



Analysis

Outdoor Recreation as a Sustainable Export Industry: A Case Study of the Boundary Waters Wilderness

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ABSTRACT

The Boundary Waters Canoe Area Wilderness (BWCAW) in northeastern Minnesota contains more than a million acres of connected lakes and rivers. As one of the most heavily visited U.S. Wilderness areas, the BWCAW represents an ecosystem managed primarily for conservation values that also has a substantial regional economic impact. This combination of high visitation and strong conservation management represents a sustainable symbiotic relationship where visitor expenditures help maintain ecosystem protection. To investigate this symbiotic relationship, the regional economic impacts of the BWCAW were estimated. Multiplier effects were calculated and the sustainability and tradeoffs associated with BWCAW tourism were examined, as was the export nature of BWCAW recreation. Data collection consisted of surveying 2016 summer BWCAW visitors. Visitor regional expenditures were extrapolated to overall visitation data and entered into IMPLAN impact analysis software. Based on 513 completed surveys, and an overall survey response rate of 40%, out-of-region visitors spent over \$56 million in the three counties surrounding the BWCAW in 2016, generating \$78 million in total economic output and creating 1100 full and part-time jobs. Estimated economic impacts of outdoor recreation and their sustainability can be helpful for informing regional economic development policy for conservation areas world-wide.

1. Introduction

Ecosystem conservation yields numerous economic benefits by providing for biodiversity, water filtration, and recreation on protected lands. Ecosystem conservation also avoids environmental degradation that might come from the exploitation of raw materials. Many of the economic benefits of ecosystem conservation are not traded directly in the market, resulting in the provision of both market and nonmarket goods and services. Nonmarket values are often the primary justification of conservation, such as the case with American Wilderness areas, but market impacts can be substantial for conserved areas that attract tourists. In conservation areas with high visitation, tourism and conservation combine for a sustainable symbiotic relationship where market impacts help maintain ecosystem protection (Boley and Green, 2016). A good example of this symbiotic relationship is the majestic Boundary Waters Canoe Area Wilderness and its surrounding gateway communities in Northeastern Minnesota.

The sustainability of nature tourism sets it apart from resource extraction development where boom and bust cycles have been the norm (Jacobsen and Parker, 2016). But the sustainability of economic impacts is not modeled in economic impact analysis and requires separate

evaluation and acknowledgement. While nature tourism can have adverse ecological and social impacts if not properly regulated (Howe et al., 1997), the annual attraction of visitors can provide for economic activities in surrounding gateway communities that can theoretically continue on and on (Dixon and Sherman, 1990).

While outdoor recreation in the U.S. has continued to grow (White et al., 2016), the role of protected public lands in overall visitation and expenditure trends has seen decreasing focus in the academic and research worlds (Holmes et al., 2016). New calls for privatizing U.S. public lands have rekindled classic “jobs versus the environment” conflicts. From a scientific standpoint, there is need for greater investigation of the role that protected public lands play in adjacent regional economies. Federal officials have taken notice of the need to further illustrate both the economic benefits and impacts associated with public lands, and have called for more research on outdoor recreation economics.¹

Designated Wilderness areas in the U.S. represent a unique type of protected public lands, as they are afforded the greatest protection and are typically in more remote areas with limited commercialization. Wilderness areas collectively provide for substantial national economic contributions, estimated to be over \$700 million in total output (Hjerpe

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¹ Sally Jewel, U.S. Secretary of the Interior, 4/19/16, Press Release available at: www.doi.gov/pressreleases/secretary-jewell-offers-vision-next-100-years-conservation-america.

et al., 2016). But due to the typically restrictive economic geography of Wilderness areas, overall visitation and opportunities for recreation-related spending are lower in the most protected public lands as compared to other public and private outdoor recreation venues.² In most regions, outdoor recreation on public lands is one of multiple land uses in the region that often include resource extraction of timber and minerals. The balancing of multiple uses is supported by planning efforts that typically include the economic impacts of the various uses (e.g., Environmental Impact Statements). In many cases, detailed estimates of timber and mining economic impacts are available, but research on the regional economic impacts of outdoor recreation is often not available. This is the case with the Boundary Waters Canoe Area Wilderness (hereafter BWCAW), which covers one million acres on the Superior National Forest in Northeastern Minnesota.

In this study, we examine the regional economic impacts of Boundary Waters visitors to adjacent communities. Because the BWCAW represents a type of Wilderness area characterized by high visitation³ and a focus on canoeing, the Boundary Waters makes for an interesting Wilderness case study. The economic impacts of recreation in the BWCAW are currently unknown, while extractive uses in the larger region such as mining are well documented and included in planning documents. Given the importance of BWCAW recreation to regional outfitting and service businesses and to gateway communities, it is prudent to quantify the overall impacts so as to illustrate the regional economic dependencies. To address this, we conduct a regional economic impact analysis, which traces the backward linkages and net regional effects of tourist expenditures (Watson et al., 2007). BWCAW visitors in 2016 were surveyed to determine their regional expenditures and impacts in regional output, employment, income, and value added were calculated using IMPact analysis for PLANning (IMPLAN) software. Economic impacts of outdoor recreationists in the BWCAW can be helpful for future public lands planning efforts and can inform regional development strategies.

1.1. Literature Review

Economic impact analysis (EIA) is a method for understanding how gateway communities are affected by visitor expenditures. As tourists come to the BWCAW, businesses located in surrounding communities such as Ely, Tofte, and Grand Marais provide lodging, outfitting, and guiding services for trips into the Wilderness. Though largely seasonal in nature, tourist spending associated with a Boundary Waters trip generates substantial employment and income in adjacent towns (Lichty and Steinnes, 1982).

Visitor surveys are the best way to determine the amount of regional spending associated with a Wilderness trip. Expenditure data can be collected with surveys and analyzed in an Input-Output (I-O) matrix. The I-O model was developed by Wassily Leontief, a Harvard economist, and is predicated on a balancing matrix where all individual industries are both a buyer and seller of goods and services (Isard et al., 1998). Leontief's inverse represents the scalar vectors in the matrix from individual businesses in terms of output (Miller and Blair, 2009). The sector contributions can be analyzed to illustrate backward linkages associated with the production of final goods. For example, visitor expenditures at Boundary Waters area restaurants are for the dining experience, while the restaurant must purchase raw materials (food), electricity, and cleaning services to provide the dining experience. Regional I-O models delineate how much of the food and services needed for production are purchased locally.

² Protected lands in the U.S. are at the lowest end of soil productivity and the highest end of elevation (Aycrigg et al., 2013), leading to an economic geography that results in a comparative disadvantage to more urban areas when considering industrial output and employment. However, this harsh and remote economic geography generates a countering influx of market investments from amenity migrants and entrepreneurs wanting to relocate to areas with higher percentages of public lands. The focus of this article is on economic impacts from tourist expenditures, but we acknowledge other regional economic contributions that result from amenity migration.

³ The BWCAW is estimated to be the most heavily visited Wilderness area in the U.S. with approximately 150,000 annual visits.

The direct effects are represented by visitor purchases of food and beverages. The backward linkages, in terms of accounting for the local goods and services purchased by the restaurant to produce the dining experience, represent the indirect effects. Recirculation of the wages from restaurant workers in the community is known as the induced effect. Direct, indirect, and induced effects are combined for a presentation of total effects and can be divided to represent multiplier effects. Because each industry requires different amounts and types of backward linkages, and because each industry pays different wages, each sector has unique indirect and induced effects. The modern multiplier (e.g., Type SAM) endogenizes household and government spending into the I-O framework and is calculated as the ratio of total effects to direct effects and can be illustrated for industries in terms of output, employment, labor income, taxes, and value added (Loomis and Walsh, 1997).

The estimation of the backward linkages and regional multipliers associated with Wilderness visitation has been few. In fact, we are only aware of one published economic impact analysis of Wilderness visitor expenditures — Keith and Fawson's (1995) study of regional expenditures from visitors to four Utah Wilderness areas. Keith and Fawson (1995) found regional expenditures of \$30 to \$40 per person per day at nearby businesses. Others have examined the economic impacts of wildland-based recreation activities (e.g., Moisey and Yuan, 1992; Yuan and Christensen, 1994), finding similar per day expenditures. Rudzitis and Johnson (2000) and Rosenberger and English (2005) have summarized existing economic impact studies on Wilderness area visitation and have detailed considerations for conducting Wilderness economic impact analyses.

On the other hand, there have been many estimates of the economic impacts of outdoor recreation in general (e.g., Bergstrom et al., 1990; Loomis and Walsh, 1997; Clawson and Knetsch, 2013). Nationally, outdoor recreation services have been estimated to be a \$887 billion annual industry in the U.S.⁴ with increasing trends expected in both participation and total recreation-related expenditures (White et al., 2016). While only a small portion of this output is generated from Wilderness visitation, much of the estimated recreation economic impacts stem from the use of protected public lands. Carver and Caudill (2013) estimated overall visitation and regional economic impacts for U.S. Fish and Wildlife Service lands, finding that some 47 million visitors to refuges in 2011 spurred approximately \$2.5 billion of regional output. On National Forest System lands, the National Visitor Use and Monitoring (NVUM) program involves extensive surveying of visitors to protected public lands including recording regional expenditures. Multiple rounds of NVUM monitoring have resulted in a number of economic impact profiles for various outdoor recreation activities (e.g., White and Stynes, 2008) and indicate the importance of outdoor recreation on protected public lands.

Recreation in the BWCAW, as indicated by the name, is primarily canoeing and boating on some of the myriad lakes in the Boundary Waters. While hiking, skiing, and dog mushing also occur in the BWCAW, the majority of visitor activities are related to paddling, fishing, and camping (Dvorak et al., 2012). As boating requires a bit more gear and accommodations than traditional Wilderness recreational activities of hiking and backpacking, we expect regional Boundary Waters visitor economic impacts to be greater than impacts in most other regions surrounding Wilderness areas (the exceptions may be Western Wilderness areas with seasonally intense multi-day horse packing or rafting trips). Lichty and Steinnes (1982) examined the economic impacts of tourism in Ely, MN, adjacent to the Boundary Waters by surveying local businesses to determine their total sales to residents and non-residents. They found over \$13 million of total output, when including indirect and induced effects, was generated by tourism spending in Ely.

Other boating-related regional EIAs have been conducted, including a recent examination of canoeing in the Northeastern U.S. Pollock et al. (2012) looked at regional economic impacts of canoeing on the

⁴ Outdoor Industry Association estimate at: https://outdoorindustry.org/wp-content/uploads/2017/04/OIA_RecEconomy_FINAL_Single.pdf.

Northern Forest Canoe Trail and found that canoers spurred about \$14 million in regional output, and about 280 jobs from \$46 of spending per day. Similar impact studies have been conducted for rafting remote, destination rivers that include Wilderness and Wild and Scenic designations such as the Gauley in West Virginia and the Middle Fork of the Salmon in Idaho (English and Bowker, 1996), recreation on rivers managed by the National Park Service (Cordell et al., 1990), and rafting in Grand Canyon National Park (Hjerpe and Kim, 2007). These river-related studies found recirculation of expenditures, or multiplier effects, ranging from 1.30–2.49 for regional output, and 1.26–1.90 for regional employment.

Research indicates that particularly in rural, remote landscapes, outdoor recreation can provide an economic stimulus to gateway communities. These regional economic impacts are sustainable into the future and can be critical in helping keep protected lands conserved for future generations. The sustainability of outdoor recreation on protected lands holds true for both aspects typically considered in nature tourism and sustainable development: the perpetuation of the tourism economic activities themselves; and the perpetuation of ecosystem preservation as a tool for broader sustainable development options (Sharpley, 2000). Notwithstanding concerns of traveler emissions and the slippery slope of sustainable tourism (Font, 2017), outdoor recreation on protected lands is likely the most sustainable economic development option available when considering the “self-renewing” aspect of the activities (Green, 2001). These long-term, or future, economic advantages of utilizing outdoor recreation as a rural development strategy are not consistently considered in land management planning and policy development.

2. Methods

To estimate the economic impacts of BWCAW visitors we surveyed BWCAW permit trip leaders in the summer of 2016. Expenditure data were collected by types of industry sectors that comprise the broader outdoor recreation industry such as outfitter services, lodging, and restaurants. Expenditure profiles were extrapolated to estimated portions of annual visitors to the BWCAW and entered into IMPLAN's impact analysis. Descriptive statistics were documented and regional economic impacts were estimated for output, employment, income, value-added, and taxes with additional investigations of multiplier effects. Detailed methods are presented in the following sections.

2.1. Study Area

The BWCAW regional economic zone was defined as the three Northeastern Minnesota counties that encompass and surround the BWCAW— St. Louis, Lake, and Cook Counties (see Fig. 1).

The size of the affected regional economy in regional EIAs has direct implications for determining overall recreation expenditures attributed to the BWCAW, and their correlating direct, indirect, and induced effects. The larger the defined regional economy, the greater, the resulting multiplier will be as expenditures have more potential to be recirculated (Hjerpe and Kim, 2007; Watson et al., 2007). However, the greater the size of the defined regional economy, the less the importance of the overall activities among a much bigger pool of economic output (i.e., the percentage of an economy's dependence on a specific industry decreases as it enters larger economies). Recommendations for matching a regional economy to the economic activity being measured include isolating gateway communities and considering the range of infrastructure and emergency services most affected by the activity (Hjerpe and Kim, 2007). Stynes⁵ suggests that the most affected areas, and thus the defined regional economy, should be all counties within 30 miles of the recreation/tourism destination.

The BWCAW and Cook, Lake, and St. Louis Counties are located in the heart of the Arrowhead Region of Northeastern Minnesota. The

Arrowhead Region is typified by small rural communities and has long been a tourist destination as well as home to intense iron mining. Taconite is the predominant exported good of the region and iron ore mining dominates regional output (approximately \$2.6 billion in 2014), yet health care, local government, and restaurants all individually provide for more regional jobs than iron ore mining. In this three-county zone, the city of Duluth is farthest away from the BWCAW and has almost half the population of all three counties. Table 1 presents the three-county totals.

2.2. Regional Economic Impact Analysis (EIA)

Regional economic impact analysis (EIA) is used to measure the changes in regional economic indicators associated with the addition or loss of a set of particular economic activities. The economic indicators typically evaluated include employment and output and the defined regional economies are typically composed of an individual county, multiple counties, or an entire state. For the Boundary Waters regional EIA, we investigated the question of size, type, and scale of economic activity that might be lost in Northeastern Minnesota if there was no BWCAW tourism.

The focus of regional EIA is to estimate the *net* effect to a particular economic region of a specific economic activity. It differs from economic contribution analysis by strictly focusing on out-of-region spending by visitors that can be attributed to the BWCAW (Watson et al., 2007). In accordance with EIA, we asked participants whether they lived inside or outside the BWCAW regional economic zone. The survey also included questioning whether the BWCAW was the primary reason for their trip and asking locals about substitute behavior. These percentages were then used for extrapolation to our overall population so as not to include expenditures from locals. We asked participants to only record expenditures that were transacted within the defined BWCAW regional economic zone. While there may be substantial out-of-region money spent for trips to the BWCAW, such as flying into Minneapolis, these trip related expenditures are not directly realized by the gateway communities surrounding the BWCAW and are to be excluded in regional EIA.

2.3. Input-Output Framework and IMPLAN

IMPLAN modeling software utilizes an input-output (I-O) framework that balances industry inputs and outputs to track the relative influence of each sector. I-O frameworks were predicated on economic base theories where a region's exports were the primary source of outside money to enter the region. The exporting industries, or basic sectors of the economy, were responsible for the in-filling of trade and services within the regional communities. Outdoor recreation and nature tourism has been treated similarly to export industries as they are bringing outside money to the region for the consumption of a local product, the BWCAW. Modern I-O frameworks are the basis for software applications such as IMPLAN. IMPLAN incorporates Social Accounting Matrices (SAMs) that have internalized previously exogenous regional economy sectors of institutions (e.g., government payments) and households so as to better model regional activity (Miller and Blair, 2009).

IMPLAN is a common tool for assessing economic impacts, but comes with a number of methodological assumptions that need to be acknowledged and understood for appropriate impact descriptions. Even before detailing IMPLAN assumptions, it is important to remember that regional EIA and IMPLAN analyses are only a partial view of the full economic picture of land use and conservation. EIA is used to estimate market impacts such as job numbers and income. These impacts are different from the values associated with the societal economic benefits and costs of land use and conservation that are used to examine economic efficiency with Benefit-Cost Analysis (BCA). Costs and benefits look more at the changes in use and passive use values of

⁵ Available at <https://msu.edu/user/stynes/mirec/concepts.htm>.

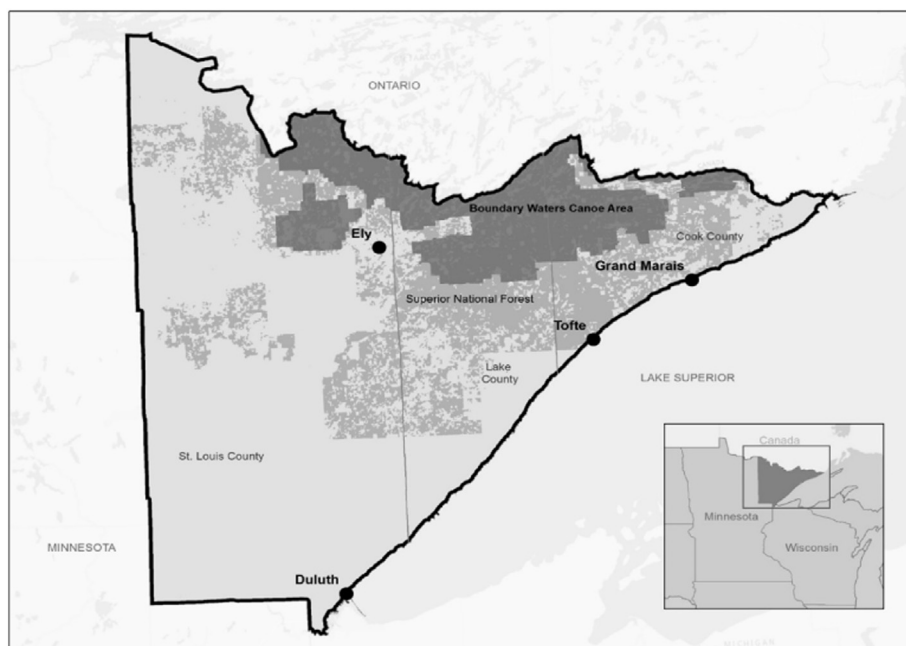


Fig. 1. BWCAW regional economic zone: St. Louis, Lake, and Cook Counties, MN.

Table 1
Description of BWCAW Regional Economy (Cook, Lake, and St. Louis Counties).

Source: IMPLAN3, Northeast Minnesota Region 2014.

Gross regional product	\$10,544,000,000
Total personal income	\$9,409,000,000
Total employment	131,200
Number of industries (SIC)	282
Land area (sq. miles)	9780
Population	216,900
Total households	96,100
Average household income	\$97,900

land management, whereas EIA traces the movement of new wealth through a regional economy under the perspective of jobs, taxes, output, and income. Importantly, EIA does not suggest which projects yield the greatest benefit to society. Rather, EIA illustrates the level of connectedness among industry sectors and net changes in market indicators. As such, EIA of BWCAW visitor expenditures does not capture many other values held by tourists and the public for Wilderness areas and should ultimately be combined with a number of economic modeling approaches (Driml, 1997).

Within this partial view, there are some strict methodological assumptions incorporated into IMPLAN that have implications for the presentation of results. IMPLAN's impact analyses represent a snapshot in time, and do not dynamically adjust forward for reactionary economic effects as done in computable general equilibrium (CGE) models. IMPLAN allows for tracing the backward linkages associated with a stimulus. Other assumptions, such as fixed technology, constant return to scales, and a lack of supply constraints, lead to a linear and slightly simplified model of total regional economic activity. Nevertheless, IMPLAN has been illustrated to be an effective performer for impact analysis of recreation when compared to other models (Crichfield and Campbell 1991; Bergstrom et al., 1990) and is often preferred for its ease of use and affordability.

Given that regional EIA is only a partial view of total economics, and the technical constraints necessary for IMPLAN modeling, estimated economic impacts should be properly qualified. For example, the expected duration of jobs and impacts should be considered (Driml et al., 2016), as should the expected sustainability of jobs within ecological limits be considered (Hjerpe et al., 2016).

2.4. Data Collection and Expenditure Profiles

A survey was conducted to obtain estimates of regional expenditures from BWCAW visitors. Survey design and administration were a combined effort from economists, regional conservation organizations, wilderness managers with the US Forest Service, and regional outfitters. Over a three-month period various iterations of the survey were pre-tested and improved based on feedback from numerous stakeholders. The final survey instrument contained ten questions on visit and visitor characteristics and 16 expenditure questions related to outfitting, lodging, dining, and retail consumption.

The USFS administers a permit system for the BWCAW that includes a quota system with a lottery draw for certain use areas. The majority of BWCAW permits are picked up by recreationists in commercial outfitter and guide businesses in the gateway communities leading to the BWCAW. These shops and camps provide an array of services ranging from fully guided and catered trips to just supplying canoes, food, camping gear, or fishing tackle. We worked with outfitters to have expenditure surveys randomly offered to trip leaders that were picking up their permits. To incorporate regional differences, we recruited 12 outfitters from across all BWCAW access points to distribute the expenditure questionnaires. Surveys were distributed throughout the summer of 2016, from June through mid-September and captured a range of overnight and day users.

Participants were asked to answer 26 questions about their trip to the BWCAW. Surveys were printed on two fold out pages inside a self-addressed stamped envelope. The introduction of the survey offered participants the option to record their survey online, where the exact same set of questions were available via computer entry. To increase response rate, we offered a cash incentive of \$100 to be randomly awarded to five participants.

Average regional expenditures were applied to the type and amount of BWCAW annual visitors using recent BWCAW visitation trend analysis from the Superior National Forest.⁶ These BWCAW tourist expenditures were entered as final demand into the IMPLAN sectors for our three-county regional economic zone. Commodities such as retail goods were margined in order to convert purchaser prices into producer prices contained in the SAM. Local purchasing coefficients were set to 100% for the region. Based on interviews with USFS managers, about 95% of the BWCAW permit fees

⁶ Available at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd513976.pdf.

Table 2
Expenditures per out-of-region party per trip.

Variable	Obs.	Mean\$	Std. dev.	Min	Max
Outfitting	499	992.27	1605.91	0	10,000
Lodging	499	224.74	406.25	0	4000
Groceries	499	71.12	102.23	0	1000
Food and drink	499	146.97	140.75	0	1000
Flights	499	40.85	258.90	0	2589
Rental vehicles	499	32.60	181.33	0	2300
Shuttle fees	499	21.10	168.91	0	2600
Motor boat tow-in	499	3.11	28.86	0	400
Gas and oil	499	50.03	51.16	0	450
Vehicle repairs	499	3.55	41.05	0	859
Retail boat	499	38.34	112.31	0	800
Retail gear	499	41.56	220.47	0	4000
Retail fish	499	29.15	80.35	0	1000
Retail clothing	499	60.20	108.37	0	1000
Fish license	499	41.71	55.57	0	312
Miscellaneous	499	53.26	126.50	0	2000

Table 3
BWCAW visitor expenditures by spending category (in-region^a).

Expenditure type (IMPLAN sector–SIC code)	Estimated annual expenditures
Outfitting (other amusement and recreation industries–496)	\$29,531,845
Lodging (hotels and motels–499)	\$6,688,690
Food and drink (full service restaurants–501)	\$4,374,107
Fishing, camping, and boat gear (retail – sporting goods–404)	\$3,245,536
Shuttles and transportation (scenic and sightseeing transportation–414)	\$2,906,548
Groceries (retail stores – food and beverage–400)	\$2,116,667
Clothes (retail – clothing–403)	\$1,791,667
Miscellaneous retail (retail—general merchandise stores–405)	\$1,585,119
Gasoline and oil (retail gas stores–402)	\$1,488,988
Fishing licenses (employment of state government, non-education–531)	\$1,241,369
BWCAW permits (employment of federal government, non-military–535)	\$1,234,810
Car repairs (automotive repair and maintenance–504)	\$105,655
Total	\$56,311,000

^a Spending only within Cook, Lake, and St. Louis Counties, excludes out-of-region expenditures for BWCAW visits.

Table 4
Top ten affected sectors by employment for loss of BWCAW visitor expenditures (\$2016).

Description	Total employment ^b	Total FTE employment ^c	Total labor income (\$millions)	Total output (\$millions)
Other amusement and recreation industries	– 510	– 417	(7.74)	(29.61)
Full-service restaurants	– 110	– 86	(2.11)	(4.85)
Hotels and motels	– 68	– 62	(1.65)	(6.75)
Retail - sporting goods, hobby, art stores	– 62	– 54	(1.60)	(1.42)
Retail - food and beverage stores	– 37	– 32	(1.16)	(0.88)
Retail - general merchandise stores	– 29	– 25	(0.75)	(0.81)
Retail - clothing and clothing accessories stores	– 29	– 25	(0.55)	(1.00)
Retail - gasoline stores	– 26	– 22	(0.61)	(0.30)
Real estate	– 18	– 17	(0.24)	(2.45)
Employment and payroll of state govt.	– 14	– 12	(1.07)	(1.24)
Total ^a	– 1105	– 918	(\$28.43)	(\$78.75)

^a Columns do not add up, as Total includes all sectors beyond just the top ten.

^b Includes full and part-time jobs.

^c Total employment converted to full-time equivalents (FTEs) based on industry-specific IMPLAN conversation rates.

stayed in the local region to be used for BWCAW management and administration. For the permit fees category, local final demand was entered at 95% of total estimated permit fees.

2.5. Extrapolating Sample Estimates to Annual BWCAW Visitor Expenditures

Stynes et al. (2002) and White et al. (2013) provide helpful considerations for extrapolating expenditure sample estimates to groups of outdoor recreationists in impact analyses and we follow their approach for the construction of our regional expenditures in IMPLAN. The first step was to approximate total regional expenditures generated by BWCAW tourism on an annual basis.

Current trend analysis from the Superior National Forest provides visitation estimates from 2010 to 2015. In 2015, approximately 143,300 people visited the BWCAW with the majority of these visitors acquiring overnight or day use paddle permits. Our survey sample closely matches overall estimates from the Superior National Forest. For example, our sample average group size per permit was 4.2 and the overall average group size per permit in 2015 was 4.0. But due to sampling limitations, our sample is more representative of summer permit holders and we are unsure of the spending patterns associated with out of season, self-issue permit holders (October–April). Furthermore, without population demographic data for comparison, it is possible that our sample is missing certain types of boaters who may spend less. Thus, response bias cannot be ruled out.

The SNF trend analysis estimated 11,600 out-of-season visitors to the BWCAW in 2015. While we know that these winter and shoulder season visitors also spent money in the adjacent gateway communities, we assume that these visitors include higher rates of locals and lower overall spending patterns. Since we do not have specific expenditure information about these visitors, we conservatively do not include their regional economic impacts in our impact analysis, but we do acknowledge that the total regional spending is a bit greater than our estimates. To estimate total spending we extrapolate our sample averages only to the approximately 131,700 visitors in 2015 that visited between May and September.

Per Stynes et al. (2002), we also need to consider attribution decisions when extrapolating our sample estimates. We are concerned with expenditures from visitors that live outside the regional economic impact zone and with expenditures that we can fully attribute to their visit to the BWCAW. In the survey, more than 97% of responses were from respondents that lived outside of the region. In total, 95% of the sampled permit holders were from out of the region and stated that the BWCAW trip was their primary purpose for their visit to northeastern Minnesota. While non-primary trip spending in the BWCAW still has regional economic impacts, we are unable to fully attribute that

spending to BWCAW visitation. So we conservatively do not include this type of spending. Excluding expenditures made by locals and expenditures made by non-primary trip visitors, reduces our annual BWCAW visitor representation to approximately 125,000 visitors ($131,700 \times 0.95$).

After converting party expenditures to visits based on the average number of people per party in our sample, as recommended by Sun and Stynes (2006), we broadly apply our sample expenditure means per visit to estimated annual summer season visitors (125,000). While the different user groups in the BWCAW in the summer (canoers, motor boaters, hikers) likely have different expenditure patterns, we feel comfortable that our sample adequately captures different users. For example, our sample is composed of about 92% Overnight Paddle permit holders, 6% Day Use paddle permit holders, and about 2% Day Use and Overnight Motor permit holders. Extrapolating our sample estimates to out-of-region BWCAW summer season visitors is appropriate and likely results in a conservative estimate of overall regional economic impacts. Day use motor and overnight motor permit holders are under-represented in our sample, but had greater regional expenditures than average overnight paddle permit holders due to additional equipment and gasoline purchases.

3. Results

The survey was administered from May through September of 2016, with a total of 513 respondents. With approximately 1300 surveys being distributed, the overall response rate was 40%. One survey was determined to be an outlier and removed from the sample, resulting in a sample size of 512. Over 97% of respondents resided outside of the region. Averages and descriptive statistics for sample expenditures from non-residents are shown in Table 2. For the full descriptive statistics of responses, please see Appendix A.

The sample expenditures were extrapolated to the appropriate set of 2016 BWCAW visitors to determine overall annual regional expenditures and to illustrate the losses to regional economic activity that would occur without BWCAW visitation. The sample estimates were applied to 125,000 summer visits from 2016 and excluded local visitors and visitors that indicated that the BWCAW was not the primary reason for their visit to Northeastern Minnesota.

Non-response bias was considered, but without contact information for trip leaders that did not respond, there is no specific information concerning non-respondents. To account for the potential of non-respondents to have fewer expenditures than respondents, we made conservative estimates when extrapolating our sample expenditures to the total number of BWCAW visitors.

Estimated 2016 annual BWCAW visitor expenditures were aggregated into 12 industry sectors and entered into IMPLAN's impact analysis for the three county region in Northeastern Minnesota. In total, approximately \$56 million was spent in the region by out-of-region visitors on their trip to the BWCAW. Table 3 illustrates the expenditure amounts and types and their correlating IMPLAN SIC sectors.

3.1. Regional Economic Impact Results

BWCAW tourist expenditures were entered into IMPLAN's impact analysis as final demand in the region. Some of this final demand immediately leaves the region as leakage, especially for margined commodity purchases such as gasoline and clothing that are produced outside of the region. The \$56 million dollars of annual final demand was realized as a \$50 million direct effect on regional output, and almost \$80 million in regional output when including indirect and induced effects of BWCAW visitation. Direct, indirect, and induced effects were calculated for employment, total labor income, and value added in addition to regional output. Table 4 presents total effects for the most affected industry sectors in terms of employment. Total employment (full and part time jobs) is shown next to full-time equivalent (FTE) conversions.

Table 5

Total effects and multipliers for loss of BWCAW visitor expenditures (\$2016). Source: IMPLAN3, Northeast Minnesota Region 2014, Type SAM Multipliers.

Impact type	Employment	Labor income (millions)	Total value added ^a (millions)	Output (millions)
Direct effect	– 879	(\$19.42)	(\$31.33)	(\$49.44)
Indirect effect	– 101	(\$4.00)	(\$6.30)	(\$13.61)
Induced effect	– 126	(\$5.01)	(\$8.56)	(\$15.70)
Total effect	– 1105	(\$28.43)	(\$46.20)	(\$78.75)
Multiplier effect	1.26	1.46	1.47	1.59

^a Value added is the difference between an industry's total output and its intermediate inputs. It includes employee compensation, taxes, and surplus.

BWCAW visitor expenditures at outfitters and in towns created a direct effect of some 880 full and part time jobs in the region. When including indirect and induced effects, more than 1100 full and part time jobs were generated across 127 different regional industries. Because industries supplying outdoor recreation services are seasonal in this study area, the full-time equivalent (FTE) number of jobs is also presented (see Table 4), representing over 900 FTE jobs in these three Minnesota counties.⁷

Total effects for four categories are presented below (Table 5). The ratio of total to direct effects is the multiplier effect. For the BWCAW gateway communities, each dollar spent by tourists generates another 59 cents of regional output by associated suppliers and services—an output multiplier of 1.59. For every \$1000 of income generated by BWCAW tourist expenditures, another \$460 of income is spurred in industries associated with outfitters, lodges, restaurants, and stores—an income multiplier effect of 1.46. In terms of employment, each 100 visitor service jobs generates another 26 support jobs—an employment multiplier of 1.26.

BWCAW visitor expenditures also spur significant tax receipts for local and state administration and for federal management. Taxes are needed to help manage roads, provide emergency services, and help manage the BWCAW. Wilderness tourism in Northeastern Minnesota brings a return on the land that communities can invest with for decades to come. For example, remote Cook County, Minnesota assesses a 3% lodging tax and have seen steady annual increases in this area. In 2015, Cook County accrued more than one million dollars in lodging taxes.⁸ A large portion of these lodging taxes come in the summer months and many of the visitors are there for the BWCAW. Table 6 shows total regional and federal taxes spurred by BWCAW tourists.

4. Discussion

Group expenditures for BWCAW boaters per trip were relatively high at \$1850 per group. More than half of these expenditures were for outfitting and guide services. These rates of expenditures indicate that BWCAW boaters are typically for multi-day visits that result in higher expenditures per visit than many other National Forest and Wilderness recreation activities such as hiking and camping (White et al., 2013). Economic studies of primarily non-motorized boaters using outfitter services are scarce. The BWCAW compares closer, though still short of, regional trip expenditures to multi-day rafting trips in Grand Canyon National Park (Hjerpe and Kim, 2007) and the Middle Fork of the Salmon in the Frank Church River of No Return Wilderness (English and Bowker, 1996). A further look at the regional economic importance of outfitter services shows that BWCAW visitors that utilized some level of outfitter services (> \$50) had much greater

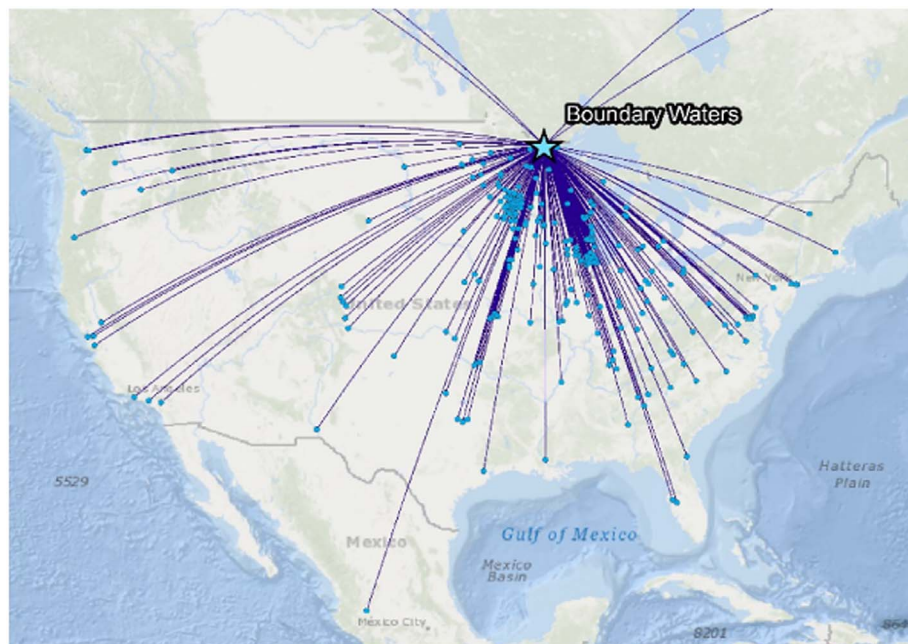
⁷ IMPLAN offers conversion ratios, at the industry level, to convert IMPLAN employment estimates into FTEs. IMPLAN utilizes Bureau of Economic Analysis (BEA) national industry employment totals, which likely inflates the local (and real) FTE conversion rates of outdoor recreation employment in Northeastern Minnesota.

⁸ Available at: <http://www.co.cook.mn.us/2016site/index.php/auditor-documents?task=document.viewdoc&id=165>.

Table 6

Total taxes generated By BWCAW visitor expenditures (in millions of \$2016).
Source: IMPLAN3, Northeast Minnesota Region 2014.

	Employee compensation	Proprietor income	Tax on production and imports	Households	Corporations
Total state and local tax	\$0.06	–	\$7.74	\$0.95	\$0.12
Total federal tax	\$3.15	\$0.18	\$1.23	\$2.14	\$0.66

**Fig. 2.** BWCAW visitor origin map.

*Visitor origins pictured only represent about 2% of BWCAW annual Quota Permits. ($n = 505$).

**Additional visitor origins from Alaska and Europe are not pictured.

expenditures on average than do-it-yourselfers (DIY). While this is expected, the difference is substantial. The 90% of BWCAW visits that included outfitter services in our sample had almost 2.5 times greater average regional expenditures (\$460) as compared to visitors that did not use an outfitter (\$190).

Regional spending by BWCAW visitors has a strong impact in Northeastern Minnesota. The almost \$60 million of regional spending in 2016 has cascading effects throughout the region. Importantly, these tourist expenditures represent new money to the region from outside of the area. Outdoor recreation and tourism is an export industry for Northeastern Minnesota, where BWCAW visitation is a marketed product that goes well beyond just local consumption. This outside money brought into the region represents a basic industry and spurs the need for community in-filling services such as medical, financial, and entertainment services. Fig. 2 illustrates the dispersion of visitor origins from our survey respondents, and illustrates the export nature of BWCAW tourism.

We focus on new money coming to the region, but acknowledge the importance of recirculated local dollars and out of region expenditures made for BWCAW trips, that are not included in our regional impact analysis. Likewise, the BWCAW spurs numerous other market impacts that are more difficult to measure and are not included in this study. Amenity migrants and retirees have moved to the region to be closer to the BWCAW, bringing investments and income permanently into the region.⁹ Media consumption in terms of purchased BWCAW photography, research, art, and stories can have a large regional economic impact and can be primarily attributed to the BWCAW. Many associated tourist attractions, such as the International Wolf Center in Ely, are primarily dependent upon BWCAW tourists.¹⁰ In total, the market

⁹ A survey respondent documented that they recently moved to the region simply to be closer year-round to the BWCAW.

impacts of the BWCAW are much more wide-reaching than just the tourist expenditures captured in this study.

Not including multiplier effects, BWCAW visitor expenditures resulted in \$50 million of direct annual regional output in the private sector. This economic activity comes from limited operational costs necessary to provide Wilderness services to the public, resulting in substantial economic impact per dollar of public expenditure used to manage and maintain the BWCAW. Total management costs, in terms of maintenance and visitor services, are about \$1 million a year,¹¹ with most of this being covered by permit fee collections. A regional “output-to-management cost” ratio of almost 50:1 indicates that the BWCAW is a powerful private sector job creator and that Wilderness represents an efficient use of public funding.

While there has been little research on the economic impacts of Wilderness areas, we presume that due to high visitation and high per person expenditures, BWCAW economic impacts are much greater than impacts associated with typical Wilderness areas. The multiplier effects found for BWCAW visitor expenditures are similar to multipliers found in previous studies of boating in rural areas and similar to reported mining multipliers in the Arrowhead region.¹² Ranging from 1.26 for

¹⁰ Also documented by survey respondents.

¹¹ Based on \$1.2 million of annual maintenance and service expenditures for the entire Superior National Forest, *Recreation Fee Program Accomplishment Highlights 2014*.

¹² University of Minnesota Duluth's economic impact analysis of exported goods to Canada from the Arrowhead Region found regional multipliers ranging from 1.29 for output, 1.53 for income, and 2.1 for employment. The predominant exported good was iron ore. But it is important to note that these multipliers were calculated for a nine-county Arrowhead region of Northeastern Minnesota, about twice the size of our three-county region. The larger the defined regional economy, the greater the resulting multiplier effect will be. Thus, an apples-to-apples comparison is not feasible. The study can be found here: https://lsbe.d.umn.edu/sites/lsbe.d.umn.edu/files/canada_minnesota_connection_report_final.pdf.

employment to 1.59 for output, BWCAW economic multipliers indicate that the outfitter and service businesses related to the BWCAW require and support additional economic activity in the region. However, as is the nature of more rural counties, many goods and services are necessarily imported into the region leading to leakage of tourist expenditures from Northeastern Minnesota.

While outdoor recreation and nature tourism is characterized by seasonal employment in this study area, and tends to be associated with lower wages when compared to extractive industries (Green, 2001), it can play a very complementary role in balanced regional development. The duration and sustainability of these jobs is much greater than industries based on nonrenewable resource extraction (Jacobsen and Parker, 2016) and nature tourism is not as susceptible to market volatility. Likewise, technological improvements in resource extraction are decreasing the number of jobs per unit of extraction, while outdoor

recreation services remain labor intensive. As is the case with BWCAW visitation and its substantial economic impacts in rural Northeastern Minnesota, Wilderness recreation can play a key role in economic development now and well into the future. Future research is needed to better understand the long term economic impacts of outdoor recreation on protected lands, and to better reconcile this type of economic development with resource extraction development.

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Appendix A. Descriptive Statistics for Survey Results

In total, 518 survey responses were received with five surveys being returned blank. The final sample size was 513 usable surveys. Participants were offered a choice of mailing the survey or conducting the survey online. The majority of respondents mailed surveys back ($n = 494$), while 19 respondents completed the survey online. Data collection focused on regional expenditure information, but trip characteristics and socio-demographic information were also collected. One outlier was removed due to being almost 50% greater than the next closest set of expenditures. Table A1 presents the descriptive statistics for trip characteristics from the sample.

Table A1
Trip characteristics per permit.

Variable	Obs.	Mean	Std. dev.	Min	Max
People on permit	512	4.1914	2.1785	1	9
Nights in BWCAW	512	3.9589	2.0417	0	16
Nights spent adjacent to BWCAW	512	1.3964	1.4145	0	12
Trip type					
Overnight paddle	512	0.9219	0.2686	0	1
Day Use paddle	512	0.0625	0.2423	0	1
Overnight motor	512	0.0019	0.0442	0	1
Day use motor	512	0.01367	0.1162	0	1
Hiking	512	0	0	0	0

The surveys requested trip leaders to fill out information for their entire permit group. Socio-demographic information was asked including where participants lived, whether or not their BWCAW trip was their primary reason for their trip to Northeastern Minnesota, and their household income. Table A2 illustrates trip leader characteristics. Respondents were overwhelmingly from outside the region and the BWCAW was their primary purpose. On average, trip leaders had relatively high incomes, indicative of the BWCAW visitor population having both leisure time and expendable income to afford a multi-day boat trip.

Table A2
Trip leader characteristics.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Live in the region	512	0.0254	0.1575	0	1
Do not live in the region	512	0.9746	0.1575	0	1
Primary reason for trip	476	0.9706	0.1691	0	1
Not primary reason for trip	476	0.0294	0.1691	0	1
Household income					
< \$35 K	490	0.0510	0.2203	0	1
\$35 K–\$50 K	490	0.0633	0.2437	0	1
\$50 K–\$75 K	490	0.1612	0.3681	0	1
\$75 K–\$100 K	490	0.1776	0.3825	0	1
\$100 K–\$150 K	490	0.2449	0.4305	0	1
> \$150 K	490	0.3020	0.4596	0	1

Per person regional expenditure means by trip type are presented in Fig. A1. For further perspectives on the type of BWCAW visitor and their spending patterns, three trip types were isolated and analyzed: 1) whether the permitted group utilized outfitter services (i.e., spent at least \$50 at outfitters) or not; 2) whether the permitted group was on a motorized trip or not; and 3) whether the permitted group was on an overnight trip or just a day trip. As expected, visitors utilizing outfitter services spent much more regionally than those visitors that did not use outfitters. Motorized visitors spent slightly more than non-motorized visitors, though our motorized sample size was very small. Finally, and perhaps more unexpectedly,

day use visitors spent more per trip than those going on overnight trips. Without camping inside the BWCWA, day use visitors had much higher regional lodging expenditures and still stayed in the region almost as long as overnight visitors.

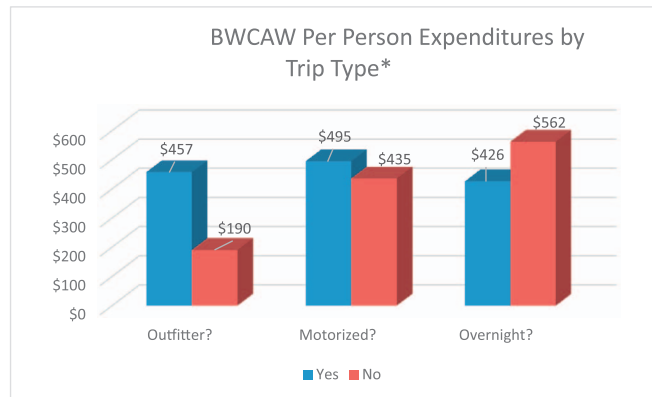


Fig. A1. BWCWA Per Person Expenditures by Trip Type*.

*Mean regional spending based on the following sample sizes (n): outfitter = 472 and no outfitter = 40; motorized = 8 and non-motorized = 504; overnight = 473 and day use = 39.

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