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Regional economic contribution and net economic values of opening access to three Colorado Fourteeners

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Climbing 'Fourteeners', peaks whose summits rise above 14,000 feet, is a popular recreational activity in Colorado. Access to these popular peaks has been jeopardized by liability issues on privately owned peaks and by overuse on publicly owned peaks. To date, there has been little analysis on the economic benefits provided by Fourteeners. This study finds that opening access to three closed peaks presents an infusion into local and state economies of 25 and 45 jobs, respectively. Access to the peaks is worth US$167 per person each trip; a relatively high value in the context of the recreation economics literature.

Keywords: contingent valuation; input–output models; peak bagging; regional economics; Colorado

A regional economic development opportunity is present in the 54 mountains in Colorado's high country with peaks that are over 14,000 feet above sea level (referred to as 'Fourteeners'). Fourteener recreation enables rural areas of the state to diversify their economies by providing off-ski season destination spots, which give additional revenue streams beyond the traditional natural resource economic base of mining, logging and livestock grazing. Thousands of people both from within the state and all across the country seek Fourteener recreation ranging from day hiking, camping, off-road vehicle trails and photography opportunities. One popular activity is 'peak bagging', which involves hikers summiting the 54 peaks – a feat which is often a lifetime goal. Fourteener

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Table 1. Fourteeners with accessibility issues due to partial or complete private ownership.

Range	Private peaks	Access permitted
10-Mile/Mosquito	Bross	Closed, with access pending
	Democrat	Closed, with access pending
	Lincoln	Closed, with access pending
	Quandary (parts)	YES – trail rerouted to avoid private land
	Sherman	YES – but future access debated
Sangre de Cristo	Culebra	Fee for access
	Crestone Group	YES – pending access issues across private lands
	Little Bear Peak	YES – trail rerouted to avoid private land
	Mt. Lindsey	YES – summit privately owned
San Juan	Wilson Peak	Closed, with access pending

recreationists make these expenditures because they receive a 'consumer surplus' or benefit in excess of their expenditures. Both expenditure and consumer surplus data are important for performing a comprehensive analysis of mountain tourism, because the data enable researchers to understand the economic benefits to the recreationists, the neighbouring communities and the regional economies. While Colorado has the largest concentration of Fourteeners, such peaks exist in California (Mount Whitney) and Washington (Mount Rainer). Thus, our valuation study begins to help fill this gap in the empirical literature and may be useful for benefit transfer purposes to high peaks in general.

What is access worth to tourism-dependent communities and hikers?

The majority of the Fourteeners are managed by the US Department of Agriculture (USDA) Forest Service. However, ten Fourteeners, listed in Table 1, have 'private in-holdings', meaning that the peaks are owned either entirely or in part by private landowners. As presented in Table 1, many of the recreation access routes have been redirected to avoid the private in-holdings. However, recently, four peaks (Mounts Lincoln, Democrat, Bross and Wilson Peak) have been closed to the public.

As also noted in Table 1, Mounts Lincoln, Democrat and Bross are part of the five-peak, 10-Mile/Mosquito Range, all of which consist of private in-holdings. The 10-Mile/Mosquito Range is located approximately 70 miles west of Denver. The economies most affected by these peak closures include the small community of Alma that lies at the base of the Fourteeners; the town of Fairplay, located approximately 8 miles to the south and also in Park County; as well as the nearby ski resort town of Breckenridge, in the southern corner of Summit County and approximately 15 miles to the north of the closed Fourteeners. The locations of the 10-Mile/Mosquito Range and these respective towns are illustrated in Figure 1.

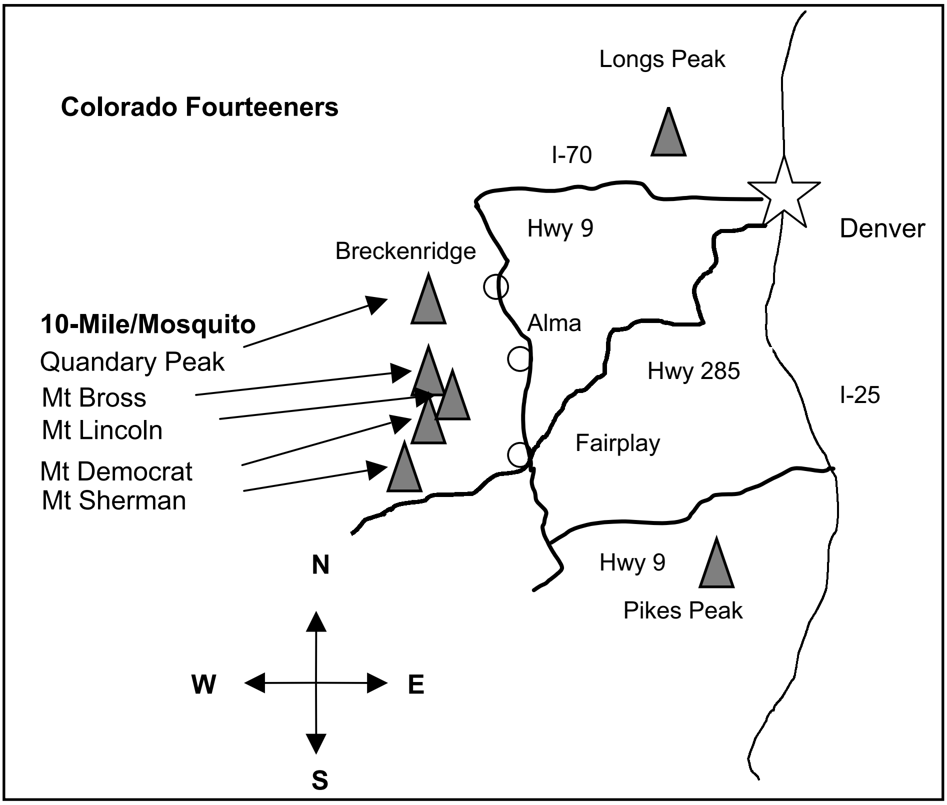

Figure 1. 10-Mile/Mosquito Range map of the location of Quandary Peak relative to closed peaks of Bross, Lincoln and Democrat.

This study provides information on: (a) the net economic benefits to the visiting public in the form of their net willingness to pay or consumer surplus – this information is relevant for benefit–cost analysis at the national level, as in evaluation of the economic efficiency of the USDA Forest Service policies, which may include acquiring private lands or charging a fee for access to popular peaks; and (b) the regional economic significance to local communities, counties and the State of Colorado from the expenditures of visitors to these areas – this information is relevant for evaluating the local costs of increasing visitor access to these peaks.

In order to provide information on (a) and (b), we quantify what access to Quandary Peak in the 10-Mile/Mosquito Range generates in terms of local and state value added (for example, wages, business income) and employment, using an input–output model combined with hiker survey data on expenditures. Employing the contingent valuation method (CVM) (Mitchell and Carson, 1989; Loomis and Walsh, 1997), we also estimate the consumer surplus to Fourteener users on nearby Quandary Peak, which traverses private land but remains open for public access. Both of these measures give insight into the regional economic significance provided by reopening access to Mounts Lincoln, Democrat and Bross.

Existing literature reviews indicate there have been no specific studies of climbing Fourteeners (Rosenberger and Loomis, 2001). However, there have been a handful of studies on rock climbing (see Grijalva and Berrens, 2003, for a summary). There have been numerous studies of hiking, including hiking in wilderness areas, but no studies have been undertaken on climbing Fourteeners. Thus, our valuation study begins to help fill this gap in the empirical literature and may be useful for benefit transfer purposes.

One observation of the value of a Colorado Fourteener is the privately owned Culebra Peak, located in the Sangre de Cristo range in southern Colorado. After being purchased in 2004, the new landowners of the Cielo Vista Ranch turned peak access to Culebra into a business enterprise by charging US$100 per person to climb Culebra and US$150 to climb both Culebra and a 'Thirteener' also located on the property (Colorado Fourteeners Initiative Website, www.14ers.org). Due to the proprietary nature of this privately owned business, visitor use estimates are difficult to ascertain, but the mountain is opened nearly every day during the prime peak climbing months of June through September and a minimum party of five is required for access (Colorado Fourteeners Initiative, www.14ers.org).

The source behind the closure of Mounts Lincoln, Democrat and Bross lies in the numerous mineral claims that dot this mountain range. Hiking trails and camping areas along these peaks cross old mine shafts and mine tunnels that either are abandoned or remain open so that landowners have the option to reopen the mines. Property owners are concerned about the liability that the mines present to Fourteener recreationists. Because 10-Mile/Mosquito Range landowners do not charge for Fourteener access, there is little economic incentive to risk the legal liability of potential injuries to recreationists or damage that may preclude future mineral extraction. As a result, in 2005, the landowners of these three peaks closed access to the public.

Economic issues resulting from peak closure

Elimination of hiker access invokes two economic issues. First, for the local economies in Park County and southern Summit County, Fourteener closure may result in serious reduced tourism and economic benefits during the summer. As a result of potential loss of revenues, the town of Alma and the State of Colorado in 2005 sought to pass legislation that essentially would indemnify the local landowner from any lawsuits related to injury or death from the old mine sites. In early 2006, the State of Colorado signed legislation HB 06-1049 into law, effectively putting this policy into operation. In exchange, the landowner agreed to open up access to the public and, in some cases, the town of Alma has leased much of the area from private landowners. HB 06-1049 was also supported by a number of local and non-profit hiking and climbing organizations.

Clearly, there are a number of incentives for local governments like city councils and grassroots organizations to become involved in ensuring Fourteener access. As noted by one of the members of the Colorado House of Representatives

'From 10,000 to 20,000 climbers head up Democrat, Lincoln and Bross each summer and contribute to the local economies' (Frazier, 2006). By leasing the land for US$1 a month, the town, as a municipality, has limited liability if sued, so it can receive the regional economic benefits without exposing itself to large liability losses (Brown, 2006). As the mayor of Alma noted, 'I felt like it was a good thing for business in Alma, Fairplay and Park County' (Brown, 2006).

The second economic issue involves a mixed open access, public good problem in that Fourteener use is non-rivalrous at low levels of use and very rivalrous at high use levels (most notably on weekends), due to congestion and environmental damage. Documentation of the congestible levels of high Fourteener visitor use and resulting ecological damage, particularly to alpine areas that are not restored easily, has been noted – Kedrowski (2006), the Colorado Mountain Club and the USDA Forest Service (Evans, 2007). Ecological and high visitor use issues have also been the source of focus of annual USDA Forest Service, Rocky Mountain Region Wilderness Manager's meetings. This region has also been evaluating several policy provisions, including fees, to reduce Fourteener use altogether or to shift peak Fourteener use times to off-peak visitor days to reduce trail widening and erosion.

Unfortunately, accurate estimates of visitor use of dispersed recreation on public lands are uncommon (Loomis, 2000). Until National Visitor Use Monitoring (NVUM, see English *et al*, 2002), the USDA Forest Service had very inaccurate estimates of overall visitor use. With the advent of NVUM, the agency now has accurate estimates at the National Forest level, but not at specific sites within the National Forest as it is not within the project scope for NVUM to go to that level of detail. Therefore, the majority of the USDA Forest Service Fourteener visitor use, trail and vegetation data has been collected by the Colorado Fourteeners Initiative (CFI), a non-profit group that receives project direction and grants from the USDA Forest Service, Rocky Mountain Region. The CFI is not viewed as a traditional activism organization but, rather, it is regarded as a non-profit group that assists the USDA Forest Service directly with implementing its Fourteener management plans.

Visitor use data gathered by the CFI is mainly the result of a 'Peak Stewarding Programme', where volunteers and staff members approach visitors, primarily from the parking lot or from the summit, and provide a resource for safety issues and general instruction on minimizing human impact on the ecology. The Peak Stewards also record number of visitors per group, dogs on the peak and other ecological information valuable to the USDA Forest Service. During the 5-year period from 2001 to 2006, based on an average of 3–9 days of non-holiday weekend observations, the Peak Stewards recorded a range of 100–151 hikers per 6-hour weekend day on Quandary Peak. Projected over 32 non-holiday weekend days from June to September (optimal Fourteener climbing months, due to weather), the estimated weekend use data are between 3,200 and 4,832 visitors. Given that 160 weekdays and holiday weekends, such as Memorial Day, 4 July holiday and Labor Day, are excluded from this data, we believe that the minimum estimate of a total of 10,000 visits reported by Frazier (2006) for the closed peaks of Democrat, Lincoln and Bross is a reasonable estimate.

These visitor use estimates are corroborated by campground trail log data from the South Park Ranger District, prior to closure of Lincoln, Democrat and Bross.[1,2] Visitor use of 4,147 and 3,427, respectively, reflect the number of groups who camped or day hiked at the site of the now-closed peaks in 2003 and 2004. By multiplying these groups by 2.85, the average group size attained by the CFI for Quandary Peak during these years, visitor use would be somewhere between 9,767 and 11,819 at Lincoln, Democrat and Bross. We view this as a conservative estimate of visitor use, as many parties do not log their visits for day hiking or overnight camping. For our purposes, these estimates are sufficiently close to that of Frazier for the total use of Lincoln, Democrat and Bross that we will use 10,000 visits as the estimate for regional economic significance and net economic value analysis.

Data collection

The data collection procedure for the 10-Mile/Mosquito Range was part of the larger study to estimate the value added to the State of Colorado by the 54 Colorado Fourteeners and to estimate the demand for specific mountain ranges. Currently, Mount Sherman is open, although it also straddles private property, and it is less difficult than the other peaks in the 10-Mile/Mosquito Range. Thus, Quandary Peak, which is of similar technical difficulty to the closed peaks, was selected as the survey peak to estimate the demand for this mountain range.

Over three days on two separate non-holiday weekends during August and September 2006, 199 mail-back surveys were distributed at Quandary Peak. These surveys were pre-tested with ten peak baggers who had reached the summit of all 54 peaks. The mail-back surveys were designed along the lines of Dillman's tailored design method (Dillman, 2000) and included an attractive cover and an easy-to-follow survey booklet. Mail-back surveys were distributed by volunteers from the Mosquito Range Heritage Initiative (MRHI), a group of stakeholders from the region that was formed to protect and preserve the unique attributes and opportunities in the Mosquito Range. Approximately eight volunteers were trained on survey distribution. To minimize any bias concern about using volunteers from this group, a script was devised for the volunteers to approach the survey respondents and volunteers were provided a script of frequently asked questions that made it clear that the Colorado State University was retaining and analysing the data. Volunteers approached hikers and other recreationists at the trailhead and in the parking lot at the conclusion of their recreation activity. There were no refusals to take the survey. After providing the visitors with the Fourteener survey and a postage-paid return envelope, volunteers collected follow-up information for the second round of survey distribution to follow Dillman's (2000) repeat mailing recommendation. Of the 199 mail-back surveys handed out, 129 surveys were returned, giving a response rate of 65%. Based on a comparison of group sizes from our survey data collected during these three weekend days with group sizes from CFI Peak Steward data collected during the majority of weekends during the summer season, it appears our data are representative of the summer season.

The survey included four separate sections, described as follows:

Information regarding the specific Fourteener trip. Comprising seven questions regarding trip purpose and recreational activities.

Trip expenditures. Comprising five questions addressing trip expenditures on the Fourteener trip, within a 25-mile radius of the recreation area and in Colorado. Respondents were asked to report the amount they and members of their parties (for example, family, companions) spent in each category in the two geographic areas. To put expenditures on a per visitor basis, they were divided by the number of people in the group. Asking for expenditures from the entire party and then dividing by group size is the preferred approach to avoid overestimating per person expenditures (Stynes and White, 2006: p 9).

Dichotomous choice contingent valuation question. The question was:

> *As you know, some of the costs of travel such as gasoline, campgrounds and hotels often increase. If the total cost of this most recent trip to the recreation area where you were contacted had been $X higher, would you have made this trip to this Fourteener? Circle one:* *YES* *NO*

The US$X bid amount had values ranging from US$2 to US$950.

Aspects of the Fourteener experience. Comprising seven questions, including visitors' perception of crowding.

Methods

The process of transferring benefit estimates for similar activities at similar locations is known as benefit transfer (Bergstrom and DeCivita, 1999). This approach has been used extensively by public agencies, where it is routine to maintain databases of net economic values of recreation and environmental quality to systematize such transfers (Environment Canada, 1998; Rosenberger and Loomis, 2001).

Expenditure data from the 2006 study were combined with estimates of visitor use of the three closed Fourteeners that, as is seen on the map, are nearby Quandary Peak. This expenditure information was entered into the IMPLAN (MIG, 1997) input–output model to estimate indirect and induced effects on local value added and employment.

Typically, recreation expenditure studies request visitor expenditure data for the site of interest using a survey (Bergstrom *et al*, 1990; English and Bowker, 1996; Chen *et al*, 2003; Stynes and White, 2006). Since the three peaks of interest have been closed to visitors for the past several years, this approach was not feasible. Therefore, we adopted a type of 'impact transfer' that involved using expenditure profiles from a nearby peak, along with visitor use estimates for the peaks of interest. This approach illustrates a type of impact transfer similar to benefit transfer. One of the earliest approaches to impact transfer is Daniel Stynes' (2007) money generation model (MGM) spreadsheet, which allows the user to apply one of three existing expenditure profiles to their site (see http://web4.msue.msu.edu). Our expenditure transfer approach (using survey data from a peak near the closed peak, for the same type of activity) is more site specific than the MGM and is an alternative approach that may be useful for quantifying the regional economic effects of re-opening access to previously closed areas.

IMPLAN input–output model

IMPLAN is an input–output model that is based on secondary data. It uses national production technology and information about counties and states to allow the user to construct an input–output model for any county, group of counties, or states in the USA (see MIG, 1997, for details). From the input–output model, inter-industry indirect effects, along with induced effects, are calculated to arrive at the full multiplier effect of direct changes in local income and employment. IMPLAN has been used extensively for evaluating the economic impacts of recreation (Bergstrom *et al*, 1990; English and Bowker, 1996). In order to build a bridge from our expenditure data into IMPLAN, visitors were asked to disaggregate their spending into expenditures within 25 miles around the peak and elsewhere in Colorado. Then, they were asked to record their expenditures into 18 spending categories that could be bridged to eight IMPLAN sectors such as hotels, restaurants, grocery stores and retail. There are several ways to bridge from visitor expenditures to IMPLAN sectors, such as using personal consumption expenditures (PCEs), and interested readers should see Bergstrom *et al* (1990) and the MIG (1997) for a discussion of these alternatives. Year 2002 IMPLAN county data profiles for Park County, where the peaks are located, and nearby Summit County, where the resort town of Breckenridge is located, were used.

Dichotomous choice contingent valuation

Most contingent valuation surveys now use a willingness-to-pay (WTP) question format, called dichotomous choice, where the respondent is asked whether they will pay a given dollar increase. The dichotomous choice format has the advantage of mimicking price-taking behaviour in the market. However, there is some evidence that WTP estimates obtained from dichotomous choice are higher than open-ended WTP (Boyle, 2003: pp 141–142). In our implementation of the dichotomous choice question, respondents were asked whether they would pay a predetermined increase in trip cost. While the predetermined amount is fixed for the respondent, it varies across the sample of respondents. This allows the analyst to trace out a quasi-demand function relating the probability a person will pay to the dollar amount they are asked to pay. Hanemann (1989) views the respondent as evaluating the difference in utility associated with the status quo versus paying some amount (US$X) to have access. If the difference in utility is positive for access, the individual is expected to respond 'Yes'. If the difference in utility is distributed logistically, a logit model can be used to estimate the parameters and allow for calculation of WTP.

The cumulative logistic distribution function is as follows:

$$\text{Prob}(Y = 1) = [\exp(\beta X_i)]/[1 + \exp(\beta X_i)]. \quad (1)$$

β is the set of parameters that reflect the impact of changes in the independent variables, X_i, on the probability of agreeing to pay, which is the binary dependent variable, $Y = 1$ if the response is 'Yes' and $Y = 0$ if the response is 'No'. The parameters and the independent variables in Equation (1) have a non-linear relationship with the dependent variable, which is why the logit model is used instead of the ordinary least squares regression. From the cumulative distribution function, we can develop the odds ratio of paying for access ($Y = 1$) or not ($Y = 0$), which is:

$$[\text{Prob}(Y = 1)]/[1 - \text{Prob}(Y = 1)] = \exp(\beta X_i). \tag{2}$$

By taking the log of the odds ratio, we develop the logit model:

$$L = \ln \{[\text{Prob}(Y = 1)]/[1 - \text{Prob}(Y = 1)]\} = \beta_0 + \beta_i X_i. \tag{3}$$

The log of the odds ratio is linear in the coefficients and the independent variables (Gujarati, 2003). t-Statistics are used to judge the statistical significance of the individual variables. To judge the overall statistical significance of the equation (that is, all the variables collectively), a likelihood ratio (LR) statistic is used. The LR statistic is also analogous to the F-statistic in OLS regression. Specifically, the LR ratio statistic tests the null hypothesis of whether collectively all the coefficients in the logistic regression are, as a group, equal to zero. To judge the goodness-of-fit of the logit regression, a McFadden pseudo R-square is computed (Gujarati, 2003).

Mean WTP is calculated applying Hanemann's formula (1989) for the mean. To calculate WTP, all non-bid variable coefficients are multiplied by their respective means and added to the constant term. This can be seen in Hanemann's formula (1989) for calculating mean WTP:

$$\text{Mean WTP} = (\ln(1 + \exp(B_0 + B_2X_2 + B_3X_3 + B_4X_4)))/|B_1|), \tag{4}$$

where B_0 is the constant term, B_1 is the coefficient on the bid amount and the other non-bid coefficients (B_2, B_3, B_4) are multiplied by their respective means (X_2, X_3, X_4) and added to the constant term.

Results

Regional economic contribution

The basic visitor expenditure profiles by IMPLAN sector are shown in Table 2. When visitors left a spending category in our survey blank, we took the conservative approach and assigned a 'zero' expenditure in our spreadsheet. This also ensured we could generalize the average expenditures to all the visitors and we avoided overstating expenditures, which would have been the result if we had taken the average of just those with a positive expenditure (Stynes and White, 2006: p 11).

The expenditures reported are for visitors who stated climbing Quandary Peak was the sole purpose of their trip (76%) or was one of several equally important reasons for the trip (21%). Per person per trip expenditure results are quite substantial, totalling around US$115 per person within the 25-mile radius (with a standard error of US$34, or 29%). Within the State of Colorado, the per person expenditures are US$168 (with a standard error of US$43, or 26%). The typical trip to climb a Fourteener is a day trip, but 34% of the sample visited the Fourteener as part of an overnight trip. About half the sample makes one trip a year and the other half takes about two trips per year.

Table 2. Fourteener visitor expenditure patterns within 25 miles of the peak and in Colorado (n = 123).

Sector	IMPLAN	Within 25 miles, per trip, per person (US$)	Within CO, per trip, per person (US$)
Groceries	405	15.46	23.72
Fuel	407	15.18	30.52
Retail	409	18.23	31.62
Hotels	479	34.56	40.81
Restaurant food	481	30.16	39.16
Public camping	496	1.88	2.17
Car rental	432	N/A	10.47
Insurance	428	N/A	23.72
Total		*115.48*	*168.00*

For purposes of the economic impact analysis and net economic valuation analysis, we use the conservative season estimate of 10,000 visits to expand our sample expenditures to the entire season. It should be noted that expansion of our visitor sampling rate to the entire season also suggests this is a conservative estimate, as just estimated weekend visitation would be 7,000 visits. Given significant use on holidays such as 4 July and Labor Day, and some minimal use on weekdays, we believe the 10,000 visits is a reasonable lower bound of total use of the three closed peaks of Democrat, Lincoln and Bross.

While direct expenditures are concentrated in the typical tourist sectors, the IMPLAN inter-industry linkages show that the indirect and induced spending permeates throughout Park and Summit County economies and the State of Colorado economy. In particular, in Park and Summit Counties, despite the relatively small multiplier of 1.2 for value added (for example, wages and business income), these indirect gains were spread through the county economies due to linkages to several economic sectors of their county economies. Significant linkages include maintenance of commercial buildings, wholesale trade, truck transport, publishing, banking, real estate, accounting, advertising and local utility district. As shown in Table 3, there are an estimated 25 jobs supported by hikers visiting the Fourteeners in Park and Summit Counties. Of course, the multiplier effects throughout Colorado are much larger, with the value-added multiplier being 1.6 and the employment multiplier being 1.3. Combining the larger total expenditures within the State of Colorado with the higher multiplier leads to US$1.9 million in total value added and 45 jobs statewide related to these three Fourteeners.

Table 3. Total value added and employment associated with Mounts Democrat, Lincoln and Bross.

	Park County	State of Colorado
Value added	US$1 million	US$1.9 million
Employment	25 jobs	45 jobs

Table 4. CVM WTP logit model results (n = 115).

Variable	Coefficient	Std error	t-Statistic	Prob
Constant	28.84635	16.2651	1.7735	0.0761
Bid amount	–0.005525	0.00118	–4.6621	0.0000
Education	–3.378617	1.94456	–1.7374	0.0823
Education squared	0.101491	0.05817	1.7444	0.0811
Travel distance	0.001916	0.00095	1.9991	0.0456
Mean dependent variable	0.574	SD dependent var	0.496	
Log likelihood	–53.73			
Restr log likelihood	–78.45			
LR statistic (5 df)	49.426	McFadden R-squared	0.315	
Probability (LR stat)	0.000			

From the standpoint of wages and business income generated, it is clear that Park and Summit Counties and the State of Colorado economies certainly benefit from leasing access and assuming landowner liability.

Dichotomous choice contingent valuation results

The logistic regression model included the following explanatory variables that were believed to have some influence on a visitor's WTP for hiking up the Fourteener.

Travel distance: the distance the visitor travelled from home to the Fourteener. The typical Fourteener visitor travelled an average of 152 miles, one way.

Education: the years of education of the respondent.

Bid amount: the increase in dollar amount the visitor was asked to pay.

Our CVM bid design appears effective, as slightly more than half the visitors answered they would pay the assigned increase in cost to access the Fourteener and slightly less than half indicated they would not be willing to pay. The results of the logit model are presented in Table 4.

Table 4 shows that the bid amount is negative and statistically significant, indicating that the higher the dollar amount the visitor is asked to pay, the less likely they will pay. This demonstrates that there is some degree of internal validity to the dichotomous choice CVM responses. The education and travel distance variables are significant at the 8% and 4% levels, respectively. However, the LR statistic suggests the independent variables collectively are significantly different from zero at the 1% level. The McFadden R-squared is reasonably high for maximum likelihood estimation at 31%.

Using the coefficients in Table 4, along with the mean values of the variables in Equation (4), yields a mean per trip net WTP or consumer surplus of US$167.50, with a 95% confidence interval of US$72–328 per person per trip. This average consumer surplus value yields a number of implications. Since this is a day trip for most of these visitors (albeit a long day), this is a substantial

WTP. This value is also particularly noteworthy since, for three-quarters of the visitors, this is the primary or sole purpose of their trip from home. Most visitors just make one trip to this Fourteener each year, so summiting is often considered the culmination of many weeks of training, hiking up lesser peaks. As noted in the introduction, there are no comparable Fourteener studies in the literature by which to judge the reasonableness of this per trip benefit estimate. However, there are several rock climbing studies, one in Colorado by Ekstrand (1994). He asked rock climbers at Eldorado Canyon outside Boulder what they would pay to do similar climbs but at remote wilderness locations. His value of US$27.95 per day in 1991 is equivalent to US$40 in 2006, the year of our data. Grijalva and Berrens (2003) estimated a value of rock climbing in Texas at between US$47 and US$56 per day trip. More comparable is the study by Grijalva *et al* (2002) that involves climbing in wilderness areas. They found a WTP of only US$20–25 per person to avoid closing climbing sites in several National Forest, National Park and Bureau of Land Management (BLM) wilderness areas.

Our consumer surplus is on a par with the US$100–150 per person access fee charged for Culebra, one of the Fourteeners that is completely on private land. Thus, our estimate of consumer surplus appears to have some correspondence with what a private landowner is able to extract from hikers wishing to climb this other Colorado Fourteener. It also is interesting to note that the consumer surplus is similar to the Colorado visitor expenditures reported in Table 2. Annual benefits associated with opening up access to Mounts Democrat, Lincoln and Bross are calculated by taking the US$167.50 consumer surplus and multiplying it by the estimated 10,000 visits to these peaks. This yields slightly more than US$1.67 million in consumer surplus to peak baggers and Fourteener recreationists each year if access is provided to these peaks. This is a sizeable amount of benefits, warranting policy considerations to ensure that access is available to these Fourteeners.

Conclusions

This is the first study to examine the economic impact on the Colorado economy of re-opening access to three Fourteeners. As our research shows, Fourteener recreation has a perceptible economic significance on the local economies of Park and Summit Counties. This is especially true as Fourteener climbing takes place during the summer, which is considered the recreation off-season in ski counties such as Summit County. In the case of Mounts Lincoln, Democrat and Bross, the infusion of revenue into rural mountain communities like Alma and Fairplay in Park County is significant. Per trip expenditures made by visitors to the 10-Mile/Mosquito Range are approximately US$115 in the 25-mile radius of the peak. This yields an estimated 25 jobs to the Park County and Summit County economies. The visitor expenditures add roughly US$1 million of value added to the local economy, much of which can be captured by the towns of Alma in the northern corner and Fairplay in the centre of Park County, as well as Breckenridge in Summit County. From a policy standpoint, this is an important consideration, since the 25 jobs may reduce some of the off-ski season unemployment and the jobs are linked to a county where there is not an abundance of employment opportunities available. The 1.2 multiplier of value added to wages and business income is also tied closely to several business sectors of the economy. Statewide in Colorado, access to these three Fourteeners is estimated to generate US$1.94 million of value added and 45 jobs. Results from the contingent valuation analysis reveal an estimated consumer surplus of US$167.50 per trip, for an annual benefit of US$1.67 million to the hikers and peak baggers themselves. This net economic value is consistent with private access fees of US$100–150 per person to climb another Fourteener in Colorado (Culebra).

In this particular circumstance, it is clearly worthwhile for the town of Alma to act as a stakeholder in the issue of Fourteener access, particularly since the liability costs of doing so are negligible and the economic contribution to their county is high. In other cases where Fourteener access becomes compromised, communities may consider the actions of the town of Alma as a case study of a successful policy intervention.

Unfortunately, access issues are not limited to privately owned Fourteeners. Given the common case of overuse on public lands, it is also important to quantify WTP for the insights gained regarding rationing use by fees. The USDA Forest Service is currently in the middle of conducting its own evaluation of whether to charge peak baggers and other recreationists fees to access either part or all of the Fourteener recreation area. Charges may be necessary to maintain trails in the face of rising use and degradation of the natural environments around many of these Fourteeners. This is especially relevant for Fourteeners within designated wilderness areas, as the USDA Forest Service simply is not allowed to let the naturalness of these areas degrade. With the results from our economic analysis, the USDA Forest Service will be able to make a more informed decision on the impact of Fourteener access on local economies and visitors.

This paper also illustrates a type of impact transfer as a method to estimate the local economic effects of peaks that are currently closed. To do this, we used visitor expenditure data collected from another nearby Fourteener to determine visitor expenditures for the peak of interest.

This study just begins to answer the question of how much economic effect all of the Fourteeners provide to the Colorado economy. Ultimately, in order to form a complete picture of the statewide economic effects and visitor benefits provided by Colorado Fourteeners, analysis should be conducted for each of the six mountain ranges that contain Fourteeners, with the goal of estimating demand for the entire Fourteeners system as a whole. Nonetheless, our analysis suggests that Fourteener recreation has the potential to rejuvenate seasonal or even lethargic regional economies, while serving as an end destination source for outdoor recreation.

Endnotes

1. 2003 and 2004 were the only years that data were available for this campground, prior to closure of these three peaks.
2. It is also noteworthy that the Colorado Fourteeners Initiative coordinates the focus of their Peak Stewardship Programme as much as possible with USDA Forest Service management plans. Thus, the CFI has not collected visitor use data on Mounts Lincoln, Democrat and Bross.

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