recreational activities (Poudyal and others 2008). Providing tangible experiences can

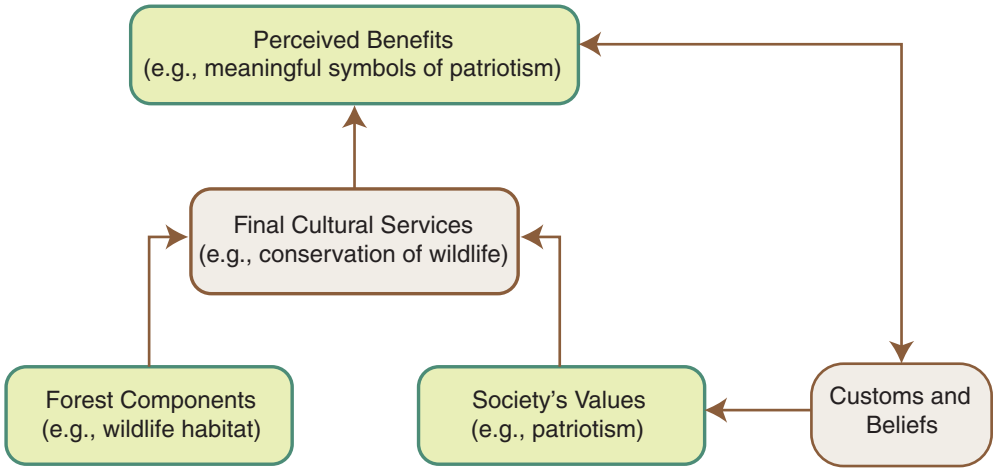

Figure 2.1—Relationship between forests and society that give rise to cultural ecosystem services and perceived benefits provided by forest lands.

Table 2.1—Typology of the components that give rise to cultural ecosystem services

Components intrinsic to visitors/users	Components intrinsic to the site	Potential benefits	Cultural ecosystem services
Social capital	Historic features	Health and well-being	Cultural identity
Skills	Biodiversity	Social contacts	Cultural heritage
Knowledge	Wildlife	Personal pride	Spiritual services
Values	Management	Education	Inspirational services
Beliefs	Structure	Inspiration	Aesthetic services
	Stories	Spiritual well-being	Recreation/Tourism
	Practices		
	Artworks		

Sources: de Groot and others (2005); Tabbush (2010).

help individuals gain a sense of place and an appreciation of the services provided by forests. Those who gain a sense of place are also more likely to perceive that they have attained the benefits they desire and will want to visit forests again in the future (Kil and others 2012).

While the importance of cultural ecosystem services has been recognized within land management and policy decisions, many services are not yet adequately defined, quantified, or integrated within the ecosystem services framework (Daniel and others 2012). This is largely because attempts to quantify these values require: 1) an understanding of how ecosystem components and associated artifacts (e.g., historic sites) interact with important human components (e.g., customs, beliefs), and 2) the suitability of the quantitative and valuation methods used to measure these interactions (de Groot and others 2005). Experts in most social science disciplines, such as anthropology, sociology, and psychology, are trained to address the first requirement, and economists are involved to address the second component. Notably, the valuation approaches used by economists tend to offer incomplete and lower bound estimates of ecosystem service values. Moreover, economists tend to use market data that is readily available but poorly suited to the task, particularly when public goods and externalities are involved (Costanza and others 1997). There is a need for decisionmakers to better understand the methods available to estimate non-market values for ecosystem services and the challenges associated with using these methods to understand tradeoffs in cultural ecosystem services.

The goal of this chapter is to provide an overview of how valuation methods can be used and applied within a cultural ecosystem services context. The first part will focus on different types of values (use and non-use values) and the ways cultural ecosystem services may be integrated within the ecosystem services framework. Second, we will examine the policy context and purpose for producing economic estimates of ecosystem services value. Third is a non-technical description of important theoretical frameworks and challenges associated with economic estimation efforts. Finally, we will provide readers with a non-technical description of commonly used non-market valuation methods and benefit transfer and will discuss these approaches within a cultural ecosystem services context. Consistent with the theme of this book, we will focus on the Southeastern United States; however, the overall concept of cultural ecosystems services, and the methods used to identify and measure the economic value of these services, are applicable well beyond this region.

CONNECTING CULTURAL ECOSYSTEM SERVICES WITH THE ECOSYSTEM SERVICES VALUATION FRAMEWORK

Cultural Ecosystem Services and Use Values

The cultural aspects of a society are often expressed through the activities, practices, skills, and events that occur in the forest, or that involve artifacts that originated from the forest (Tabbush 2010). These activities may involve the consumptive use of forests (e.g., mushroom picking) as well as non-consumptive uses (e.g., hiking). To help readers understand use values in the context of cultural ecosystem services, this section will provide an in-depth discussion about recreational and aesthetic experiences, also known as amenity services (de Groot and others 2005). Since amenity services are often associated with public lands, the last part of this section will describe some of the cultural ecosystem services also associated with private forest lands.

The benefits of engaging in outdoor recreation activities on forest lands have long been important to people in the southeast region of the United States (Ownby 2014). Today, millions of people participate in non-consumptive recreational activities such as walking, hiking, camping, birdwatching, wildlife viewing,

and other such pursuits in forests every year (Cordell 2008). Southeastern forests are also habitat for many game animals and fish sought by consumptive recreationists, such as hunters and anglers, and serve as the source of rivers and streams used for recreational activities. It is unsurprising that the value of recreation in the southeast region has been the subject of numerous economic studies (see Appendix 2.1). The number of visitors to southeastern forests is expected to rise over time along with demand for different recreational activities (Bowker and others 2013).

Several authors have suggested that for accounting purposes, recreation (e.g., angling) should be thought of as a benefit that arises from the joint use of other ecosystem services (e.g., clean water) and conventional goods and services (e.g., fishing equipment) (Boyd and Banzhaf 2007, Fisher and others 2009). There is a long history of research on the components of and benefits from a recreation experience (Driver and others 1991, Manfredo and Driver 1996, Manfredo and others 1983, Manning 1999). In the recreation literature, the recreation experience is most often understood from the psychological perspective. Consequently, individuals who participate in outdoor recreation do so with the expectation that the recreation activity, done in a particular setting, will result in certain beneficial psychological and physiological outcomes (Manfredo and Driver 1996, Stein and others 2003). This is commonly referred to as the experiential or behavioral model of recreation where the outcomes of recreation rather than the activities themselves are deemed to be the benefits (Driver and others 1991). Interestingly, the majority of the benefits categorized as cultural ecosystem services by most authors (MEA 2003, DeGroot and others 2005) are tied to outdoor recreation (see table 2.2 in chapter 2 Moore and Driver 2005).

The key aspects of setting in the recreation experience model are defined as the physical setting (e.g., level of remoteness), the social setting (e.g., level of crowding), and managerial setting (e.g., level of management restrictions and facilities) (Driver and others 1987). Settings are expected to influence the activities that can be performed in any given location and the benefits that recreationists might expect to obtain (Pierskalla and others 2004). We have taken the outdoor recreation experience model and ungrouped the three setting attributes so that we can begin to elaborate on the physical setting (Morse 2010) (fig. 2.2). Presented this way, the biophysical setting is considered to be but one aspect of the recreation setting. Furthermore, the physical setting is more than simply a level of remoteness, but also a combination of geophysical, biological, and vegetative attributes that are spatially explicit (Morse and others 2009). It is this ecological portion of the physical recreation setting that is the final service (the forest, the water body, and the fish) recognized by Boyd and Banzhaf (2007), or the result of indirect and final structural and functional services of Fisher and others (2009).

By conceptualizing the recreation experience model in this way, we can identify clearly the contribution of the ecosystem as a critical aspect of the recreation setting. It also demonstrates that the ecosystem is but one of the attributes that combine to form a recreation opportunity setting, or the amenity service. Using recreation theory, we can also identify the many benefits (psychological, physiological, etc.) that are accrued from recreation experiences. Finally, the model clarifies the subjectivity of an experience (essential for cultural ecosystem services) that is dependent on how different individuals' motivations and expectations regarding their experience and desired outcomes can influence their value of the recreation experience.

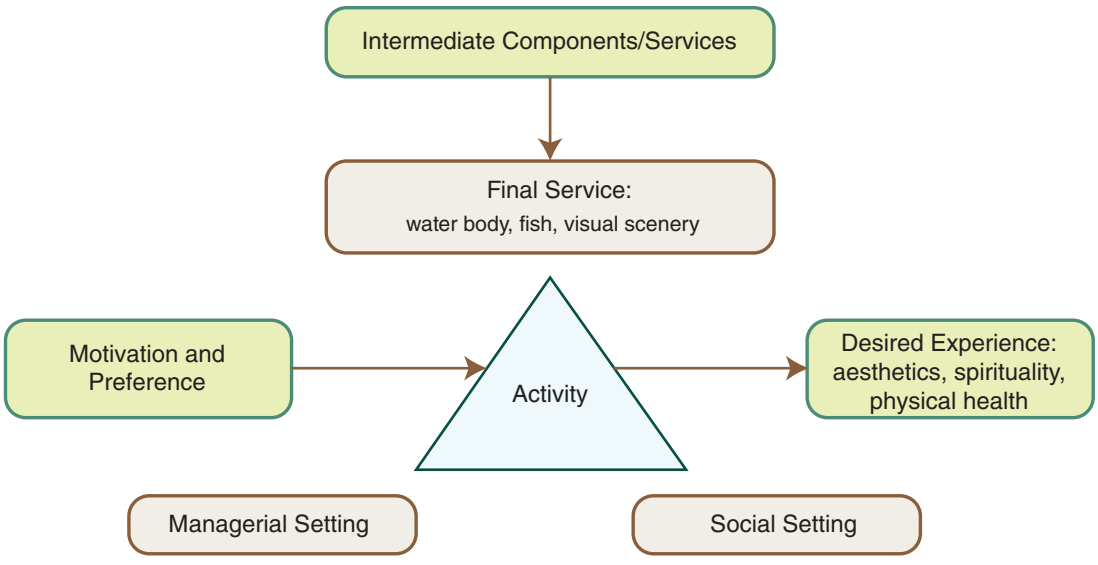

Figure 2.2—Integrating recreation theory with ecosystem services.

Public lands are often recognized as being central to the provision of cultural and amenity ecosystem services; however, private forest lands also play an important but less well understood role. In the southeastern region of the United States, the value of recreation on private lands is most often associated with lease and fee hunting (Mozumder and others 2007). Willingness to pay for hunting leases in Alabama was found to be steadily increasing and was last valued at $1.29 per acre per hunter (Zhang and others 2004). Willingness to pay for fall and spring turkey hunting permits in Mississippi has been valued at $11.00 and $36.25, respectively (Brunke and others 2006). The value of the hunting leases can depend on a number of factors such as alternative hunting access options, hunter perception of crowding on public lands, availability of game species on leased lands, and duration of the lease agreement (Munn and others 2011).

Even when the public is not able to access private lands, certain benefits may still be provided in the form of spillover effects (Blitzer and others 2012). Private lands offer green landscapes and positive aesthetic experiences for neighbors and others in the community (Luttik 2000). Moore and others (2011) estimated total aesthetic value of Georgia's private forests to the residents of Georgia at $11.2 billion per year. Haefele and others (1991) found people were willing to pay $100 per year and $21 per year, respectively, for protecting high-elevation spruce-fir forests in the southern Appalachian Mountains from exotic insect infestations and air pollution damages. With continued forest fragmentation and a loss of forest cover, demand for green spaces can be expected to increase in the Southeastern United States (Griffith and others 2003).

Similar to aesthetic benefits, how land is managed can serve as salient symbols on the landscape, expressing important cultural priorities and values (Allison 1996, Sorice and others 2012). For example, planting even-aged pine stands can be seen as an homage to the South's longstanding history in producing forest products (Zhang and Polyakov 2010), or more simply the virtue of productivity. Likewise, prescribed burning can help express the value of living in harmony with nature or the importance of maintaining certain management traditions (Putz 2003). The act of owning forest land also helps people express important ideals about identity, individualism, a sense of duty (toward nature or society) and skepticism about State control (Brook and others 2003, Burton 2004). Maintaining the ability for self-determination has important psychological benefits and can enhance perceptions of personal well-being (Ryan and Deci 2000). Those who help shape the landscape may also have a greater sense of place and assign a higher value to the cultural benefits associated with private lands (Kil and others 2012).

Due to changing cultural values and perceptions, there is an increasing tendency to create landscapes with high amenity values (for aesthetic and recreational use, for example) at the expense of traditional landscapes with high cultural and spiritual ecosystem service values, and to disregard those with traditional knowledge about forest management (de Groot and others 2005). When changes are made to the landscape, either through market forces or government interventions, this can be perceived as a threat to certain cultural ecosystem service values and the psychological well-being of forest owners (Kreye and others 2016). Government interventions that seek to improve public welfare through the management of private forest lands should also recognize the cultural ecosystem service values and traditional knowledge associated with maintaining private lands. Policy efforts that recognize the unique benefits associated with maintaining private forest lands can help improve the quality of human life within rural communities while simultaneously achieving forest conservation and sustainable use goals (de Groot and others 2005).

Cultural Ecosystem Services and Non-use Values

Some of the cultural ecosystem services provided by forests do not have to be *used* for the benefits to be recognized or considered valuable. Non-use (or passive use) values are ideals that serve as a guiding principle in how people make decisions about the environment and are an expression of important cultural values (Dietz 2015). Understanding people's attitudes (positive or negative) toward different types of non-use values can improve our understanding of public priorities for less tangible cultural ecosystem services. Table 2.2 provides a list of the non-use values most often recognized in the research literature (Dietz 2015).

Bequest value, or beliefs about the importance of passing ecosystems on to future generations in good condition, relates to the heritage services provided by conserved or restored forests (Broadbent and others 2015). What separates bequest value from a general concern about environmental integrity or altruistic

Table 2.2—A topology of non-use values

Option value	Bequest value	Existence value	Altruistic value
The value of maintaining an asset or resource to have the possibility that it may someday be used.	The value of maintaining or preserving an asset or resource so that it is available for future generations.	The benefit people receive from knowing that a particular environmental resource, organism or thing exists.	The value of maintaining an asset or resource that is not used by the individual, so that others may make use of it.

Source: Dietz (2015).

value is the additional desire that a specific group (i.e., future generations) be given the opportunity to benefit from forests (Walsh and others 1984). In the southeastern United States, longleaf pine *(Pinus palustris)* ecosystems, and associated wildlife such as the gopher tortoise *(Gopherus polyphemus)*, are considered by many to be part of the cultural heritage of the region. However, less than 6 percent of the original extent of longleaf pine ecosystems remains in the South (Guldin and others 2016). Participants in advocacy organizations, such as the Longleaf Alliance, recognize the bequest value associated with these ecosystems and seek to promote longleaf pine restoration on public and private lands.

Society's beliefs about the treatment of non-humans and ecosystems are an important part of the spiritual and cultural identity ecosystem services provided by forests (Davidson 2013, de Groot and others 2005). Some people psychologically benefit from knowing that a certain organism exists, because the organism is an important symbol within their community or personal life (de Groot and others 2005). Some also believe we have an ethical responsibility as a society to protect the integrity of ecosystems (Pienaar and others 2013). To illustrate, households in South Carolina were found to have a willingness to pay of $10.64 annually for the benefits associated with protecting the endangered red-cockaded woodpecker *(Leuconotopicus borealis)* (Loomis and White 1996). Research has also found that people in the United States, including the Southeast, tend to have biocentric attitudes toward forests (i.e., a concern about the well-being of all organisms) (Kreye and others 2014, Pienaar and others 2013).

The beliefs people hold about *how* ecosystem services should be distributed to society (e.g., government interventions, markets) can also contribute to the cultural identity and heritage ecosystem services associated with forests in the Southeastern United States (Johnson and Duke 2007, Kreye and others 2016, Poudyal and others 2015). Beliefs about government control over the distribution of services can impact the perceived legitimacy and public acceptance of environmental policy decisions (Petersmann 2004) as well as estimates of willingness to pay for ecosystem service provision used in decisionmaking (Kreye and others 2014, 2016b). Most government approaches to ecosystem service distribution involve the permanent modification of private property rights (e.g., land acquisition, conservation easements). Government entities may also use laws and regulations to oversee the fair distribution of cultural benefits, such as access to outdoor recreation and other resource amenities by minority groups (Floyd and Johnson 2002, Johnson and others 1998). However, for some goods and services, government involvement may be considered cumbersome or less effective compared to free market approaches. Government involvement in service provision may also involve certain tradeoffs, such as the psychological benefit of being assured that resources will be protected into the future (e.g., option value) but the loss of the psychological benefits associated with maintaining private lands (e.g., self-determination). Recent research has found public values for forest-based services in Florida and Georgia are indeed influenced by the policy processes (e.g., conservation easements) and the institutions (e.g., State agency) used to bring about the services (Kreye and others 2016, Poudyal and others 2015). While a broader body of social science research has recognized the relationship between social trust and ecosystem management, this relationship is rarely incorporated into valuation efforts and is not well understood as a contributor to cultural ecosystem services (Kreye and others 2014).

Why Assess the Economic Value of Cultural Ecosystem Services?

Given the difficulties in defining and quantifying certain cultural ecosystem services, one may question the rationale behind attempts to estimate economic values for these services. Some advocate that multi-criterion and deliberative evaluation procedures be used instead of strict economic strategies to clarify tradeoffs and synergies involving cultural ecosystem services (Daniel and others 2012). Moreover, some argue that traditional market approaches are inappropriate for identifying and measuring cultural ecosystem services (Kumar and Kumar 2008, Peterson and others 2009). Still, we see evidence every day of people expressing important cultural values through consumer and market behaviors (e.g., visiting National Parks, buying organic food), but this can only occur when markets exist that allow people to express these values. The metric that can best express changes in human well-being for decisionmaking purposes often depends on the policy context and stakeholder needs.

In most policy contexts, the need to obtain economic values can arise when (1) there is a need to justify management costs for current levels of service provision, or (2) when a common metric (i.e., dollar) is needed to assess tradeoffs in welfare across dissimilar services (e.g., clean water benefits versus agricultural goods). In the first case, a single value estimate may be all that is needed for use in a cost-benefit analysis. In the second case, each policy alternative may need to account for other associated factors such as the number of people impacted by a change in service provision and the distribution of benefits over time.

Economic values are also central to helping advance market-based approaches (i.e., payments for ecosystem services) to ecosystem service provision. In the past, the valuation of cultural ecosystem services, primarily recreation, has been limited to public lands. Increased population growth and demand for forest-related benefits in the Southeastern United States has now compelled decisionmakers to also understand the full value of private lands. Traditionally, the value of private forest lands has been associated with agricultural productivity (i.e., timber) and landowners receive little or no external reward for securing services that help provide cultural benefits. As such, ecosystem services with either off-site or non-use values are likely to be undersupplied by private forest landowners because it is difficult for them to capture those values. Helping landowners diversify income by offering a variety of nature-based activities that

capitalize on cultural ecosystem services could play an important role in encouraging private landowners to maintain recreational benefits and culturally valuable ecosystem services. Key to this approach is understanding public willingness to pay (i.e., demand) for cultural ecosystem service provision and landowner willingness to accept compensation (i.e., price) for providing cultural ecosystem services.

Economic Concepts and Theoretical Assumptions

Economic theory attempts to describe the values people hold for different goods and services under different contexts (e.g., a change in quality, the availability of substitutes) and when choices are constrained by cost (e.g., income). Because of these constraints, monetary values do not represent the inherent value of an ecosystem, only its value in relationship to other levels of provision or other goods (Kallis and others 2013). It is assumed that the benefits derived from cultural ecosystem services provide the individual with some utility or measure of satisfaction. Random utility theory states that the level of utility associated with a good or service will vary randomly across a population (Train 1998). It is also assumed that measured estimates of willingness to pay (WTP) are an appropriate representation of individual utility. Therefore, the most commonly accepted and applied metrics for valuing cultural services are individuals' maximum WTP in dollars for ecosystem service provision. In some cases, economists may also choose to measure the minimum willingness to accept (WTA) to forego the provision of a good or service (Brown 2007).

The difference between what a consumer is willing to pay and what they actually paid for a good (i.e., its price) is known as consumer surplus. In cases where market prices do not exist, but goods or services have recognized value, individual consumer demand is represented by WTP. When consumer surplus is aggregated across a population, an estimate of the welfare gain to consumers of that good or service is obtained. The analogue for producers is known as producer surplus and is typically thought of as profit—the difference between the price and the cost of providing the service (i.e., supply curve). Producer surplus can help describe how producer welfare can be improved through the development of missing markets. Market-based solutions to welfare—or ecosystem service—distribution are considered efficient when supply equals demand. Change in consumer and producer surplus is the measurement that economists provide to policymakers to help describe how public welfare is impacted by changes in ecosystem service provision (Brown 2007).

To facilitate a successful market transaction, it is important that goods and services embody certain characteristics (Brown 2007). One important characteristic is the ability to be rivalrous, or when the good is consumed by one person it prevents simultaneous consumption of the good by others (e.g., timber). Another characteristic is the ability to exclude or prevent people who have not paid for a good or service from having access to it (e.g., fee-based access to a State park). Goods and services that have a direct use value and are rival and/or excludable tend to be already traded in a market setting. However, use values are only part of the total economic value (TEV) associated with a good or service. Non-use values are also considered important because of how these values relate to important beliefs and ideologies that help drive consumer behaviors and preferences for less tangible cultural ecosystem services. Non-use values may also constitute an important part of the total value associated with certain forests, such as wilderness preserves (Loomis and Richardson 2000, Walsh and Loomis 1989).

When attempting to link land management decisions with certain cultural ecosystem service values, it is useful to employ Lanscaster's theory of values, which postulates that the utility we expect from a good or service is dependent on the characteristics, or bundle of attributes, that make up the good or service (Lancaster 1966). This is to say, consumers decide which services (or goods) are preferable by examining the attributes or features that make up the service, along with the price of the service and the income they have available to spend on it. Advanced valuation approaches, such as an attribute-based choice experiment and hedonic methods, are often structured around this theory. The advantage of this approach is that both attributes on the landscape—created through management actions—and attributes describing cultural components can be linked with changes in benefits or utility. Attributes on the landscape may include forest plant diversity and structure, trails and historic sites, and spatial relationships among important features (e.g., distance between historic sites). Attributes that describe important cultural components may include the customs of service users (e.g., level of hiking activity) and/or beliefs that people hold about service outcomes (e.g., health benefits, importance of passing forests to future generations). Unfortunately, attributes that describe the human components of cultural services are less often examined or understood in a valuation context, more of which will be discussed later on in the chapter.

The theoretical frameworks and assumptions presented above also come with some important limitations. One limitation is that WTP estimates are a meaningful proxy of utility only for those who have a sufficient amount of disposable income. This means that valuation efforts may not be appropriate for addressing environmental justice concerns in poor communities. Another limitation is the occurrence of lexicographic preferences or when a person is unwilling to forego a good in exchange for any other amount of another good based on ethical reasons. There is also the assumption that people, as consumers, are primarily interested in maximizing their utility and make decisions outside of social contexts. In reality, some people are willing to be losers at times (e.g., pay higher taxes) if they believe that this will help society or their community as a whole succeed. Similarly, some landowners may be motivated by personal ethics (e.g., being a good land steward) to assume the costs of conservation and are unwilling to accept financial incentives for providing certain cultural ecosystem services.

The theoretical issues described above illustrate the difficulty of understanding human behaviors toward the environment using a strictly economic approach. Still, valuation methods are continually being improved and offer a useful way of comparing tradeoffs in utility associated with ecosystem service provision. For example, non-market valuation approaches have been the subject of investigation in 130 countries for over 50 years and have resulted in over 7,500 published research papers (Carson 2012). It is our recommendation that those who plan to employ valuation methods consider how the associated assumptions may impact their efforts to produce useable estimates of economic value within a given policy situation. In some policy contexts, non-monetary metrics or a mixed methods approach (i.e., using both quantitative and qualitative methods) can instead be used to understand policy impacts and inform decisionmaking.

VALUATION METHODOLOGIES

This section of the chapter provides a general description of the non-market valuation methods currently used to generate estimates of economic value. Revealed preference methods, such as travel cost and hedonic pricing, rely on data from actual spending choices or behaviors to infer underlying relative utilities for non-market goods and services. Stated preference methods use hypothetical market contexts to quantify non-market values (e.g., by asking respondents to state their maximum WTP or WTA) for a non-market good or service (e.g., using a survey approach). We also provide a comparison of the outcomes of an economic impact analysis with non-market valuation methods so that readers can better distinguish between the approaches.

Limitations of an Economic Impact Analysis

Economic impact analysis is a quantitative approach often used by government agencies to justify management or program costs. This approach focuses on policy driven changes on the landscape which result in changes in business revenue, business profits, personal wages, and/or jobs. For example, recreation on Federal lands contributes about $13.6 billion to the Nation's gross domestic product each year and supports approximately 205,000 jobs, many of which are located in rural areas (Weldon 2014). The total economic impact of hunting activities, wildlife viewing, and recreation in the southern Appalachian region was estimated at $594 million, $407 million, and $6 billion, respectively, in 1996 (Barnhill 1999). It is also reported that expenditures made on wildlife related recreations (e.g., fishing, hunting, and wildlife-watching) generated 0.7 percent of regional employment and gross output in the Southeastern United States (Munn and others 2010).

Clearly, public demand for cultural ecosystem service provision has an important economic impact on surrounding communities. However, these types of economic metrics (i.e., jobs created, revenue earned) do not offer a suitable description of consumer or producer surplus necessary for describing changes in utility for a given service. Moreover, economic impact estimates are based on existing market values for a limited number of services and fail to describe the value associated with related non-market goods and services. To use economic estimates within an ecosystem services framework, at a minimum the estimates need to be comparable across services and describe consumer surplus for both market and non-market values.

Revealed Preference Methods

Travel cost methods—Travel cost methods are primarily used to estimate the value of recreation offered at a specific site (e.g., a State park). Economists assume that the economic cost necessary to reach a recreational site, such as travel expenses and associated user fees (e.g., entrance fees), is an estimate of user WTP for recreation. In other words, it is assumed that people perceive and respond to changes in travel costs and amenity qualities the same way that they would respond to changes in market price and qualities of purchased goods. The values generated using this method can allow decisionmakers to compare estimated benefits with the costs of maintaining the site for visitors (Parsons 2003).

A simple zonal travel cost method can be applied by collecting information from visitors about the number of visits and their travel distance to the site. Because travel costs tend to increase with distance, researchers are able to construct a demand curve by calculating the number of visits purchased at different prices or travel costs (fig. 2.3). Consumer surplus for users is then estimated by quantifying the area above the price line and below the demand curve.

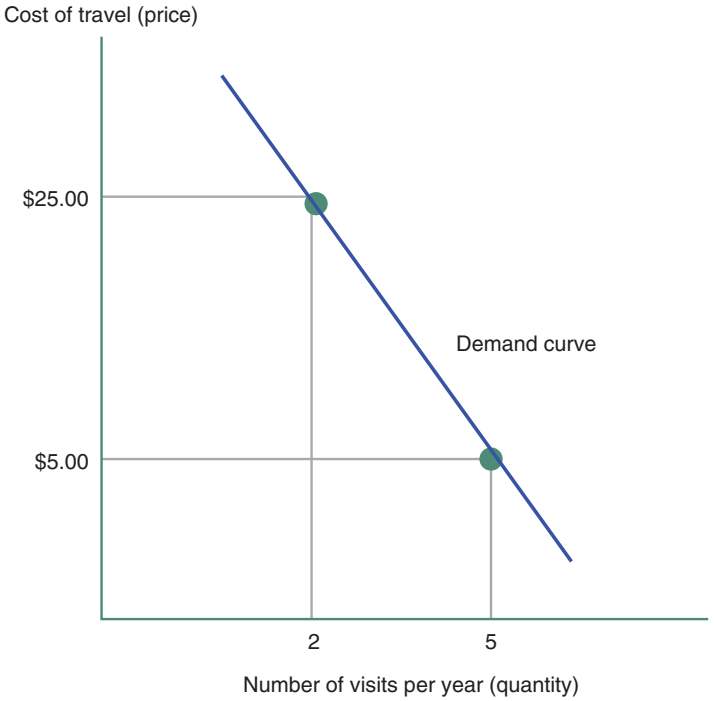

Figure 2.3—Example of a demand curve based on the cost of travel (purchase price) and number of visits to the site (quantity).

The merits of the travel cost method are that it is often relatively inexpensive to apply and uncontroversial because it is based on standard economic techniques for measuring value. The challenge with using the simple zonal approach is accurately estimating the travel costs of visitors. Transportation costs often include gas prices and—if traveling a long distance—possibly food and hotel accommodations. The value of the visitor's time is sometimes also considered by including estimates of wages lost while traveling and visiting the site. These average costs are included in the travel cost calculation as average distances, gas prices, and proportion of wage values (e.g., Amoako-Tuffour and Martinez-Espiñeira 2012). A potential source of error in the value estimates occurs when cost information is not collected directly from the visitor, but instead is approximated by the researcher. Error can also be associated with the assumption that the visitor's sole purpose for the trip was to recreate at that site. Similarly, the availability of substitutes and their effect on preferences are also not usually considered (Randall 1994).

By focusing only on costs, this simple valuation method tends to provide an incomplete understanding of the associated benefits. Many natural areas offer multiple activities (hiking and boating), which a given visitor, based on their customs, may or may not use. Linking travel costs with specific psychological or physiological benefits is also difficult unless additional data are collected to better understand how users perceive their experiences. It is also important to consider that the simple travel cost approach only provides values associated with current benefit levels, not changes in benefits levels, which would be more useful for planning. Finally, travel costs can only examine the use values associated with the park and not the non-use values. In short, simple travel cost estimates provide an incomplete understanding of consumer surplus and potential tradeoffs in social welfare associated with different management outcomes.

The simple zonal travel cost method could be improved by using an individual travel cost or hybrid travel cost/contingent valuation approach with a more detailed survey of visitors' characteristics and expected benefits (Armbrecht 2014, Cameron 1992, Randall 1994). Survey questions can pertain not only to individual travel costs but the purpose of the visit (e.g., hiking and/or fishing) and how changes in benefit levels or costs may impact visitor behaviors. For example, a recent study used the individual travel cost method to compare the value of non-trail backpacking activity with trail backpacking activity at Allegheny National Forest (Cho and others 2014). In another study, a series of questions describing different activities and benefit levels was used to cluster visitors into user groups, such as "backcountry enthusiasts," "do it all adventurists," "windshield tourists," and a "creature comfort" group (Benson and others 2014). In these cases, the data collected not only provided park managers with estimates of economic value, but also a better understanding of how management funds should be distributed to maintain certain benefits.

Even with advanced sampling and analysis methods, the travel cost approach may not always be appropriate for estimating the value of cultural ecosystem services in all policy contexts. When the focus is on private or local forests, the travel cost approach to valuation is more likely to result in the underestimation of consumer surplus. To build a demand function, the resource needs to be far enough away to have an effect on the income of visitors, which may not be the case for local visitors. Also, those who live nearby may place a relatively higher cultural ecosystem service value on local resources due to place attachment (Kil and others 2012). This may be a particular concern in the rural Southeast where there are fewer acres of public lands per capita, compared to the West, and recreational activity on private lands is poorly or infrequently documented.

Hedonic pricing—The hedonic pricing method takes advantage of the fact that sometimes non-market values for cultural benefits such as aesthetics, recreation, and other environmental amenities (e.g., clean air and water) are embodied in the price of other goods and services and can therefore be derived (Dietz 2016). This method is most effective when there has been a distinct change in environmental quality that has impacted the quality or satisfaction associated with a related good. For example, it is assumed that home buyers select houses based on their preferences for different attributes of the house including location (e.g., distance to parks and schools), features (e.g., number of bedrooms/bathrooms), and surrounding environment (e.g., air and water quality). After controlling for variation in price, location, and house features, it is assumed that the remaining difference in home prices is related to a difference in environmental quality. The implicit price estimates are then used to estimate inverse demand functions or marginal WTP.

How hedonic values are used in a policy context depends on how the associated environmental benefits are perceived. Values associated with green space and aesthetic amenities can be used to justify changes to zoning laws and other regulations that help control urban sprawl and land use change (Gibbons and others 2014). Values associated with increases in pollution or a decline in health benefits can be used to justify costs associated with remediation or health care provision. Hedonic models have long been used by the Environmental Protection Agency to derive the value of living in neighborhoods with high or low levels of air quality (Smith and Huang 1995). A few studies have also estimated the economic value of trees or forests on property price in the Southeastern United States (table 2.3). Using the hedonic property price models, Anderson and Cordell (1988) analyzed the economic value of urban trees and found certain trees were associated with a 3.5-4.5 percent increase in homes sales price. Likewise, Mansfield and others (2005) found proximity to forest types and proportion of parcel that was forested increased home sales prices in Research Triangle, North Carolina.

Hedonic modeling uses regression analysis to determine how changes in the attributes of the good, the users, and the environment (i.e., independent variables) are correlated with

Table 2.3—Economic value of forests in the Southeast region

Study	Measurement used	Location	Method	Results
Anderson and Cordell (1988)	Number of large, small, pine, and hardwood trees in front yards of residential single family properties	Athens, GA	Hedonic property price	Trees were found to be associated with a 3.5%–4.5% increase in homes sales price
Mansfield and others (2005)	Percentage of residential single family parcel that was forested, acres of forest on a parcel, percentage of forested land within 400-m, 800-m, and 1,600-m buffers around parcel, distances to private and institutional forests	Research Triangle NC	Hedonic property price	Proximity to both forest types and proportion of parcel that was forested increased home sales prices; increasing forest cover on parcel by 10% adds less than $800 to home sales prices while adjacency to private forests add more than $8000

changes in price. Market data for housing is often secured from the property appraiser's or tax offices. Measured changes in environmental quality (e.g., water pH, turbidity) can be secured from the State or Federal agencies responsible for monitoring those changes. Census data is often used to describe relevant changes in social components such as demographic characteristics, annual household income, and employment. Sometimes, it may be necessary to use GIS spatial software to map the location of the house relative to the site where the service (or disservice) originates (e.g., a nature park or an industrial park). Because changes in environment quality and the housing market can be masked by other influences on the market, large amounts of data often needed for analysis and estimates depend heavily on model specification (Lipton and others 1995).

The main strength of the hedonic approach is that, as a revealed preference method, the non-market value estimates are derived from actual choices and reflect the cultural customs of homebuyers. Property markets have been found to be relatively efficient in responding to information and property records can be reliable in reporting market transactions. Still, outside influences like taxes, interest rates, or housing market bubbles can affect housing prices, masking the influence of the environmental amenities. There are also limitations to the hedonic method in regard to informing policy. Researchers can only examine the environmental qualities that are directly associated with the good (e.g., housing) and apply these values to policy contexts with a similar physical setting. For example, the value of wildlife habitat provided by trees on a parcel of land in a neighborhood may not be comparable to the value associated with habitat located in large, unbroken parcels of forest (Willis and Benson 1988).

Hedonic pricing also provides a limited understanding of the expected benefits, which is important for characterizing the cultural ecosystem service values associated with forests. It is assumed that potential homeowners are aware of the surrounding environmental conditions and will make their selection based on how it will enhance their quality of life or reduce discomfort or effort (Dietz 2015). Moreover, hedonic pricing can only *suggest* the presence of certain self-enhancement benefits (e.g., self-seeking analysis of costs and benefits) and not the self-transcendent attitudes (e.g., altruistic and biocentric attitudes) often associated with non-use values and benefits (e.g., existence value) (Dietz 2015). Similar to travel cost methods, hedonic pricing can only account for certain use values, and therefore it can describe only part of the total economic value of a good or service. One way to improve the hedonic approach is to use it in combination with stated preference methods. Using a combined methods approach, Johnston and others (2001) found that the optimal scale and design of population growth management policies depended upon many factors, including the distribution of benefits and costs among heterogeneous groups.

Revealed preference methods are often preferred by economists because the observations included in the analysis are based on actual market data. However, to improve our understanding of cultural ecosystem service values, there is a need to better measure and quantify certain human components (i.e., beliefs and perceived benefits) that market behaviors alone cannot describe, and relate these measurements to changes in forest management. Given the flexibility, stated preference methods may instead provide the appropriate tools needed to meet this challenge.

Stated Preference Methods

Stated preference methods estimate non-market values by querying individuals on their WTP for improvements (or willingness to accept payment for losses) to an environmental good or service using choice trials and surveys. These WTP estimates can then be used to estimate consumer surplus and associated demand curves. These methods include several approaches (e.g., contingent valuation, contingent ranking and rating, contingent behavior, choice experiments, and paired comparisons) that construct hypothetical markets for ecosystem services and observe study participant behavior to infer their preferences and subsequent economic value.

Given their reliance on practitioner-defined hypothetical market contexts, stated preference methods can be applied in virtually unlimited ways to inform a diversity of policy decisions (Bennett 2011). However, an important concern associated with this method is that valuation estimates are vulnerable to several biases. For example, with hypothetical bias, respondents may consider their responses to be less consequential (and therefore respond differently) than if they had to actually pay. Response bias can occur if the people who answered the survey are not representative of the larger population. Strategies for dealing with bias concerns have been the subject of ongoing research since the early 1990s when it was recommended that stated preference methods be used to inform natural resource damage assessments in U.S. Federal courts (Arrow and others 1993, Carson and others 2003). Since that time, stated preference methods have been improved and are shown to provide valid, useful, and scientifically defensible value estimates (Haab and others 2013). Indeed, for services that lack markets altogether, stated preference methods are the only adequate link to the economic value and public preferences for these services. Stated preference approaches also offer a way to link valuation estimates to perceived (versus actual) benefits, which are critical for understanding how various groups in society may value cultural ecosystem services differently and the role of education and knowledge in enhancing perceived benefits.

Since surveys are the primary mode of data collection, survey design and associated data analysis are critical considerations for appropriately assessing the value of cultural ecosystem services. Researchers often use interviews and focus groups to inform a more thorough survey and as part of quantitative or mixed methods research approach. The data that is collected is then used to parameterize a hypothesized utility function and the design of the WTP questions. A typical utility function assumes that the utility associated with a good or service is impacted by the attributes that make up the service, the unique preferences of the respondent for that service, and the cost or price of the service. Ultimately, the data collection tool should contain opportunities to observe respondents' preferences to descriptions of the hypothetical changes to an ecosystem service and associated prices. Information on respondent characteristics are later integrated into analysis as additional explanatory variables.

When setting up a stated preference study to examine cultural ecosystem service values, it is important to determine which data types will best deliver the desired information for the given policy context (Carson and others 1994). Below we describe the two most commonly applied stated preference methods: contingent valuation and choice modeling. As described in the sections above, these procedures can also be combined with revealed preferences methods to meet certain data objectives.

Contingent valuation—In a contingent valuation question, the respondent is presented with two alternatives—a status quo, with respect to the current provision level of one or more ecosystem services—and the policy alternative with a specified payment vehicle (e.g., tax) and dollar amount. This method initially utilized simple question formats, such as open-ended questions (e.g., fill in the blank) or bidding procedures to elicit WTP values (table 2.4). In the more commonly applied referendum approach, the investigator presents a single offer and records the participant's "yes" or "no" response. These responses are typically analyzed with dichotomous choice models (logit or probit) from which a welfare measure can be derived (table 2.4). The contingent valuation approach has some practical limitations in describing important tradeoffs; therefore, this approach may be suitable in contexts where decisionmakers need to understand the welfare associated with a single policy or a policy that has already been implemented. To understand tradeoffs in relative utility and WTP among different services or service levels, for planning purposes, a choice experiment approach may be more suitable.

Choice modeling—Choice modeling methods, or choice experiments, arose from conjoint-analysis procedures and have been employed in the marketing, transportation, and psychology

Table 2.4—Main forms of contingent valuation

Open-ended question	Iterative bidding	Payment card	Dichotomous choice/discrete choice	Double-bounded dichotomous choice
Respondents are directly asked their maximum willingness to pay.	Respondents are asked whether they are willing to pay a certain amount and then extra or reduced increments (bids) until their maximum WTP is reached.	Respondents are given a card that contains several payment bids and they choose one.	Known as the referenda model, respondents are asked if they support a change in environmental quality given a specific additional payment.	Similar to dichotomous choice, but then depending on whether they responded, respondents are asked if they are willing to pay a slightly higher or lower amount.

Source: Morrison and others (1997).
WTP = willingness to pay.

literature for some time. In this approach, respondents are asked to choose from a selection of alternative bundles of attributes, which is more comparable to an actual market setting where tradeoffs are assessed and decisions are made (Adamowicz and others 1998). Rather than being questioned about a single event in detail, subjects are questioned about a sample of events drawn from a universe of possible alternatives. It is assumed that the order of preferences (A over B; B over C) for different services (or levels) generated using this approach is related to the respondent's latent scale of utility (Boyle 1990). Compared to contingent valuation, the choice experiment approach offers a richer description of the attribute tradeoffs individuals are willing to make and the estimated WTP values generally have smaller variances relative to the mean (Adamowicz and others 1998).

The effect of changing the level of a single attribute is known as a main effect. To understand main effects on the WTP decision, a main effects orthogonal array can be used to design a series of choice sets (Street and others 2005). To illustrate this procedure, a list of key attributes describing a forest-water protection program was developed through a series of interviews with the members of the public and experts in the field (see table 2.5; Kreye and others 2016b). Attributes of the clean water service provided by forests, including use and non-use values, were arranged into 16 different choices sets, each containing one attribute level from every attribute category.

Latent utility for ecosystem service attribute levels can be measured using several different methods (Carson and others 1994). In a dichotomous choice question format, the respondent is able to accept or reject the ecosystem service bundle or outcome described in each choice set (but without a specific reference to the status quo, as with contingent valuation) (fig. 2.4). This approach is similar to how consumers make decisions, which are often binary (e.g., category or brand decision, buy now or wait, etc.), and binary decisions are often consistent with economic demand theory. To produce a direct measure of relative utility for each attribute level, a ranking procedure may be used. In best-worst scaling, the respondent is asked to indicate which attribute is the "best" and which is the "worst" within each choice set (Louviere and Islam 2008). A novel approach to survey design is to combine ranking and dichotomous choice methodologies in the same choice experiment question to generate both direct and indirect estimates of utility and allow for internal validation procedures (Kreye and others 2016b, Soto and

Table 2.5—Survey items describing attributes of a forest-water protection program

Attribute category	Attribute levels	Item code
Non-use benefits	Ensure clean water in the future (option value)	1
	Ensure all people benefit (altruistic value)	2
	Pass along to grandchildren (bequest value)	3
	Maintain an unpolluted ecosystem (existence value)	4
Use benefits	Recreation	5
	Groundwater recharge (drinking water)	6
	Commercial fisheries	7
	Storm protection	8
How the program will be implemented	Purchase private forest land	9
	Conservation easement	10
	Technical assistance for landowners	11
	Financial assistance for landowners	12
Who will implement the program	Federal agency	13
	State agency	14
	County government	15
	Private non-profit organization	16
Proposed monthly utility tax payment	$0.50/month	17
	$1.00/month	18
	$3.00/month	19
	$5.00/month	20

Source: Kreye and others (2016b).

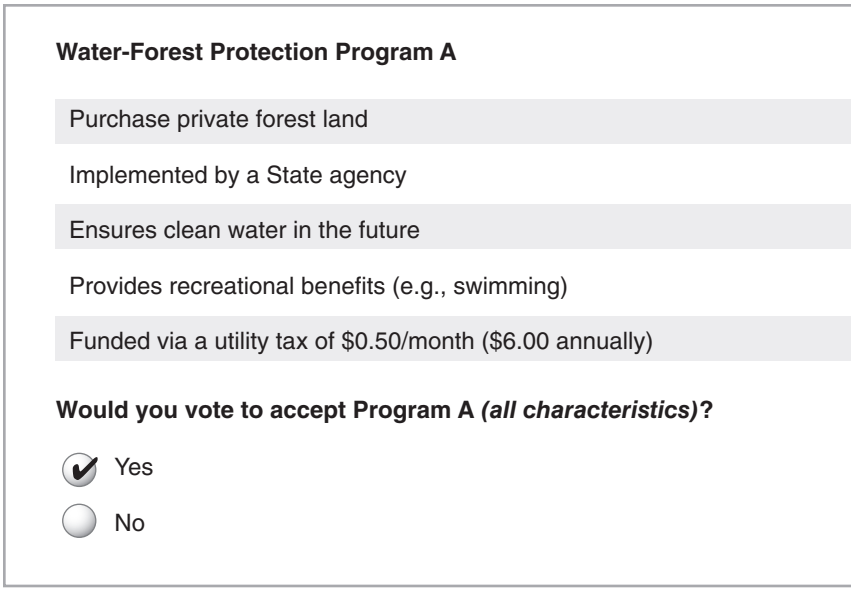

Figure 2.4—Example of a dichotomous choice experiment question presented in a valuation survey.

others 2013, 2016). Other methods that measure latent utility using a choice modeling approach include: ranking alternatives in order of preference, series of paired comparisons, bundle selection (i.e., pick some number of the best alternatives), judgmental ratings, and fixed-sum allocation tasks (Carson and others 1994).

Data analysis procedures for choice modeling are regression-based and produce statistically defensible estimates of value based on calculated probabilities. The independent variables in the model reflect the specified utility function and include specific attributes of the service (or multiple services) and of the respondent (e.g., demographic characteristics). Depending on how the dependent variable is characterized, the data are most often fitted to either a multinomial logit or probit model, but linear, quadratic, or log response functions may also be chosen (Boyle 1990, Johnson 2013). Advanced functional forms of these models (i.e., the conditional, random effects or mixed models) are largely recognized as being more effective in accounting for unobserved random utility or realistic variation in WTP estimates (Wooldridge 2013). Table 2.6 describes the outcome of a random-effects logistic model containing the attributes listed in table 2.5.

The part-worth value, or marginal rate of substitution, for each attribute and the expected mean WTP value can be calculated using the estimated model coefficients (Hanemann 1984). Confidence intervals around mean WTP can be calculated using the variance-covariance matrix and a simulation approach (Krinsky and Robb 1986). Table 2.7 reports mean WTP estimates for some of the non-use values and policy processes found in table 2.5 and illustrates how individual WTP for a given policy alternative can be extrapolated to a larger population when it is multiplied by the number of households at the policy site. The estimated total annual value describes potential market demand for the associated non-market service.

Stated preference and cultural ecosystem service values— Stated preference methods are well suited to assess cultural ecosystem service values because expected benefits can be part of the valuation question, whereas with revealed preference methods, expected benefits are often inferred. For example, using a choice experiment approach, researchers found that Danish recreationists experienced the greatest aesthetic benefits, and WTP, in forest stands that contain a mix of conifers and broadleaf trees (Nielsen and others 2007). The study presented in table 2.5 described public values for clean water benefits by including descriptions of non-use values and beliefs about the effectiveness of certain conservation processes (e.g., conservation easements or technical assistance for landowners) as attributes in a choice experiment (Kreye and others 2016b).

The stated preference approach can also include metrics that describe important attitudes or knowledge as explanatory covariates in the predictive model (Manning and others 1999, Walsh and others 1990). Attitudes toward the environment, as described by the new ecological paradigm scale (i.e., biocentric, anthropocentric) have been found to have an important influence on WTP behaviors for environmental goods and services (Dunlap

Table 2.6—Dichotomous choice model using random effects logistic regression to estimate household willingness to pay (WTP) for a forest-water protection program in Florida

Variable	Coefficient	S.E.	p>Z	Δ in monthly WTP[a]	Mean annual WTP
Payment	-0.5070	0.3200	0.0000		$29.64
Ensure all people benefit	-0.1640	0.0840	0.0490	-$0.81	
Ensure clean water in the future	0.2300	0.0990	0.0210	$1.13	
Groundwater recharge (drinking water)	-0.3880	0.0820	0.0000	-$1.89	
Conservation easement	0.3670	0.1000	0.0000	$1.78	
Technical assistance for landowners	-0.2370	0.0850	0.0050	-$1.15	
Private non-profit organization	0.3380	0.0990	0.0010	$1.78	
County government	-0.2190	0.0830	0.0080	-$1.08	
Weight	1.1970	0.3150	0.0000		
Constant	-0.9610	1.7760	0.0000		

Adapted from Kreye and others (2016b).
Number of observations = 4,140.
[a] Difference from mean monthly WTP estimate of $2.47 (2014 dollars).

Table 2.7—Total annual benefits estimated for 50 percent of households for two policy alternatives to protect forests and water resources in the State of Florida

Policy alternatives	Household		Percent of households	Number of households	Annual total
	Monthly WTP	Annual WTP			
Alternative 1: Ensure clean water in the future using conservation easements	$5.38	$64.56	50%	3,573,508	$230,705,676
Alternative 2: Ensure all people benefit from clean water by offering landowners technical assistance	$0.51	$6.12	50%	3,573,508	$21,869,868

Based on Kreye and others (2016b).
WTP = willingness to pay.

and others 2000, Kreye and others 2016b, Spash and others 2009). Metrics, such as level of ecological and environmental knowledge and level of environmental concern, are also related to important attitudes and beliefs that make up cultural values and often used by researchers to explain consumer behaviors for environmental goods (Mostafa 2007, Nielsen and others 2007).

As a caution, standard descriptions of the population, such as demographic characteristics (e.g., age, race, household income, employment, place of residence) may offer an incomplete description of the human components that make up cultural ecosystem service value. Estimates of WTP and attitudes toward forest ecosystems have been broadly correlated with demographic characteristics (Tarrant and Cordell 2002, Torgler and others 2008, Vaske and others 2001). However, this pattern may not always hold across all populations or be useful in all policy contexts. For example, campers and hunters in Canada tend to have strong biocentric attitudes, and these attitudes are not strongly correlated with the socio-economic characteristics of the campers and hunters (McFarland and Boxall 2000).

Valuation studies nearly always include variables describing population characteristics but only intermittently include variables measuring associated attitudes or psychological benefits. This is because these aspects of human behavior are usually outside the training of a traditional economist who often works with market data. Economists with training in stated preference methods and who work in interdisciplinary fields such as psychology, marketing, behavioral and ecological economics are often better equipped to provide decisionmakers with an understanding of the human components that give rise to cultural ecosystem services and impact WTP estimates.

Benefit Transfer Method

A benefit transfer is a procedure that transfers existing estimates of non-market values to a new study or policy context that differs from the original study. Benefit transfer is often used in legal proceedings and government policy analysis when there is not sufficient time or funds available to develop original benefit estimates using primary data specific to the issue at hand (Boyle and Bergstrom 1992). Rosenberger and others (2017) describe its application to estimating the economic benefits of outdoor recreation in the National Forest System. The following sections provide a description of common benefit transfer procedures and important considerations for using benefit transfer to estimate cultural ecosystem service values.

The simplest form of benefit transfer is when the unit value(s) is directly transferred from the study site to the policy site with only a few minor adjustments (e.g., inflation). An improvement on this method is a preference calibration transfer that calibrates the preference structure (i.e., utility model) described in the original study to match the characteristics of the policy site (Smith and others 1999). In cases where there are many studies available, a meta-analysis benefit transfer function may be used. In a regression-based meta-analysis, the dependent variable is the estimated WTP and the information provided in the study are the independent variables or factors found to influence WTP estimates (e.g., age, income). The entire equation (function) is then transferred to the site by adjusting the model to fit the policy context or the population affected by the policy. Figure 2.5 illustrates the general differences between these three benefit transfer methods.

Unit value transfer—A direct unit value transfer is one of the more commonly used methods to help inform agency decisionmaking (Brown and Shi 2014, Gilmore 2014, Kroeger 2005). This is done by applying a single statistic (usually an average from one or more study sites) to the policy site. For example, a mean WTP estimate for lake fishing from a single study can be transferred to assess the value of fishing on similar lakes. In the context of cultural ecosystem service values, transferring a simple mean value across relatively similar sites may only be appropriate when the benefiting population is relatively the same (Bateman and others 2011).

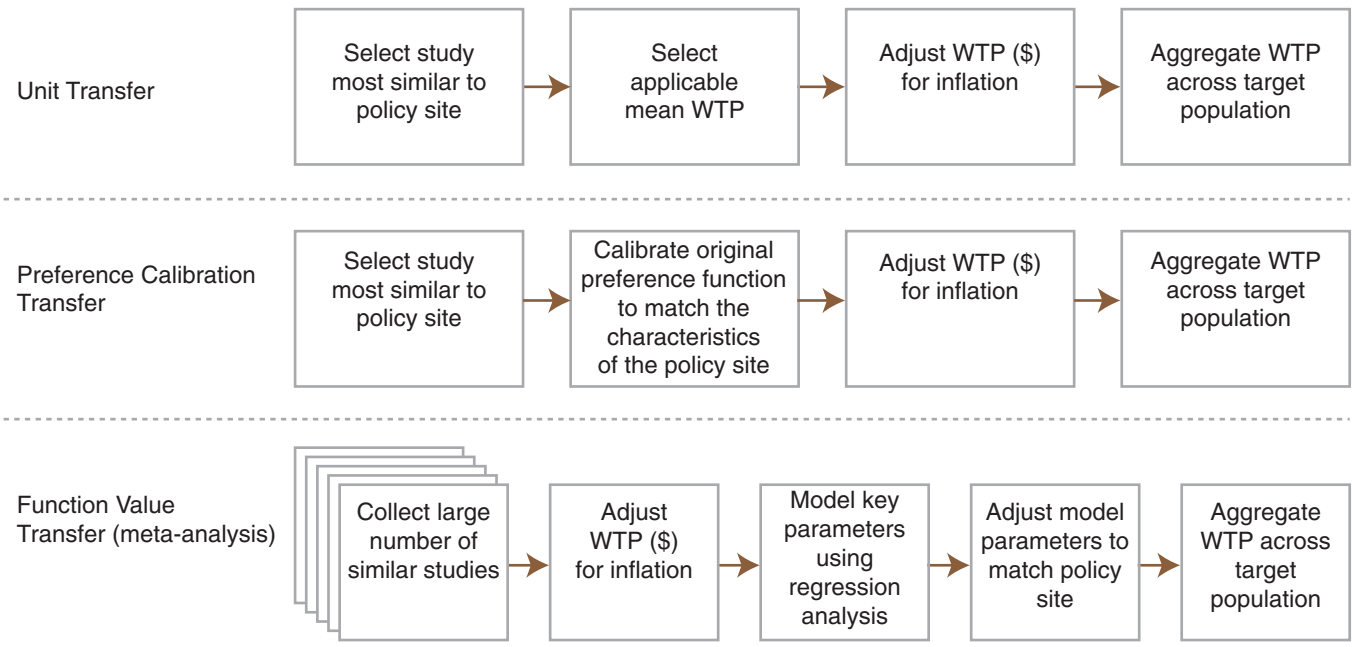

Figure 2.5—Comparison of general benefit transfer methods.

Preference calibrated benefit transfer—A benefit transfer approach known as preference calibration offers an improvement over the direct unit value transfer approach by linking the fundamental preference structure of individuals with WTP estimates. Through an algebraic exercise, the researcher can "back out" the parameters of the original function presented in a single study; the function is then calibrated and used in a new WTP function at the policy site (Smith and others 1999). Assuming that the ecosystem characteristics and benefits generated at the study and policy sites are similar, this approach allows researchers to address variation in preferences based on the features in the household budget constraint, such as household income, average travel cost, and rent. This approach does require researchers to be well founded in utility function theory and have advanced algebraic skills. Williamson and others (2007) provides an example of how to perform a preference calibration transfer for changes in water quality using hedonic property values, travel cost, and contingent valuation values.

Benefit transfer meta-analysis—A meta-analysis is a statistical method for analyzing results from existing studies with a set of related research hypotheses and has widespread use in several areas including health sciences, psychology, education, marketing, and social sciences (Nelson and Kennedy 2009). In economics, meta-analyses are often used to synthesize numerous studies that place economic values on environmental goods and services (Rosenberger and Loomis 2000). The results of a meta-analysis can be used to predict estimates of value constructs (i.e., influential factors, or drivers) while controlling for important differences among studies. Given that the sources of variation in WTP can occur at both the site and population level, a meta-analysis approach may be preferred to other benefit transfer approaches (Rosenberger and Loomis 2000, Walsh and others 1990). As such, the meta-analysis approach to benefit transfer is provided in the next section.

Meta-analysis approach—A meta-analysis is a regression-based modeling approach and the studies that are selected and included in the analysis formulate WTP using the same methodological approach (e.g., contingent valuation) for the same services or benefits (e.g., hiking) in the same general type of ecosystem (e.g., a forested landscape). Researchers may also consider if the studies are conducted within a given region and within a designated time frame (e.g., Rosenberger and Loomis 2000). The value estimate (WTP) selected from a set of related studies (e.g., contingent valuation studies) serves as the dependent variable and variables describing study methods, target population, and site characteristics serve as the independent variables (Rosenberger and Loomis 2000) (fig. 2.6).

Standard error, standard deviation, and sample size are useful proxies for study quality and are often used as a weighting variable to address sample bias or to reduce the impact of lower quality studies on model performance (Nelson and Kennedy 2009). The data can be fitted to a wide variety of models including linear and weighted regression and ordinary least squares models. The resulting coefficients are then adjusted to meet the characteristics of the policy site and back calculated to obtain estimates of WTP (see Johnston and Besedin 2009). Confidence intervals can also be calculated using the equations

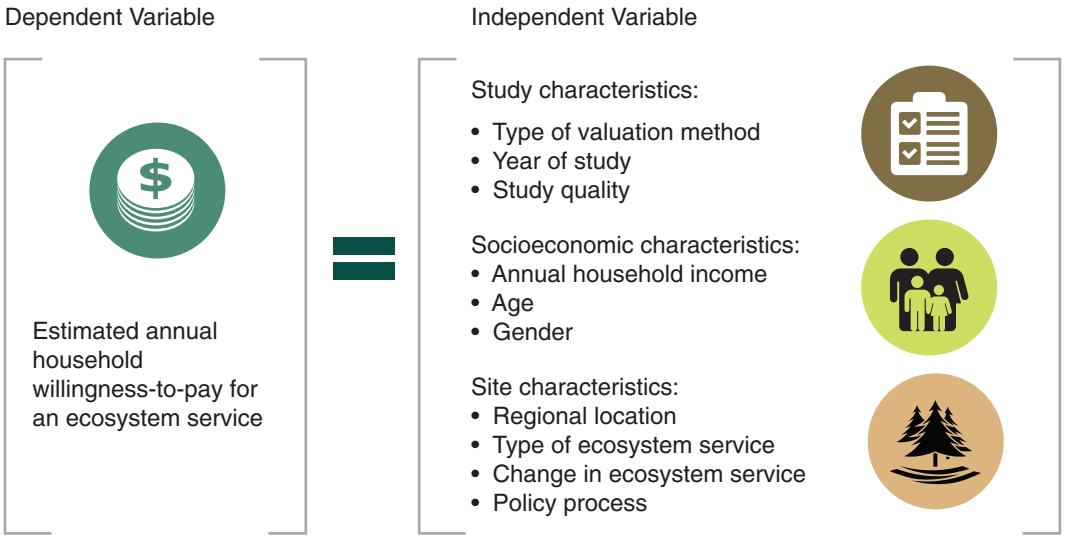

Figure 2.6—Conceptual model of a meta-analysis of valuation studies.

and the statistics commonly reported in regression analysis such as the margin of error and standard error. For more examples of a meta-analysis benefit transfer of forest values, see Chiabai and others (2009), Ding and others (2010), Escobedo and Timilsina (2014), Kreye and others (2014), and Zandersen and Tol (2009).

Benefit transfer and cultural ecosystem service values—The primary challenge of benefit transfer is the presence of important and unaccounted differences between the study site and the policy site. Selecting studies that help minimize these differences can be particularly challenging in the context of cultural ecosystem service values, as many valuation studies often fail to appropriately measure important human components (e.g., perceived benefits, beliefs) that give rise to cultural ecosystem service values. Without an understanding of the underlying cultural benefits, or the values associated with different benefits, we cannot adequately determine how changes in forest management or service provision impact public welfare. Even with calibration procedures, transfers across different sites are subject to less error than a transfer across populations for a given site (Morrison and others 2002). In other words, WTP estimates are more often impacted by the characteristics of the population valuing the forest, rather than the characteristics of the forest itself. As discussed earlier in the chapter, relying on demographic data alone to describe perceived benefits may provide an incomplete description of important cultural ecosystem service values (Bengston 1994). Another challenge is that many benefit transfer studies do not account for differences in perceived risk and the availability of substitutes across sites, which can also impact WTP behaviors and lead to the under or overestimation of transfer of values (Batabyal and others 2003, Johnston 2007). Until the body of research examining cultural ecosystem services can provide a more contextualized description of the human components that give rise (e.g., beliefs, attitudes) or reinforce (e.g., perceived benefits) cultural ecosystem service values, the benefit transfer method will likely remain problematic in producing accurate and reliable estimates of value for many types of cultural ecosystem services.

CONCLUDING REMARKS

This chapter reviewed ways that human culture gives important meaning to forests that society recognizes as valuable. We also described commonly used approaches for assessing the economic value of cultural ecosystem services and highlighted important challenges associated with these valuation methods. Clearly, efforts to understand tradeoffs in the provision of cultural ecosystem services is a formidable challenge. Despite this, integrating cultural ecosystem service values into decisionmaking remains a pressing issue. Failing to account for diminished cultural services that result from forest management decisions or loss of forest lands will likely lead to less effective forest policy and reduced social welfare. Future research should work to advance valuation methods and approaches while continuing to investigate how cultural ecosystem service values are mediated by perceptions, customs, and beliefs. Providing decisionmakers with improved value estimates can lead to better policy and program design and help ensure that society continues to benefit from the full spectrum of ecosystem services provided by public and private forest lands.

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Appendix 2.1

Recreation and tourism values of forests in the Southeast region

Study	Geographic scope of values	Basis for valuation	Value estimates
Walsh and Loomis (1989)	Virginia	Use value of wilderness protection (contingent valuation)	$12/visitor day
Zhang and others (2004)	Alabama	Hunters' WTP (contingent valuation)	$1.29 per acre per hunter or $23 per acre per hunter
Munn and others (2011)	Mississippi	Hunters' WTP (contingent valuation)	$0.65 to $6.40 per acre
Brunke and others (2006)	Mississippi	Hunters' WTP (contingent valuation)	$11 and $36.25 for fall and spring turkey hunting permits
Moore and others (2011)	Georgia	Non-use value of private forests	$11.2 billion per year
Haefele and others (1991)	Southern Appalachian region*	Non-use value (WTP for protecting forests)	$100 per year and $21 per year for dichotomous choice and payment card estimates
Talberth and Moskowitz (1998)	Southern Appalachian region	Expenditures on hunting equipment and trip expenses	$1.3 billion in 1988
Loomis and Rochardson (2000)	Southern Appalachian region	Consumer surplus of recreational fishing	$237 million to $637 million in 1997
Barnhill (1999)	National Forests of the Southern Appalachian region	Economic impact of recreational fishing	$407 million
Barnhill (1999)	National Forests of the Southern Appalachian region	Total economic impact of hunting and wildlife viewing	$594 million and $407 million, respectively, in 1996
Barnhill (1999)	National Forests of the Southern Appalachian region	Economic impact of recreation on the National Forests	$6 billion annually

* The Southern Appalachian region consists of Alabama, Georgia, North Carolina, South Carolina, Tennessee, and Virginia.