Wild and Scenic Rivers

An Economic Perspective

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Abstract: To date, economic valuation studies have focused on individual rivers and not the National Wild and Scenic Rivers System (NWSRS) as a whole. Following Morton (1999), we provide a brief conceptual taxonomy of on- and off-site economic benefits that might be relevant to the NWSRS. These benefits include values associated with individual rivers within the NWSRS and benefits of the system, including ecosystem services. The published empirical literature is also reviewed, focusing on the economic valuation of wild and scenic rivers. Although the empirical studies and valuation results are relatively sparse, we provide a qualitative and quantitative summary and assessment of these results and an assessment of the economic impacts of wild and scenic rivers on local communities. Finally, we identify and discuss the shortcomings in the existing body of economic literature and resulting research needs to better understand the economic value and impacts of wild and scenic rivers.

Mike Bowker and Sete on the Upper Kenai River, Alaska.

John Bergstrom and son Luke on Chattooga River, Georgia.

The National Wild and Scenic Rivers Act was spawned by public and political realization that exceptional stretches of free-flowing rivers were valuable beyond the reasons of commerce, such as power generation and commercial transportation (Walsh et al. 1985). Walsh et al. (1985) point out that the act provides protection for rivers, or sections thereof, according to three categories of classification: *Wild river areas*, characterized by lack of impoundments and generally inaccessible except by foot, with undisturbed shorelines and unpolluted waters; *Scenic river areas*, characterized by slightly less pristine conditions wherein there still are no impoundments, but shorelines are largely primitive and undeveloped with some road access; and *Recreational river areas*, characterized by possible impoundment in the past with accessibility by rail or road and some level of development along their shorelines.

In "Conservation Reconsidered," Krutilla (1967) recognized the growing importance of economic benefits from preserving natural environments and that not all economic values derive from market transactions. Since that time, the discipline of economics has developed theoretical and conceptual tools to estimate monetary values for many goods and services for which markets do not exist. This development has afforded policy makers a more informed and common metric for comparing the benefits of natural areas protection and use. For example, surveys by Bowker et al. (2005, 2014) demonstrated the various types of nonmarket values accruing to the National Wilderness Preservation System (NWPS). Holmes et al. (2016) found evidence suggesting that NWPS values are increasing over time. Patton et al. (2015) developed and implemented methods for measuring the economic values of ecosystem services provided by wetlands in the National Wildlife Refuge System.

In this article, we inventory and assess what is known about the economic benefits, or dollar values, accruing to

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Americans from the National Wild and Scenic Rivers System. Following Morton (1999), we provide a brief taxonomy of the kinds of economic benefits that might be considered relevant to the NWSRS. These benefits include values from individual rivers and ecosystem service benefits arising from the complete NWSRS. To date, economic valuation studies have focused on case studies of individual rivers or parts thereof, not the NWSRS as a whole. Virtually no studies have attempted the difficult task of isolating the value of designation, that is, accounting for the increase (decrease) in value to the public of ensuring protected status for future generations.

We also review the empirical literature focusing on the economic valuation and values of wild and scenic rivers. Although the empirical studies and valuation (e.g., willingness-to-pay) results are relatively limited, we provide a summary of these results. We also provide an assessment of the economic impacts of wild and scenic rivers on local communities. Finally, we identify and discuss the shortcomings in the existing economic literature and resulting research needs to better understand the economics of wild and scenic rivers.

Economic Value from Wild and Scenic Rivers

Designation and thus preservation of rivers in the NWSRS can lead to many individual and societal benefits not unlike those of designated wilderness. Morton (1999) summarized these benefits into seven categories as they apply to wilderness. These benefits include "on-site" recreation, community, scientific benefits and "off-site" biodiversity conservation, ecological services, and passive use benefits (Figure 1). A key difference is that unlike wilderness benefits, those arising from river designation can be partial, that is, restricted to a segment of a river, and within any of the three designated classes (see Palmer, this issue). Moreover, many NWSRS rivers transect designated wilderness, thus leading to questions of value attribution and possible double-counting of these benefits. Most of the empirical research to date on NWSRS river values has focused on measuring on-site recreation use value.

On-site recreation benefits derive from visiting NWSRS locations and include activities such as camping, canoeing, fishing, hiking, hunting, kayaking, rafting, and wildlife viewing. These benefits require directly accessing a specific river or buffer zone of a river for a recreation visit. *Passive use benefits*, or nonuse benefits (Krutilla 1967; Freeman 1994) or preservation benefits (Walsh

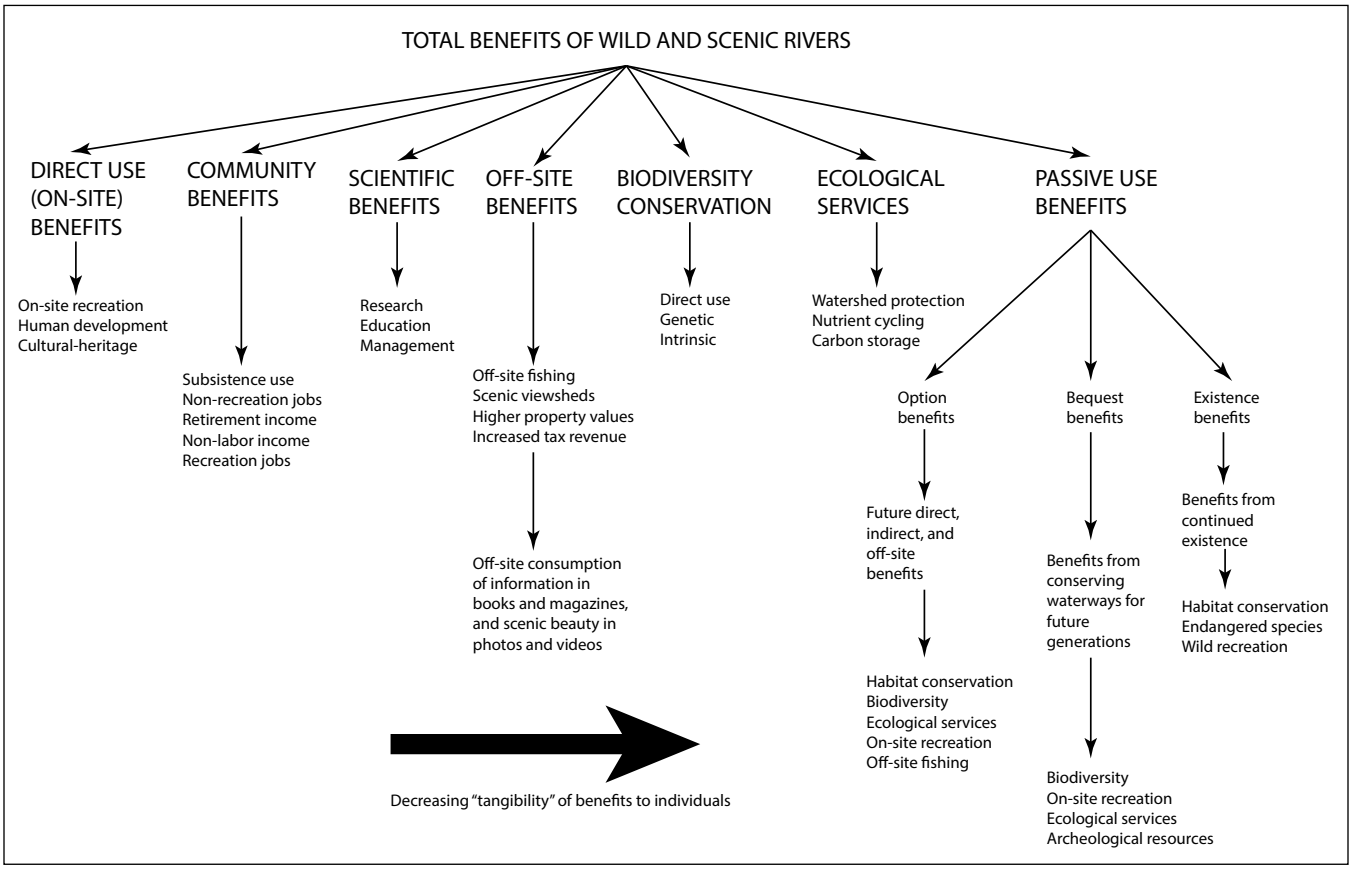

Figure 1 – Total benefits of wild and scenic rivers (adapted from Morton 1999)

et al. 1985), are less tangible as on-site access is not required. Passive use benefits reflect the utility a person receives from knowing that some or all the NWSRS is preserved, even if they neither have visited, nor ever plan to visit, any of the rivers in the system. Passive use benefits include: (1) option, (2) bequest, and (3) existence benefits. In terms of their applicability to the NWSRS, "option benefits" refer to knowing that preservation of these rivers ensures an opportunity to visit a part of the NWSRS in the future. Similarly, "bequest benefits" arise from the knowledge that the NWSRS will continue to be available and enjoyed by present and future generations. Existence benefits derive from simply knowing that NWSRS and the designated rivers and ecosystems contained within the system continue to exist – regardless of current or expected human use. There is some debate among economists over the precise definitions for the various components of passive use benefits, and even more debate over how to reliably parse and estimate their economic value. This would seem particularly problematic for the NWSRS, given the piecemeal nature of designation, that is, multiple classes, and potentially heterogeneous application to any given river. However, economists generally agree that passive use can generate benefits, which do have an economic value (Freeman 1994). Studies also suggest that passive use values may make up the largest component of the total economic value of a protected area (Bowker et al., 2005; Haefele et al. 2016).

Morton identified other benefits of wilderness that one could also apply to the NWSRS, including *community, scientific, off-site, biodiversity conservation,* and *ecological service benefits*. These benefits affect individuals more indirectly and have proven enigmatic to economists estimating dollar values for a site or system like wilderness, NWSRS, and the National Wildlife Refuge System (e.g., see Patton et al. 2015). Walsh et al. (1985), focusing on benefits strictly applicable to the individual, did not include these values in their seminal work on the economics of the potential designation of Colorado rivers to the NWSRS in 1983.

Community benefits may include jobs and income created and supported through spending by foreign visitors to the NWSRS. Rosenberger and English (2005) addressed the state of knowledge about the community economic impacts of wilderness recreation, focusing on local communities and regional economies. Holmes and Hecox (2004) found that wilderness counties in the West experienced significantly increased employment, income, and population. For the NWSRS, community benefits resulting from designation could accrue similarly. However, most economists would put said *benefits* into a category of income transfers or redistribution rather than net economic benefits, because the spending is likely to simply be transferred to another recreation venue or substitute river in or out of the NWSRS. Insofar as there is a societal benefit from redistributing wealth, (e.g., from urban and suburban wealth centers, or internationally, to more rural areas), this could be viewed as a net gain. However, determining such a net gain, if it exists, would be very difficult empirically and is thus typically left for debate in the political arena.

An alternative type of *community benefit*, argued and empirically demonstrated by Phillips (2004) in the case of wilderness designation in the Green Mountains of Vermont, are concomitant increases in property values for property owners within a defined spatial limit of the designated area. This type of "hedonic price" benefit could likely be ascribed to select properties proximal to NWSRS designations. Moore and Siderelis (2002) used a similar approach to assess the property value increases associated with designation of the West Branch of the Farmington River.

In keeping with Morton's (1999) benefit typology for wilderness, three types of *scientific benefits* –research, education, and management – may arise from the wilderness related to the NWSRS. Pristine waters and adjacent land can be recognized as a living laboratory and benchmark for evaluating the impacts of development elsewhere (Loomis and Richardson 2000). Educational benefits include the development of wilderness waterway travel and survival skills, as well as opportunities for personal growth and improved health (Morton 1999; Stolton and Dudley 2010). Wilderness also acts as a model for understanding and restoring natural forest ecosystems, hence the *Wild rivers* classification would contribute in this regard.

Off-site benefits of wilderness include providing habitat for fish, wildlife, and a wide variety of other species. However, species depending on this habitat do not necessarily have to be enjoyed by visiting a wilderness area. A golden eagle soaring beyond the boundary becomes an important off-site benefit. Off-site benefits of nature described here could take the form of enhancing fish and wildlife population numbers downstream. Moreover, benefits could take the form of eliminating or lowering the frequency of externalities such as run-off, contaminant release, and siltation downstream. While these benefits are tangible and conceptually sound, accu-

rately estimating dollar values for such benefits has proven to be quite challenging. Walsh et al. (1985) attempted to estimate such benefits, ex ante, for a set of rivers in Colorado were they to become part of the NWSRS.

Conserving biodiversity is highly important to policy makers and scientists (Ando et al.1998). Biodiversity conservation in wilderness and protected areas legislation and management assures preservation of representative ecosystems, threatened species, and genetic diversity (Loomis and Richardson 2000). Conceivably, the NWSRS contributes to preserving biodiversity in similar ways. This would be particularly applicable to NWSRS rivers falling into the *Wild rivers* and *Scenic rivers* classifications.

In addition, Forest Service-administered units in the NWSRS system also protects more than 1.4 million acres of riparian ecosystems (USDA Forest Service, January 19, 2017), including wetlands and upland forests. These ecosystems provide a variety of ecosystem services, including active and passive use values associated with wildlife habitat, erosion control, flood control, water pollution control, natural pest control, and climate regulation through carbon sequestration. Nonmarket valuation techniques can be applied to monetarily quantify the values of riparian ecosystem services (Bergstrom and Loomis 2017; Holmes et al. 2004; Loomis and Richardson 2000; Morton 1999; Patton et al. 2015; Woodward and Wui 2001). Several examples of previous studies that valued ecosystem services supported by riparian ecosystems are discussed below in the "Ecological Values" section.

While the above economic values are conceptually valid and realistic, two important aspects should not be overlooked. First, the value of the foregone benefits (or "opportunity costs") arising from designation to the NWSRS must be acknowledged, as well as the obvious economic costs associated with initial acquisition and investments and annual management of NWSRS lands (Walsh et al. 1985). For example, depending on the location of the river and types of commercial activity in the area, there may be opportunity costs arising from the loss of timber, mineral extraction, or grazing on surrounding land (Walsh et al. 1985). Much harder to capture are the opportunity costs associated with foregone development opportunities proximal to the river. In any case, careful estimation of the net economic benefits and opportunity costs is necessary to determine the economic efficacy of additions to the NWSRS.

Economic Value Research and the NWSRS

In the 1960s, nonmarket valuation gained credibility among economists. Several studies have since focused on estimating the economic benefits for rivers outside of strictly commercial uses such as transportation and hydroelectric generation. The National Park Service produced an annotated bibliography of studies on the economics of conserved rivers (USDI, NPS 2001). Nine organizing categories were used for the economic benefits, including Floodplain Management, Instream Flow, Property Value, General Value to the Public, Recreation and Tourism, Water Quality, and Wildlife/Habitat/Riparian. The report acknowledges that most studies fall into either the Instream Flow or the Recreation and Tourism categories. Few of the studies looked specifically at the NWSRS, and the time frame was limited to the preceding 10-year window. Moreover, economic benefits, as detailed above, and economic impacts (effects on jobs and income from NWSRS expenditures) were both considered economic benefits.

The relationship between expenditures and net economic benefits is displayed in Figure 2, where direct

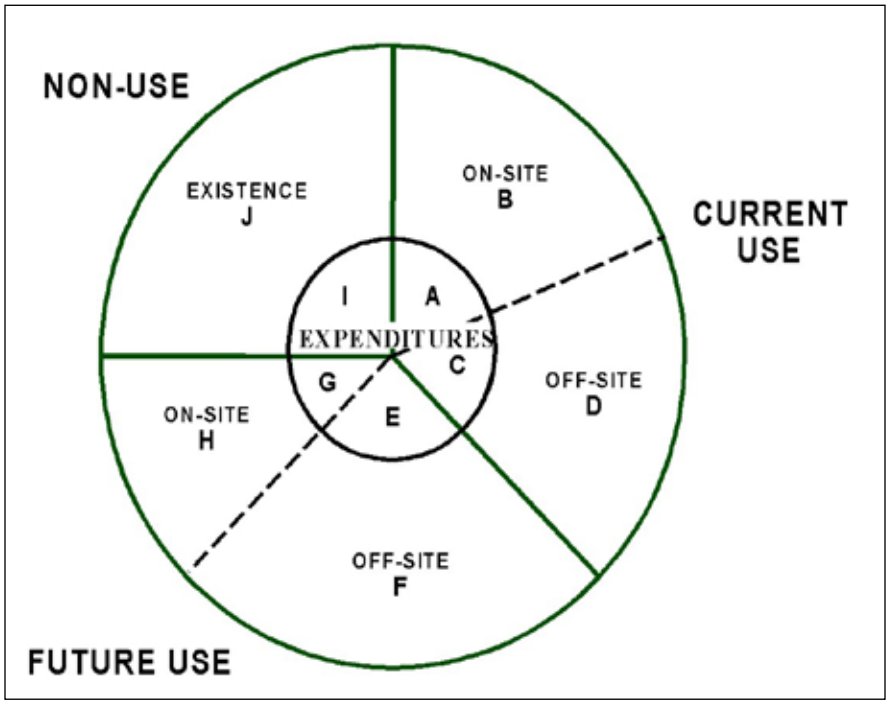

Figure 2 – Total economic value of wild and scenic river use (adapted from Bergstrom et al. 1990)

personal expenditures related to NWSRS benefits (A, C, E, G, I) are juxtaposed with the resulting net economic benefits or consumer surplus (B, D, F, H, I). Thus, to obtain the on-site benefits of a recreation trip to a NWSRS river (A+B), the individual would have to spend A, leaving a net economic benefit of B.

On-Site Recreation Use Value

On-site recreation value estimation constitutes most studies by economists on rivers, in and out of the NWSRS. The number of studies addressing the economic values associated with the NWSRS is quite limited (Rosenberger 2016), with a total of 16 independent studies, from 1977 to 2014, appearing in peer-reviewed publications and proceedings that provide estimates of the *on-site recreation benefits* of the NWSRS. These studies relied on either of two popular methods, travel cost or contingent valuation, to estimate the net economic benefits, or consumer surplus (CS), of river access for recreation. In many cases, for example, English and Bowker (1996a, 1996b) and Bowker, English, and Donovan (1996), the studies provide multiple estimates for recreation access concurrent with exploring methodological issues or differences in underlying assumptions. No studies provide an aggregate value of recreation access to the whole NWSRS. Rosenberger (2016) provides single or multiple estimates reported by study scaled to a common unit (CS/per person/per day in 2016 dollars). These estimates, averaged for studies reporting more than one estimate per river, along with authors, year, river, and miles of designation by category, are provided in Table 1. In addition to the Rosenberger (2016) estimates, we provide comparable estimates from three additional studies (Walsh et al. 1985; Moore and Siderelis 2002; Moore and Siderelis 2003).

Estimates of the consumer surplus per person per day reported in Table 1 range from $501 on the spectacular Middle Fork of the Salmon River to $11 on the very accessible Upper Delaware River. While somewhat simplistic, an average across all studies yields an estimate of $99 in consumer surplus for one day's recreation on a NWSRS river. This is comparable to estimates for other outdoor recreation activities in many other natural settings (Rosenberger 2016; Sardana et al. 2016). Across NWSRS studies there are considerable differences. First, research approaches including sampling, estimation methodologies, and underlying assumptions vary considerably over such a long period of time, reflecting both researcher judgments and the methods available when the study was conducted. Second, rivers in the NWSRS and populations who frequent them are by no means homogenous. It is beyond the scope of this article to delve further into these issues, and our average CS estimate is rough, resting on the assumption that the studies are a representative sample of rivers and users of the NWSRS, and that the methods are reasonably convergent.

Employing an estimate such as $99 CS/day/person to obtain the annual value of recreation benefits of a NWSRS river would necessarily require commensurate estimates of recreation visitor days for any given river. For example, Moore and Siderelis (2002) estimated annual visits to the West Branch of the Farmington River at 77,400. For this river, they also estimated a CS of $48 per person per day, yielding an annual aggregate recreation use value of $3.7 million for the designated 14-mile (22.5 km) segment, or about $265 thousand of use benefits per river mile. Moore and Siderelis (2003) obtained a value of total annual recreation use value for floating (guided and unguided) on the Chattooga of $7.4 million in 2002 for all visits (42,998) or $126 thousand of use benefits per river mile. Bowker et al. (1997) arrived at an estimate of $7.1 million for guided use alone on the Chattooga (about 80% of use). Note that using the overall average of $99 reported in Table 1 would underestimate value for the Chattooga by about 45% in this case. Thus, we advise caution when applying a system average to obtain the annual recreation use value of any river in the system given the variation in CS estimates.

Passive Use Value

While several passive or nonuse values were reported for the NWPS in Bowker et al. (2014), studies estimating passive values for the NWSRS are rare. As passive use values do not require accessing the site, defining the relevant population of "passive users" is paramount to estimating a protected area's passive use value. We know of only two case studies pertaining to passive use value for NWSRS rivers: Walsh et al. (1985) and Helvoigt and Charlton (2009).

Walsh et al. (1985) used a household contingent valuation survey to value passive use for potential designations of 11 rivers in Colorado, each with sections qualified for protection under the Wild and Scenic Rivers Act. The authors estimated a value of $78 (per household) to preserve sections of what Colorado residents identified as the three most valuable rivers (Cache la Poudre, Elk, Colorado), or $26 per household per river. Forty percent of responding

Table 1 – Recreation use values for wild and scenic rivers (2016 dollars)

Authors	River	ST	Wild miles	Scenic miles	Recr. miles	CS/pers/ day	CS/pers/ day/mile
Daubert and Young (1981)	Cache le Poudre	CO	30	46		$ 40	0.53
Loomis and McTernan (2014)	Cache le Poudre	CO	30	46		109	1.43
Loomis (2005)	South Fork	ID	30.2	1.2		235	7.48
Johnson, Bregenzer and Shelby (1990)	Rogue	OR	33.6	43.4	7.5	26	0.31
Johnson, Shelby and Bregenzer (1990)	Rogue	OR	33.6	43.4	7.5	18	0.22
Stavins (1984)	Tuolumne	CA	47	13	23	112	1.35
Loomis (2003)	Snake	WY	217.9	29	140.6	20	0.05
Klemperer, Buhyoff, Verbyla and Joyner (1984)	Chattooga, S-III	GA/SC	41.6	14.6	2.5	14	0.24
Bowker, English, and Donovan (1996)	Chattooga	GA/SC	41.6	14.6	2.5	328	5.58
English and Bowker (1996a)	Chattooga	GA/SC	41.6	14.6	2.5	14	0.23
English and Bowker (1996a)	Chattooga	GA/SC	41.6	14.6	2.5	23	0.38
Siderelis, Whitehead and Thigpen (2004)	NC NWSRS	NC	46.2	52	95.5	86	0.45
Matthews, Homan, Easter (1999)	Minnesota (MVNWR)	MN			70	43	0.61
Michalson (1977)	St. Joe	ID	26.6	39.7		53	0.80
Rosenthal and Cordell (1984)	Upper Delaware	DE		50.3	23.1	11	0.15
Michalson (1977)	Middle Fork Salmon	ID	103		1	501	4.8
Rosenthal and Cordell (1984)	Middle Fork Salmon	ID	103		1	64	0.62
Bowker, English and Bergstrom (1997)	Middle Fork Salmon	ID	103		1	106	1.02
Bowker, English and Bergstom (1997)	Chattooga	GA/SC	41.6	14.6	2.5	181	3.08
Moore and Siderelis (2002)	Farmington	CT		14		48	4.00
Moore and Siderelis (2003)	Chattooga	GA/SC	41.6	14.6	2.5	180	3.06
Walsh, Sanders and Loomis (1985)	Cache la Poudre	CO	30	46		55	0.73
Average CS/day across Studies						**$99**	
Average CS/day per designated mile							**$1.62**

households reported either no value, or felt that they should not have to pay for passive use. Expanding protection to 11 rivers (Cache la Poudre, Elk, Colorado, Gunnison, Green, Yampa, Piedra, Los Pinos, Conejos, Dolores, Encampment), value rose to $185 for the system, dropping the average household value per river to $17. Given Colorado's population at the time (1.185 million households), the passive use value to preserve identified segments of the three most valuables rivers was about $30.1 million. As it turns out, relevant sections on one of those rivers, the Cache la Poudre, were designated and are currently the only NWSRS miles in Colorado, although parts of the remaining rivers are managed much like those in the NWSRS. Walsh et al. (1985) was hampered by methodological issues and the fact that none of the rivers had yet to be designated, but it proved that substantial passive use values exist for high caliber wild and scenic rivers. Acknowledging limitations and societal changes in preferences for preservation as protected areas became scarcer between 1983 and 2016, the Walsh et al. (1985) household average estimates of $17–$26 per river, and the designated mileage for the Cache la Poudre river of 76 miles (122 km), could be used to infer an average household passive use value of $0.22–$0.34 per river mile.

Helvoigt and Charlton (2009) estimated nonuse value for the wild and scenic Rogue River in Oregon less directly than Walsh et al. (1985). They estimated the nonuse value of preserving the indigenous salmon fishery as a proxy. Using estimates from previous studies, and extrapolating across the populations of Oregon, Washington, and California, they estimated an annual willingness-to-pay per resident of $37, or $97 per household, which equated to $1.7 billion per year. Considering both designated sections of the Rogue, this amounts to

about $0.78 per river mile. As there are factors beyond a healthy salmon population contributing to the passive use value of the Rogue River, these estimates are a lower bound. Passive use value estimation for protected resources remains empirically controversial. However, few would argue that humans receive benefits with undeniable economic value from passive use.

Locational Value

Moore and Siderelis (2002) is the only NWSRS river study to assess the monetary effect of designation to adjacent property values. They used a hedonic analysis to assess river proximity and real estate prices within a 6-mile (9.6 km) zone of the West Branch of the Farmington River's 14 miles (22.5 km) designated under the recreational category in 1994. They analyzed property transactions from 1986 to 2001 and found that land values correlated inversely with distance from the river, in other words, prices decreased as one went farther from the river. Lots in immediate proximity to the river had an amenity benefit of 42% of the selling price. On a value per acre basis, being 1,000 feet (305 m) farther from the river dropped per acre value by $40,000, while being a mile (1.6 km) off the river meant $75,000 less per acre. Being six miles from the river translated to a decrease in land value per acre of over $100,000. However, they found that designation did not affect values in a statistically significant way. They suggested cautious interpretation of their results because of the small sample of transactions over the 16-year period, and that their land value model accounted for only 8% of the variation in residential land prices. We know of no studies formally investigating the value to businesses of being located proximal to the NWSRS.

Ecological Values

We found no previous studies that estimated ecosystem service values such as water purification, carbon sequestration, natural pest control, or flood control for designated wild and scenic rivers. However, several studies provide examples of estimating ecosystem service values for other US rivers. For example, Loomis et al. (2000) used contingent valuation to measure the economic value of ecosystem services supported by a restored riverine ecosystem within a 45-mile (72.4 km) section of the South Platte River corridor in Colorado. These broad ecosystem services included water purification, erosion control, and fish and wildlife habitat. They estimated that households in the South Platte River Basin would pay an average of $250 and $27 million total annually to obtain the ecosystem services supported by the restored riverine ecosystem. These values convert on an annual basis to $8 per river mile per household, and $600,000 per river mile aggregated across all households in the study area river basin.

Holmes et al. (2004) used contingent valuation to measure the economic value of ecosystem services supported by a restored riverine ecosystem within a 6-mile (9.6 km) section of the Little Tennessee River corridor in North Carolina. Ecosystem services valued included water clarity, wildlife habitat in stream bank buffer zones, and the naturalness of the river corridor. They estimated that in the county where the river segment is located, households would pay an annual average of $35 and $450,000 total to obtain the ecosystem services supported by the restored riverine ecosystem. These values convert to $6 per river mile per household and $75,000 per river mile aggregated across all households in the county.

Broadbent et al. (2015) used contingent valuation to measure the economic value of restored riverine ecosystems within a 35-mile (56 km) section of the San Pedro River corridor in Arizona and an 80-mile (128 km) section of the Rio Grande corridor in New Mexico. The primary ecosystem service valued was fish and wildlife habitat. The estimated economic value to Arizona households of the restored San Pedro riverine ecosystem was $50 annually, which converts to $1.40 per household per mile and about $0.16 per household per riverine acre. The estimated value to New Mexico households of the restored Rio Grande riverine ecosystem was $0.80 per mile per household. This value converts to about $0.01 per acre per household.

Patton et al. (2015) estimated carbon sequestration values for the riparian wetlands along the Rio Grande in New Mexico flowing through the Sevilleta and Bosque del Apache National Wildlife Refuges. They estimated the net economic value of carbon stored in these riparian wetlands in terms of willingness-to-pay to mitigate negative global climate change impacts in the absence of these carbon sequestration services. The present value of carbon sequestration services provided by the Rio Grande riparian wetlands in the Sevilleta and Bosque del Apache National Wildlife Refuges was estimated at $2.32 million total – an average of $470 per wetland acre.

Part of the Rio Grande in northern New Mexico is designated in the NWSRS. The Rio Grande segments

valued by Patton et al. (2015) and Broadbent et al. (2015) are in middle to southern New Mexico, characterized by a more arid climate and environment compared to northern New Mexico. Thus, the ecosystem service values reported in these studies may be of limited use as proxies for the ecosystem service values of the designated portion of the Rio Grande. However, to illustrate how ecosystem service values of NWSRS corridors could be valued, consider the case of carbon sequestration.

The Forest Service-administered section of the Rio Grande corridor contains approximately 1,200 acres (485 ha) (USDA Forest Service, January 19, 2017). Patton et al. (2015) estimated carbon sequestration values of about $470 per acre in their Rio Grande corridor study area. Transferring this value estimate to the WSR section of the Rio Grande would imply carbon sequestration values for wetlands in this section of the river of about $564,000. The Patton et al. (2015) study results, however, indicated that wet climates and environments generate higher carbon sequestration values compared to dry climates and environments (because the wetter climates and environments have more carbon-absorbing vegetation). Thus, the estimate of $564,000 may be a lower bound on the carbon sequestration value of the designated section of the Rio Grande.

Transferring carbon sequestration values from the middle/southern Rio Grande to the northern Rio Grande as illustrated above is an example of benefit transfer procedure. There is a vast literature on best practices for benefit transfer, and concurrence in the literature that benefit transfer is a "second best" valuation approach to valuation based on site-specific, primary data collection (Johnston and Rosenberger 2010). Thus, accurate estimates of the carbon sequestration and other broad ecosystem service benefits of river corridors across the United States, including those associated with NWSRS rivers, requires further case studies specific to the ecosystems where these rivers are found.

Economic Impacts

Economic impacts associated with the NWSRS result directly from recreation use, in other words, spending in local economies due to recreation visits. Recreation expenditures are represented by area B in Figure 2. Alternatively, and more completely, the flow of economic payments, services, values, and benefits is shown in Figure 3 (adapted from Mates and Reyes 2006, p. 8).

"Many people derive multiple benefits from accessing NWSRS rivers and their immediate surroundings, either directly for recreation, or through simply knowing that the system and the rivers and ecosystems within exist in a perpetually protected state."

Visitor expenditures flow directly to businesses and often back to the managing agency through user fees. The NWSRS provides recreation benefits to visitors and a combination of ecosystem services and nonuse benefits to society at large. Both society and visitors have a total value or willingness-to-pay for such services/benefits. Businesses and individuals provide tax revenues, which in turn support protected areas and their managing agencies. These agencies contract services and goods from businesses and private individuals and use the same to maintain sites and provide services to visitors.

Studies of the economic impacts of wild and scenic rivers on regional economies (Tables 2 and 3) are few compared to previous studies measuring the net economic value (Table 1). Most of the existing NWSRS economic impact studies are relatively dated, with the most recent being the Rogue River study published about eight years ago (Helvoigt and Charlton 2009). Each of the seven previous studies shown in Table 2 estimated mean expenditures per person per trip associated with recreational trips to an NWSRS site. Average expenditures on gasoline, food, beverages, lodging, fees, and other typical items purchased on a recreational trip across all studies was $441 per person per trip with the Middle Fork of the Salmon River, and $148 per person per trip excluding the Middle Fork. The higher relative expenditures for the Middle Fork, Chattooga River, and Rogue River are accounted for by higher fees paid for white-water rafting (e.g., guide fees). The Middle Fork is an expenditure outlier because it offers elite and unique white-water rafting experience.

Per-person-per-trip expenditure data as shown in Table 3 can be combined with visitor use data to estimate aggregate recreational expenditures within an economy attributable to a site or activity. These aggregate expenditures can then be fed into a reginal input-output model such as IMPLAN to estimate economic impacts (total output, jobs, and income) generated in the regional economy. The

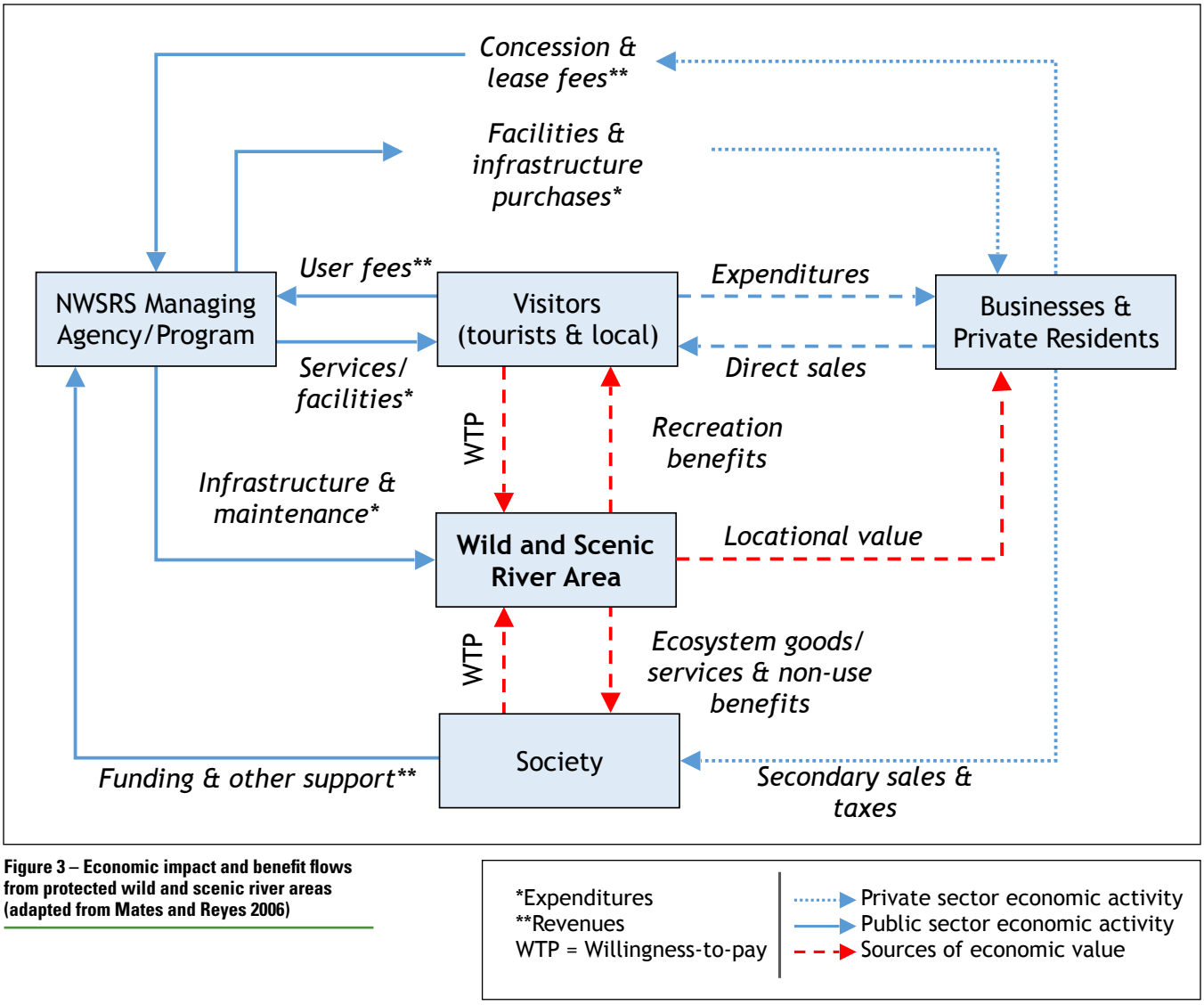

Figure 3 – Economic impact and benefit flows from protected wild and scenic river areas (adapted from Mates and Reyes 2006)

contribution of aggregate recreation trip expenditures at NWSRS rivers to total industrial output in impact regions of different size are shown in Table 3. For the studies shown in Table 3, the contribution of NWSRS-related recreational expenditures to total industrial output ranged from about $3.5 million for a six-county impact region (Moore and Siderelis 2003) to about $29 million also for a six-country impact region (Cordell et al. 1990).

The addition of total industrial output in a region due to NWSRS-related recreational expenditures stimulates more employment, employee and property income, and tax revenues (see studies cited in Table 3 for details on these impacts). Whether designation of a river as wild and scenic leads to a net increase in regional economic activity is still unresolved (e.g., see Malm 2012). Malm (2012), using county level data from 1970-2009, presented statistical evidence that designation yields a relatively minor negative impact (0.3% points) on county level per capita economic growth in the short run, but the effect diminished through time. Because boosting regional economic development was not one of Congress' original purposes behind creating the NWSRS, whether rivers in the system are a net gain or drain on regional economies may be unimportant from a national policy perspective. However, people living in local areas affected by existing or proposed new designations may not see it that way, leading to conflicting goals with respect to NWSRS policy and management at the local, state, and national levels.

Discussion

Creation of the NWSRS by Congress in 1968, like the Wilderness Act of 1964, was based on the recognition by representatives of the public

Table 2. Wild and Scenic River Recreational Trip Expenditures

Wild and Scenic River	Study	State(s)	Mean Expenditures Per Person Per Trip (2016 dollars)
Chattooga River	Moore and Siderelis (2003)	GA, NC, SC	$340
Chattooga River	English and Bowker (1996b)	GA, SC	$165
Delaware River (Lower and Middle)	Cordell et al. (1990)	NJ, PA	$90
Delaware River (Upper)	Cordell et al. (1990)	NY	$43
Farmington River	Moore and Siderelis (2002)	CT	$55
Rogue River	Helvoigt and Charlton (2009)	OR	$197
Salmon River (Middle Fork)	English and Bowker (1996b)	ID	$2,196
Average			**$441**
Average without Salmon River			**$148**

that protecting outstanding river resources in essentially undisturbed states for present and future generations would be complementary to commercial development of the nation's waterways in other locations. Many people derive multiple benefits from accessing NWSRS rivers and their immediate surroundings, either directly for recreation, or through simply knowing that the system and the rivers and ecosystems within exist in a perpetually protected state. However, aside from a few studies looking at recreation benefits and nonuse values, limited empirical research has quantified these benefits into a dollar metric. Moreover, the research done to measure the economic benefits of rivers in the NWSRS remains mostly piecemeal and dated. Nevertheless, the work leaves little doubt that the "values" recognized by Congress are quantifiable and substantial. As Walsh et al. (1985) showed, the estimated economic benefits in many cases exceed the opportunity and management costs associated with designation, thus providing further justification via the economic efficiency criterion.

A second type of economic dollar metric associated with the NWSRS pertains to economic impacts. These impacts result from spending during recreation visits to system rivers. As the spending reverberates through the local economy, jobs and income are supported contributing to regional economic growth. Many economists would argue that because most visits, and thus spending, in the NWSRS originate domestically, this form of "economic growth" is more a transfer of spending from one region to another. Such a transfer may be in the interests of the nation in cases where policy objectives include sustaining rural economies, or targeting certain subgroups. However, as Malm (2012, p. 72) points out, [T]he main objective of the 1968 Act was not to promote economic growth, but to preserve these rivers and ecosystems." Indeed, his work looking at the whole system showed that in the short

Table 3 –Total industrial output (TIO) generated by aggregate recreational expenditures on trips to wild and scenic rivers

Wild and Scenic River	Study	State(s)	TIO (2016 dollars)	TIO	
Chattooga River	Moore and Siderelis (2003)	GA, NC, SC	$3,480,000	2,608,000	6 county region
Chattooga River	English and Bowker (1996b)	GA, SC	$7,440,000	4,350,000	GA and SC state total
Delaware River (Lower and Middle)	Cordell et al. (1990)	NJ, PA	$15,220,000	8,900,000	5 country region
Delaware River (Upper)	Cordell et al. (1990)	NY	$29,420,000	17,200,000	6 county region
Farmington River	Moore and Siderelis (2002)	CT	$4,920,000	3,630,000	5 riverfront towns
Rogue River	Helvoigt and Charlton (2009)	OR	$8,910,000	7,700,000	one county
Salmon River (Middle Fork)	English and (1996b)	ID	$3,900,000	2,280,000	ID state total

run (up to 15 years), designation is negatively correlated with a county's per capita income. But, in the long run, the marginally negative effects became statistically insignificant, indicating that, up to now, the rivers neither impede nor stimulate appreciable economic activity.

We have several thoughts and suggestions for future research regarding economic valuation of wild and scenic rivers, and application of these values to policy and management. First, because the degree of "naturalness," types of use, and consumer preferences can vary significantly between the "*Wild*," "*Scenic*," and "*Recreational*" categories of designation for both recreational use and passive use values, future studies should attempt to disaggregate values categorically. Such disaggregation can help managers determine where to target limited resources to both existing and potential designated rivers to get the most "bang for the buck" (i.e., how to allocate scarce time and money to achieve economic efficiency). This is especially relevant for evaluating future designation of rivers to the NWSRS.

Previous studies of wilderness suggest a growing demand by Americans for passive use and broad, ecosystem service values provided by wilderness that do not involve on-site visits. Such a trend is also likely for wild and scenic rivers, implying that off-site ecosystem service and passive use values of wild and scenic rivers may become just as important and valuable to Americans as on-site recreational values, if they have not already done so. The fact that most previous economic valuation studies of wild and scenic rivers focused on on-site recreational use values suggests a potentially serious knowledge gap. For example, if new studies, such as those for wilderness protection, show higher individual and aggregate values for more wild and natural rivers due to stronger preferences for off-site ecosystem service and passive use values, Congress and federal resource management agencies may put a higher priority on protecting more rivers as part of the NWSRS. A very good example of looking at system values, and something to be considered for the NWSRS, is provided by Haefele et al. (2016) for the national park system.

Although wild and scenic rivers are becoming scarcer every day on a per capita basis, much of their value is not reflected in the marketplace and remains unknown. Consequently, the value for conserving, rather than developing a river may be relatively underestimated. This inevitably leads to a bias toward development and exploitive use of an area; the result being fewer rivers are protected than would be if all the benefits of conservation were included in the economic analyses of alternative uses. Given the scarce resources currently available, and the persistent human use pressure on the NWSRS, and rivers with designation potential, it is recommended that economic research efforts pertaining to the NWSRS be focused on better accounting for the full suite of benefits derived from natural riverine ecosystems and the likely consequences to those benefit flows from alternative development options. Valuing NWSRS resources based on a more complete estimate of the benefits they provide will help ensure that priorities are set such that healthy river ecosystems and appropriate visitor services are provided and maintained – to leave these areas available in their exceptional state for future generations.

References

Ando, A. W., J. Camm, S. Polasky, A. Solow. 1998. Species distributions, land values and efficient conservation. Science 279: 2126–2128.

Bergstrom, J. C., and J. B. Loomis. 2017. Economic valuation of river restoration: An analysis of valuation literature and its uses in decision-making. Water Resources and Economics 17: 9–19.

Bowker, J. M., H. K. Cordell, and N. C. Poudyal. 2014. Valuing values: A history of wilderness economics. International Journal of Wilderness 20(2): 26–33.

Bowker, J. M., D. B. K. English, and J. A. Donovan. 1996. Toward a value for guided rafting on southern rivers. Journal of Agriculture and Applied Economics 28(2): 423–432.

Bowker, J. M., D. B. K. English, and J. C. Bergstrom. 1997. Benefits transfer and count data travel cost models: An application and test of a varying parameter approach with guided whitewater rafting. Faculty Series 16703, University of Georgia, Department of Agricultural and Applied Economics. Retrieved from https://ideas.repec.org/f/pbe916.html, accessed January 31, 2017.

Bowker, J. M., J. E. Harvard III, J. C. Bergstrom, H. K. Cordell, D. B. K. English, and J. B. Loomis. 2005. The net economic value of wilderness. In The Multiple Values of Wilderness, ed. H. K. Cordell, J. C. Bergstrom, and J. M. Bowker, (pp. 161–180). State College, PA: Venture Publishing.

Broadbent, C. D., D. S. Brookshire, D. Goodrich, M. D. Dixon, L. A. Brand, J. Thacher, and S. Stewart. 2015. Valuing preservation and restoration alternatives for ecosystem services in the southwestern USA. Ecohydrology. Published online in Wiley Online Library (wileyonlinelibrary.com), DOI: 10.1002/eco.1628.

Cordell, H. K., J. C. Bergstrom, G. A. Ashley, J. Karish. 1990. Economic effects of river recreation on local economies. Water Resources Bulletin 26(1): 53–60.

English, D. B. K., and J. M. Bowker. 1996a. Sensitivity of the travel cost method to pecuniary cost specification. Journal of Environmental Management 47: 79–91.

———. 1996b. Economic Impacts of Guided Whitewater Rafting: A Study of Five Rivers. Water Resources Bulletin 32: 1319–1328.

Freeman, A. M., III. 1994. The Measurement

of Environmental and Resource Values: Theory and Models. Washington, DC: Resources for the Future.

Haefele, M., J. Loomis, and L. J. Bilmes. 2016. Total economic valuation of the National Park Service lands and programs: Results of a survey of the American public. HKS Faculty Research Working Paper Series RWP16-024, June. Retrieved from https://research.hks.harvard.edu/publications/citation.aspx?PubId=11308&type=PT&LookupCode=RP, accessed May 3, 2017.

Helvoigt, T.L., and D. Charlton. 2009. The Economic Value of Rogue River Salmon. Report Commissioned by the Save the Wild Rogue Campaign. ECONorthwest. January 30, 2009. Retrieved from http://kswild.org/what-we-do-2/WildlandProtection/RogueSalmonFinalReport.pdf, accessed February 6, 2017.

Holmes, F. P., and W. E. Hecox. 2004. Does wilderness impoverish rural regions? International Journal of Wilderness 10(3): 34–39.

Holmes, T., J. Bergstrom, E. Huszar, S. Kask, and F. Orr. 2004. Contingent valuation, net marginal benefits and the scale of riparian ecosystem restoration. Ecological Economics 49: 19–30.

Holmes, T. P., J. M. Bowker, J. Englin, E. Hjerpe, J. Loomis, S. Phillips, and R. Richardson. 2016. A synthesis of the economic values of wilderness. Journal of Forestry 114: 320–328.

Johnston, R. J., and R. S. Rosenberger. 2010. Methods, trends and controversies in contemporary benefit transfer. Journal of Economic Surveys 24(3): 479–510.

Krutilla, J. 1967. Conservation reconsidered. The American Economic Review 57: 777–786. Loomis, J., P. Kent, L. Strange, K. Fausch, and A. Covich. 2000. Measuring the total economic value of restoring ecosystem services in an impaired river basin: Results from a contingent valuation survey. Ecological Economics 33: 103–117.

Loomis, J. B., and R. Richardson. 2000. Economic values of protecting roadless areas in the United States. An analysis prepared for The Wilderness Society and Heritage Forests Campaign. June. Retrieved from http://www.sierraforestlegacy.org/Resources/Conservation/FireForestEcology/ForestEconomics/Economics-Loomis00.pdf, accessed February 1, 2017.

Malm, G. 2012. An exploration into the economic impact of the wild and scenic river designation: A quasi-experimental approach. Theses, Dissertations, Professional Papers 134. University of Montana. Retrieved from http://scholarworks.umt.edu/etd/134, accessed January 17, 2017.

Mates, W. J., and J. L. Reyes. 2006. The Economic Value of New Jersey State Parks and Forests. New Jersey Department of Environmental Protection, Division of Science, Research & Technology. Retrieved from http://www.nj.gov/dep/dsr/economics/parks-report.pdf, accessed April 18, 2017.

Moore, R. L., and C. Siderelis. 2002. Use and Economic Importance of the West Branch of the Farmington River. Report prepared for American Rivers, Inc. and Park Planning and Special Studies and Rivers, Trails and Conservation Assistance Programs of the National Park Service. September 9. Retrieved from https://www.nps.gov/ncrc/rivers/projpg/farm.pdf, accessed December 15, 2016.

———. 2003. Use and Economic Importance of the Wild and Scenic Chattooga River. Report prepared for American Rivers, Inc. and Park Planning and Special Studies and Rivers, Trails and Conservation Assistance Programs of the National Park Service. November 10. Retrieved from https://www.nps.gov/ncrc/rivers/projpg/chatt.pdf, accessed December 15, 2016.

Morton, P. 1999. The economic benefits of wilderness: Theory and practice. Denver Law Review 76(2): 465–518.

Patton, D., J. C. Bergstrom, R. Moore, and A. P. Covich. 2015. Economic value of carbon storage in U.S. national wildlife refuge wetland ecosystems. Ecosystem Services 16: 94–104.

Phillips, S. 2004. Windfalls for wilderness: Land protection and land value in the Green Mountains. PhD dissertation. Virginia Polytechnic Institute and State University, Blacksburg.

Rosenberger, R. S. 2016. Recreation use values database. Oregon State University, College of Forestry. Retrieved from http://recvaluation.forestry.oregonstate.edu/database, accessed January 31, 2017.

Rosenberger, R. S., and D. B. K. English. 2005. Impacts of wilderness on local economic development. In The Multiple Values of Wilderness, ed. H. K. Cordell, J. C. Bergstrom, and J. M. Bowker (chapter 10). State College, PA: Venture Publishing, Inc.

Sardana, K., J. C. Bergstrom, and J. M. Bowker. 2016. Valuing setting-based recreation for selected visitors to national forests in the southern United States. Journal of Environmental Management 183(3): 972–979.

Stolton, S., and N. Dudley. 2010. Vital Sites: The contribution of protected areas to human health. The Arguments for Protection Series. World Wide Fund for Nature (WWF). Avenue du Mont-Blanc, 1196 Gland, Switzerland. Retrieved from https://www.iucn.org/content/vital-sites-contribution-protected-areas-human-health, accessed April 18, 2017.

USDA Forest Service. 2017. Personal Communication with Stephen M. Chesterton, Wild and Scenic Rivers Program Manager, Forest Service, Washington Office, National Forest System, January 19.

USDI. National Park Service. 2001. Economic benefits of conserved rivers: An annotated bibliography. Retrieved from https://www.nps.gov/ncrc/rivers/fulabib.pdf, accessed January 10, 2017.

Walsh, R. G., L. D. Sanders, and J. B. Loomis. 1985. Wild and Scenic River Economics: Recreation Use and Preservation Values. Fort Collins, CO: Colorado State University, Department of Agriculture and Natural Resource Economics. American Wilderness Alliance.

Woodward, R. T., and Y. S. Wui. 2001. The economic value of wetland services: A meta-analysis. Ecological Economics 37: 257–270.

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