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ARTICLES

National and Community Market Contributions of Wilderness

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ABSTRACT

Wilderness attracts tourists and generates visitor spending in proximate communities as people enjoy Wilderness for outdoor recreation. Wilderness also attracts amenity migrants and out-of-region investments into surrounding regional economies. To investigate the amount and types of employment and income generated by Wilderness visitation, we conducted an economic contribution analysis of aggregate national visitor expenditures. The U.S. Forest Service National Visitor Use and Monitoring (NVUM) economic spending profiles were used to construct types and amounts of Wilderness visitor spending and were applied to an estimated 9.9 million annual visitors across federal agencies. IMPLAN modeling software was used to estimate total effects and multipliers for output, employment, income, and value added. Results show that some $500 million is annually spent in communities adjacent to Wilderness, generating a direct effect of 5,700 jobs and a total output effect over $700 million across numerous industries ($2012 including indirect and induced effects).

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Introduction

Congressionally designated Wilderness areas (hereafter Wilderness) in the United States spur economic impacts in surrounding regional economies as outside visitors purchase local goods and services in the region (Rosenberger and English 2005). Wilderness can also induce people and businesses to relocate to regions as they look to be closer to the aesthetic and recreational opportunities associated with Wilderness (Power 1992). Other economic benefits are generated by Wilderness, including numerous nonmarket values, such as consumer surplus for those who recreate in Wilderness (the value above and beyond the price paid) and passive use values held by both users and nonusers of Wilderness (existence, option, and bequest values) (Bowker, Cordell, and Poudyal 2014). Typically, economic investigations of Wilderness focus on either economic impacts or economic values. Economic impacts are market indicators associated with Wilderness, such as employment and income, and typically represent shifts of labor or wages from one area to another. Economic values, on the other hand, are changes (benefits or costs) in individual welfare resulting from the presence of Wilderness.

While local guiding and lodging services can be influenced by Wilderness visitor expenditures, Wilderness is typically located in the most remote and inaccessible regions,

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meaning that the overall impact of visitor spending is small and localized. The very intent of the Wilderness Act was to preserve natural processes, and the act explicitly disallowed any new commercial enterprise or the development of permanent roads. Wilderness was to be "untrammeled by man" and where man "is only a visitor." Clearly, market contributions of Wilderness are not the driving force behind preservation, and the economic impacts of Wilderness are unlikely to win any money and jobs competition. Despite the Wilderness concept being antithetical to commercialization, Wilderness provides a unique niche for surrounding gateway communities and generates a number of national market contributions.

As the current market contributions of Wilderness are unknown, we investigate the aggregate economic impacts, or contributions, of Wilderness areas in the United States, including traditional economic impact indicators of jobs, output, and income. We frame these market contributions in the greater economic context of Wilderness to illustrate that income and jobs coming from Wilderness are only one part of the societal value of Wilderness. We also synthesize additional market indicators associated with Wilderness, such as effects on community economic development trends. While there have been general estimates of Wilderness economic contributions, we are not aware of any published national economic contributions analyses of Wilderness.[1]

Background

There are 758 Wilderness areas in the United States, comprising almost 110 million acres of federal lands, with more than half of those acres being located in Alaska (wilderness.net). The U.S. federal government manages roughly 640 million acres of land (Gorte et al. 2012), making Wilderness only 17% of public lands. Table 1 illustrates that Wilderness spans multiple federal agencies, including the Bureau of Land Management (BLM), the U.S. Forest Service (USFS), the National Park Service (NPS), and the U.S. Fish and Wildlife Service (USFWS), and the many types of federal designations within these agencies (e.g., national park, national forest, refuge, etc.). The overlapping jurisdictional and management designations of Wilderness allow for multi-agency collaboration, but can also impede the ability to consistently monitor and isolate Wilderness visitors and to attribute economic contributions directly to Wilderness. For example, among all agencies that manage Wilderness areas, only the USFS tracks total Wilderness visitation.[2]

Investigations of market contributions of Wilderness should consider the economic effects of the geography and the rural nature of Wilderness (see Figure 1). Wilderness has a unique economic geography due to being generally restricted to high alpine elevations and other less productive lands. Aycrigg et al. (2013) recently confirmed this, showing that U.S. protected lands are, on average, at the lowest end of soil productivity and the highest end of elevation compared to nonprotected lands. The unique economic geography of Wilderness came about as Wilderness was designated in the least politically contentious

[1]The USFS estimated national Wilderness economic contributions for their agency in a 2014 one-page briefing paper (English, Winter, and White 2014). This briefing only addressed USFS-managed Wilderness and did not provide further economic context of Wilderness.

[2]There is a lack of agency-wide Wilderness visitation estimates for the BLM, the USFWS, and the NPS, despite some individual units of these agencies tracking Wilderness visitation. This lack of Wilderness visitation totals is problematic for estimating national economic contributions.

Table 1. Wilderness by U.S. federal agency.

Agency	Number of wilderness areas	Acres of wilderness	Wilderness percentage of agency acres
Bureau of Land Management	221	8,710,087	3.5
Fish and Wildlife Service	71	20,702,488	23.3
Forest Service	439	36,165,620	18.7
National Park Service	61	43,932,843	54.9
Total	758*	109,511,038	17.0

Source: Wilderness.net as of June 2, 2014.
*Does not add up due to multiple agencies overlapping management of wilderness areas.

areas, or the lands most difficult to develop. This geography consists of vast acres of mountains, canyons, tundra, glaciers, and desert. The economic geography of Wilderness that results is a land that is generally inaccessible, inhospitable, and costly to develop. This economic geography naturally limits the amount of commercialization and subsequent economic impacts from visitors, but can also serve as an attractant to locals and visitors.

Literature Review

Given the different economic values and impacts generated by Wilderness, it is helpful to frame economic contributions of visitor expenditures within an overall picture of Wilderness economics. With the noncommercial intent drafted into the language of the Wilderness Act, much of the economic value of wilderness comes from nonmarket values. These nonmarket values are comprised of on-site benefits, scientific benefits, off-site

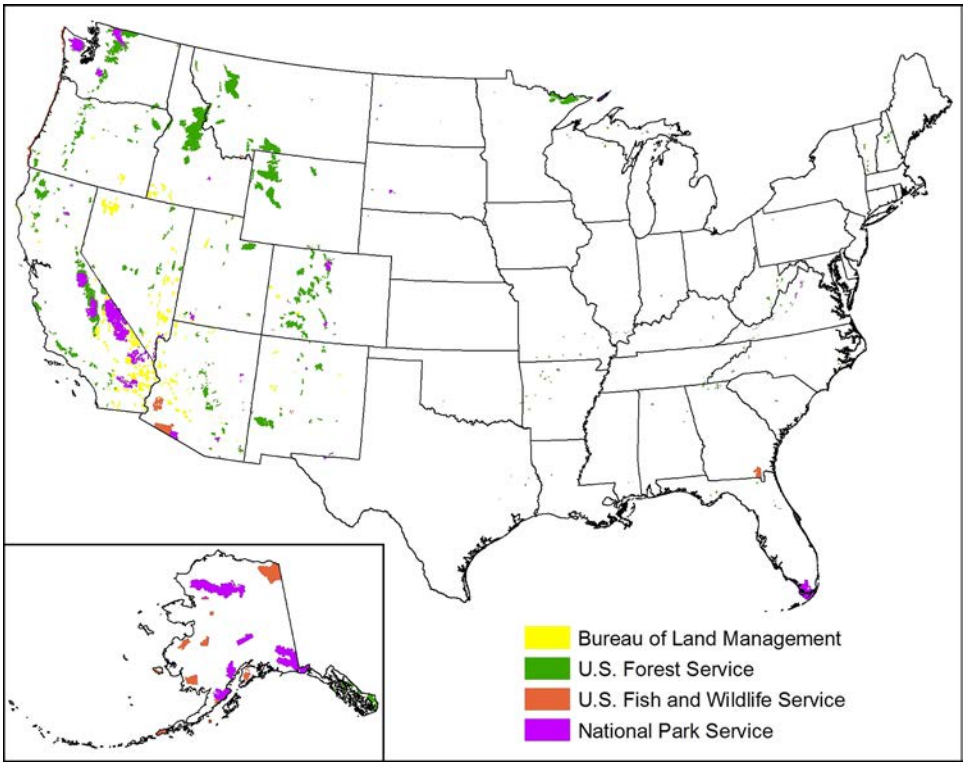

Figure 1. Wilderness areas in the United States.

benefits, biodiversity conservation, ecological services, and passive use benefits (Morton 1999). Previous research on Wilderness economics has focused on classifying the various types of values (Power 1996a; Morton 1999; Holmes et al. 2015) and quantifying potential total values (Loomis and Richardson 2001; Bowker et al. 2005). Others have conducted case studies empirically investigating consumer surplus of Wilderness recreationists and willingness to pay for passive use values generated by Wilderness (e.g., Walsh, Loomis, and Gillman 1984; Gilbert, Glass, and More 1992; Weber, Mozumder, and Berrens 2012). Our focus, however, is on the regional market indicators associated with community impacts of Wilderness.

Wilderness Visitor Spending

Wilderness attracts visitors who come to recreate in protected areas. These visitors purchase food, lodging, and services in gateway communities adjacent to Wilderness areas. These visitor expenditures result in economic impacts such as increases in sales revenue, income, jobs, and taxes. Economic contributions associated with Wilderness visitor expenditures are a measure of economic activity of suppliers of goods and services and are not measures of value derived by individual recreationists (Loomis and Walsh 1997).

Visitor expenditures have direct effects on suppliers of services, but also generate further spending in regional economies as suppliers purchase local intermediate goods and services in order to produce a final service. These backward linkages can be quantified and are known as indirect effects. Additional economic activity is generated as workers spend wages on local services and entertainment. Employee spending provides an "in-filling" effect to the regional economy and creates induced effects. The ratio of total effects (direct, indirect, and induced) to direct effects is the regional multiplier effect (Loomis and Walsh 1997). Multipliers can be calculated for output, income, and employment and measure the amount and number of times initial Wilderness visitor expenditures are re-circulated throughout the regional economy.

There have been a number of economic impact analyses of outdoor recreation in rural areas (e.g., Bergstrom et al. 1990, Hjerpe and Kim 2007; Carver and Caudill 2013; White, Goodding, and Stynes 2013). But in terms of Wilderness, there has only been one published economic impact analysis of individual Wilderness areas. Keith and Fawson (1995) determined regional economic impacts from visitors to three Utah Wilderness areas. They found expenditures ranging from $28 to $40 per visitor per day when adjusted to $2013 dollars. Others (Rudzitis and Johnson 2000; Rosenberger and English 2005) have proposed methods for analyzing the economic impacts of Wilderness users and have summarized findings. In general, Wilderness economic impacts and contributions tend to be lower than outdoor recreation on other types of public lands (Rudzitis and Johnson 2000), but there is little empirical evidence to evaluate.

Rural Economic Development and Wilderness

Pristine and mountainous landscapes can spur other economic effects, beyond those associated with visitor expenditures. Wilderness can attract people to relocate to nearby communities, bringing businesses and investments into rural communities that were once dependent on extracting resources (Power 1992). The influx of people relocating to areas with high natural amenities and Wilderness is termed "amenity migration." Amenity migration has been part of changing economic development trends, particularly in the rural American West. People are no longer following jobs; rather, jobs are following people

in these rural areas (Power and Barrett 2001). These changing development patterns include shifts in employment from extractive industries to services industries in rural areas (Power 1996b), in large part due to migrants seeking amenities provided by Wilderness and similar natural settings (Power 1996a).

Because Wilderness is typically part of a larger set of public lands serving as an attractant to amenity migrants, it is difficult to tease out the specific economic effects that Wilderness has on attracting new income and investments into the region. However, a few studies have examined associations between Wilderness and overall regional economic indicators. Duffy-Deno (1997) examined rural Western county employment levels and found no difference among counties containing Wilderness and those without Wilderness. Using time trend analysis since Wilderness designation, Holmes and Hecox (2004) found income, employment, and population increases for rural Western counties with Wilderness. However, these positive economic effects of Wilderness mirror those found for most types of public lands (Lorah and Southwick 2003), making it difficult to gauge the role that Wilderness plays in attracting new migrants for outdoor recreation on public lands.

Methods

We conducted a national economic contribution analysis of Wilderness visitor expenditures. Economic contribution analysis is similar to economic impact analysis in the identification of annual expenditures and ripple effects throughout the economy by modeling final demand in an input–output model, but contribution analysis is more appropriate for estimating ongoing contributions of an industry rather than the creation or loss of new business (Watson et al. 2007). Additionally, national contribution analysis is less concerned with delineation between local and nonlocal users.

We utilized visitor expenditure data (White, Goodding, and Stynes 2013) compiled from the National Visitor Use and Monitoring (NVUM) database, an existing tourism and recreation expenditure profile set for protected federal lands. Wilderness expenditure profiles were created and applied to the input-output model IMPLAN (IMpact analysis for PLANning) used to estimate economic impacts. We constructed a North American Industry Classification System (NAICS) sectoring scheme that captures the industrial sectors most affected by Wilderness visitor expenditures. This sectoring scheme was compiled from previous research on Wilderness expenditures and from other tourism and recreation economic impact analyses (e.g., Hjerpe and Kim 2007), though expenditure data categories in NVUM are easily bridged to specific IMPLAN sectors. Sectoring schemes need to fully account for all types of visitor spending that might occur in the region and need to properly match spending categories to NAICS sectors. Specific industry sectors affected include amusement and recreation services, eating and drinking establishments, lodging, passenger transportation, recreational equipment, miscellaneous retail, gas stations, federal nonmilitary (any entrance fees/permits), and other (see appendix). Expenditure data were coded by commodity/service and year and applied to the constructed sectoring scheme for the national economy. Retail expenditures were margined in order to convert purchaser prices into producer prices contained in the accounting matrices. All expenditures were adjusted to 2012 prices contained in IMPLAN. Annual contributions were examined in terms of output, income, employment, and value-added. Multiplier effects for wilderness visitor expenditures were also reported.

Wilderness Visitor Expenditure Profile

The NVUM data were the primary expenditure information used to construct overall Wilderness visitor expenditure profiles. The NVUM program visitation data come from state-of-the-art sampling of National Forest visitors across all Forest Service regions in the United States. The sampling design used in the NVUM program captures a broad representation of forest visitation, activities, and economic expenditures over time. Three rounds of NVUM surveys have been conducted: Round 1 occurred during 2000–2004, Round 2 during from 2005–2009, and Round 3 occurred during 2010–2014 but has yet to be fully analyzed. We used Round 2 expenditure data, where approximately 105,000 visitors were sampled, with roughly one-third of the visitors completing a supplemental set of spending questions (White, Goodding, and Stynes 2013). Forest visitors are sampled at four distinct site types, or strata in the NVUM sampling design. These four site types are day use developed sites, overnight use developed sites, Wilderness sites, and general forest areas (Zarnoch et al. 2011).

As Wilderness is one of the four areas where visitors are sampled, there is an additional level of detail for the Wilderness stratum. However, expenditure information at the individual stratum layer is insufficient for statistical support of unique profiles (White and Stynes 2008). The same is true of individual activity expenditure profiles as presented in Forest Service research publications on NVUM results (e.g., White and Stynes 2010). Wilderness-related recreation activities such as backpacking, bird-watching, camping, fishing, hiking, hunting, and rafting (Bowker, Cordell, and Poudyal 2014) might be a good grouping for expenditure profiles, but the type of activity statistically explains less of the NVUM samples as compared to trip type segments (White and Stynes 2008). Trip-type visitor segments include seven categories of trips: nonlocal day trips, nonlocal overnight on the forest, nonlocal overnight off the forest, local day trips, local overnight on the forest, local overnight off the forest, and nonprimary. It is the trip types that determine the greatest difference in visitor expenditures, accounting for 27% of the variation in spending (White and Stynes 2008).

White, Goodding, and Stynes (2013) provide estimates of visitor spending within 50 miles of the recreation destination collected from primary data of the NVUM program. They estimated the spending patterns of National Forest System (NFS) lands users, including differentiating between local and nonlocal users and day users and overnighters. As the NVUM spending patterns are the most detailed economic information from a diverse set of users on federal protected lands in the United States, we apply NFS lands estimates to Wilderness visits on all federal lands. An average wilderness visitor expenditure profile was constructed and applied to the annual number of Wilderness visits. See the appendix for the listing of the White, Goodding, and Stynes (2013) recommended steps for constructing expenditure profiles and how we addressed each step in our methods. The recommended approach for determining expenditures for unique sets of visitors, such as Wilderness users, is to incorporate the average spending profiles by trip type (local/nonlocal; day/overnight), as determined for all forest users, and extrapolate it to estimates of total Wilderness visits (White, Goodding, and Stynes 2013).[3]

[3]In Appendix 1 of White, Goodding, and Stynes (2013), they provide general guidelines for applying the national spending profiles.

Economic Contribution Analysis

In our economic contribution analysis, expenditures are allocated to particular sectors of the economy (restaurants, fuel, etc.) and applied to a single national study area economy. These expenditures represent final demand for economic goods in the local regions around Wilderness areas, which have a ripple effect in the economy nationally as indirect and induced effects. For wilderness contributions, we refer to the example of a lodge located close to Wilderness. The direct effect is the payment by the Wilderness visitor to spend a night or two at the lodge, before or after their Wilderness trip. Indirect effects are represented by supply purchases made by lodge owners necessary to provide services to wilderness visitors such as food, drinks, and cleaning services. Induced effects include the recirculation of lodge worker's income, as they spend money on groceries and entertainment. These additional economic activities are known as multiplier effects.

Input–output modeling is the basis for economic contribution analysis and the accounting of multiplier effects. As one sector of the economy ramps up production, other sectors are needed to increase production to provide the necessary inputs. Input–output models use an interindustry transactions table to track producers' output and inputs, where each industry is both a producer and a consumer of products. Input–output frameworks were modernized by Harvard economist Wassily Leontief in 1936 (Isard et al. 1998). The industry transactions table can be further enhanced by including households and institutions (e.g., government transfers). This expanded table is known as the social accounting matrix (SAM) and allows for complete tracking of all market actors (Miller and Blair 2009).

The proliferation of prepackaged national and regional SAMs and increased computing power has resulted in numerous economic impact and contribution analyses. We use IMPLAN software (3.0) developed and maintained by MIG, Inc. IMPLAN is one of the most commonly used customized input–output (I-O) models. IMPLAN is a static I-O model, making it less flexible than dynamic computable general equilibrium (CGE) models such as Regional Economic Models, Inc. (REMI). Static I-O models such as IMPLAN depend on a few critical assumptions necessary for complex analysis, including constant return to scales, no supply constraints, and fixed input structure and technology. IMPLAN's linear and static assumptions result in trade-offs between mathematical simplicity and modeling flexibility that more adequately account for market reactions and time trends. This trade-off results in IMPLAN being widely available (it is much cheaper than more flexible modeling software such as REMI) and easier to use. But it also limits the long-term accuracy of market responses to stimulus, or expenditures, and does not account for changing technology and changing ratios of supply inputs that happen as businesses are forced to change production behavior as the price and scale of their inputs change. These trade-offs require caution when generalizing IMPLAN results and an understanding that estimated contributions represent a snapshot in time. Despite its linear approach, IMPLAN has been shown to be an effective performer when compared to other models such as REMI in terms of independent market criteria (Crihfield and Campbell 1991) and is well suited for outdoor recreation (Bergstrom et al. 1990).

Results

Spending patterns for Wilderness visitors, as determined from NVUM surveys, were estimated for the annual number of all U.S. Wilderness visits across multiple federal

agencies. Total expenditures from all Wilderness visits were then applied to a national I-O model (IMPLAN) for an economic contribution analysis. Affected industry sectors and multiplier effects were examined to understand the economic backward linkages associated with Wilderness visitor expenditures.

Wilderness Visitor Expenditures

Annual Wilderness visitor expenditures were determined by estimating total visitation across federal agencies and applying spending profiles for the various trip-type segments as determined in recent NVUM reports (e.g., White, Goodding, and Stynes 2013). NVUM Round 3 surveys for 2010–2014 have been completed and are currently being analyzed. Based on the NVUM Round 3 data, there are an estimated 3.435 million party visits (a Wilderness visit by one party of visitors traveling together) annually to NFS Wilderness areas (Don English, NVUM Director, personal communication on October 7, 2014). About 55% of Wilderness visits were day trips from residents of the local area. Approximately 30% of visits were from nonlocals (outside of 50 miles from the Wilderness area). Each of the seven visitor trip type categories was weighted by their unique spending profiles[4] and combined to represent total annual Wilderness visitor expenditures for NFS lands. Based on previous research (David Cole, Aldo Leopold Wilderness Research Institute, personal communication on December 21, 2015), we assumed that NFS Wilderness visitors comprised approximately 80% of all national Wilderness visits.[5] We also assumed that Wilderness visitors for other federal agencies were distributed similarly among the seven visitor trip-type segments, as they were for NFS lands and the NVUM data. Adding on the additional 20% of Wilderness visits provided an estimate of 4.295 million Wilderness party visits nationally each year. With an average party size of 2.3 people (White, Goodding, and Stynes 2013), the 4.295 million party visits translates to 9.875 million individual visits each year to Wilderness.

Visitors in each of the seven trip types have unique spending profiles for various spending categories. For example, nonlocals will have greater expenditures in lodging, dining, and fuel needs. Once the numbers of annual Wilderness parties were categorized by trip-type, we applied a weighted average to each spending category to determine overall expenditures. These spending categories, their correlating IMPLAN sectors, and the total expenditures are presented in Table 2. Almost 10 million annual Wilderness visits yielded in-region expenditures of approximately $500 million (in $2012). Approximately 75% of these Wilderness expenditures were for gas, groceries, restaurants, and lodging. Of the trip types, nonlocal overnight visitors that stayed off the forest had the greatest expenditures. Full data sets are available from the authors.

[4]Local day use expenditure profiles were used for the "not-primary" trip type visits, as the not-primary expenditure profiles include spending attributed to other activities outside of the National Forest.

[5]With missing Wilderness-specific visitation estimates from other federal agencies, we acknowledge uncertainty in this estimate. While agencies such as the NPS can require overnight permits, there is often no stratification of these permits by Wilderness boundaries. Additionally, day-use visitors are not always tracked and it is difficult to determine whether or not Wilderness was the primary reason for the visit. It is also difficult to determine whether visitors to other agency-managed Wilderness have similar trip types and spending patterns. For example, NPS Wilderness visitors may have higher entry fee expenditures as compared to USFS visitors.

Table 2. National wilderness visitor expenditures by spending category (in-region*).

Spending category	IMPLAN sector	Weighted annual expenditures (millions of $2012**)
Motel	Hotels and motels (411)	88.19
Camping	Other accommodations (412)	23.87
Restaurant	Food services and drinking places (413)	89.12
Groceries	Retail stores—food and beverage (324)	90.05
Gas and oil	Retail stores—gas stations (326)	112.28
Other transportation	Scenic and sightseeing transportation (338)	3.42
Entry fees	Other federal government enterprises (429)	21.97
Recreation and entertainment	Other amusement and recreation industries (410)	23.39
Sporting goods	Retail stores—sporting goods (328)	28.41
Souvenirs and other expenses	Retail stores—miscellaneous (330)	20.91
Total		501.63

Source: NVUM visitor-trip type spending segments (White, Goodding, and Stynes 2013) applied to estimated annual wilderness visitors in each segment.
*Spending only within 50 miles of wilderness areas, excludes out-of-region expenditures for wilderness visits.
**Expenditures were inflated from $2009 used in White, Goodding, and Stynes (2013).

Economic Contribution Analysis

Annual Wilderness visitor expenditures were applied to a national input–output model in IMPLAN. Expenditures in ten spending categories were entered into IMPLAN's impact analysis for the U.S. national economy in 2012. Table 3 illustrates employment, income, valued-added, and total output for industrial sectors most affected by Wilderness visitor expenditures.

Wilderness visitor expenditures recirculate through the economy as lodges and retail stores purchase greater inputs, and as workers spend wages on services. Total effects are presented in Table 4. In total, Wilderness visitor expenditures annually contribute to more than 8,400 jobs, about $270 million in labor income, and more than $700 million in national output. As shown in Table 3, restaurants and drinking establishments spur the greatest amount of employment (1,688 full- and part-time jobs). Wilderness management and administration account for a number of jobs as well (other federal government enterprises). In terms of total output, hotels and lodging establishments spur the second greatest amount of output ($85 million).

Table 3. Top 10 affected sectors for wilderness visitor expenditures ($2012).

Description	Total employment	Total labor income ($millions)	Total value added** ($millions)	Total output ($millions)
Food services and drinking places	1,688	38.4	52.7	97.1
Other federal government enterprises	1,443	13.7	20.8	27.2
Hotels and motels, including casino hotels	752	26.1	56.8	85.2
Other amusement and recreation industries	633	15.6	20.6	32.5
Retail stores—food and beverage	462	14.2	18.5	26.7
Retail stores—miscellaneous	382	8.5	12.8	16.8
Other accommodations	268	5.9	7.2	12.5
Retail stores—sporting goods, hobby, books, and music	256	9.4	13.1	22.6
Retail stores—gasoline stations	176	6.3	8.8	12.7
Real estate establishments	143	2.6	18.0	22.0
Total*	8,422	269	438	737

Source: IMPLAN3, U.S. region 2012.
*Includes all sectors.
**Value added is the difference between an industry's total output and its intermediate inputs. It includes employee compensation, taxes, and surplus.

Table 4. Total effects and multiplier for wilderness visitor expenditures ($2012).

Impact type	Employment	Labor income (millions)	Total value added (millions)	Output (millions)
Direct effect	5,698	$130	$199	$313
Indirect effect	998	$56	$94	$171
Induced effect	1,727	$83	$145	$253
Total effect	8,422	$269	$438	$737
Multiplier effect	1.48	2.07	2.20	2.35

Source: IMPLAN3, U.S. region 2012, type SAM multipliers.

There are other national economic contributions beyond the area of the Wilderness destination as well. Estimated contributions in the preceding are based in Wilderness visitor expenditures within 50 miles of Wilderness areas. However, 30% of Wilderness visitors are nonlocal, meaning that they could have had additional trip expenditures related to their Wilderness visit beyond 50 miles of the recreation destination that were not captured in NVUM spending averages. Out-of-region spending is rarely captured in impact analyses of outdoor recreation, as the focus is typically on the regional level, where expenditures outside of the region have no local impact.[6] It is likely that nonlocal Wilderness visitors have other, out-of-region, expenditures. Much of the costs of transportation, to and from Wilderness, will occur outside of the regional economy. Likewise, equipment purchases[7] and often food and beverages will be purchased prior to entering the regional economy. Nonlocal visitors of Wilderness also understand that communities surrounding Wilderness are likely to be rural with less developed retail options. While we were unable to quantify out-of-region expenditures associated with nonlocal Wilderness visitation, we do acknowledge additional and substantial Wilderness expenditures not captured in this study.

Discussion

Wilderness visitor expenditures contributed to more than $700 million of annual output nationally and thousands of jobs. The contributions are important economic activity for rural communities and are representative of the unique economic geography of remote and mountainous lands associated with Wilderness. The national totals are surprising given the noncommercial intent of the Wilderness Act, but play a very small role in the overall market contributions of all outdoor recreation. With much of the total economic value derived from Wilderness coming from passive use values, these market contributions should be considered in a greater and complementary context—a market side effect stemming from the very preservation of future opportunities. Wilderness will not compete with other land uses in short-term market yields, nor in the traditional economic efficiency criteria calculated in many federal land management plans. To shed more light on the complementary role of Wilderness market contributions we discuss their multiplier effects, their opportunity costs, and the role of amenity migration.

As multiplier effects measure the amount and frequency with which contributions are recirculated in an economy, the size of the defined economy and the diversity of industries

[6]Regional economic impact analyses are concerned only with new money coming from outside of the study area. Expenditures from locals are typically excluded as they represent re-circulated income that would be spent in other areas of the regional economy in the absence of the recreation opportunity (Johnson and Moore 1993). Some cases call for inclusion of local spending if there is no equal substitute within close proximity.

[7]See Bergstrom et al. (1990) for a methodological approach for including previously purchased recreation equipment and portioning the expenditure value to a specific trip.

contained within that economy have a tremendous effect on multipliers. Nature tourism and outdoor recreation expenditures typically have lower multiplier effects as compared to extractive and manufacturing industries (Loomis and Walsh 1997), as their backward economic linkages do not require as many resources and materials as these other industries. The multipliers in this national study for employment (1.48) and income (2.07) are small for a national defined study area. For example, national industry estimates for expenditures in all types of outdoor recreation found an employment multiplier of 2.0 and an income multiplier of 2.6.[8] Likewise, a study by the industry association for mining[9] reports a national employment multiplier of 3.0 and a labor income multiplier of 2.5. Even within recreation industries, Wilderness expenditures and their multiplier effects are on the lower end of the spectrum. However, this is to be expected for Wilderness expenditures due to the remoteness of Wilderness and the nonmechanized activities allowed in Wilderness. Motorized activities such as riding all-terrain vehicles or dirt bikes typically require more spending on gear and fuel. While some high-profile Wilderness areas (e.g., Boundary Waters Canoe Wilderness Area, Bob Marshall Wilderness Areas) are likely to create substantial regional economic contributions, Wilderness writ large is located and intended without concern for market contributions.

These contributions should also be considered alongside opportunity costs and other economic trade-offs of Wilderness areas. With the nonmarket intent of the Wilderness Act, new development and extractive industries will not take place in Wilderness areas. The opportunity cost is the foregoing of using Wilderness lands to achieve the short-term market returns through logging or gas development, for example, and the associated economic impacts and linkages associated with increased development. While Wilderness restrictions can have constraining effects on particular industries (e.g., timber and mining industries), there has been no peer-reviewed evidence of adverse economic effects on regional economies adjacent to Wilderness. To the contrary, regional economies adjacent to Wilderness have grown more rapidly and more strongly than similar economies without Wilderness (Lorah and Southwick 2003; Holmes and Hecox 2004), while employment levels for counties with Wilderness were undifferentiated from counties without Wilderness (Duffy-Deno 1997). The constraining economic effects of Wilderness are typically felt by a few individual industries, with the majority of regional industries realizing either positive or no economic effects from Wilderness.

There are also other regional economic contributions of Wilderness, beyond visitor expenditures. Power's (1992) recommendation to regional economists studying economic contributions of Wilderness was to go beyond just the examination of recreation expenditures and include other community impacts such as amenity migration. Christensen (2011) contends that the amenity-based community contributions of Wilderness likely far exceed visitor expenditures. However, the quantification of these other community impacts has proven difficult. The difficulty of quantifying an amenity migration-effect size for changes in employment or income for particular natural amenity attributes, in this case the presence of Wilderness, is that the natural amenities that spur the relocation of investments and people are a broad set. That is, Wilderness is one of a number of natural amenities that collectively attract migrants, alongside proven amenities of climate, mountains, and public

[8] http://outdoorindustry.org/pdf/OIA_OutdoorRecEconomyReport2012.pdf.
[9] http://www.nma.org/pdf/economic_contributions.pdf.

lands in general. Deller et al. (2001) found five broad natural amenity indices all played significant roles in influencing rural amenity migration locations, and further decomposed these five indices into many smaller principal components. The presence of Wilderness was shown to be one of the strongest contributors as a smaller principal component, though still just a small player among numerous other factors (Deller et al. 2001).

Charnley, McLain, and Donoghue (2008) point out that many of the amenity migration economic effects are extremely localized, often making community-level analysis much more appropriate than larger regional level analysis. For Wilderness, and public lands in general, the majority of the empirical research on correlating economic effects and trends is conducted at the county level, due to greater availability of economic data. Furthermore, a number of researchers have also illustrated potential adverse economic effects for communities boosted by amenity migration (e.g., Gosnell and Abrams 2011). Local growth in employment and income can increase the cost of living in communities and can sometimes outpace the supply of necessary infrastructure and emergency services. This suggests that a quantification of total economic contributions of Wilderness should be separated from a cost/benefit analysis, or a distribution analysis of economic winners and losers.

Concerning the market contributions of Wilderness, these lessons learned provide us with critical suggestions for future research. First, in regard to national contributions on Wilderness visitors, there is a tremendous need for greater monitoring data from other federal agencies both in terms of the number of Wilderness visitors and their spending behaviors. Our analysis is based on NVUM visitation estimates for NFS Wilderness. While we feel that this is likely representative of all Wilderness visitors, we do not know the total amounts of visitors to BLM, NPS, and USFW Wilderness areas—nor do we know whether they have similar expenditure patterns in industry sectors and locations. Further information on amounts, types, and spending of visitors to Wilderness areas on other agency-managed lands would provide greater confidence in our results and would help further other social research surrounding Wilderness. Likewise, more case studies determining the economic contributions of individual Wilderness areas would provide greater representation and knowledge of Wilderness contributions.

Second, it is important to gain greater understanding of changing trends in visitor trip type segments, as Wilderness may see changing ratios of local and out-of-region visitation. These trends may be indicative of the trends in amenity migration towards protected public lands and may have repercussions on Wilderness visitor expenditures. Nonlocal visitors tend to spend more in region than local Wilderness visitors, as they are in need of lodging and goods not available in the comfort of their own home. But greater local visitation to Wilderness would push per-day and total expenditures downward and local visitor expenditures are not typically considered as new money to the area. Future research should be aimed at understanding how amenity migration trends affect both Wilderness visitation and expenditure trends.

Finally, knowledge of market contributions of Wilderness would be improved by research that attempts to isolate the percentage influence that Wilderness plays in amenity migration and quantifies this effect in terms of economic indicators. Wilderness is typically proximate to other public lands and is part of broader set of "natural amenities" that drive amenity migration, making it difficult to isolate the size of the effect on amenity migration Wilderness plays as compared to surrounding non-Wilderness lands and other attributes. Survey-based methods, including both revealed and stated preferences methods, combined

with growth equilibrium models may be used to capture this effect. Without future research in this area, the community market contributions of Wilderness will be underrepresented.

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Appendix: Construction of Wilderness Visitor Expenditure Profiles

White, Goodding, and Stynes (2013) build on the Stynes et al. (2002) methods to illustrate how NVUM spending profiles can be bridged to industry sectors in I-O models such as IMPLAN. In the following, we list their seven recommended steps for applying national spending profiles and provide details of the methods used in this study.

1. *Choose a set of visitor segments.* As we examined national economic contributions, we included all seven visitor segments, including nonlocal day, nonlocal overnight on the forest, nonlocal overnight off the forest, local day, local overnight on the forest, local overnight off the forest, and nonprimary.
2. *Choose a spending profile for each segment.* White, Goodding, and Stynes (2013), and previous NVUM economics research, categorize spending into high, average, and low profiles to provide regional analysts applicable results for forests that may afford greater or lower spending opportunities. While a case could be made for using low or high profiles for Wilderness visitor expenditures, we use average spending profiles for the national sample for all visitor segments. Wilderness is generally in the more remote parts of national forests, leading to lower spending opportunities and potentially lower spending. On the other hand, Wilderness typically has special and unique attributes as compared other forest land with different uses such as motorized use and/or wood production. These unique attributes may garner more out of region visitors than other forest areas and may invoke longer stays. If so, both of these would lead to higher spending associated with Wilderness trips. Without firm evidence in either direction, we hypothesize that Wilderness visitor expenditures are similar to those of all national forest visitors.
3. *Estimate the number of visits by each segment.* Based on personal communications with NVUM Director Don English, Wilderness visitors to NFS lands were determined for each segment. In total for NVUM Round 3, almost 3.5 million parties were estimated to have visited Wilderness in NFS lands. Estimated percent of Wilderness visit by the seven trip-type visitor segments are:
   - Nonlocal day trips (10%).
   - Nonlocal overnight on the forest (9%).
   - Nonlocal overnight off the forest (10%).
   - Local day trips (55%).
   - Local overnight on the forest (3%).
   - Local overnight off the forest (1%).
   - Nonprimary (12%).

   As noted in the text, trip type percentages and associated expenditures came from NVUM surveys. NVUM samples only visitors to NFS Wilderness lands, leaving out expenditures coming from visitation to Wilderness on other agency-managed lands such as Wilderness on National Park Service lands, Bureau of Land Management Lands, and Fish and Wildlife lands.

   With limited monitoring of Wilderness visitors, we incorporate estimates from Bowker et al. (2005) that indicate approximately 80% of Wilderness visitation might

Table A1. Bridge from NVUM spending categories to IMPLAN sectors.

Spending categories from NVUM profiles	IMPLAN description (IMPLAN sector)
Motel	Hotels and motels (411)
Camping	Other accommodations (412)
Restaurant	Food services and drinking places (413)
Groceries	Retail stores—food and beverage (324)
Gas and oil	Retail stores—gas stations (326)
Other transportation	Scenic and sightseeing transportation (338)
Entry fees	Other federal government enterprises (429)
Recreation and entertainment	Other amusement and recreation industries (410)
Sporting goods	Retail stores—sporting goods (328)
Souvenirs and other expenses	Retail stores—miscellaneous (330)

be to NFS lands. For the national economic contribution analysis, we have inflated NFS Wilderness party estimates in the preceding by 20%. We assume visitors to other agency-managed Wilderness have similar percentages of visitor segments and similar spending patterns.

4. *Convert estimates of visits to party visits.* We used spending profiles from White, Goodding, and Stynes (2013) that were already in "per party" amounts. Thus, we did not need to do this step to derive overall spending. However, to estimate overall annual Wilderness visitation, we used an average conversion of 2.3 individuals per party (White, Goodding, and Stynes 2013).
5. *Estimate total spending.* Total spending was estimated by multiplying the number of Wilderness party visits by their unique spending profiles. "Not primary" visits were assigned the "Local day" user spending profiles. As noted in the Results section, this did not include additional out-of-region expenditures by nonlocals.
6. *Apply total spending to the I-O model.* Spending categories as presented in White, Goodding, and Stynes (2013) are easily bridged to specific NAICS sectors used in IMPLAN models. Table A1 illustrates the sectors we use for each spending category. Local purchasing coefficients were set to 100%.
7. *Attribution decisions.* Depending on the defined study area, only some economic contributions and impacts can be relevant. Our study examines national Wilderness visitor expenditures. As such, we include all expenditures associated with Wilderness visitation. We include forest visitation spending attributed to both local and nonlocal users. Our economic contribution analysis aims to provide a complete set of expenditures, regardless of location. However, expenditures estimated in NVUM are from within a 50-mile radius of the forest. In the text we acknowledge additional expenditures outside local areas, but do not attempt to quantify these.