UTAH STATE UNIVERSITY

Economic Impacts of Land Use Restrictions on OHV Recreation in Utah

A Report for the Utah Governor's Public Lands Policy Coordination Office

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Table of Contents

Executive Summary 3

Introduction 4

Methods 6
- Sampling 6
- Other Needed Data 7
- County-Level Site Attributes 10
- Statistical Methods: The Travel Cost Model 12
- Statistical Methods: Economic Impact Analysis 14
- Summary of Methods 17

Results 18
- Travel Cost Modeling 19
- Economic Impact Analysis 26

Conclusions 32

References 33

Appendix 1: The Survey 34

Appendix 2: The Travel Cost Model 50

List of Figures and Tables

Figures

Figure 1: Overall Methodology 18

Tables

Table 1: A comparison of this Survey and the National Survey of Recreation and the Environment 8

Table 2: OHV Access to BLM Land: Current Acreage vs. Preferred Alternative (Acres).... 12

Table 3: Travel Cost Model of OHV Recreation 20

Table 4: Change in the Number of Trips Under Proposed BLM Resource Management Plans, by Site 24

Table 5: Gross and Net Changes in OHV Trips, by Regional Grouping 25

Table 6: Regional Impacts of OHV Activity 28

Executive Summary

Using the data collected in the OHV owner survey questionnaire, a data set consisting of the county destinations of each trip from each county origin was created. Several econometric models were tested to determine the significant variables affecting choices of trip destinations by each origin. These models used travel cost, the percentage of public land open, limited (restricted to specific trails), and closed to off-highway vehicle (OHV) use, the existence of sand dunes, the existence of "red rocks" and a county-specific "dummy" variable. Results indicated that all of the variables were significant for each origin county, with the exception of the "county specific" variable, which was significant about half the time.

In order to examine the effects of proposed changes in OHV access in the Bureau of Land Management (BLM) resource management plans (RMPs) as they currently are proposed, the changes in access were used to estimate changes in trip destinations. In general, trip destinations changed from the Southeastern portion of Utah to the Western and Northwestern portions. Most changes were relatively small (less than 2 percent). However, some changes were relatively large (a reduction of 20 per cent in Carbon and Emery Counties and an increase of 40 percent in Sevier County).

Expenditure per trip data from the questionnaire were used in order to determine the economic impact of OHV use in general and the predicted changes in use. Some counties had over 100 jobs associated with current levels of OHV use, but most had much smaller numbers of jobs. Compared to the economic bases of these counties, OHV impacts were quite small (less than 1 per cent). Since changes in visitation were only a portion of the total visitation, the effects of changes on the local economies was very small. The most affected counties (Carbon and Emery) were predicted to lose about 15 jobs, compared to a total employment of over 18,000.

The study indicated, first, that trip destination appeared sensitive to the amount of open, limited and closed land available to recreators. Predicted changes in visitation ranged from very small (around 2 per cent) to signficant (20 to 40 percent). Nevertheless, the economic impact of OHV visitation in general was small relative to the total economies, and the changes were insignificant. It should be noted, however, that those changes could be serious should they occur in a single town or small area.

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Introduction

The use of off highway vehicles (OHVs) is one of the most rapidly growing outdoor activities in the United States and in Utah.[1] Nationally, participation by residents aged 16 years and older has grown from 17% in 1999 to just under 20% in 2007 (Cordell et al., 2008). This means that some 44 million people engaged in OHV recreation in 2007. The Mountain West states as a group (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah and Wyoming) and Utah, in particular, have seen participation rates well above the national average, at 28% and 32%, respectively, in 2007. Indeed, Wyoming, Idaho, and Utah all rank in the top 5 states based on OHV participation. This popularity is reflected in the sharp growth in OHV registrations, with vehicle registrations in the state of Utah growing 233% during the 1998-2006 period (Smith et al., 2008).

Concomitant with the growth in OHV participation has been a host of management problems for stewards of public land. In 2003 Chief Dale Bosworth of the US Forest Service (USFS) declared unmanaged recreation, of which OHV use is an important component, as one of the top four threats facing national forests. Chavez and Knap (2004) outline the reason why

[1] Off highway vehicles are defined as four wheel-drive vehicles, motorcycles, all terrain vehicles (ATVs), and other specially designed vehicles such as dune buggies and sandrails. We do not include snowmobiles in this definition, nor in any of the statistics reported in the study.

unmanaged recreation by OHV users was declared a threat: OHVs can result in unplanned roads, soil erosion, degradation of water quality, destruction of habitat, the spread of invasive species, and conflict with non-motorized users, among other problems.

In response to the problems posed by unmanaged recreation, federal agencies have been directed to develop "travel management plans" as part of an agency's planning process. Agencies such as the USFS and the Bureau of Land Management (BLM) have proposed or are developing plans that restrict access to public lands by OHVs. In general, land management agencies are moving away from current policies that generally allow access to both roadways and cross-country travel with only few areas where access is prohibited, to proposed policies that have tighter restrictions on cross-country travel and larger amounts of land where OHV access is strictly prohibited (see, for example, USDI BLM, 2001).

The goals of this study were to examine the effect of land access restrictions on OHV use in Utah and their potential impacts on local economies. Using a sample of OHV owners who have registered their vehicles, a travel cost model is used to link access to public lands to where OHV owners choose to recreate. Our statistical models are constructed at the county level and allow us to conclude that when access to public land is restricted in a particular county, OHV owners are more likely to recreate in other counties. We examine the changing recreation visitation patterns in response to the access restrictions and predict the net change in visits, by county. We then use this information to gauge the economic impacts at the county level.

Methods

Sampling. Our goal was to sample a randomly selected group of OHV owners in the state of Utah. The survey protocol involved sampling from the list of registered owners maintained by the state.[2] Some 181,500 vehicles were registered during the Spring of 2007. Eliminating duplicate names (many people own more than one vehicle) yielded a population of about 113,700 OHV owners, from which some 1500 names and addresses were drawn for participation in the mail survey. The survey materials (cover letter, survey and state map) were designed by Utah State faculty in consultation with representatives of the Utah Governor's Office of Public Lands Policy Coordination, with an initial mailing date of June 2007. Eighty-four surveys were classified as undeliverable. Five attempts were made to elicit a response: the initial mailing of the survey, a reminder postcard, a second full survey mailing, a second reminder postcard and, finally, a third mailed survey. Mail activities were completed in August 2007. Of the 1416 "deliverable" addresses, responses were received from 600 for a response rate of 42.4%. The survey instrument appears in Appendix 1.

We can evaluate the represenativeness of the sample by comparing statistics yielded by the National Survey of Recreation and Environment (NSRE). The two samples are not entirely comparable in that the NSRE is a sample of overall participation in various recreation pursuits whereas our survey focused on those who own and register OHV vehicles. Thus the NSRE sample includes, for example, friends and family members who participate in OHV recreation but do not own a vehicle, and those who rent OHVs. The reasons for not owning a vehicle are

[2] Complete details are available in Smith et al. (2008).

many (e.g., a lack of sustained interest in OHV recreation, income constraints, etc.) so we do not expect an exact correspondence across the two samples.

Table 1 shows that our sample of Utah residents who own and register their OHVs is older than the general population engaging in OHV recreation. Further, our sample is less ethnically diverse and has greater household income. Educational questions were not asked in an identical manner across the two surveys: we combined our "some college" and "technical degree" categories into the "some college" category of the NSRE. Our sample has fewer respondents in the both the lowest and highest educational categories. In general, this demographic pattern across the two surveys corresponds well with our expectations: OHV owners were expected to be older and have greater incomes than the general population of OHV recreationists.

Other Needed Data. Survey data are supplemented by secondary sources. Our statistical model, based on the cost of travel from ones home to a destination, requires that one be able to identify both the origin of the trip—where the rider left home—and the destination of the trip—exactly where he or she recreated. Origins were identified using the respondent's home zip code. Destinations were elicited by first asking the name of the destination (trailhead) for the respondent's most recent trip and then asking for the county in which this destination is located (questions 4 and 5 in Appendix 1). This information was used to develop a list of recreation sites that correspond to a set of latitude and longitude coordinates. Respondents were also asked to estimate the number of trips made to each county in Utah and trips to neighboring states over the previous 12 month period (question 17 in Appendix 1).

Table 1: A Comparison of this Survey and the National Survey of Recreation and the Environment (NSRE Study, Cordell et al. 2008).

Category	This survey	NSRE
Age		
Less than 30	6.9%	26.4%
30 – 50	49.0%	38.8%
Over 50	45.0%	34.9%
Ethnicity		
White	98.4%	90.0%
Other	1.6%	10.0%
Income		
Less than $49,999	19.6%	55.0%
$50,000 - $74, 999	27.6%	24.2%
$75,000 - $99,999	25.5%	10.2%
$100,000 - $149,999	17.7%	7.5%
Over $150,000	9.6%	3.1%
Education		
Less than High School	2.3%	6.5%
High School Graduate	20.8%	23.5%
Some college	48.5%	36.7%
Bachelor's degree	19.0%	20.4%
Post-graduate degree	8.7%	12.9%

Most sites were relatively easy to locate: site names provided by respondents were input into the search procedure in the All Topo CD-ROM map set for Utah and neighboring states.[3] After locating the site, coordinates for latitude and longitude were recorded. Other sites, such as the

[3] All Topo is a CD-ROM product that includes digitized 7.5 minute maps for the entire state. The "map search" feature identifies the 7.5 minute quadrangle on which given site name appears, as well a providing a location "tag". Scrolling the cursor anywhere on the map provides the geographic coordinates.

"West Desert", refer to an expansive geographical region and there was little we could do to identify the trailhead visited. Our final data set consisted of 235 identifiably distinct destinations. Unfortunately, 235 choice destinations for a recreation activity such as OHV riding presents many empirical difficulties. First, the site location is merely a trailhead from which riders depart for recreation. The analyst must somehow define site attributes (e.g., miles of trail or acres of public land) for the area accessed from a trailhead. How large should the area around the trailhead be? Is it the mean daily distance traveled on the OHV (say, a 60 mile radius around the trailhead, or a 11,300 square mile area) or the median distance (a radius of 40 miles, or 5000 square miles)? Why would the area be defined by a circle around the trailhead? Would not the appropriate area and shape of a region differ depending upon the terrain at the site? Analysts have found no clear answer to questions such as this (see Karou *et al.* 1995 for an example of boat launching on the Atlantic coastline). A second complication is that 235 sites make for an unwieldy and difficult statistical model; indeed this number exceeds the maximum number of choices that can be handled by current statistical computer programs. Thus, it is desirable to reduce the number of choices.

In view of these empirical difficulties, individual sites were aggregated to the county level (again, see Karou *et al.* 1995). All sites within a county were combined into a single "aggregate county site" by creating a weighted average of the latitude and longitude coordinates for all destinations within a county. Weights were defined by the number of people visiting each site, such that the most heavily visited site in a county received the greatest weight while the least visited site received the smallest weight. As a final step in the process, travel distances were measured from the center of each origin zip code to the geographic coordinates for each of the

29 aggregate county-level sites and three neighboring states (Arizona, Idaho and Wyoming) using the USDA computer program ZIPFIP. The cost of travel to these sites was calculated by multiplying by a constant per mile cost of vehicle operation, $0.201 per mile, the estimated variable cost of operating a sport utility vehicle in the year 2006 (AAA).

County Level Site Attributes. Two key attributes of site-choice decisions are (1) the amount of area available for OHV activities and, (2) the miles of OHV trail available. The State of Utah Automated Geographic Reference Center provides relevant GIS data for the entire state. These GIS databases were used to construct measures of current land use by county (i.e., how much land is public, private, covered by water, in designated wilderness areas, etc.). The key GIS categories for the purposes of this study are the total amount of land in a county, the total amount of public land in a county, and the amount of public land from which OHVs are prohibited. While the first two categories were easily determined from GIS data, we did not have access to an exact measure of public lands from which OHVs are currently prohibited. Public lands used for military purposes, designated wilderness areas, and Wilderness Study Areas have OHV access prohibited, and we were able to calculate the amount of land within these categories. Similarly, six BLM field offices (FOs) have published draft resource management plans (RMPs) that report acreage and provide maps on which OHV use is currently prohibited or limited. Table 2 shows acreage for the Price, Moab, Monticello, Price, Richfield, and Vernal FOs.

Each BLM RMP reported land management acreage for the entire Field Office. The RMP also included maps of land under which OHV use is permitted, limited or prohibited under current

and proposed management alternatives. Each BLM Field Office encompasses more than one county, so it was necessary to convert this information to correspond to our designation of recreation sites (counties). With the exception of the Kanab FO, the maps for current and preferred management alternatives were digitized to allow calculation of acreage in the open, limited, and closed categories. This step was unnecessary for the Kanab FO, which provided this information upon request. Our measure of "closed" public lands in a given county is calculated as the sum of military, designated wilderness, wilderness study areas, and closed BLM land.

Unfortunately, we did not have access to the amount of acreage closed to OHV use by other state and federal management agencies (e.g., USFS or USNPS), or for BLM Field Offices which have not yet developed an RMP. Because we do not have a measure of all land on which OHV access is restricted, we are undercounting the amount of public land on which access is prohibited or limited under current management conditions.[4]

Other site attributes may also be important factors. GIS data were available for miles of "A50" road in each county, where the U.S. Bureau of Census definition for an A50 road is "Jeep trail, passable only by four-wheel drive (4WD) vehicle". Site attributes such as the presence of a sand dune (Kane and Juab counties) or red rock country (the broad swath of counties across southern and north eastern Utah) may also be important. These influences were captured by

[4] This introduces the problem of measurement error into the statistical model. The result is that our parameter estimate for, say, "closed acreage", will be attenuated toward zero. That is, we will be underestimating the effect of closed acreage on visitation (Greene, 2000).

Table 2: OHV Access to BLM Land: Current Management vs. Preferred Alternative (Acres)

Category	Current	Preferred	Net Change
		Kanab FO	
Open	466,600	1,100	(465,500)
Limited	66,200	524,000	457,800
Closed	21,200	28,900	7,700
		Moab FO	
Open	620,212	1,866	(618,346)
Limited	1,196,920	1,481,334	284,414
Closed	5,062	339,298	334,236
		Monticello FO	
Open	611,310	2,311	(608,999)
Limited	895,380	1,362,142	466,762
Closed	276,430	418,667	142,237
		Price FO	
Open	754,193	0	(754,193)
Limited	1,590,540	2,076,096	485,556
Closed	9,689	403,181	393,492
		Richfield FO	
Open	1,636,400	8,400	(1,628,000)
Limited	277,600	1,909,200	1,631,600
Closed	214,000	210,400	(3,600)
		Vernal FO	
Open	787,859	6,202	(781,657)
Limited	887,275	1,643,475	756,200
Closed	50,388	75,845	25,457

including “county specific constants” in the statistical models, where the constants measure unobserved attribute differences across the counties.

Statistical Methods: The Travel Cost Model. Our basic statistical aproach is to use a “travel cost model” to measure OHV visitation patterns within Utah and to surrounding states. The travel cost model will statistically link public lands policy regarding OHV access to where OHV enthusiasts visit and how often they visit. Our hypothesis is that if a federal agency restricts OHV access to public lands, OHV users are more likely to choose alternative sites for recreation, i.e., recreate in other counties or states. This will result in a change in expenditures in the

original counties. We then use an "economic impact model" to estimate the impact of changing expenditures on income, jobs and tax revenues in the affected counties.

Details of the travel cost model appear in Appendix 2, but here we provide an intuitive explanation of the approach. The travel cost model is based on a simple insight: given two recreational sites of identical quality, a person will visit the site that is closer to his home. That is, one will choose the cheaper choice, where cost is measured by the cost of travel to the site. With travel cost acting a price variable and the number of recreational trips corresponding to a measure of quantity demanded, economists have long noted that one can map out a demand relationship showing the link between price and quantity, where the number of trips is inversely related to the travel cost: as cost increases, the number of trips to any particular site decreases (Ward and Beal, 2000).

Of course, travel cost is not the only factor influencing where people choose to recreate. The *quality* of a site also matters. For example, the quality of a fishing site could be measured by the number of fish caught, the size of fish caught, presence of a favored species, etc. In the case of OHV recreation, quality characteristics could include the amount of public land available and "open" for OHV recreation, miles of trail, and landscape characteristics such as the presence of sand dunes and red rock country. To the degree that desired characteristics are present at a given site, people may be willing to drive past a nearby site (thus incurring greater costs) to enjoy the higher quality site.

We can estimate a statistical model linking the places that people visit to the travel cost and site quality characteristics of that site. Mathematically, we can write the statistical model as,

$$\text{Number of Trips} = \alpha + (\beta \times \text{Travel Cost}) + (\gamma \times \text{“Open” Public Land}) + (\delta \times \text{Other Variables})$$

The parameters denoted by the greek letters α, β, γ, and δ are values to be estimated by the statistical model. We expect the travel cost parameter, β, to be negative. That is, as travel cost increases, all else equal, people will take fewer trips. We also hypothesize that OHV enthhusiasts prefer public land that is open to OHV use, so we expect that our statistical model will yield a positive value for γ. That is, people will take more trips to areas and regions that have greater amounts of public land available for OHV recreation; as the amount of accessible public land decreases, people will visit less frequently.

We use a form of the travel cost model called the linked site choice-total trips model. The model will allow us to estimate the probability that any given site (county) is visited on a given trip occasion, which is then linked to the total number of trips taken during a 12 month period. Under changing land access conditions, we can estimate how people will change both where they choose to go and how often they choose to go (see Appendix 2 for details).

Statistical Methods: Economic Impact Analysis. Expenditures by OHV enthusiasts for goods and services, capital equipment, and other materials enhance both the local economy and the local tax base. One way the extent of economic benefits garnered by a region can be measured is in terms of the number of jobs created and the amount of personal income accruing to residents. The process can also work in reverse: the loss of expenditures in a “region” (county, group of counties, State, or nation) directly leads to a loss in income and jobs, additional lost sales, jobs, and incomes in supplier firms, etc.

These impact measures can be further broken down into *direct, indirect, and multiplier* (or *ripple*) effects. *Direct* effects are those attributable specifically to the new expenditures in a region, and more specifically the goods or services "exported" from the region. For example, expenditures by non-resident OHV recreationists at a restaurant lead to the employment of waiters, cooks, and cashiers. These workers represent the direct employment impact of the expenditures.

However, only expenditures from visitors outside the region can be counted as direct effects or additions to spending. This is because it is assumed that local residents would spend on some other recreation (or other) activity were the specific activity of interest not available. For example, local residents might attend a movie instead of eating at a restaurant. Only if it can be shown that those residents would make expenditures *outside the region* if the specific activity of interest were not available can the expenditures of residents be counted as a direct effect, or "export." Thus, resident expenditures are not a part of the "direct" effects, or exports.

Indirect effects arise from businesses' expenditures on raw materials, services, supplies, and other operating expenses which help to support jobs in other local businesses. For example, a restaurant may see its sales expand due to recreation expenditures, thus requiring more purchases from food services wholesalers and, potentially, greater accounting and legal services from other local firms. Note that only the *value added* via the local production process, not the total *retail sale*, gives rise to additional economic benefits for the community. Only the portion of the expenditure actually retained by the local vendor can be used in the

calculation of the firm's indirect income impact on the *local* economy. It is for this reason that retail sales, in isolation, represent a poor measure of economic impact. Hence, when local businesses purchase merchandise for resale, most of the proceeds accrue to the community where the goods were manufactured. Thus, the size of a firm's indirect impact on local incomes depends primarily on the dollar value of locally purchased goods and services *and* whether or not these same goods and services are locally produced or imported into the community. In addition, the amount of indirect employment generated by the business firm will vary with the amount of under-utilization of workers and capacity existing in local businesses. Although the firm's payments to local vendors increase the amount of local business activity, they will not translate to significant increases in employment if local firms are currently experiencing excess capacity. Instead of hiring new workers, managers will utilize the excess capacity first, thereby resulting in a smaller indirect impact than if local supply firms were operating at full capacity.

Finally, *induced,* or *ripple* effects are created as the new household income generated by the direct and indirect effects is spent and re-spent within the local economy. Note that it is the new purchasing power from *outside* the community—the ability to "export" recreation—that gives rise to the direct, indirect, and induced effects. For example, part of the wages received by a firm's employees will be spent on housing. If the employee rents an apartment in Moab, a portion of the rent payment will be used to pay local employees of the apartment complex. These employees will in turn spend a portion of their income in the local community on groceries, housing, etc., thus adding to the amount of local personal income attributable to the firm's activities. However, during each of these subsequent rounds of spending, a large portion

of the income generated leaks out of the state or regional economy through taxes, savings, and spending outside the region, thereby diminishing the increment to regional income attributable to these firms.

Total economic impacts attributable to increased business activity are computed as the sum of the direct, indirect, and induced effects. The "multiplier" is the relationship between the direct effect and the sum of direct, indirect, and induced effects. However, because of the many factors that must be considered in determining the size of the multiplier, gaining an accurate measure of total new personal income (or jobs) accruing to the state or region can be difficult.

Summary of Methods. An overview of our methods can be seen in Figure 1. Our population survey is used to establish baseline county-level OHV recreation visits and expenditures in the Utah and in surrounding states. A Travel Cost Model is used to link visitation patterns to public lands management. As management of public lands changes, say, moving public land from "open access" to "closed", the travel cost model allows us to see how OHV enthusiasts respond. We expect the model to show vistiation moving away from regions with increased land closures and toward regions that maintain current land access policies. The changing recreation visitation pattern implies a changing pattern of expenditures. Regions experiencing decreased visitation due to increased public land closures will experience a decrease in expenditures by OHV recreationists. Our economic impact analysis will gauge the employment, income and fiscal impacts of the change in expenditures.

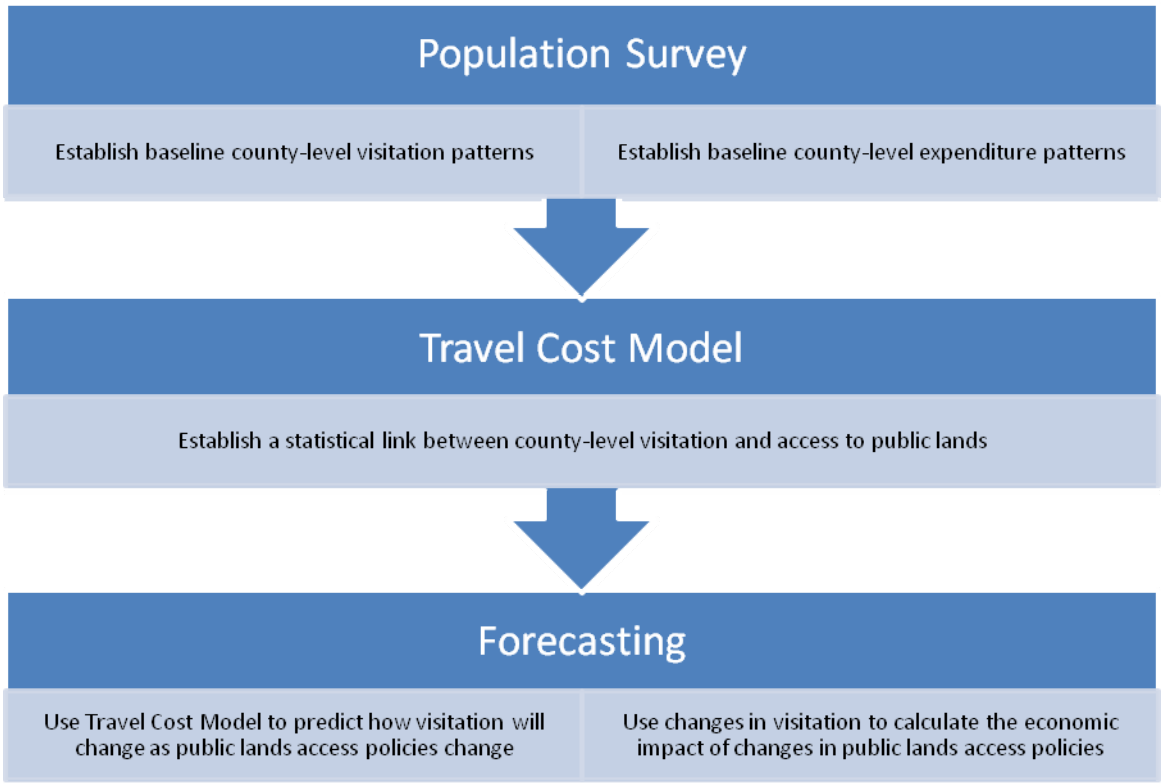

Figure 1: Overall Methodology

Results

The travel cost model presented below focuses on the tripmaking behavior of 540 owners of OHVs who supplied complete data. Of this group, the average OHV owner took 10.5 trips with their OHV during the 12 months preceding the survey. Trips were dispersed across the state, with the most popular sites for the most recent trip being in Utah, Juab, Tooele, and Washington counties. These four counties accounted for nearly 25% of total trips within the state of Utah during the twelve month period.[5] The most popular out-of-state destination was

[5] See Smith et al. (2008) for trip statistics for all 29 Utah counties and neighboring states.

Idaho, where the sand dunes near St. Anthony are a major attraction. Some 76% of OHV owners reported traveling along established roads on their OHVs, although a sizable minority (24%) reported spending much of their riding time off established trails.

Travel Cost Modeling. Numerous specifications of our linked site choice-total trips travel cost model were estimated, with our preferred specification presented in Table 3. The top of the table reports the site-choice portion of the model (where people visit) and the bottom part of the table reports the total trips portion of the model (how often people make trips, regardless of where they go). The model includes 32 choices of recreation destination—the 29 counties in Utah and then aggregated state-level sites in Arizona, Idaho, and Wyoming.

In the site-choice portion of the model all of the site-attribute measures have the expected sign. That is, the *Travel Cost* parameters are negative (closer sites are preferred to sites located farther away) and *Miles of Trail* is positive (four-wheel drive roads are viewed positively by OHV enthusiasts). Our key attribute measures concern acreage of public lands that are closed and open to OHV users, both of which entered the model as the natural logarithm of acreage.[6] The coefficient on *Closed Acreage* is negative, implying that as the amount of "closed" acreage in a county increase the site is less likely to be selected as a place to visit. The coefficient statistically insginificant at conventional levels of the two-sided hypothesis test that the coeeficicient is equal to zero. Our expectation is that the sign would be negative, though, and one-sided t-test of the null hypothesis that the coefficient is greater than or equal to zero is

[6] We do not include the amount of acreage that is "limited" to travel on existing trails for two reasons. First, the Miles of Trail variable does capture the effect of roads and trails on site choice. The second reason is far more technical: the amount of "limited" acreage is highly correlated with both "closed" and "open" acreage. The high correlation causes the model to become unstable.

Table 3: Travel Cost Model of OHV Recreation

Variable	Coefficient	t-Statistic	Statistically Significant?
	Site Choice Model		
In-state Travel Cost	−0.057	−12.272	Yes
Miles of Trail	0.003	1.585	No
Ln (Closed Acreage)	−0.046	−1.174	No
Ln (Open Acreage)	0.210	4.491	Yes
Out-of-state Travel Cost	−0.013	−1.828	Yes
*County Specific Constants**			
Beaver	0.799	2.371	Yes
Box Elder	−1.917	−4.168	Yes
Cache	−0.323	−1.185	No
Carbon	0.376	1.203	No
Daggett	0.070	0.117	No
Davis	0.653	2.100	Yes
Duchesne	−1.215	−4.858	Yes
Emery	0.273	0.838	No
Grand	1.845	6.384	Yes
Iron	0.711	2.353	Yes
Juab	0.115	0.492	No
Kane	0.858	2.007	Yes
Millard	−0.610	−1.598	No
Morgan	−0.799	−1.690	Yes
Piute	2.164	4.699	Yes
San Juan	1.199	3.963	Yes
Sanpete	0.645	1.642	No
Sevier	0.068	0.197	No
Summit	−0.674	−1.779	Yes
Tooele	−1.571	−4.397	Yes
Uintah	−1.032	−2.898	Yes
Utah	−1.094	−5.369	Yes
Wasatch	−0.830	−2.085	Yes
Washington	1.342	4.023	Yes
Arizona	2.388	3.049	Yes
Idaho	2.728	7.475	Yes
	Total Trips Model		
Intercept	−0.239	−0.335	No
Inclusive Value	0.406	3.257	Yes

*Due to collinearity issues, constants were omitted for Garfield, Rich, Salt Lake, Wayne, and Weber counties in Utah, and for the state of Wyoming.

rejected with a P-value of 0.13. The coefficient on the *Open Acreage* is positive, implying that as the amount of open acreage in a county increases, the site is more likely to be selected as a place to visit. The coefficients on *Travel Cost* and *Open Acreage* were statistically significant , with *Miles of Trail* falling just below standard levels of significance under standard two-sided hypothesis tests.

Unmeasured attributes of a given recreation site were captured using alternative (county) specific constants (ASCs).[7] With 32 choices, one cannot include a constant for all choices due to collinearity problems. After experimentation with a variety of specifications, ASCs were dropped for Garfield, Rich, Salt Lake, Wayne, and Weber counties in Utah, and for the state of Wyoming. In essence, we are treating these counties as the base against which all other counties are compared. As such, one can interpret a positive ASC as indicating, all else equal, that a county has unobserved attributes which are preferred to the baseline counties. A negative ASC implies unobserved attributes which are not preferred to those in the baseline counties, all else equal. Of the 26 ASCs parameter estimates, 10 are negative and 16 are positive. Eighteen of the estimates are statistically significant at conventional levels of significance. Two others lie just below this level of significance.[8]

[7] These attributes include things such as the presence of a popular sand dune site, or the presence of Utah's spectacular red rock country.

[8] We also estimated models that did not include alternative specific constants (ASCs) but instead included the site attributes listed in footnote 7 in addition to the site attributes shown in Table 3. These statistically strong models conformed to expectations for all attributes, but did not predict current visitation patterns as well as the ASC-model. Given our goal of predicting changes in visitation in response to changes in land management, it was decided to use the model that best predicted visitation patterns under current land management conditions.

The total trips model appears in the bottom portion of Table 3. The intercept is statistically insignificant, but the inclusive value parameter is positive and staistically significant. This implies that as the attributes of OHV recreation that yield satisfaction increase, then the number of trips made each year will also increase. If attributes desired by OHV recreationists decrease, the number of trips will decrease. For example, under the present baseline access conditions, the model predicts that average OHV owner is predicted to take 10.47 trips over a twelve-month period. Under the proposed land access conditions, less public land will be available, causing fewer trips to be made.

The model presented in Table 3 can be used to estimate how OHV users will react to changes in public lands access. Using the site choice-total trips model we first evaluate the baseline probability that a given site is chosen (see Appendix 2). For example, under current (baseline) land management conditions Carbon county is expected to account for 2.80% of all OHV trips taken to the 32 choices, whereas Summit county is predicted to account for 5.54% of all OHV trips. In Carbon county the preferred management plan reported in the BLM's Price FO RMP calls for a large movement of acreage from "open" to "limited" and "closed".[9] In contrast, we record no change in land management in Summit county. Using the parameters of the travel cost model presented in Table 3, we estimate that loss of acreage open for OHV access will cause the probablity that Carbon county is visited to fall to 1.97%, a percentage change of almost 30%, a decrease of some 7,900 trips.

[9] Carbon County was calculated to have about 90,000 acres of public land closed to OHV access under baseline conditions. Similarly, Summit County had about 165,000 acres of public land close to OHVs. Under the Price FO preferred alternative, more than 100,000 additional acres would be closed to OHV access. Summit County would experience no change in access to public lands.

The linked site choice-total trips model takes this loss in satistfaction and allocates it in two ways: some people will simply go someplace else, and some people may chose to make fewer recreation trips. In our model, for example, the probability that Summit county is chosen for a recreation visit increases to 5.65%, a net percentage change of 1.85%. The six BLM FOs for which RMPs have been developed are all located in eastern and south-central Utah. At the time of this writing (September 2008) RMPs for other BLM offices and plans for other state and federal agencies are not yet available. As such, all the "loss" in public lands occurs in the eastern and south-central parts of the state. Our model predicts a movement of trips out of this portion of the state and into counties located in the western and northern portions of the state, and to the surrounding states of Arizona, Idaho and Wyoming.

Changes in visitation for all 32 destinations appear in Table 4. Most of the changed trips were less than 2% of the baseline. However, Carbon and Emery Counties had decreases of greater the 20%, Grand and Wayne Counties had decreases of more than 10%, and Piute and Uintah Counties had decreases of close to 10%. Only Sevier County had an increase of more that about 2%. Its increase was over 40%.[10]

In order to examine the effects on the Associations of Governments (AOGs) and BLM FOs, counties were grouped together (Table 5). Note that county groupings for most FOs are somewhat inaccurate, because many FO boundaries are determined by geographic and physical

[10] Sevier County "gains" because the preferred alternative of the Price FO does not propose closing any additional acreage. The fact that many counties experienced the exact percentage change in visitation is an artifact of the RUM approach. These counties had no change in their attributes, so the RUM model simply "redistributes" trips to these counties in equal proportion.

Table 4. Change in Number of Trips Under Proposed BLM Resource Management Plans, by Site

County	Baseline Trips	Change in Trips with New BLM RMP	% change in trips by county
Beaver	12688.11	234.8058	1.85%
Box Elder	20512.44	379.6027	1.85%
Cache	56885.03	1052.713	1.85%
Carbon	26645.03	-7901.32	-29.65%
Daggett	3172.028	43.19468	1.36%
Davis	33412.02	618.3219	1.85%
Duchesne	21569.79	424.3963	1.97%
Emery	46100.13	-16857.9	-36.57%
Garfield	22627.13	-1045.52	-4.62%
Grand	23473.00	-4082.41	-17.39%
Iron	23895.94	428.1865	1.79%
Juab	78454.81	1451.882	1.85%
Kane	49483.63	-1335.6	-2.70%
Millard	37006.99	684.8502	1.85%
Morgan	12476.64	230.8924	1.85%
Piute	14168.39	-1146.32	-8.09%
Rich	20300.98	375.6893	1.85%
Salt Lake	30028.53	555.707	1.85%
San Juan	18609.23	-960.944	-5.16%
Sanpete	58999.71	-2198.14	-3.73%
Sevier	63229.08	27273.26	43.13%
Summit	66824.05	1236.644	1.85%
Tooele	74013.98	1369.7	1.85%
Uintah	18397.76	-1749.22	-9.51%
Utah	88605.3	1639.727	1.85%
Wasatch	55616.22	1029.232	1.85%
Washington	73802.51	1365.787	1.85%
Wayne	21781.26	-3701.25	-16.99%
Weber	18186.29	336.555	1.85%
Arizona	17128.95	316.9878	1.85%
Idaho	74518.85	1379.044	1.85%
Wyoming	11298.36	209.0871	1.85%

Table 5. Gross and Net Changes in OHV Trips, by Regional Grouping

Region	Gross change number of trips	Net Change number of trips
Beaver/Iron	663	348
Box Elder, Cache, Rich	1,808	974
Carbon, Emery	-24,759	-12,007
Daggett, Duchesne, Uintah	-1,282	-401
Davis, Morgan, Salt Lake, Tooele, Weber	3,111	524
Garfield, Kane	-2,381	-1,513
Garfield Piute, Sanpete, Sevier, Wayne	19,182	6,583
Grand, San Juan	-5,043	-3,907
Juab, Millard	2,137	2,000
Piute, Sanpete, Sevier, Wayne	20,228	7,473
Summit, Utah, Wasatch	3,906	2,394
Washington	1,366	404
Kane	-1,336	-580
Cache, Rich	1,428	883
Box Elder, Tooele	1,749	1161
Morgan, Summit, Wasatch	2,497	2115
Beaver , Iron, Juab, Millard	2800	2345
Garfield, Kane, Wayne	-6082	-4138
San Juan	-961	-526
Grand	-4082	-3570
Piute, Sanpete, Sevier	23929	11227
Beaver, Garfield, Iron, Kane, Washington	-352	-218

features and can include all or part of a given county. As a result, several alternative groupings were used, as suggested by the Utah Governor's Public Land Policy Coordination Office and others. Again, in each of these county groupings, the "net" trips had to be determined. Intra-county trips were subtracted from the sum of all the trips to a given region, in order to exclude "local" expenditures from the impact analyses. These "net trips" are listed in Table 5.

Note that Garfield County is included in two BLM regions: Kanab FO and Richfield FO. This is because both FOs contain portions of Garfield County, but there is no way to distinguish proportions of OHV use between the portions of Garfield County in each FO. Changes in trips within a region are assumed to follow the same relationship as current trips within a region. That is, if 10% of the trips in the Carbon-Emery region (Price FO) are intra-regional trips (either within or between the two counties), 10% of the change in trips was assumed to come from those intra-regional trips (a reduction in this region). The Richfield FO contains counties with relatively large losses in trips (Piute and Sanpete Counties) and Sevier County which has a relatively large gain in trips. Moreover, many of the trips are intraregional. Thus, the net change in out of region use in the Richfield FO is much smaller than the total trips to all these counties, even though the counties within the FO experience relatively large changes.

Economic Impact Analysis. In order to estimate the impacts of changes in visitation due to BLM policies, the change in non-resident visitor expenditures were determined. Visitor expenditures "outside their county of origin" were collected for eight economic sectors consistent with North American Industrial Classification System sectors. These were: restaurant and eating establishments, grocery stores, transportation services, lodging, non-food retail, entertainment,

rental equipment and supplies, and parking and entry fees. It was assumed that these expenditures occurred in the destination county. Mean expenditures were determine by sector, by county, and then used to calculate OHV visitor expenditures. Again, the level of expenditure in each group of counties had to be determined by calculating the expenditures within each county by outside residents, so that intra-regional trip expenditures were not counted. Once the "export" expenditures were determined, they were entered into the IMPLAN ("IMpact analysis for PLANning") model as changes in final demand. Changes in trip expenditures were treated exactly the same way. Table 6 presents the direct (export) and total (direct, indirect and induced) changes in regional sales (Regional Gross Output, or RGO), employment, household income, and value added for both total trips and for changed trips.

In general, OHV expenditures are a very small part of these regional economies, never exceeding more than about 1.5 % of total employment, income, value added or RGO. Nevertheless, an important number of jobs and associated amounts of income and value added are due to OHV visitors in several of the counties and regions. Clearly, the small changes in visits in most counties due to BLM land management policies will have no perceptible effect on these regional economies. The largest proportional change is in Carbon and Emery Counties, where about 40% of the jobs and income associated with OHV recreation are lost as a result of reduced OHV use. That is, of the 37 jobs associated with with OHV recreation in these two counties, about 15 will be lost due to the Price FO proposed Resource Management Plan. As a percentage of the entire employment base of over 18,000 jobs, though, this is less than a 0.1% change in the total local employment. In no case does the change in any economic measure exceed 0.1%.

Table 6: Regional Impacts of OHV Activity

		Total Economic Impact of OHV Visitation			Total Economic Impact of Changes in OHV Visitation		
	Measure	***Direct***	***Direct + Indirect + Induced***		***Direct***	***Direct + Indirect + Induced***	***Region Total, All Economic Sectors***
Beaver/Iron							
Change in Visits	RGO	$155,080	$208,848	RGO	$4,045	$5,451	$2.88 bil
+348	Emp	2.3	3	Emp	0.1	0.1	27,723
	HHI	$44,555	$59,165	HHI	$1,165	$1,546	$825 mil
	VA	$69,286	$98,608	VA	$1,843	$2,610	$1.3 bil
Box Elder/Cache/Rich							
Change in Visits	RGO	$2,833,720	$3,618,448	RGO	$51,202	$63,952	$10.7 bil
+974	Emp	37.6	46.4	Emp	0.6	0.8	82,774
	HHI	$588,446	$802,057	HHI	$9,876	$13,409	$2.83 bil
	VA	$950,400	$1,334,226	VA	$16,202	$22,546	$4.1 bil
Carbon/Emery							
Change in Visits	RGO	$1,887,327	$2,379,732	RGO	($764,783)	($960,976)	$2.259 bil
-12,007	Emp	31.8	37.3	Emp	-12.6	-14.8	18,228
	HHI	$487,173	$637,960	HHI	($193,188)	($253,263)	$722 mil
	VA	$823,803	$1,108,030	VA	($329,451)	($442,647)	$1.284 bil
Daggett/Duchesne/Uintah							
Change in Visits	RGO	$1,563,862	$1,952,609	RGO	$24,803	$31,107	$3.65 bil
-401	Emp	23.4	27.6	Emp	0.4	0.5	25,128
	HHI	$413,454	$531,731	HHI	$6,849	$8,755	$1.13 bil
	VA	$686,416	$913,077	VA	$11,975	$15,640	$2.16 bil

Table 6: Regional Impacts of OHV Activity, continued

		Total Economic Impact of OHV Visitation			Total Economic Impact of Changes in OHV Visitation		
	Measure	***Direct***	***Direct + Indirect + Induced***		***Direct***	***Direct + Indirect + Induced***	***Region Total, All Economic Sectors***
Davis/Morgan/Salt Lake/Tooele/Weber							
Change in Visits	RGO	$2,320,204	$3,793,221	RGO	$11,974	$19,337	$130.7 bil
+524	Emp	32.8	45.7	Emp	0.2	0.2	1,022,516
	HHI	$710,348	$1,158,120	HHI	$3,552	$5,808	$44 bil
	VA	$1,126,296	$1,919,034	VA	$5,930	$9,903	$66 bil
Garfield and Kane							
Change in Visits	RGO	$4,821,745	$5,925,737	RGO	($229,591)	($282,734)	$657 mill
-1513	Emp	73.7	86.9	Emp	-3.5	-4.2	7,071
	HHI	$1,417,712	$1,721,776	HHI	($68,399)	($83,081)	$207 mil
	VA	$2,122,632	$2,761,400	VA	($99,738)	($130,522)	$360 mil
Garfield/Piute/Sanpete/Sevier/Wayne							
Change in Visits	RGO	$9,958,383	$13,128,774	RGO	($172,800)	($232,733)	$2.41 bil
+6583	Emp	162.5	198	Emp	-3	-3.6	24,380
	HHI	$2,640,724	$3,475,041	HHI	($52,588)	($68,499)	$741 mil
	VA	$4,069,865	$5,652,589	VA	($72,667)	($102,824)	$1.13 bil
Grand/San Juan							
Change in Visits	RGO	$1,493,830	$1,968,477	RGO	($290,524)	($382,830)	$782 mil
-3907	Emp	23.9	28.9	Emp	-4.6	-5.6	10,024
	HHI	$429,440	$567,796	HHI	($83,129)	($110,062)	$308 mil
	VA	$750,953	$1,015,850	VA	($146,120)	($197,573)	$475 mil

Table 6: Regional Impacts of OHV Activity, continued

		Total Economic Impact of OHV Visitation			Total Economic Impact of Changes in OHV Visitation		
	Measure	***Direct***	***Direct + Indirect + Induced***		***Direct***	***Direct + Indirect + Induced***	***Region Total, All Economic Sectors***
Juab/Millard							
Change in Visits	RGO	$3,494,330	$4,207,456	RGO	$90,656	$109,190	$1.35 bil
+2000	Emp	44	54.5	Emp	1.1	1.4	14,132
	HHI	$657,115	$842,510	HHI	$17,049	$21,861	$417.5 mil
	VA	$1,101,471	$1,505,672	VA	$28,577	$39,067	$754 mil
Piute/Sanpete/Sevier/Wayne							
Change in Visits	RGO	$6,043,702	$8,102,866	RGO	$374,919	$475,799	$2.15 bil
+7473	Emp	121.6	143.8	Emp	7.4	8.7	21,412
	HHI	$1,604,922	$2,133,745	HHI	$90,165	$121,315	$656.5 mil
	VA	$2,662,332	$3,664,784	VA	$166,823	$225,444	$988.2 mil
Summit, Utah, Wasatch							
Change in Visits	RGO	$8,022,628	$12,074,334	RGO	$176,578	$265,710	$29.2 bil
+2394	Emp	112.3	153.9	Emp	2.5	3.4	275,125
	HHI	$2,450,329	$3,678,462	HHI	$53,892	$80,905	$9.7 bil
	VA	$3,658,017	$5,888,636	VA	$80,593	$129,663	$14.6 bil
Washington							
Change in Visits	RGO	$742,969	$1,060,376	RGO	$16,591	$23,679	$6.04 bil
+404	Emp	10.7	14.1	Emp	0.2	0.3	64,718
	HHI	$220,360	$316,921	HHI	$4,921	$7,077	$2.14 bil
	VA	$366,735	$546,223	VA	$8,190	$12,198	$3.16 bil

Table 6: Regional Impacts of OHV Activity, continued

		Total Economic Impact of OHV Visitation			Total Economic Impact of Changes in OHV Visitation		
	Measure	***Direct***	***Direct + Indirect + Induced***		***Direct***	***Direct + Indirect + Induced***	***Region Total, All Economic Sectors***
Kane							
Change in Visits	RGO	$2,007,517	$2,395,082	RGO	($73,483)	($87,660)	$394 mill
-580	Emp	30.4	34.9	Emp	-1.1	-1.3	4,103
	HHI	$542,164	$645,342	HHI	($19,834)	($23,608)	$122 mill
	VA	$956,354	$1,180,218	VA	($34,982)	($43,171)	$221 mill

Note: RGO = Regional Gross Output, Emp = Employment, HHI = Household Income, VA = Value Added
Negative economic impacts appear in parentheses

Conclusions

Although OHV ownership and use in Utah has increased dramatically over the past decade, it appears that despite relatively high rates of visitation, the economic impact of that recreation activity is small compared to the rest of the economic activity in the AOGs and FOs in Utah. According to our statistical analysis, changes in BLM policy toward more lilmited access for OHV use may have an impact on the location and amount of visitation in some parts of Utah. In particular, the "red rock" scenic areas of Southeastern Utah will likely see some reduction in visits, while other areas (the Western and Northern portions of Utah) will likely see increases in use as recreators shift from increasing limited access areas to more "open" areas. However, our model suggests that these changes will be relatively small, and the resulting economic impacts will be negligible.

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Appendix 1

The Survey

Utah Recreational

Off-Highway Vehicle Use Survey

*For the purposes of this study, Off-Highway Vehicles (OHVs) are defined as **any all-terrain vehicle, dune-buggy, rock-crawler, or motorcycle**. This excludes snowmobiles. While snowmobiles are often considered Off-Highway Vehicles, they **are not** within the focus of this study and have been excluded, with the exception of Question 1.*

*This study also **specifically** concerns off-highway **recreational** use on **public lands**. If you only use your OHV for work purposes or you do not recreate on public lands, **don't disregard this survey**. We are still interested in what you have to say, please complete question 1, then skip to question 20 toward the end of the booklet.*

First, please tell us about the types of Off-Highway Vehicles that you own.

1. How many are in each of the following categories?

Off-highway motorcycles or mini-bikes. _____
3 or 4 wheel All-Terrain Vehicles (ATVs). _____
Other non street-legal 4-wheel drive vehicles. _____
Dune buggies or sand rails. _____
Snowmobiles or snowcats. _____

Most Recent Trip

We would like to begin by asking you about your most recent recreation trip during which you used your OHV. Questions 2 through 15 pertain to your most recent trip only.

2. What type of Off-Highway Vehicle did you use on your **most recent trip** (Please select all that apply)?

☐ Off-highway motorcycle, mini-bike, etc.
☐ ATV, etc.
☐ Other non street-legal 4-wheel drive vehicles.
☐ Dune buggy, sand rail, etc.

3. In what month and year was your **last** recreation trip when you **used an OHV**?

Month _____ Year _____

4. In which Utah County or adjacent state was that **trip taken**? (Use the **map** at the end of this booklet to assist you).

☐ Beaver	☐ Iron	☐ Sevier	☐ Arizona
☐ Box Elder	☐ Juab	☐ Summit	☐ Colorado

☐ Cache	☐ Kane	☐ Tooele	☐ Idaho
☐ Carbon	☐ Millard	☐ Uintah	☐ Nevada
☐ Daggett	☐ Morgan	☐ Utah	☐ New Mexico
☐ Davis	☐ Piute	☐ Wasatch	☐ Wyoming
☐ Duchesne	☐ Rich	☐ Washington	
☐ Emery	☐ Salt Lake	☐ Wayne	☐ Other States
☐ Garfield	☐ San Juan	☐ Weber	
☐ Grand	☐ Sanpete		☐ Don't Know

5. What is the name of the area or trail where your **last trip** occurred?

_____

6. Are you aware of which agency is responsible for the management of that area?

☐ Yes
☐ No

6a. If **yes,** which agency is it (Check all that apply)?

☐ USDA Forest Service
☐ Bureau of Land Management
☐ Utah State Parks
☐ Other, please specify: _____

7. For your **most recent trip**, how **satisfied** were you with the availability of information about rules, hazards, and conditions? This includes maps, brochures, newsletters, laws, etc.

Strongly dissatisfied	Somewhat dissatisfied	Neutral	Somewhat satisfied	Strongly satisfied
☐	☐	☐	☐	☐

7a. How **important** to you is it that this information is available?

Not important at all	Not very important	Neutral	Moderately important	Very important
☐	☐	☐	☐	☐

8. Again for your **most recent trip**, how **satisfied** were you with the availability of trailhead facilities? This includes restrooms, water, unloading ramps, signs, garbage receptacles, camping areas, etc.

Strongly dissatisfied	Somewhat dissatisfied	Neutral	Somewhat satisfied	Strongly satisfied
☐	☐	☐	☐	☐

8a. How **important** to you is it that these facilities are provided?

Not important at all	Not very important	Neutral	Moderately important	Very important
☐	☐	☐	☐	☐

9. Continuing with your **most recent trip**, how **satisfied** were you with the maintenance of site facilities and maintenance of the OHV trail or area?

Strongly dissatisfied	Somewhat dissatisfied	Neutral	Somewhat satisfied	Strongly satisfied
☐	☐	☐	☐	☐

9a. How **important** to you is it that the site facilities and the OHV trail or area be maintained?

Not important at all	Not very important	Neutral	Moderately important	Very important
☐	☐	☐	☐	☐

10. For this trip, how **satisfied** were you with the provision of trail or area signs? These signs can be directional, reassurance, informational, caution, etc.

Strongly dissatisfied	Somewhat dissatisfied	Neutral	Somewhat satisfied	Strongly satisfied
☐	☐	☐	☐	☐

10a. How **important** to you is it that these signs are provided?

Not important at all	Not very important	Neutral	Moderately important	Very important

☐	☐	☐	☐	☐

11. Again for your **most recent trip**, how **satisfied** were you with the enforcement of rules and regulations by ranger patrols or other enforcement officials?

Strongly dissatisfied	Somewhat dissatisfied	Neutral	Somewhat satisfied	Strongly satisfied
☐	☐	☐	☐	☐

11a. How **important** to you is it that this enforcement is provided?

Not important at all	Not very important	Neutral	Moderately important	Very important
☐	☐	☐	☐	☐

We have a few more questions concerning your **most recent trip**. They relate to your group makeup, the length of your trip, and some expenses that may have been associated with your trip.

12. How many people were with your group?

# of people _____

12a. How many of those people were…

Immediate family (individuals living **in** your household)? _____
Extended family (individuals living **outside** your household)? _____
Friends? _____
Others, please specify: _____ _____

13. How long did your trip last, from the time you left home until the time you returned? (*write in number of hours **OR** number of days*)

Number of hours if one day trip _____
Number of days if overnight trip _____

14. To improve our understanding of how OHV use affects local economies and the state economy we need to know what **you** spent on your **most recent** OHV recreation trip in Utah

or elsewhere. Please write down your best estimate of what **you** spent for each kind of item **within** your home county and **outside** of that county.

Item	**Within** your home county	**Outside** of your home county
Lodging: Includes hotels, motels, bed/breakfasts, cabin or home rentals, public or private campgrounds, tents, and campers.	$_____.00	$_____.00
Food and Beverages purchased at grocery stores.	$_____.00	$_____.00
Food and Beverages purchased at restaurants and convenience stores.	$_____.00	$_____.00
Transportation: Includes gasoline and oil for your transportation/tow vehicle, gasoline and oil for your OHV(s), and repairs/services on both your transportation/tow vehicle and your OHV(s).	$_____.00	$_____.00
Parking, trail use, and area access fees.	$_____.00	$_____.00
Rental fees and supplies: Includes RVs, trailers, other OHV(s), and fishing and hunting supplies.	$_____.00	$_____.00
Entertainment: Includes movies, amusement, etc.	$_____.00	$_____.00
Retail goods other than food and beverages.	$_____.00	$_____.00

15. On **this trip**, what **recreation activities** did you participate in? (*check all that apply)*

☐ Driving backroads	☐ Camping	☐ Photography
☐ Dirt biking	☐ Boating	☐ River running
☐ Hill climbing	☐ Fishing	☐ Rock climbing
☐ Trail riding	☐ Hunting	☐ Wildlife/Bird watching
☐ Open-area driving	☐ Target shooting	☐ Backpacking
☐ Competitive events	☐ Swimming	☐ Cross-country skiing
☐ Hiking/walking	☐ Picnicking	☐ Snowshoeing
☐ Sightseeing	☐ Visiting Historical/ Archeological sites	☐ Other, please specify: _____

Now, we need to ask you some questions about OHV purchases and recreation trips you have taken **in the last 12 months**. Questions 16 through 20 pertain only to recreation trips taken **within the last 12 months**.

Trips Within the Last 12 Months

16. How many off-highway vehicle recreational trips have you taken within the last 12 months for each of the following OHV types?

Vehicle Type	# of Trips within the last 12 months				
	1-5	6-10	11-15	16-20	21+
Off-highway motorcycles or mini-bikes	☐	☐	☐	☐	☐
All-Terrain Vehicles (ATV).	☐	☐	☐	☐	☐
Other 4-wheel drive vehicles or rock-crawlers	☐	☐	☐	☐	☐
Dune buggies or sand rails	☐	☐	☐	☐	☐

17. Now please tell us how many of your trips **within the last 12 months** were to each Utah county or adjacent state. Please use the Utah **map** to assist you.

	# of trips		# of trips		# of trips		# of trips
Beaver	_____	Iron	_____	Sevier	_____	Arizona	_____
Box Elder	_____	Juab	_____	Summit	_____	Colorado	_____
Cache	_____	Kane	_____	Tooele	_____	Idaho	_____
Carbon	_____	Millard	_____	Uintah	_____	Nevada	_____
Daggett	_____	Morgan	_____	Utah	_____	New Mexico	_____
Davis	_____	Piute	_____	Wasatch	_____	Wyoming	_____
Duchesne	_____	Rich	_____	Washington	_____		
Emery	_____	Salt Lake	_____	Wayne	_____	Other States	_____
Garfield	_____	San Juan	_____	Weber	_____		
Grand	_____	Sanpete	_____				

18. For the area that you use most often, why do you ride in this area?

- ☐ It is easy to get to.
- ☐ It is one of my favorite places to ride.
- ☐ There is no other place to ride.
- ☐ I can afford to go there.
- ☐ Other, please specify:_____

19. Do you have any OHV trips that you take on the same time or days of the year to a particular location? *(Eg. Holidays or festival trips or perhaps family reunions.)*

_____ Yes
_____ No

19a. If **Yes**, please indicate the place where you go, the date, or holiday when you typically go, and the purpose for the trip **(if there are multiple trips, please list them separately)**.

OHV area or trail: _____
Date or holiday: _____
Purpose: _____

OHV area or trail: _____
Date or holiday: _____
Purpose: _____

20. Please write down your best estimate of what you spent **within the last 12 months** for each kind of item:

OHV Expenses: Includes OHVs purchased, custom parts/installation, tools, tires/rims, parts/repairs.	$_____.00
OHV Insurance:	$_____.00
Licenses, permits, and emissions checks:	$_____.00
Vehicles purchased **specifically** to tow your OHVs:	$_____.00
Support Equipment: Includes equipment purchased exclusively for OHVs.	$_____.00
Repairs and Services: Includes repairs/services on both your transportation/tow vehicle and your OHV(s).	$_____.00
Rental fees and supplies: Includes RVs, trailers, other OHV(s), and fishing and hunting supplies.	$_____.00
Out-of-pocket medical costs related to your OHV use	$_____.00
Miscellaneous Includes riding apparel, safety gear, emergency supplies, memberships, and entry fees.	$_____.00

21. Now, for your **entire lifetime**, how much would you estimate that you have invested in OHV equipment? This includes vehicles, custom parts, installation, and support equipment like tools.

$_____ .00 over my **entire lifetime**.

We just have a few more questions about your experience and your opinion on different fees for OHV management.

Experience

22. How many years have you been riding Off-Highway Vehicles?

_____ # of years

23. How would you rate your skill level in driving your OHV?

- ☐ Beginner
- ☐ Novice
- ☐ Intermediate
- ☐ Advanced
- ☐ Expert

24. Many trail systems around the state are now designating their routes according to difficulty. Of the following trail ratings, which do you prefer to ride on?

- ☐ Easiest (relatively smooth throughout).
- ☐ More difficult (narrow sections, steep grades, minor drop-offs).
- ☐ Most difficult (sharp turns, steep side-slopes, exposure to large drop-offs).
- ☐ Extreme (extremely steep and rocky with ledges and severe drop-offs).

25. Please indicate the extent to which you would oppose, favor, or feel neutral towards each of the following methods to raise funds for the OHV management actions listed in questions 7 thru 11 (availability of information, trailhead facilities, site maintenance, trail or area signs, and enforcement).

	Strongly Oppose	Somewhat Oppose	Neutral	Somewhat Favor	Strongly Favor
Daily use fee for certain heavily used areas (e.g., Paiute, Shoshone, Hog Canyon, other)	☐	☐	☐	☐	☐

Additional Utah state tax on sale of new OHVs	☐	☐	☐	☐	☐
Trailhead parking fees for **all** users	☐	☐	☐	☐	☐

Activities/Motivations

26. Below is a list of your possible reasons for OHV riding. Please tell us how important each one is to you when you go riding.

The OHV allows me to:	Not important at all	Not very important	Neutral	Somewhat important	Very Important
Stress Relief and Nature Appreciation					
Enjoy natural scenery.	☐	☐	☐	☐	☐
Get away from the demands of life.	☐	☐	☐	☐	☐
Experience personal freedom.	☐	☐	☐	☐	☐
Experience solitude.	☐	☐	☐	☐	☐
Release or reduce built-up tension.	☐	☐	☐	☐	☐
Share Similar Values					
Be with other people who enjoy the same activities that I do.	☐	☐	☐	☐	☐
Be with members of my group.	☐	☐	☐	☐	☐
Achievement/Stimulation					
Do something challenging.	☐	☐	☐	☐	☐
Enjoy a place that is special to me.	☐	☐	☐	☐	☐
Experience excitement.	☐	☐	☐	☐	☐
Develop my skills and abilities.	☐	☐	☐	☐	☐
Test the capabilities of my vehicle.	☐	☐	☐	☐	☐
Learn New Things					
Experience new and different things.	☐	☐	☐	☐	☐
Learn more about the natural history of an area.	☐	☐	☐	☐	☐
Independence					
Do things my own way.	☐	☐	☐	☐	☐
Be in control of things that happen.	☐	☐	☐	☐	☐
Teach/Lead Others					

Help others develop their skills.	☐	☐	☐	☐	☐
Share what I have learned with others.	☐	☐	☐	☐	☐
Lead other people.	☐	☐	☐	☐	☐
Meet new people					
Talk to new and varied people.	☐	☐	☐	☐	☐
Observe other people in the area.	☐	☐	☐	☐	☐

Environmental Attitudes

27. Finally, we would like to get your opinion on a wide range of environmental issues. The following questions were asked on a national survey of OHV users affiliated with the **National Off-Highway Vehicle Conservation Council (NOHVCC)**. We would like to ask the **exact same questions** of Utah OHV users to determine both similarities and differences between nationwide OHV users and users in Utah.

For each of the following statements, please indicate the extent to which you agree or disagree.

	Strongly Disagree	Somewhat Disagree	Neutral/ Unsure	Somewhat Agree	Strongly Agree
We are approaching the limit of the number of people the Earth can support.	☐	☐	☐	☐	☐
Humans have the right to modify the natural environment to suit their needs.	☐	☐	☐	☐	☐
When humans interfere with nature, it often produces disastrous consequences.	☐	☐	☐	☐	☐
Human ingenuity will insure that we do not make the Earth unlivable.	☐	☐	☐	☐	☐
Humans are severely abusing the environment.	☐	☐	☐	☐	☐
The earth has plenty of natural resources if we just learn how to develop them.	☐	☐	☐	☐	☐
Plants and animals have as much right as humans to exist.	☐	☐	☐	☐	☐
The balance of nature is strong enough to cope with the impacts of modern industrial nations.	☐	☐	☐	☐	☐
Despite our special attributes, humans are still subject to the laws of nature.	☐	☐	☐	☐	☐

The so-called "ecological crisis" facing humankind has been greatly exaggerated.	☐	☐	☐	☐	☐
The Earth has a finite amount of room and resources.	☐	☐	☐	☐	☐
Humans were meant to rule over the rest of nature.	☐	☐	☐	☐	☐
The balance of nature is delicate and easily upset.	☐	☐	☐	☐	☐
Humans will eventually learn enough about how nature works to be able to control it.	☐	☐	☐	☐	☐
If things continue on their present course, we will soon experience a major ecological catastrophe.	☐	☐	☐	☐	☐

Demographics

Now, we would like to know some general information about you and your family in order to make comparisons among the many kinds of visitors to public lands in Utah. Remember that all information is voluntary and confidential and will not be identified with your name.

28. What is the highest level of education you have completed?

- ☐ Less than a high school degree
- ☐ High school degree or GED
- ☐ Some college or a community college
- ☐ 2 year technical or associate degree
- ☐ 4 year college degree (BA, BS)
- ☐ Advanced degree (MA, MS, JD, MD, Ph.D.)
- ☐ Don't Know/Refuse

29. How many years have you lived in Utah?

_____ # of years

30. In which county do you currently live?

_____

31. How many years have you lived in your current county?

_____ # of years

32. Before taxes, for 2006, what was your total household income?

- ☐ Under $15,000
- ☐ $15,000 -- $24,999
- ☐ $25,000 -- $34,999
- ☐ $35,000 -- $49,999
- ☐ $50,000 -- $74,999
- ☐ $75,000 -- $99,999
- ☐ $100,000 -- $149,999
- ☐ $150,000 -- $200,000
- ☐ Over $200,000
- ☐ Don't Know/Refuse

33. In what year were you born?

19___

34. How many children do you have under 18?

_____ # of children

35. How many people live in your household in the following age groups?

Under 15	_____
15-24	_____
25-54	_____
55 – 64	_____
65 or older	_____

36. What is your present marital status?

- ☐ Single
- ☐ Married
- ☐ Separated/Divorced
- ☐ Widowed

37. Which of the following best describes your ethnic origin?

- ☐ White
- ☐ African American
- ☐ Hispanic
- ☐ Native American
- ☐ Asian American or Pacific Islander

- ☐ Other: _____

38. Do you currently belong to any of the following kinds of **organizations**?

- ☐ Conservation/Protection groups (Audubon Society, Sierra Club, etc.)
- ☐ Wildlife conservation groups (Ducks Unlimited, R. M. Elk Foundation, etc.)
- ☐ Fish conservation groups (Trout Unlimited, etc.)
- ☐ Rod and gun clubs
- ☐ Sportsman/Sportswomen groups
- ☐ Motorcycle clubs
- ☐ Dune-buggy clubs
- ☐ Jeep and four-wheel drive owners' associations
- ☐ ATV/OHV clubs
- ☐ Other (please specify): _____

39. With respect to your political views, do you consider yourself to be a:

- ☐ Conservative
- ☐ Moderate conservative
- ☐ Moderate
- ☐ Moderate liberal
- ☐ Liberal
- ☐ Other

Thank you for your participation in this survey!

PLEASE TAPE OR STAPLE THE CORNERS OF THE SURVEY AND DROP IT IN THE MAIL. NO POSTAGE IS NEEDED.

If you have any further comments you wish to make, please use the space below.

_____
_____
_____
_____
_____
_____

Appendix 2

The Travel Cost Model

The key tool in estimating changes in OHV use patterns is the travel cost model. This model has a long history, and several versions of the model have been developed (Ward and Beal, 2000). The random utility model (RUM) version allows the analyst to estimate the impact of changing access policies on use patterns. The RUM is a probabilistic modeling approach, where the demand for a given recreation site is measured through the probability that the site will be visited (Morey, 1999). Sites with more desirable characteristics (for OHVs these characteristics could be low travel cost, abundant public lands and many miles of jeep trail) will be chosen with greater frequency relative to sites with less desirable characteristics. The theoretical basis for the model is that the recreationist will compare the utility (satisfaction) associated with one site j, U_j, to the utility of visiting an alternative site k, U_k. The recreationist will choose the site that yields the most satisfaction, choosing site j if

$$U_j > U_k, \text{ for all alternative sites } k$$

Put simply, a person will choose to go where he or she derives the most satisfaction, relative to all available choices.

The satisfaction derived from any site j is a function of the cost to gain access to the site (the "travel cost") as well as other attributes of the site. For any site j, let TC_j be the travel cost the site, L_j be a measure of public land at the site, and M_j be the miles of jeep trail at site j. Further, if it is necessary to combine multiple sites (trailheads) into a single aggregate destination, the analyst must include a variable, S_j , measuring the number of sites within the

aggregate. Other factors may also influence the site choice of an individual recreationist. Whereas all factors influencing site choice are known by the recreationist, some may remain unknown to the analyst, thus introducing random error, ε_j, into the choice problem. Again, the recreationist will choose to visit the site yielding the greatest utility, choosing to visit site *j* rather than site *k* if,

$$U(TC_j, L_j, M_j, S_j) + \varepsilon_j > U(TC_k, L_k, M_k, S_k) + \varepsilon_k$$

If the errors are assumed to be additive and independently and identically distributed according to a type I extreme value distribution, the probability that a person will choose site *j* over all other *K−1* alternative sites is given by,

(1) $$P(\text{choose site } j) = \exp\{U(TC_j, L_j, M_j, S_j)\} / \Sigma_{k=1}^{K} \exp\{U(TC_k, L_k, M_k, S_k)\}$$

The model is made operational by specifying the form of the U(•) function; for example, a common specification is linear,

(2) $$U(TC_j, L_j, M_j) = \alpha_j + \beta\, TC_j + \gamma\, L_j + \delta\, M_j + \ln(S_j)$$

where α is an intercept term, β is the travel cost parameter and γ and δ are parameters for site attributes L_j and M_j, and the parameter on the site aggregation term is fixed equal to one.[11] The parameters can be estimated via the method of maximum likelihood using equation (1) as the basis for the likelihood function. Economic theory indicates that we should observe a negative sign for β and positive signs for γ and δ if the site attributes are desirable.

[11] This follows a standard approach in dealing with aggregate sites (Lupi and Feather).

The basic site choice portion of the linked site-choice-total trips model is based on equation (1). The link to total trips taken during a given year is done by calculating the "inclusive value" from the site choice model, where the inclusive value (IV) is given by,

(3) $IV = \ln[\sum_{k=1}^{K} \exp(\alpha + \beta\, TC_j + \gamma\, L_j + \delta\, M_j + \ln(S_j) + 0.577]$

where the summation is over all sites. Intuitively, one can think of the IV a a measure of the total utility, or satisfaction, that can be gained from making a recreation trip. The total trips model then given as a function of the Inclusive Value,

(4) $\text{Total Trips} = \mu + \theta \times IV$

And we expect a positive sign on the inclusive value parameter (θ), indicating that the greater the satisfaction with OHV recreation, the greater will be the number of trips taken.

Given the estimated parameters, Morey (1999) shows how the model can be used to estimate the effect of changing access policies. Say, for example, public lands managers are considering a policy such that public lands that are currently "open" to OHV use will instead be designated as "closed". For each site *j* that experiences a change in site access conditions, the amount of land available for OHV recreation changes from L_j to L_j^*, where restricting acces to public land implies $L_j > L_j^*$. One can measure the change in the probability of visitation to a given site (county) by using equation (1) to calculate the probability of visitation under baseline conditions (L_j, the initial amount of public land at site *j*) and proposed conditions (L_j^*, the new amount of public land at site *j*). The loss in public land access decreases satisfaction with any given site (if $\gamma>0$), which lowers the probability that site *j* will be chosen for an OHV trip. This

change in probability is linked to the change in satisfaction via the inclusive value, from which the change in total trips can be measured. If satisfaction with a single site decreases, then IV declines; given a positive value for θ, the implication is that total trips will also decline.