

THESIS

THE ECONOMIC CONTRIBUTION OF RIVER RECREATION AND TOURISM IN THE
LITTLE YAMPA CANYON, COLORADO

Submitted by

Matthew Burkard

Department of Agriculture and Resource Economics

In partial fulfillment of the requirements

For the Degree of Master of Science

Colorado State University

Fort Collins, Colorado

Fall 2023

Master's Committee:

Advisor: Dawn Thilmany

Rebecca Hill
Jude Bayham
Tian Guo

Copyright by Matthew Burkard 2023

All Rights Reserved

ABSTRACT

THE ECONOMIC CONTRIBUTION OF RIVER RECREATION AND TOURISM IN THE LITTLE YAMPA CANYON, COLORADO

The Yampa River is a key driver of outdoor recreation and tourism opportunities to the city of Craig, Colorado and the surrounding Moffat County, drawing in river-based recreators and tourists from surrounding areas. So, opportunities to enhance access are important to a region that seeks to further diversify its economic portfolio in light of broader transitions occurring in the energy and agriculture sector. A land acquisition proposal by the Bureau of Land Management seeks to expand public access to the Yampa River and the nearby recreation amenities and improving highway access to the current Little Yampa Canyon Special Recreation Management Area, while protecting additional wildlife habitat and fisheries. The purpose of this research is to collect and analyze outdoor recreation and tourism spending data from resident and non-resident recreators near Craig, Colorado to ascertain one set of potential benefits of such an investment.

This research employs an intercept survey at key access points along the Yampa River near the proposed land acquisition to capture recreator information such as dollar amounts spent across common expenditure categories, typical recreation habits, user perceptions of current and proposed recreational resource access and qualities, and demographic information. This paper utilizes an input-output methodology via IMPLAN to produce economic contribution estimates using data received from intercept surveys to quantify both the baseline contribution of

recreation near Craig, Colorado and the potential, additional expenditure Craig would receive with an increase in local and publicly accessible recreation opportunities provided through the BLM's land acquisition. This paper also performs a sensitivity analysis to estimate economic contributions at lower levels of participation as compared to an estimated typical year. Using spending data combined with user responses, this paper seeks to provide key insights into user perceptions for consideration in future policy and management decisions impacting Moffat County's recreation and tourism economy, with insights important to greater Northwest Colorado as well.

ACKNOWLEDGEMENTS

I would like to thank and commend my advisor and committee members including Dawn Thilmany, Rebecca Hill, Jude Bayham, and Tian Guo for their continued support and guidance throughout my research and graduate studies. I'd like to give Rebecca Hill a special thank you for providing amazing mentorship and support for this research and other projects. I would also like to issue a special thank you to the City of Craig Chamber of Commerce and the Bureau of Land Management – Little Snake Field Office for providing the funding and resources necessary to deliver my analysis. I'd like to share my gratitude for Friends of the Yampa, Colorado Parks and Wildlife, and the many wonderful people of Craig, Colorado that aided in my time collecting data in the field. Many thanks to my fellow DARE graduate students and faculty and the REDI team.

Finally, a big thank you to my partner, family, and friends for providing endless support during my graduate program, I am forever grateful to have you all in my life.

TABLE OF CONTENTS

ABSTRACT.....	ii
ACKNOWLEDGEMENTS.....	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
Chapter 1 Introduction	1
Chapter 2 Background and Literature Review.....	4
2.1 Background of Study Area.....	4
2.2 Previous Literature on Regional Economic Contributions of Recreation.....	9
Chapter 3 Study Methodology	11
3.1 Input-Output Methodology	11
3.2 Data Collection.....	15
3.3 Survey Procedures.....	16
3.4 Aggregation of Sample to Population	20
Chapter 4 Results and Discussion.....	23
4.1 Sensitivity Analysis.....	28
4.2 Policy and Management Implications	30
Chapter 5 Conclusion.....	35
5.1 Limitations	37
5.2 Future Analysis	38
Bibliography	40
Appendix A.....	43
Appendix B.....	44
Appendix C.....	45

LIST OF TABLES

Table 4.1 Responses per Survey Day.....	24
Table 4.2 Survey Responses by Type of Resident	25
Table 4.3 Aggregated Spending by Industry.....	26
Table 4.4 Input-Output Results Under Current Conditions	26
Table 4.5 Input-Output Results from BLM Acquisition.....	27
Table 4.6 Input-Output Results for Baseline + BLM Acquisition	27
Table 4.7 Input-Output Results for Lower Population Bound.....	29
Table 4.8 Recreation Quality Preferences by # of Additional Days per Year.....	33
Table 4.9 Additional Non-Resident Spending Generated from Quality Improvements	34

LIST OF FIGURES

Figure 1: Map of Study Area and BLM Acquisition.....	8
Figure 2: Output by Industry.....	28
Figure 3: Listed Activities from Survey Respondents	32

Chapter 1

Introduction

Craig, Colorado and the surrounding Moffat County are looking to diversify and enhance their economic activity by increasing access and opportunities for outdoor recreation and tourism. The Bureau of Land Management plans to expand access to public lands by acquiring additional land to add to the Little Yampa Canyon Special Recreation Management Area (SRMA) through the purchase of privately held lands along the Yampa River. Specifically, this additional parcel would be developed for recreational purposes, including a new public access site to the river, additional hiking, biking, and motorized vehicle trails, and a new access point to the current SRMA that would reduce commute time to those originating their recreational travel from Craig, Colorado.

Nature-based outdoor recreation is a fast-growing industry, accounting for 1.9% of national GDP and generating \$454.0 billion of current-dollar GDP in 2021, while participation grew 2.2% relative to 2020 (Rzenzik et al., 2003; Outdoor Foundation, 2023). Colorado remains one of the most attractive states for conventional outdoor recreation and tourism: recreation contributed 2.7% to the state's GDP, generating \$4.195 billion for the state in 2021 (Rzenzik et al., 2021). One major boon for the outdoor recreation economy in Colorado is the history of investments in public lands within the state, which comprise more than one third of Colorado's land for recreational use such as hiking, biking, camping, fishing, boating, etc. (Colorado Tourism Office, 2021). Colorado's headwaters via the Rocky Mountains provides an attractive and diverse portfolio of locations for recreationists who seek to float or fish quality surface water within the mountain range, as well as across both the eastern and western slopes. Residents and non-residents alike seek out Colorado's publicly owned and managed lands for "wildland

recreation”, defined simply as a multitude of different forms of outdoor recreation taking place in a natural or natural-appearing area (Hammit et al., 2015).

In this paper, we will address the following questions: What is the current economic activity that outdoor recreation and tourism brings to the Little Yampa Canyon SRMA, specific to spending in tourism supporting sectors within the local economy? If the proposed BLM acquisition brings additional opportunities to Moffat County, what would be the broader economic implications through additional recreation and tourism spending from non-resident visitors? How dependent is a non-resident recreator’s visitation frequency with respect to the convenience, access, and diversity of recreational opportunities?

This study uses input – output analysis to estimate the broader economic contributions related to estimated expenditure values of river-based recreation in Moffat County. Using expenditure data collected from river-based recreation participants in summer 2023, common recreation-specific spending data is mapped to IMPLAN’s NAICS codes to provide an estimated additional activity to Moffat County’s economy. The data is expanded to estimate visitation using 2020 visitor check-in sheet data and the survey data collected in the field. A baseline to establish typical spending in the summer season was calculated, as well as the potential marginal augmentation from increased recreational opportunities provided by the BLM’s expansion of public lands in the study area. A sensitivity analysis was performed to analyze the influence of different levels of visitation in a summer season (assuming weather and water conditions vary greatly across years) and thus it offers a range of potential contributions to the economy.

This paper builds upon an earlier framework and research by Hjerpe and Kim (2007) who utilized input-output methodology to measure the economic contribution of river boating in Grand Canyon National Park, identifying the key sectors that outdoor recreation and tourism

impact. Southwick et. al (2009) provides insight into which recreators are key drivers to augmenting values entered into the input-output methodology via exogenous spending. Finally, we expand on work by Lankford et al. (2003) to categorize user perceptions of recreational opportunity and is taken into consideration when making informed recommendations for Craig's outdoor recreation and tourism investment and management decisions.

Chapter 2

Background and Literature Review

2.1 Background of Study Area

The economic contribution of outdoor recreation and tourism, especially within rural areas, may be measured through the direct, indirect, and induced effects attributed to recreational expenditures. By way of standard export base theory, the outdoor recreation industry is considered a basic exporting industry (Bergstrom et al., 1990; Flores & Schwartz, 2015). In concept, the “exports” of recreational activities bring dollars from outside of the local economy through non-resident visitation. Outside expenditures typically are classified into tourism-supporting sectors. Sectors impacted heavily by tourism activity are defined as transportation, lodging, food and beverages, and retail (Headwater Economics, 2023; Bergstrom et al., 1990). Outdoor recreation and tourism overlap for the purposes of this paper; the characteristics of both involve travel and interaction between people and the environment preferred and sought by recreators (Jenkins and Pigram, 2005). Therefore, the expenditures relative to outdoor recreation are the same as those for tourism, highlighting the importance of outdoor recreation spending to tourism-supporting industries. Craig is a small town of 8,969 and is historically a mining town in northwestern Colorado, previously housing the largest power generating plant in Colorado and multiple coal mines. As the energy sector transitions out of Craig, the city is looking to shift and strengthen their economy with more of a focus on non-consumptive resource use, primarily in tourism and outdoor recreation. This is a potentially viable option due to the Yampa River, which provides ample opportunity for recreation on or around the river (Day, 2021). The Bureau of Land Management has proposed the acquisition of an approximate 660-acre parcel of land south

of the City of Craig which would become publicly accessible land managed for recreational usage. This parcel also connects to a current SRMA, which would allow for easier access to and better leverage the existing SRMA and additional river and trail access points, expanding its potential contribution to attracting more or longer visitation to interested recreationalists.

To show that this acquisition may represent a positive economic contribution to the local community, public, private, and non-profit stakeholders need to understand the current and future impacts of outdoor recreation and tourism in the region. Economic contribution studies are a commonly adopted approach to evaluating economic events and investments in the field of economics. In recreational economics, these studies have been used to measure the direct and spillover effects from public land designation and the regional economic impact of these decisions (Cleine et al., 2011,). Economic contribution analyses have been used previously to measure river-based recreational impacts from non-resident participants (Hjerpe and Kim, 2007; McGrath et al., 2017; Loomis, 2002). Basing our visitor survey and estimation approach on previous literature will ensure a credible measurement of this economic contribution as it relates to the local region which can be benchmarked against analogous studies (Southwick, et al., 2009).

Rural areas, including Craig, Colorado and the surrounding Moffat County, hold a comparative advantage for recreation, tourism, and non-consumptive natural resource use by way of their land and natural amenities (Marcoullier and Hoogasian, 2014). These natural amenities are important for rural economies to capitalize on as historically rural industries continue to decline and urbanization increases (Magnan and Seidl, 2004). Tourism and outdoor recreation can prove to be a positive economic force for such communities through benefits such as job creation, tax revenue, infrastructure, local identity, and entrepreneurial opportunities

(Magnan and Seidl, 2004; Lawson, 2019). As of 2021, Moffat County's tourism-supporting industries employ 14.9% of the local workforce, with the highest portion of these industries comprised of accommodations and food services (10.4%), followed by retail trade (2.9%) and arts, entertainment, and recreation (1.6%) (Headwater Economics, 2023). The most relevant outdoor recreation sites near Craig, Colorado include the Yampa River and its multiple public access points and the Little Yampa Canyon Special Recreation Management Area (SRMA), shown in Figure 1. The parcel of land that the BLM would fold into the existing SRMA is comprised of approximately 660 acres of private land owned by multiple landowners. Of note, a majority of this land was under the ownership of Peabody Williams Fork Mining LLC/Sage Creek Holdings, who have since ceased operations in the area and have begun the mining reclamation process, which is important to note since it significantly minimizes the opportunity costs of conserving this land.

The parcel investment would open a new publicly accessible stretch of the Yampa River approximately 8 miles long. Without the purchase of this land by any public entity, it would remain privately held by multiple landowners, maintaining the status quo for the Little Yampa Canyon and contributing little to expanding the area's recreation and tourism industry. There is currently little to no opportunity cost in pursuing outdoor recreation and tourism development, due to the planned closure of the Tri-State Craig Station coal power plant and the Colowyo mine which supplies it. The closure is primarily due to state greenhouse gas reduction requirements, and the power plant does not meet the goals of cleaner and cheaper energy production. Tri-State has developed a plan to shut down all of their systems in rolling closures through the next 7 years; the Colowyo mine and other local mines that supply the plant will be shut down as well. In short, all of the land currently owned by stakeholders in the energy industry of Craig will go

unused after 2030, and as this industry continues to move out of Craig, the opportunity cost associated with public land designation and outdoor recreation development will be minimal.

If acquired, a public land designation has heightened potential to impact the local economy, as additional public land designations in more isolated counties are strongly associated with income growth in the western US (Rasker, 2006). This project would also include a new boat ramp for river-based recreators using nonmotorized watercrafts, and the addition of trailheads leading into the preexisting SRMA land for both motorized and nonmotorized land-based recreation. Currently, access to the SRMA requires visitors take a southeastern route to remain on established roadways leading to the only vehicle access point on the southern edge of the recreational area, which is perhaps viewed as a barrier to usage for some recreational visitors. The proposed public land acquisition to be purchased by the Bureau of Land Management would reduce transportation time to the SRMA by an estimated 30 minutes from Craig.

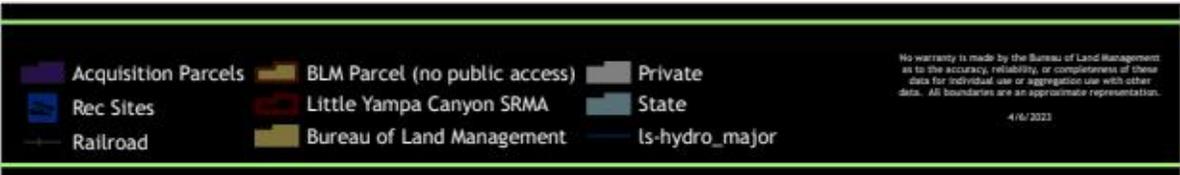
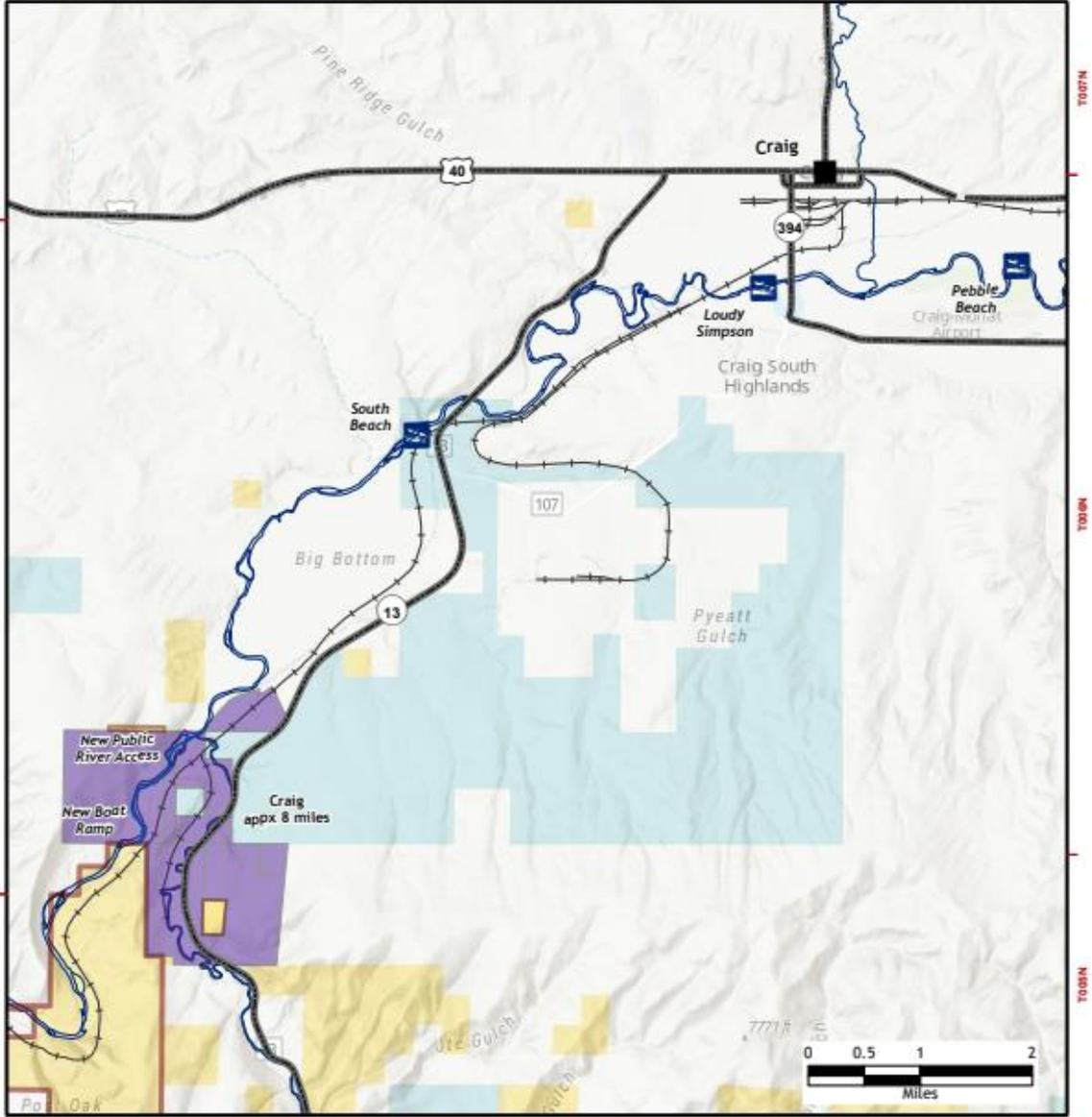


Figure 1: Map of Study Area and BLM Acquisition

2.2 Previous Literature on Regional Economic Contributions of Recreation

Hjerpe and Kim (2007) perform an economic impact analysis of river-based recreation on the Colorado River in the Grand Canyon National Park, and found that river rafting in the Grand Canyon generated notable economic activity across 220 regional industrial sectors, totaling over \$21 million in economic activity in Northern Arizona, as found through the direct, indirect, and induced effects created through an input-output model of Coconino County (Hjerpe and Kim, 2006). A key insight from this study is the leakage that occurs when recreational spending is attributed to behavior outside of the study area, representing potential activity from counties or states adjacent to Coconino County. There are negative contributions of rafting-related expenditure that represent a hinderance to local benefits, such as increased traffic, congestion, and ecological degradation, which reduces local, positive economic impacts. This study highlights the importance of isolating category-specific expenditures that occur within the area of study, which is key to fully understanding the positive economic impacts received by a particular city or county.

To develop an understanding of what this paper defines as an economic contribution, Southwick et al. (2009) is a primary source for understanding which visitors are key drivers to economic growth in recreational visits to the region. Outside sources of revenue, i.e., tourists from somewhere outside the region of study spending in the area, are of primary interest within economic impact studies through their exogenous spending within a region (Southwick et al., 2009). Across the United States, both human-powered and wildlife-based recreation account for a multi-billion contribution to the gross US economy while improving the quality of life of participants (Southwick et al., 2009). Their work also could shed light on the missing values

when performing an input-output analysis: the utility gained by recreators when engaging in their preferred leisurely activity. Although the input-output framework does not calculate a recreator's WTP for outdoor recreation, this value could be determined using the travel cost method or other CVM approaches, but those valuations are beyond the scope of the current study.

The economic contribution of tourism expansion is often focused on non-resident outdoor recreation experiences and expenditures, while resident experience is often overlooked. Lankford et al. (2003) sheds light on the foregone resident impact to a community as a result of tourism infrastructure expansion and emphasizes the impacts of tourism specifically on resident outdoor recreation experiences in Maui, Hawaii, Honolulu, and Kauai counties. Through a mailed survey, their paper denotes the effects on heavily invested tourism as an impact to residents' leisure activity participation and satisfaction. A critical point raised in this literature is a lack of improvement or increase in recreational opportunities and services negatively affecting leisure activity for residents (Lankford et al., 2003). This outcome has potential for resident recreators to take their activity and resulting expenditures outside of the community, which would reduce the movement of income within the local economy and reducing the multiplicative effect of recreation-supporting industries. With this impact in mind, the methodology and supporting survey instrument employed for this research will target both resident and non-resident recreators in the study area. Through the survey instrument, residents will be able to demonstrate their expected surplus from a proposed increase in recreational opportunities and their perceived impact of increased public outdoor recreation within their community.

Chapter 3

Study Methods

3.1 Input-Output Methodology

Terminology in the literature of regional economics has been inconsistent in the use of economic contribution, economic impact, and economic benefit, so explicitly stating the difference between these three methodologies is critical to interpreting the scope of this paper. Economic contribution is measured as the gross changes to a region's economy in its current state resulting from a change in policy or management. Contribution tracks economic activity as dollars cycle through the active industries and households in a region. It does not consider the net changes of new economic activity in the affected region, which would include additional information such as import substitution derived from locals (Watson et al., 2007). An impact analysis does capture this net spending change and requires more data on the local population within the region to determine how their spending would shift across industries and time as attributed to the change in policy or management. Neither economic contribution nor economic impact measure changes in welfare measures; an economic benefit analysis would be used to ascertain changes in consumer surplus, equivalent variation, or compensating variation (Watson et al., 2007). To reiterate, this study is an economic contribution analysis and is focused on the gross changes to Craig, Colorado's regional economy through a change in recreation management.

We use input-output modelling as the main empirical method to quantify the region's economic contributions and potential new recreation around Craig, Colorado. Through the I-O model, a static framework of the local economy can be used as a baseline for the interactions

between various active sectors (Davis, 1990). Using input-output modelling reveals the sources of economic stimuli associated with a sector's change in behavior, which can be further investigated by augmenting the incoming revenue associated with a sector. Observed data from economic activity in a particular area, such as a county or city, can be further represented through economic linkages across a variety of productive sectors across a specific period and exchange goods endogenously (Rosenberger et al., 2017).

After creating the baseline economic profile for a study area, exogenous spending can be introduced into one or multiple sectors to parse out the potential additional economic contribution certain spending habits inject into the local economy (Miller and Blair, 2009). In this paper, the external stimuli will be represented by the estimated initial purchases of commodities and services made by estimated additional recreational non-resident visitors within the subject area, within a 20-mile radius of Craig, Colorado. Once purchases are made locally, we assume the sectors which receive new revenue or sales must acquire more inputs or services from other sectors within the economy to continue meeting demands of household consumption, thus resulting in a net impact to the region's economy.

This research will use the IMPLAN input-output model for Moffat County, a computer software first developed by the US Forest Service for the express purpose of modernizing input-output methodology. Through the provided framework, IMPLAN is able to estimate the direct effect of an additional amount of spending attributed to recreational visitation. IMPLAN will also identify indirect and induced effects of additional spending, which when combined, represent the multiplier effects associated with the exogenous injection of income to a certain sector, specifically the tourism-supporting sectors previously mentioned. IMPLAN has been used in a wide swath of literature since its inception, specifically for regional economic contribution

and impact analyses of new events and investments. Within the scope of the outdoor recreation economy, the input-output model used will estimate the backwards linkages needed to produce goods and services such as equipment, lodging, food, transportation, and other trip-specific purchases that are required by recreationists centered around Craig, Colorado.

To easily incorporate the expenditure information provided by study participants, trip expenditures were broken into relevant categories. The following categories were presented to participants: restaurants/bars/concessions, lodging, gas and fuel (purchased within 20 miles), riverboating gear, fishing gear, hiking/biking gear, camping or general outdoor gear, groceries/snacks, other retail and shopping purchases, shuttle services or public transport, guides/tours/outfitters, equipment rentals, permits and fees, sightseeing/entertainment, and other expenses. These survey expenditure items were specifically chosen to represent the typical outdoor recreation expenditure patterns within the area given the nature of recreation in this region, and to be correlated with the industrial sectors provided by IMPLAN (Hjerpe and Kim, 2007; Fredman, 2008; Stoll et al., 1987). These categories represent the following IMPLAN 546 code industries that comprise the relevant aggregated tourism supporting sector¹:

- Full-service restaurants (510)
- Limited-service restaurants (510)
- All other food and drinking places (511)
- Hotels and motels (507)
- Retail – Gasoline stores (408)
- Retail – Sporting goods, hobby, musical instrument, and bookstore (410)

¹ NAICS codes for full-service restaurants, limited-service restaurants, and all other food and drinking places were aggregated together to reflect the survey's design.

- Retail – Food and beverage stores (406)
- Retail – General merchandise stores (411)
- Other amusement and recreation industries (504)
- Other support industries (478)

Guidance for the selection of expenditure categories was based on previous literature, as well as local input gathered through interviews with the Bureau of Land Management, City of Craig Chamber of Commerce, and supporting local nonprofits such as Friends of the Yampa to ensure accuracy to the study area and typical expenditure trends for the outdoor recreation community in Moffat County, Colorado. The regional model constructed through IMPLAN parsed out the defined study area of Craig, Colorado and surrounding area within Moffat County. To calculate the regional multipliers for income, output, and employment, the expenditures provided by recreational participants are entered into IMPLAN's impact analysis framework. Using a Leontief Production Function (LPF), IMPLAN produces output based on several inputs within the economy, but of those measured in this study, consumer expenditures by those from outside the area act as the exogenous variable in this model. Within the program, inputs go through a matrix of LPFs representing each industry within the Craig economy and how they will allocate additional output resulting from an increase in expenditures. Through this matrix, backwards linkages are generated from industries purchasing operational inputs from other industries, referred to as intermediate inputs. Each industry needs to pay for both labor income and proprietor income. Industries also pay taxes on production and imports (TOPI) and realize profits from production represented by other property income (OPI). The following equation represents the composition of output for a given industry.

$$\text{Output}_i = \text{Intermediate Inputs} + \text{Employee Compensation} + \text{Proprietor Income} \\ + \text{TOPI} + \text{OPI}$$

Once expenditure information is expanded to population size and imported into IMPLAN's sectors, four important measures of economic impact are provided in the resulting input-output model: Output, Employment, Labor Income, and Value Added. Employment represents the full-time, part-time, and seasonal mix of employees specific to an industry that would be supported through additional inputs. Labor incomes represent the combination of wages and benefits, as well as proprietor income produced by an industry through additional input. Value added includes employee compensation, proprietor income, TOPI and OPI, which defines the economic impact of an industry without including the goods and services purchased from other industries for production.

3.2 Data Collection

Estimates of the recreational contributions of outdoor recreation and tourism activity rely on site-specific reported trip expenditures to create an input for final demand estimates. A review of the literature and publicly available data found no existing region-specific recreation expenditure information for Moffat County, and therefore, no expenditure information relevant to outdoor recreation and tourism in the study area surrounding the Yampa River and Little Yampa Canyon. Due to a lack of readily available expenditure data for a niche resource, user surveys afforded the most efficient and reliable estimates for relevant expenditures. Data collection took place over 9 days in the summer of 2023, split up into two separate sessions. Survey periods were centered around the weekend to align with the patterns of many forms of outdoor recreation; peak participation is observed Friday through Sunday in a typical week during the respective recreational season.

3.3 Survey Procedures

The primary empirical estimates used in this study are gathered through intercept surveys conducted on location at the area of study. Interviews were conducted with individuals who were observed performing any outdoor recreation activities in the study area. Most of these surveys were conducted at South Beach Boat Ramp, the closest location to the BLM proposed land acquisition and the only public put-in for the Little Yampa Canyon section of the Yampa River. Ideally, this survey would capture a random sample of river recreators who would utilize the proposed land parcel, as any boaters putting in at that location would be passing through the parcel on their way to campsites or boat ramps further downstream. Yet, due to the nature of the intercept survey, only information from paddlers or other recreators that accessed the river during the survey periods in summer of 2023 was captured. This eliminates a sample of recreators that were present before or after the survey was performed, or during days in which surveying did not occur. However, since most of the boaters and recreational users of the Yampa are present on weekends or holidays, this sample taken during specific weekend and holiday periods should be fairly representative of the seasonal summer use of the Yampa River and Little Yampa Canyon.

These surveys were designed to be given in-person on location, with an interviewer leading the participant through questions. Only one interviewer was used during the respective survey periods to maintain consistent data reporting and reduce bias. Along with the in-person intercept, a version of the survey was created with a QR code link that could be placed on fliers around Craig. Both versions of the survey, along with accompanying documents related to surveyor approaches and scripts, were approved by Colorado State University's Institutional Review Board. Survey procedures and materials were deemed appropriate for use and in accordance with the University's code ethical principles and regulatory requirements for human

subjects in research. The data from this variant of survey was kept separate from the intercept responses until response integrity could be confirmed. Very few responses came from the QR code surveys posted around the community, and ultimately only 3 responses of those QR-based responses had all questions completed; these 3 were then identified as usable in the data analysis and added to the intercept response pool to expand our sample.

Surveys were designed with 4 distinct parts to identify various characteristics of river users during this survey period. Respondents were first asked a series of questions to identify travel party characteristics, such as where they were travelling from, how many people they travelled with, and how many times they visit this area for recreation in a typical year. This section also identified key recreational data pertaining to their trip by identifying which types of outdoor recreation they were doing on this trip and how long they would be in the area for recreational purposes. Respondents were then asked a series of expenditure questions, all of which were intended to capture the amount spent by the whole travel party across the entire trip, specifically within 20 miles of Craig, Colorado. These expenditure questions were segmented into specific categories with the intent of separating expenditure for data analysis, and to encourage respondents to consider their expenditures across different industries.

The next section of the survey instrument focused on the proposed BLM acquisition and the potential for increased recreational opportunities in the area. Respondents were shown 2 maps that identified the land parcel in question and its relevance to the Little Yampa Canyon stretch of the river. Questions in these sections were designed to capture user perceptions of recreational improvement in the area, including a list of potential quality improvements relevant to the Little Yampa Canyon, a reduction in driving time to access the current BLM SRMA that would result from the acquisition of the aforementioned land parcel, and their estimated future

use of the new land parcel given that changed access. All of these questions were framed to capture potential impacts in terms of an increase, decrease, or no change to their typical recreational visitation to the area in a typical year due to these changes in recreational quality, to provide context on frequency change to scale of the expenditure questions answered earlier. The last section of this survey captured demographic information that could define a profile for the average recreational user of the Little Yampa Canyon, including typical demographic information such as age, gender, race/ethnicities, and household income.

Using intercept surveys as a data collection approach provides notable biases that must be addressed and minimized. The first is interviewer bias, an issue of consistency. An interviewer needs to supply participants with consistent guidance and explanations when administering the survey, without giving additional biased information to participants that may alter their responses. One point of control to this bias was that only one interviewer was used to collect responses, so consistency was possible. Information given out by the researcher was designed to be non-biased by maintaining a neutral stance on the proposed BLM acquisition and was focused on little to no deviation from the site information that was already presented in the survey instrument.

To avoid oversampling and ensure that travel groups were not represented by more than one survey, the researcher needed to identify the members of each travel party before approaching a potential participant. Because many large groups would consist of smaller family units from different home towns, the researcher used their best judgement to ensure that any “travel group” would consist of the number of people that left home together and traveled to the survey location together; thus larger groups were divided into smaller, more consistent travel parties that would provide different expenditure and travel information depending on how long

their commute was or where they decided to stop for items such as food, fuel, and outdoor gear. Separating groups into travel parties also reduced the chances of oversampling by ensuring that a travel party would be aware that they already had a representative fill out the survey once and did not need to be counted again. Recreators returning to the boat ramp in order to pick up their cars were not intercepted to ensure that there were no duplicative surveys.

Avidity bias was also of concern for this research. Due to the on-site interception of potential participants, intercept surveys may provide an inaccurate profile of visitation due to infrequent or other uses of the study area outside of the focused demographic, such as people just passing through the area or using the site for purposes irrelevant to the subject of research. Fortunately, all of the intercept surveys were performed on-site by a researcher who could differentiate recreational users from non-recreational users of the boat ramp, to ensure that the only subjects captured in the intercept survey were those that intended to use the site and the larger Little Yampa Canyon for relevant recreational purposes, as opposed to incidental travelers or visitors using the site for something other than outdoor recreation. By interviewing only on-site at a recreational location, the chances of interviewing primary and secondary purpose visitors of that specific location are increased. The downside of this approach is that sampling cannot occur simultaneously at other locations that may provide relevant information, such as other public boat ramps, during a respective survey day. This can best be addressed by the description of the study area, in which there are no publicly available recreational put ins for the stretch of the Yampa River that the proposed BLM acquisition would be located at. Subjects that wished to boat or fish the Little Yampa Canyon currently needed to put in at the South Beach Boat Ramp to do so, which provides representative spending profile for avid users of this specific area.

3.4 Aggregation of Sample to Population

Expenditure information was disentangled at an individual level to determine the average per person, per day expenditure for each category collected in this study. Respondents were asked how many people they were travelling with and the number of days they would be recreating, with each expenditure category representing spending across the entire group. Due to survey responses representing an entire travel group, all expenditure information was divided into individual contributions, i.e., a group of 4 people who spent \$200 on groceries over 2 days would be broken out into 4 separate individuals who each spent \$50 on their groceries for that trip. Furthermore, an individual's expenditure was divided by the number of days they spent in the area to capture the per-day expenditure on a category, meaning an individual who spent \$50 on groceries over a 2-day period spent \$25 per day on groceries. The following equation was used for each survey response to capture the per person, per day expenditure on for each category included in the survey instrument.

$$\text{Spending per category}_i = \left(\frac{\text{Expenditure category}_{ix}}{\# \text{ of individuals in group}} \right) / \# \text{ visitation days}_i$$

It is important to note that the sample presented in this paper represents only the people using the Yampa River during the days of field interception by the research team. To infer the recreational and spending habits of the summertime Yampa River recreators as a whole, the sample must be expanded using previous participation data at relevant locations.

The primary source of use data used to aggregate sample information to reflect a reasonable and historically supported population estimate was a voluntary check-in sheet collected in previous years on location by Colorado Parks and Wildlife at the South Beach Boat Ramp. These check-in sheets included information such as the number of recreators in a group,

date of departure, estimated date of return, type of recreation and watercraft, and a hometown for each travel party. To appropriately scale what the 2023 sample period's visitation patterns were relative to a full season, a continuous data set was identified: the 2020 check in sheet including all relevant months for river recreation without interruption². The sample size given by intercept survey responses was 141 non-residents captured during survey periods. In comparison, the check-in sheet provided a sum of 318 non-resident users for the previous, analogous period. Comparing the attendance of non-resident recreators during the survey periods of 2023 with their analogous weekend periods of 2020 showed that the check-in sheet captured approximately 31% of recreators, under the assumption that visitation habits during 2020 are the same as visitation habits during 2023.

Determining the additional contribution of the BLM acquisition and its economic contribution to Moffat County was performed using expenditure information and trip information provided by participants. At the end of section 5 of the intercept survey in which participants were informed of the potential changes to location, including new infrastructure elements and possible expansion of the Duffy Mountain SRMA (see Appendix C, Section 4), participants were asked "Refer to the proposed land acquisition. If this project were to come to fruition, by how many days would you increase or decrease your visits to the area in a typical year?". Their response was recorded as a potential number of days that they would increase their recreation in a typical year, and when calculating the impact of the additional days, their spending habits for recreational trips were held constant. For all completed non-resident survey,

² Check-in sheet information from 2021 was also available but did not include the month of April and showed gaps or missing pages throughout the summer. Thus, the 2020 check-in sheet was deemed the most complete information and thus used for the population estimate.

responses for each expenditure category were divided by the number of days³ that the respondent was going to spend in the area, and then multiplied by the number of additional days they would visit in the area in a typical year due to the inclusion of the new BLM parcel.

$$\text{Additional spending per category}_i = \left(\frac{\text{Expenditure category}_{ix}}{\# \text{ of trip nights}_i + 1} \right) \# \text{ additional days}_i$$

The additional expenditure per category was then summed across all respondents to ascertain the impact of including this new BLM land as a publicly accessible recreation asset in the Little Yampa Canyon area. The sum of each category was aggregated to the population estimate using the same 7.3897 multiplier used during the baseline estimate aggregation.

³ The survey instrument asks, “How many nights are you staying in the local area on this trip?” which implies that the time spent in the area is 1 day longer than the number of nights they spent in the area.

Chapter 4

Results and Discussion

Potential participants were approached and explained the purpose and scope of the survey, and how it would be used to research economic contributions in the local community. After introduction, participants were explicitly asked if they would like to participate in the survey voluntarily, with an option to decline and end the interaction. Were the participant to decline taking the survey, this response would be collected and included in the bank of all completed surveys and omitted during data analysis. Before using the collected responses as inputs to the input/output model for whitewater and river activity in the Little Yampa Canyon, it is important to ensure that all responses are appropriate to use for data analysis. We identified any outliers or answers that may be unrepresentative of the population before aggregation by using boxplots for expenditure and trip information. No responses were deemed outliers.

Out of 53 intercept surveys collected, all potential participants that were approached chose to continue the survey, with no in-person participants declining. Of the surveys collecting online via QR codes, only 3 of the 12 returned surveys completed all questions; the remaining 9 surveys did not complete any questions past section 2 and were considered unusable for the purposes of this study. The 3 completed QR code survey responses were deemed appropriate for inclusion and were added to the flagship data set used in this study.

The complete dataset used in this study included 56 responses, with each response considered complete in each section and deemed usable for the purposes of this research. Including both intercept and online surveys conducted, 56 out of 65 completed surveys represents a response rate of 86.15% for this sample. Table 4.1 shows the days surveyed and how many responses were collected each day, across the two intercept sampling periods performed.

Responses were also to be omitted if the participant answered the question, “Is recreation the primary, secondary, or incidental reason for your visit to the area?” with “incidental reason” as to maintain a representative sample of purposeful users of the area and to screen for incidental users.

Table 4.1: Responses per Survey Day

DAY	DAY OF WEEK	DATE	TOTAL SURVEY RESPONSES
1	Thursday	25-May	5
2	Friday	26-May	10
3	Saturday	27-May	5
4	Sunday	28-May	3
5	Monday	29-May	0
6	Friday	16-Jun	12
7	Saturday	17-Jun	12
8	Sunday	18-Jun	6
9	Monday	19-Jun	0

For the purposes of this input/output model, understanding which responses came from non-resident visitors is of importance to determine the additive effect of expenditures in the local economy. This intercept survey instrument began by asking residents to supply their 5-digit home zip code as well as included a question to understand if the respondent was a local or seasonal resident of the study area to confirm their resident status. Individuals who identified themselves as living in the area for at least 4 weeks per year were excluded from the pool of non-residents that would ultimately be used to calculate the economic contribution. The total number of non-residents identified in this sample was 141 individuals, represented by 45 different travel-party surveys, as shown in Table 4.2.

Table 4.2: Survey Responses by Type of Resident

	Local, seasonal, or second home resident	Non-resident	% of non-residents in sample
Surveys	8	45	85%
Individuals represented	26	141	84%

To estimate the relevant population, first, the intercept survey sample was expanded up to the non-resident sample size of 318 given by the check-in sheet. Using the 31% estimate of captured recreators from the 2020 check in sheet, sample data was further aggregated to reflect the estimated population in a typical summer season. With 318 non-resident recreators representing 31% of estimated non-resident visitors in a typical year, the total number of recreators during the summer season of 2020 is estimated to be 1,042 users. This estimated visitation was used to aggregate the 2023 survey data to a representative population size under the assumption that the 2020 and 2023 seasons were identical in visitation. To expand from the sample size of 141 non-residents to the total estimated 1,042 site visitors in 2023, each summed expenditure category for all non-resident responses in the original intercept survey sample was multiplied by 7.3897. This multiplier was applied across all iterations of the input-output model under these 2023 site visitor conditions.

$$Pop. Estimate = CheckIn Sheet Sample Size * 100 \left(\frac{CheckIn Sheet Sample_t}{Survey Sample_t} \right)$$

All surveys from non-resident participants were separated from the original sample to isolate the expenditures that are appropriate inputs for an input/output analysis. The results from expenditure questions are shown in Appendix A. Both the baseline and additional spending for each column were summed through each expenditure category and aggregated to the scale of the estimated population and is shown in table 4.3.

Table 4.3: Aggregated Spending by Industry

Expenditure by category	Aggregated total		Aggregated additional spending
Restaurants, bars, food concessions	\$	15,385.50	\$ 26,657.36
Lodging	\$	6,724.69	\$ 3,660.40
Gas and fuel	\$	19,804.58	\$ 34,297.15
Riverboating gear	\$	5,542.33	\$ 7,081.86
Fishing gear	\$	1,404.06	\$ 2,763.77
Hiking/Biking gear	\$	-	\$ -
Camping or general outdoor gear	\$	258.64	\$ 849.82
Groceries and snacks	\$	11,542.82	\$ 26,503.41
Other retail and shopping purchases	\$	1,625.75	\$ 4,039.74
Shuttle service	\$	1,995.24	\$ 3,547.09
Guides, tours, and outfitters	\$	-	\$ -
Equipment rentals	\$	7,352.82	\$ 12,550.29
Permits and fees	\$	4,249.12	\$ 3,837.75
Sightseeing / entertainment	\$	-	\$ -
Other expenses	\$	369.49	\$ 3,694.88
Total	\$	76,255.03	\$ 129,483.53
	\$	-	
Outside of the region	\$	82,358.98	

Using IMPLAN's sectors, each expenditure category was assigned to the relevant sector affected by non-resident spending. The baseline, estimated additional spending, and estimated total spending are shown below.

Table 4.4: Input-Output Results Under Current Conditions

Economic impact	Direct effects	Indirect effects	Induced effects	Total effects	Type SAM multiplier
Total output	\$48,681	\$13,074	\$8,618	\$70,374	1.45
Total employment	0.53	0.08	0.06	0.67	1.26
Total labor income	\$16,274	\$2,263	\$2,263	\$20,799	1.28
Value added	\$26,892	\$5,151	\$4,775	\$36,817	1.37

Table 4.5: Input-Output Results from BLM Acquisition

Economic impact	Direct effects	Indirect effects	Induced effects	Total effects	Type SAM multiplier
Total output	\$75,517	\$20,355	\$13,625	\$109,497	1.45
Total employment	0.85	0.13	0.09	1.07	1.26
Total labor income	\$25,729	\$5,000	\$3,577	\$34,306	1.33
Value added	\$42,172	\$8,061	\$7,549	\$57,782	1.37

Table 4.6: Input-Output Results for Baseline + BLM Acquisition

Economic impact	Direct effects	Indirect effects	Induced effects	Total effects	Type SAM multiplier
Total output	\$124,198	\$33,430	\$22,243	\$179,871	1.45
Total employment	1.38	0.21	0.14	1.74	1.26
Total labor income	\$42,003	\$7,262	\$5,840	\$55,106	1.31
Value added	\$69,064	\$13,211	\$12,324	\$94,599	1.37

We find that under current recreational conditions, estimated seasonal spending as a result of non-resident visitation to the Little Yampa Canyon will produce \$70,374 in total additional economic output. The additional public land and amenities to be included by the Bureau of Land Management is projected to increase the effect of non-resident expenditures on output by \$109,497. Once the project is complete and recreational opportunities are available to the public, the contribution of river-based recreation in the Little Yampa Canyon will result in \$179,870 in total economic activity for Craig, Colorado. Output from the aggregated restaurants, other

amusement and retail, and gasoline/fuel rank amongst the highest output across tourism-supporting industries in Craig, Colorado.

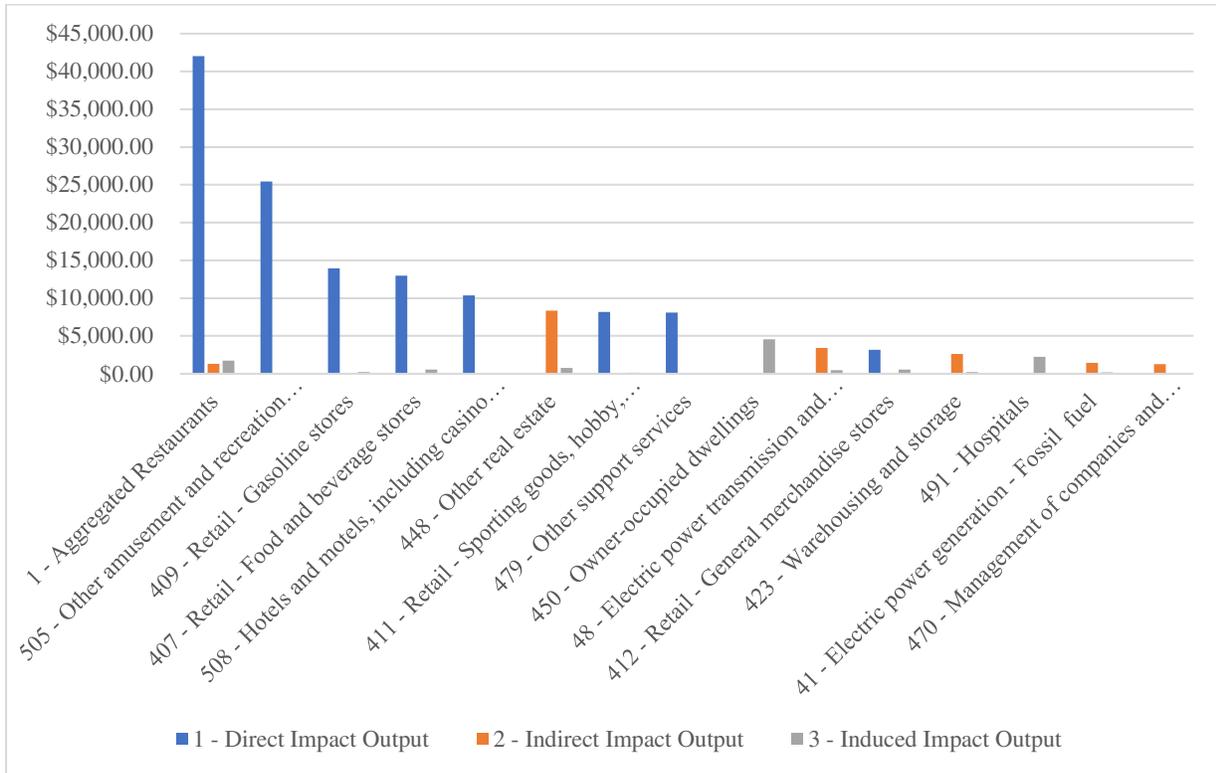


Figure 2: Output by Industry

4.1 Sensitivity Analysis

Due to the use of the voluntary check-in sheet as a guiding metric for the population estimate, a sensitivity analysis was performed to provide a lower bound estimate for the baseline contribution of recreation in the Little Yampa Canyon and the estimated additional contribution of the Bureau of Land Management’s proposed land acquisition. While responses for the voluntary check in sheet were estimated to represent 31% of river users based on the recorded responses from the intercept survey, the same methodology was employed using a response estimate of 50% for check-in sheet data. All else constant, the new estimated non-resident

population estimate was 636, which was then used to aggregate the sample size (141 non-residents) to the full population estimate for summer use. This would result in a population decrease of 39% from the original population estimate used in this research.

Under this new aggregation scheme, the same expenditure categories were mapped into sectors within IMPLAN to perform the same input-output analysis. Under the parameters established in the original sample expansion, the survey data for each expenditure category was aggregated to the alternative population using a multiplier of 4.51. New baseline, additional, and estimated total spending by category are provided in appendix . At this lower population bound, the baseline total expenditure was reduced to \$46,525, and the estimated expenditure after including the additional outdoor recreation opportunities was reduced to a total of \$125,581. The results for total expenditure at the lower population estimate are provided in Table 7 below.

Table 4.7: Input-Output Results for Lower Population Bound

Economic impact	Direct effects	Indirect effects	Induced effects	Total effects	Type SAM multiplier
Total output	\$75,809	\$20,405	\$13,577	\$109,791	1.45
Total employment	0.85	0.13	0.09	1.06	1.26
Total labor income	\$25,638	\$4,983	\$3,565	\$34,186	1.31
Value added	\$42,156	\$8,064	\$7,523	\$57,743	1.37

We find that under this new level of economic input, the total estimated new economic output is \$109,791 from the reduction in population size, a decrease of \$70,079 when compared to the original population parameters. Input-output modelling is linear in nature, thus a percent change in population should result in the same percent change in output.

A sensitivity analysis with a wide range of visitation can be used by policymakers and land management agencies to prepare for low-visitation seasons. This scenario could occur for multiple reasons in outdoor recreation planning, such as a low-inflow or drought year that would produce a shorter season for recreators using the free-flowing Yampa River. With minimal water resource improvement opportunity for the Yampa River, inflow is a primary factor in recreation demand and key driver to the visitation of the river for whitewater boating. Additionally, poor weather conditions or natural disasters such as an early season forest fire in the area could reduce the summer season for river recreation. Economic contribution is perfectly linked to the number of recreators and recreator-days that this area accumulates over a given season, and providing a lower-bound estimate for the economic contribution can provide context for low-visitation scenarios assuming there could be variability in recreation conditions across the season and different years.

4.2 Policy and Management Implications

IMPLAN results from an economic contribution study are commonly used by public managers to estimate the potential gross changes to a region's current economy. These studies typically consider a change in spending via policy or event that results in new dollars entering and cycling through a region's economy. This paper attempts to estimate a change in visitation using the acquisition of new public lands and recreational infrastructure as an event which could impact the level of non-resident spending in Moffat County, Colorado. The survey instrument designed for this research included metrics on how often people come to the area, which outdoor recreation activities they are performing at that time, and site quality changes that would impact the number of days they come to the area. Using this information, conclusions can be drawn

about the most popular forms of recreation amongst users of the Little Yampa Canyon and which recreational amenities would be most appropriate for the local stakeholders to pursue.

Based on sample data, the most popular current uses of the Little Yampa Canyon are whitewater boating, camping, wildlife viewing, and river-based fishing. Due to the distance between the public put-in (South Beach boat ramp) and nearest public take-out location (Duffy Mountain boat ramp) for whitewater boating in the Little Yampa Canyon, these two activities were tied together frequently amongst recreators south of Craig, Colorado because boating through the Little Yampa Canyon was a multiple day float and required camping at least one night during the trip. 89% of survey respondents were whitewater boating in the Little Yampa Canyon, which implies that other recreational activities were participated in as an additional or circumstantial result of their trip.

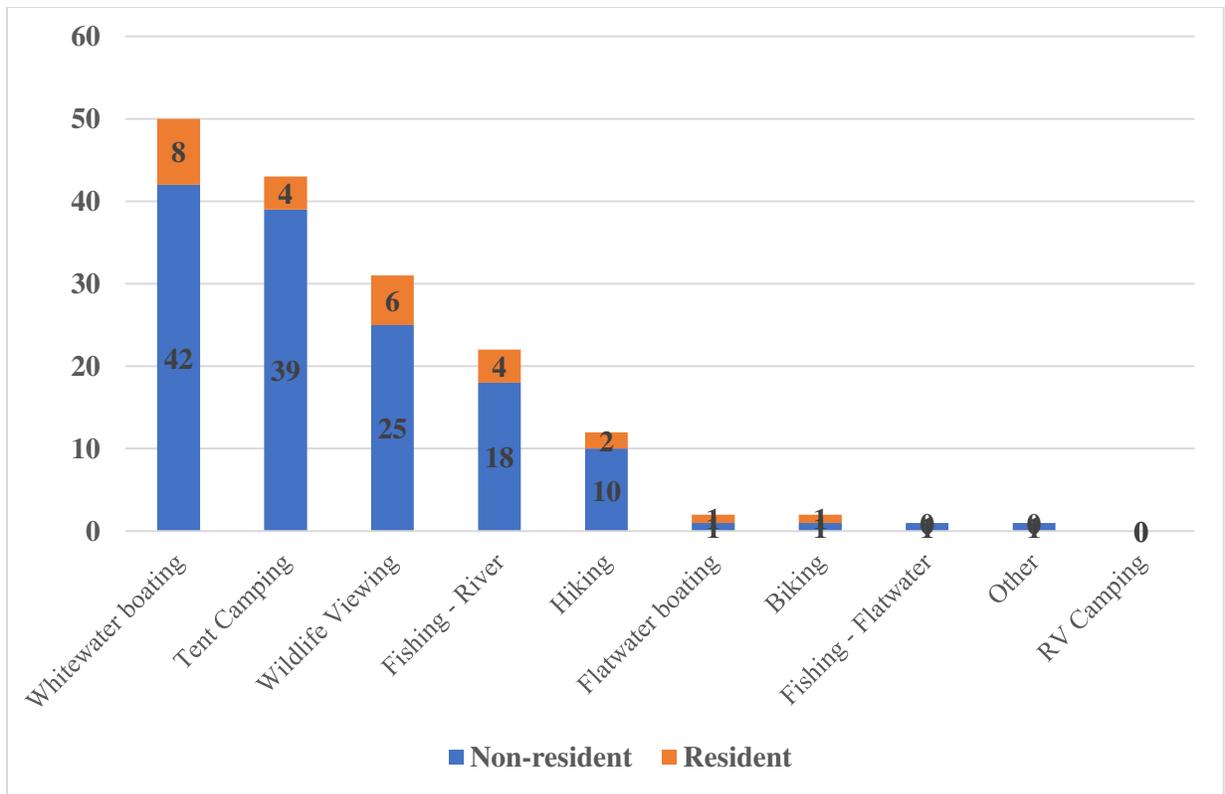


Figure 3: Listed Activities from Survey Respondents

Respondents were asked, “How would a small improvement in the following factors affect the number of trip days you recreate in this area in a typical year?”⁴ to provide empirical measurement of recreation quality preferences in the study area. A majority of respondents were whitewater boating; their responses to quality site improvements were highly focused on the improvement of whitewater boating amenities. Increases in the number of public river access sites and additional trail access are the most sought-after quality improvements, with a potential outcome of the area receiving a higher number of additional trips. The average respondent would spend an additional 3.3 days per year recreating in the Little Yampa Canyon from additional

⁴ Respondents were asked to consider each quality improvement independently from other quality improvements when considering the effect of the improvement on their annual days per year spent in the area.

public river access points, with other quality improvements increasing estimated annual visitation by one or multiple days as shown in Table 4.8.

Table 4.8: Recreation Quality Preferences by # of Additional Days per Year

Recreational Quality Preferences	Nonresident	Resident	Total	Average days/participant
Increased # of public put-ins, take-outs, and fishing access sites	142	33	175	3.30
Hiking/biking/motorized vehicle trail access	103	45	148	2.79
Water levels	111	13	124	2.34
Fishing opportunities/conditions	99	13	112	2.07
More challenging features/trails	77	21	98	1.85
Wildlife and surrounding habitat	69	11	80	1.51
Hunting access	74	3	77	1.45
Scenery/natural setting	40	11	51	0.96

The average non-resident visitor takes 3.42 trips per year with an average of 3.17 days spent in the area. Assuming the typical visitor travels to Little Yampa Canyon 10.84 days in a typical year, if the Bureau of Land Management were able to increase the number of public access sites along the Yampa River, they could expect an increase in non-resident visitation of 30.45%. Calculating this contribution using baseline expenditure as an input, Craig could expect \$21,433 in economic output as a result of non-resident recreators spending additional time in the area. In Table 4.9, we have estimated the rest of the recreation site quality improvements using the same data from the intercept survey.

Table 4.9: Additional Non-Resident Spending Generated from Quality Improvements

Recreational Quality Preferences	Average Days/Participant	Additional Expenditure	Additional Total Output
Increased # of public put-ins, take-outs, and fishing access sites	3.30	\$ 23,224	\$ 21,433
Hiking/biking/motorized vehicle trail access	2.79	\$ 19,641	\$ 18,126
Water levels	2.34	\$ 16,456	\$ 15,187
Fishing opportunities/conditions	2.07	\$ 14,588	\$ 13,463
More challenging features/trails	1.85	\$ 13,006	\$ 12,003
Wildlife and surrounding habitat	1.51	\$ 10,617	\$ 9,798
Hunting access	1.45	\$ 10,219	\$ 9,431
Scenery/natural setting	0.96	\$ 6,768	\$ 6,246

Previous literature would suggest that for local users of these outdoor recreation sites, providing additional locations and opportunities for recreation is more important than the improvement of existing sites (Lankford et al., 2003; Stoll et al., 1987).

Chapter 5

Conclusion

Little Yampa Canyon has the potential to create new and diversified economic contributions to Craig and Moffat Counties in Colorado by promoting opportunities for recreation and tourism that ultimately bring nonlocals, and their expenditures, into the community. Moffat County can expect to gain an additional \$109,408 in estimated annual economic output from the acquisition of further public land attached to the Little Yampa Canyon SRMA. The primary economic sectors affected will be food services, other recreation services, lodging, and gas and fuel. The stakeholders involved in this expansion project include the Bureau of Reclamation, the City of Craig, Colorado, and the community leaders in river recreation. These estimates provide insight into activity, spending, and frequency of visitation of outdoor recreation and tourism visitors for use in planning with the improvement of recreational opportunities. Identifying the key industries in Craig that support recreation and tourism shows the local community the impact of investing in recreation infrastructure. Due to the economic contribution model's linear results, stakeholders can create similar estimates under different levels of potential visitation to the area, but it is important to note that estimates may be less reliable as the range expands beyond that estimated in this study. This project's partners can also use the results of the intercept survey instrument to consider which recreational amenities should be improved upon to garner more visitation and thus more estimated economic output from the region's annual recreators.

The real GDP of Moffat County, Colorado, was estimated to be \$1.21 billion in 2021 across all industries, and the total economic contribution of \$179,871 annually as estimated in this study accounts for less than 0.1% of the real GDP across all industries. However, the results

of this study are almost entirely localized to Craig, Colorado, as opposed to Moffat County as a whole, and the contributions make a strong local influence on the limited number of industries affected by an increase in recreation expenditures. Additionally, there are non-market benefits associated with the increase of recreational opportunities that are primarily realized within the residents of this community. Quality of life improvements, community health, employee recruitment and business development improvements are some of the potential, primary benefits attributable to recreational expansion within Craig, Colorado, and could be further measured to obtain economic value by proponents of the BLM expansion project.

The development of additional public recreation opportunities in the Little Yampa Canyon may increase the recreational visitation to the area, however it is important to consider the changes in recreational habits across users derived from the expansion of public lands. The expenditure and economic contributions presented in this study are reliant on the assumption that recreational habits and expenditure profiles remain constant after the BLM acquisition, but this may not be the case in practice. There is variability in expenditures across seasons and conditions, where recreators may change their spending habits to reflect the changes that occur in outdoor recreation management in the Little Yampa Canyon. Additional mountain biking and hiking trails in the area may lead to additional days or trips spent performing those activities instead of others (such as whitewater boating), and visitors' expenditure will shift towards those activities.

With additional recreation opportunities added to the Little Yampa Canyon area, there may be additional recreators drawn to this area that were not captured in the scope of this study, which will provide a different expenditure profile to Craig that could not be represented by the expenditure information collected from respondents in this study. We can assume that additional

visitation will lead to an increase in economic contribution to Craig, but the additional expenditure from contributions will be distributed differently across industries as compared to the baseline expenditure measured in this study. Assuming that recreation management is directed primarily towards the river-based activities focused on in this research, stakeholders can assume that the economic contribution estimates will maintain their validity in the short term. Prioritizing the improvements that respondents favored, i.e., public river access points and additional trails, will translate most effectively to providing the economic contribution described in this study.

5.1 Limitations

This empirical research estimate was based on a traveler sample from 2023, which is an important context for river recreation in the study area due to exceptionally high flows in the Yampa River during the season. Through Little Yampa Canyon, the river saw peak flows around 12,000 cfs on May 16th; to put in context, the recommended runnable amount for this stretch is between 10,000 and 2,500 cfs. This exceptionally high flow led to campgrounds and surrounding land being flooded and difficult to use for camping, which is virtually required to navigate from South Beach to the Duffy Mountain take-out. Subsequently, the number of recreators using the Little Yampa Canyon during the months of April and May was likely lower than typical flow years. Additionally, the check-in sheet used for reference to create the population estimate was from the year 2020, in which the COVID-19 pandemic likely altered outdoor recreation participation across a majority of activities, at least in the short run. Better population estimates could be gathered from car counts specifically located at the South Beach boat ramp or Duffy Mountain boat ramp, however short-term day use by non-recreators at these sites may alter the identifiable number of river recreators from outside the area. For future estimated, additional

years of check-in sheet data could also produce a reasonable estimate for the average use of these sites in a typical year.

The survey location and methodology used in this study were primarily focused on the representative, non-resident recreator who visits this area for recreation annually and/or frequently. Thus, there is limited representation of locals using this area, and non-residents who do not visit the Little Yampa Canyon frequently. The spending profile of both of these groups should presumably be different to the avid non-resident recreator which makes up the majority of respondents in this study. Residents using the Little Yampa Canyon that were captured in this study use the area more frequently than the average non-resident recreator and would likely receive the most non-market benefit from additional recreation development and publicly available land near Craig. Non-residents that used the area fewer than 3 times a year were the sole contributors of equipment rental expenditures, and it is reasonable to assume that frequent boaters or anglers won't be renting equipment for their regular trips as frequent recreators are more likely to own equipment. Due to expenditure profiles appearing to be different across the variety of visitors to the Little Yampa Canyon, there is some uncertainty in how expenditures may change with the addition of new recreators in a typical season. With substantial development in the Little Yampa Canyon, these expenditure profiles are subject and expected to change over the next few years.

5.2 Future Analysis

Due to a short window of time between collecting the data set used in this research and the effective end date of this project, this paper only begins the portfolio of research needed and planned for understanding community and economic recreation and tourism effects in Moffat County. By design, the survey instrument used in the study included all the necessary

information to create a travel cost model to estimate demand for river-based recreation in Craig, specifically including details such as demographic information, travel time, home location, and income level. These questions, combined with information gleaned from expenditure and recreation questions used for the input-output model, could develop a revealed preference model that includes the derived value of recreation from consumers. Consumer surplus could be measured for both the current and expanded Little Yampa Canyon recreation amenities. The survey instrument also informed participants about a decrease in roundtrip travel time to the current SRMA, which could provide insight into the value of commuting to the new BLM site.

With more time and resources, this research could be expanded to include a larger intercept survey sample size and possibly more survey locations to paint a better picture of potential changes in recreational use in the Craig, Colorado and the broader Moffat County area. Most of the intercept surveys were performed at South Beach Boat Ramp during the summer, but a larger variety of recreators could be sampled in locations such as the Duffy Mountain SRMA during other seasons to capture recreation year-round. Furthermore, the spending profiles for activities such as hunting and RV camping could be captured, which were not brought into consideration in this study due to seasonality or location restrictions.

Bibliography

- Bergstrom, J. C., Cordell, H. K., & Ashley, G. A. (1990). Economic Impacts of recreational spending on rural areas: a case study. *Economic development quarterly*, 4(1):29-39.
- Cline, S. A., Weiler, S., & Aydin, A. (2011). The Value of a Name: Estimating the Economic Impact of Public Land Designation. *The Social science journal*, 48(4):681-692.
- Colorade Tourism Office. (2021). *Colorado Travel USA Visitor Profile*.
<https://oedit.colorado.gov/sites/coedit/files/documents/2021%20Colorado%20Travel%20USA%20Report.pdf>
- Davis, C. H. (1990). *Regional economic impact analysis and project evaluation*. UBS Press.
- Day, N. K. (2021). *Assessment of Streamflow and Water Quality in the Upper Yampa River Basin, Colorado 1992-2018*. US Department of the Interior, US Geological Survey.
- Flores, L., & Schwartz, A. (2015). Economic Contributions of Outdoor Recreation to Whatcom County, Washington. *Earth Economics*.
- Fredman, P. (2008). Determinants of Visitor Expenditures in Mountain Tourism. *Tourism Economics*, 14(2):297-311.
- Hammitt, W. E., Cole, D. N., & Monz, C. A. (2015). *Wildland recreation: ecology and management*. John Wiley & Sons.
- Headwater Economics. (2023). *A Profile of Industries that Include Travel and Tourism, Selected Geographies: Moffat County, CO*. <https://headwaterseconomics.org/apps/economic-profile-system/800017760>
- Hjerpe, E. E., & Kim, Y.-S. (2007). Regional economic impacts of Grand Canyon river runners. *Journal of environmental management*, 137-149.
- Jenkins, J., & Pigram, J. (2005). *Outdoor recreation management*. Routledge.
- Kurtz, R. S. (2010). Public Lands Policy and Economic Trends in Gateway Communities. *Review of Policy Research*, 27(1)77-88.

- Lankford, S. V., Pfister, R. E., Knowles, J., & Williams, A. (2003). An Exploratory Study of the Impacts of Tourism on Resident Outdoor Recreation Experiences. *Journal of Parks & Recreation Administration*, 21(4).
- Lawson, M. (2019). *Recreation Counties Attracting New Residents and Higher Incomes*. Headwater Economics.
- Loomis, J. B. (2002). *Integrated public lands management: principles and applications to national forests, parks, wildlife refuges, and BLM lands*. Columbia University Press.
- Magnan, N., & Seidl, A. (2004). Community economic consideration of tourism development. *Doctoral Dissertation, Colorado State University Libraries*.
- Marcouiller, D. W., & Hoogasian, A. (2014). The role of public outdoor recreation providers in supporting rural development. *Public economics: The Government's role in American economics*, 61-88.
- Miller, R. E., & Blair, P. D. (2009). *Input-output analysis: foundations and extensions*. Cambridge University Press.
- Outdoor Foundation. (2023, 03). *2022 Outdoor Participation Trends Report*. <https://outdoorindustry.org/wp-content/uploads/2023/03/2022-Outdoor-Participation-Trends-Report.pdf>
- Rasker, R., Gude, P., & Delorey, M. (2013). The Effect of Protected Federal Lands on Economic Prosperity in the Non-metropolitan West. *Journal of Regional Analysis and Policy*, 43:110-112.
- Rosenberger, R. S., White, E. M., Kline, J. D., & Cvitanovich, C. (2017). *Recreation economic values for estimating outdoor recreation economic benefits from the National Forest System*. US Department of Agriculture, Pacific Northwest Research Station.
- Rzeznik, S., Washington, P., & O'Connell, C. (2022, November 9). *Outdoor Recreation Satellite Account, U.S. and States, 2021*. <https://www.bea.gov/news/2022/outdoor-recreation-satellite-account-us-and-states-2021>

- Sage, J. L. (2020). Using Tourism to Recruit New Businesses: Tourism's Role in Economic Development. *Institute for Tourism and Recreation Research Publications*, 409.
- Southwick, R., & J Bergstrom, C. W. (2009). The Economic Contributions of Human-Powered Outdoor Recreation to the US Economy. *Tourism Economics*, 15(4):709-773.
- Stoll, J. R., Loomis, J. B., & Bergstrom, J. C. (1987). A framework for identifying economic benefits and beneficiaries of outdoor recreation. *Review of Policy Research*, 7(2):443-452.
- Watson, P., Wilson, J., Thilmany, D. and Winter, S. (2007) Determining Economic Contributions and Impacts. What Is the Difference and Why Do We Care? *Journal of Regional Analysis and Policy*, 37, 140-146.

Appendix A

Table A.1: Expenditure Question Results Before Aggregation

Expenditure by category	Totals	Additional Spending w/ BLM acq.
Restaurants, bars, food concessions	\$ 2,082.00	\$ 3,607.33
Lodging	\$ 910.00	\$ 495.33
Gas and fuel	\$ 2,680.00	\$ 4,641.17
Riverboating gear	\$ 750.00	\$ 958.33
Fishing gear	\$ 190.00	\$ 374.00
Hiking/Biking gear	\$ -	\$ -
Camping or general outdoor gear	\$ 35.00	\$ 115.00
Groceries and snacks	\$ 1,562.00	\$ 3,586.50
Other retail and shopping purchases	\$ 220.00	\$ 546.67
Shuttle service	\$ 270.00	\$ 480.00
Guides, tours, and outfitters	\$ -	\$ -
Equipment rentals	\$ 995.00	\$ 1,698.33
Permits and fees	\$ 575.00	\$ 519.33
Sightseeing / entertainment	\$ -	\$ -
Other expenses	\$ 50.00	\$ 500.00
Total	\$ 10,319.00	\$ 17,522.00
Outside of the region	\$ 11,145.00	

Appendix B

Table B.1: Sensitivity Analysis Expenditure at 50% Response Rate

Expenditure by category	Aggregated total	Aggregated additional spending	Baseline + Additional
Restaurants, bars, food concessions	\$ 9,391.15	\$ 16,271.38	\$ 25,662.52
Lodging	\$ 4,104.68	\$ 2,234.27	\$ 6,338.95
Gas and fuel	\$ 12,088.51	\$ 20,934.62	\$ 33,023.13
Riverboating gear	\$ 3,382.98	\$ 4,322.70	\$ 7,705.67
Fishing gear	\$ 857.02	\$ 1,686.98	\$ 2,544.00
Hiking/Biking gear	\$ -	\$ -	\$ -
Camping or general outdoor gear	\$ 157.87	\$ 518.72	\$ 676.60
Groceries and snacks	\$ 7,045.62	\$ 16,177.40	\$ 23,223.02
Other retail and shopping purchases	\$ 992.34	\$ 2,465.82	\$ 3,458.16
Shuttle service	\$ 1,217.87	\$ 2,165.11	\$ 3,382.98
Guides, tours, and outfitters	\$ -	\$ -	\$ -
Equipment rentals	\$ 4,488.09	\$ 7,660.57	\$ 12,148.65
Permits and fees	\$ 2,593.62	\$ 2,342.52	\$ 4,936.14
Sightseeing / entertainment	\$ -	\$ -	\$ -
Other expenses	\$ 225.53	\$ 2,255.32	\$ 2,480.85
Total	\$ 46,545.28	\$ 79,035.40	\$ 125,580.68

Appendix C

Survey Instrument

Section 1: Interviewer script

Hello I am _____ a (PI/Co-PI). I am collecting information from visitors to the Little Yampa Canyon for an economic impact study being conducted by Colorado State University in partnership with the Bureau of Land Management and the City of Craig.

This short interview will help us better understand how recreation impacts the local area. We would like you to answer a few short questions about your recreational visit to the region. Participation will take less than 5 minutes, and your participation in this research is voluntary. If you decide to participate in this study, you may withdraw your consent and stop participation at any time without penalty.

No personal identifiers except for zip code will be collected. When we report and share the data with others, we will combine data from all participants. There are no known risks or direct benefits to you from this research study.

Would you be willing to participate? Please do not participate in this survey if you or someone in your group has filled out this survey before.

- Yes, begin survey (1)
- No (2)

Section 2: Trip information

Q1 What is your 5-digit home zip code, or country of residence if from outside the U.S.?

Q2 Are you a local or seasonal resident (more than 4 weeks per year) of the immediate area (within 20 miles from the area)?

- Yes, a local resident (1)
- Yes, a seasonal resident (2)
- Yes, a second homeowner (3)
- No (4)

Q10 Including yourself, how many people are you travelling with?

Q30 Approximately how much time did it take for you to travel to this location, in minutes?

Q31 What method(s) of travel did you use to get to this area?

- Driving (1)
- Commercial Flights (2)
- Private Flights (3)
- Public Transportation / Shuttle Service (4)

Q5 Is recreation the primary, secondary, or incidental reason for your visit to the area?

- Primary Reason (1)
- Secondary Reason (2)
- Incidental Reason (3)

Q12 In a typical year, how many times do you visit this area for recreational purposes?

Q6 What outdoor activities are you doing on this trip? (Select all that apply)

- Whitewater boating (kayaking, rafting, tubing) (1)
- Flatwater boating (on a lake or reservoir) (2)
- Wildlife Viewing (3)
- Fishing - River (4)
- Fishing - Flat Water (5)
- RV Camping (6)
- Tent Camping (7)
- Hiking (8)
- Biking (9)
- Other (please specify) (10) _____

Q7 Which best describes your current visit to the Little Yampa Canyon?

- Overnight visit (spending one or more nights away from your permanent home) (1)
- Day visit (left from home and will return home in the same day) (2)

Skip To: Q3 If Which best describes your current visit to the Little Yampa Canyon? = Day visit (left from home and will return home in the same day)

Q8 How many nights are you staying in the local area on this trip?

Q9 What type of lodging are you using on this trip?

- Hotel / motels / lodges (1)
- Airbnb, VRBO, Private Rental (2)
- Staying with friends or family (3)
- Camping - Public or Dispersed (4)
- Camping - Private/Corporate Campground (5)
- Other (6) _____

Q3 Are you with a commercial company, outfitter, or guide today?

- Yes (1)
- No (2)

Q4 What company are you with today?

Section 3: Expenditure

Q11 Approximately how much did you and your travel party spend in total on this trip on the following items during your time in the local area (within a 20-mile radius of Craig). Include all spending made in the local area. Exclude spending if the purchases were made outside of the

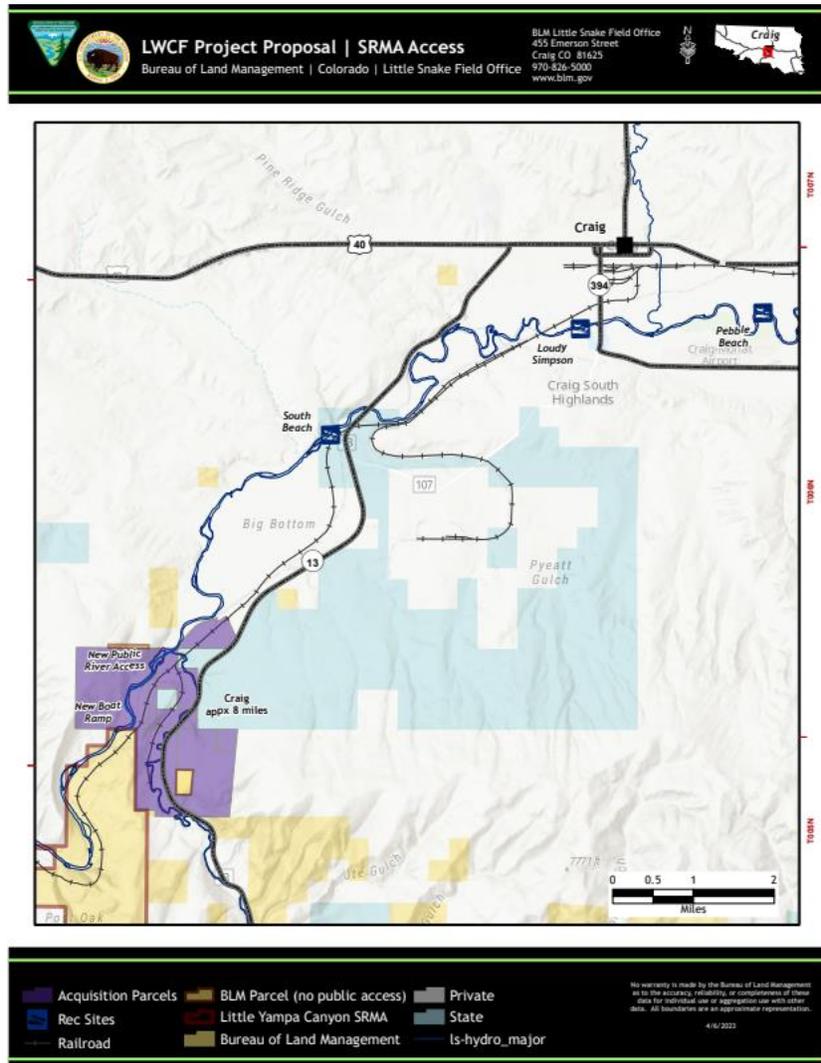
area, out of state. Local/Seasonal residents only include spending related to your outdoor recreation trip. Exclude airfare.

Category	\$
Restaurants, bars, food concessions (1)	
Lodging (2)	
Gas and fuel (purchased within 20 miles) (3)	
Riverboating Gear (4)	
Fishing Gear (5)	
Hiking/Biking Gear (6)	
Camping or general outdoor gear (7)	
Groceries and snacks (8)	
Other retail and shopping purchases (gifts, etc.) (9)	
Shuttle service or public transport (10)	
Guides, tours, and outfitters (11)	
Equipment rentals (12)	
Permits and fees (fishing/hunting, camping) (13)	
Sightseeing / entertainment (golf, scenic tours, etc.) (14)	
Other expenses (15)	

Q29 What is the total expenditure your group made outside the local area (further than 20 miles from Craig) related to this trip? Costs can include airfare, travelling costs, access fees, equipment rentals, and any relevant purchases that you did not list above.

Section 4: BLM acquisition

Q13 Please view this proposed BLM land acquisition.



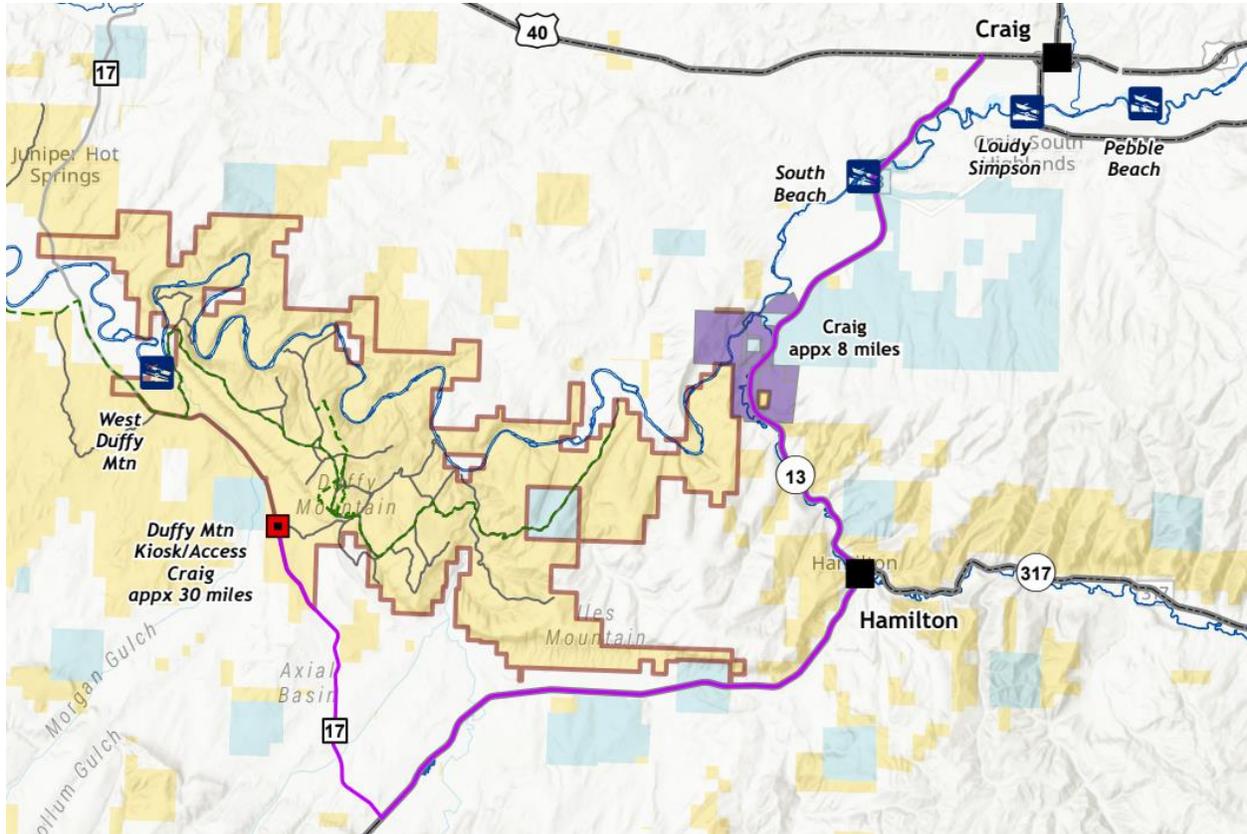
Q37 Before taking this survey, were you aware of this proposed land acquisition?

- Yes (1)
- No (2)

Q16 How would a small improvement in the following factors affect the number of trip days you recreate in this area in a typical year?

	Increase by ____ days (1)	Decrease by ____ days (2)	No Impact (3)
Hiking biking and motorized vehicle trail access (1)			
Fishing opportunity/conditions (2)			
Water levels (3)			
Increased put-ins and take-outs or fishing access sites (4)			
Scenery/natural setting (5)			
Wildlife and surrounding habitat (6)			
More challenging features/trails (7)			
Hunting access (8)			

Q27 Please look at this map showing the current route to the established BLM SRMA and where the proposed land acquisition would be located, reducing driving time between the SRMA and Craig by 30 minutes from any direction.



Q15 Refer to the proposed land acquisition. If this project were to decrease your travel time to access current BLM SRMA land by 30 minutes per trip, by how many days would you increase or decrease your visits to the area in a typical year?

- Increase by ___ days (1) _____
- Decrease by ___ days (2) _____
- Would not increase or decrease # of days (3)

Q14 Refer to the proposed land acquisition. If this project were to come to fruition, by how many days would you increase or decrease your visits to the area in a typical year?

- Increase by ___ days (1) _____
- Decrease by ___ days (2) _____
- Would not increase or decrease # of days (3)

Section 5: Demographic information

Q33 What is your age (in years)?

Q36 What gender do you identify as?

- Male (1)
- Female (2)
- Non-binary / third gender (3)
- Prefer not to say (4)

Q34 Please select any races/ethnicities you identify as.

- American Indian or Alaskan Native (1)
- Asian (2)
- Black or African American (3)
- Hispanic or Latino or Spanish Origin of any race (4)
- Native Hawaiian or Other Pacific Islander (5)
- White (6)
- Other (please specify) (7) _____

Q35 Please select your annual household income

- \$0 to \$24,999 (1)
- \$25,000 to \$49,999 (2)
- \$50,000 to \$74,999 (3)
- \$75,000 to \$99,000 (4)
- \$100,000 to \$149,999 (5)
- \$150,000 to \$199,999 (6)
- > \$200,000 (7)