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A recent public lands settlement between the State of Utah and the federal Bureau of Land Management releases millions of acres from de facto wilderness management. BLM will use settlement guidelines to manage its land in all other states except Alaska. Released acreage will be opened, in principle, to agricultural and mining use, as well as Off Highway Vehicle (OHV) recreation. This paper analyzes changes in OHV visitation patterns under the settlement, as well as estimating the consumer surplus accruing to OHV users. The model indicates that OHV visitation will shift toward the southeastern portion of the state where the greatest amount of land is released, whereas the remainder of the state will lose visitation. This implies that beneficial economic impacts in the form of increased income and employment are likely to be concentrated in the southeast. Unless total visitation increases, the remainder of the state will lose OHV users.

Key words: off highway vehicles, BLM, random utility model, economic benefit
Section 1. Introduction

In April 2003 the State of Utah and the U.S. Department of Interior agreed to a Memorandum of Understanding concerning Bureau of Land Management (BLM) lands in Utah. In exchange for dropping its land management lawsuit against Department of Interior (DOI) Interior Secretary Gale Norton, the State of Utah received release of 3.5 million acres of public land from BLM's "Wilderness Inventory." The wilderness inventory status was applied to some public lands because they possessed characteristics that might make them eligible for wilderness status. Management followed a "non-impairment" standard, thus establishing inventory acreage as *de facto* wilderness and restricting land uses to primarily non-motorized recreation. Except for "grandfathered" access, no mining or agricultural use is permitted. The Utah-DOI settlement frees the inventoried land from *de facto* wilderness status and allows it to be exploited for mining and agricultural uses, as well as for motorized recreational use. On September 29, 2003, BLM issued Instruction Memorandum No. 2003-274, informing state BLM directors that the terms of the Utah settlement would be applied to all BLM wilderness inventory land in the United States.²

A vocal constituency in support of the Utah lawsuit and the subsequent settlement has been advocates on behalf of Off Highway Vehicle (OHV) users, one of the fastest growing user groups of BLM land (BLM, 2001). With authority granted by Executive Orders 11644 and 11989, agencies such as BLM have regulated OHV use by designating land and OHV routes as

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² Designation of wilderness in Alaska is covered by a separate decision.
“open” or “closed” to OHV use. The release of wilderness inventory land is important to OHV enthusiasts because the “open-closed” management approach, in conjunction with the increasing population of OHV users has resulted in a perceived “shortage” of land available for OHV users. Indeed, issues associated with access to public lands have been identified as the chief concern of OHV users and a major concern for land managers (Fisher et al., 2001; Harlan 2003; BLM 2001; U.S. Forest Service, 2001). If upheld by the judicial process, the Utah-DOI memorandum will certainly release more land to OHV use.

This paper analyzes two aspects of OHV use likely to be affected by the Memorandum, namely, the change in the pattern of use by OHV users across the state of Utah and the increase in economic value accruing to OHV recreationists. Predicting changes in recreation use patterns is important because the beneficial economic impact of expenditures associated with OHV visitation is often touted. But if improved access is concentrated in one portion of the state relative to another, it is possible that some regions will “lose” users while others will gain.

Second, whereas the economic value, or benefit, to for many outdoor activities (such as fishing or hunting) have been investigated in many numerous research studies, a review of the literature reveals only four published research paper that examined OHV use. Thus the literature on economic value of OHV use is very thin. In addition to providing a valuable case study for Utah, the general approach outlined in this paper is applicable to other regions of the country subject to the terms of the Utah-DOI settlement.

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3 Over 50% of Utah OHV users cited access problems as the “most important issue affecting OHV use” (Fisher, et al., 2001, page 34). In 2003 Forest Service Chief Dale Bosworth cited “unmanaged recreation” (primarily OHV use) as one of the four greatest “threats” to forest management in the U.S. On te Wasatch-Cache National Forest in Utah, for example, OHV use increased by almost 11,000 percent between 1984 and 1997 (USDA Forest Service, 2001, page 3-171).

4 As of February 2005, the settlement was on appeal at the U.S. District Court level.

5 See, for example, Rosenberger and Loomis (2001) cite only three studies in the past, all of which employed relatively outdated methods. Englin et al. (2003) provide a fourth study.
Section 2. Data and Methods

The Travel Cost Demand Model. The key tool in estimating changes in OHV use patterns and in estimating economic value 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 and economic value. 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 ATVs 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, \( \varepsilon_j \), 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,

\[
P(\text{choose site } j) = \frac{\exp\{U(TC_j, L_j, M_j, S_j)\}}{\sum_{k=1}^{K} \exp\{U(TC_k, L_k, M_k, S_k)\}}
\]

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

\[
U(TC_j, L_j, M_j) = \alpha + \beta TC_j + \gamma L_j + \delta M_j + \ln(S_j)
\]

where \( \alpha \) is an intercept term, \( \beta \) is the travel cost parameter and \( \gamma \) and \( \delta \) are parameters for site attributes \( L_j \) and \( M_j \), and the parameter on the site aggregation term is fixed equal to one.\(^6\) 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 \( \beta \) and positive signs for \( \gamma \) and \( \delta \) if the site attributes are desirable.

Given the estimated parameters, one can then calculate the economic value of an ATV trip under current access and site attribute conditions. This value, or "per trip consumers' surplus" is given by,

\[
CS = \ln\{\sum_{k=1}^{K} \exp\{U(TC_k, L_k, M_k, S_k)\}\} / -\beta
\]

where the \( U(\cdot) \) is calculated for each site at the current magnitudes for the independent variables and the estimated parameters. Morey (1999) shows how the model can be used to estimate the

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\(^6\) This follows a standard approach in dealing with aggregate sites (Lupi and Feather).
economic value of changing access policies. Say, for example, public lands managers are considering a policy such that public lands that are currently “closed” to ATV use will instead be designated as “open”. For each site $j$ that experiences a change in site access conditions, the amount of land available for ATV recreation changes from $L_j$ to $L_j^*$. The economic value of this expansion of access can be estimated as:

$$\Delta CS = \frac{\ln\{\sum_{k=1}^K \exp\{U(TC_k, L_k^*, M_k, S_k)\} - \ln\{\sum_{k=1}^K \exp\{U(TC_k, L_k, M_k, S_k)\}\}}{-\beta}$$

where the magnitude of $L_k^*$ in the first bracketed term represent the new amount of public land at each site $k$, and the $L_k$ in the second term represents the initial magnitude of public land at each site.

**Data Collection.** This study uses behavioral data collected by the Utah State University Institute for Outdoor Recreation and Tourism (Fisher et al. 2001). In 2000 the Institute conducted a telephone survey of OHV owners. Respondents were selected through a random sample of 943 OHV owners whose vehicles were registered with the Utah Department of Transportation. After cleaning the list of duplicate names and addresses, phone numbers were matched for 494 of those randomly selected. Telephone interviews were conducted with 335 OHV owners, for an effective response rate of 68%. This sample may underrepresent OHV owners with unlisted phone numbers, OHV owners without telephones and OHV owners who recently moved to Utah and have not yet registered their vehicles with the State. Details of the sampling procedure, as well as all study results, can be found in Fisher et al. (2001).

The main goals of the survey were to ascertain the characteristics of OHV users, the number and type of vehicles owned, typical and preferred riding behaviors, preferences regarding OHV use, opinions on land management and educational/safety programs and, most important for this study, a description of the most recent trip. The model below focuses on all-
terrain vehicle (ATV) owners; some 89% (n=298) of the sample reported owning at least one 
ATV. The average ATV owner took 13.9 trips with their ATV 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 Juab, Sevier, and Utah counties in the central part of the state. The median distance 
traveled to an ATV site was 70 miles, with a mean of 100 miles. Public lands were the most 
popular sites, with 40% of ATV riders visiting BLM land on their last trip and another 35% 
recreating on Forest Service land. Some 56% of ATV owners reported traveling along 
established roads on their ATVs, although a large minority (39%) reported spending much of 
their riding time off established trails. Riders reported driving their ATV a mean of 57 miles 
(median 40 miles) after arriving at a trailhead.

**Identifying ATV Recreation Sites.** A travel cost model requires that one be able to identify both 
the origin of the trip—where the rider left home—as well as the destination of the trip—exactly 
where he or she recreated. The Fisher et al. survey collected this information by asking three 
questions. Origins were elicited by asking each respondent their home zip code. Destinations 
were elicited by first asking the name of the destination and second, how many miles the 
respondent traveled to reach this destination. This information was used to develop a list of 
recreation sites that correspond to a set of latitude and longitude coordinates.

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. After locating the site, 
coordinates for latitude and longitude were recorded. Other sites, such as the “West Desert” 
refer to an expansive geographical region. More narrowly defined destinations for many of these 
respondents were recovered by comparing the origin zip code and distance traveled to popular

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7 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 as providing a location “tag.” Scrolling the cursor anywhere on the map provides the geographic coordinates.
potential sites that had been previously located for other respondents. For example, a respondent reporting a Salt Lake City zip code and saying they traveled about 100 miles to the West Desert was assumed to have traveled to the Wendover region near the Nevada border, whereas a Salt Lake resident reporting a 50 mile distance was placed in the Knolls region. Some respondents reported destinations that could not be reliably located, and these were deleted. The final ATV sample consists of 241 observations traveling to 100 distinct sites.

Unfortunately, 100 choice destinations for a recreation activity such as ATV 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 around a trailhead. How large should the area around the trailhead be? Is it the mean distance traveled on the ATV (say, a 57 mile radius around the trailhead, or a 10,200 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? 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 this question (Karou et al. 1995). A second complication is that 100 sites make for an unwieldy and difficult travel cost model; indeed this number equals the maximum number of choices offered by standard 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 "county site" by creating a weighted average of the latitude and longitude coordinates. Weights were defined by the number of people visiting each site, such that the most heavily visited site in

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8 Sites such as "private land" and "around the ranch" were impossible to locate.
a county received the greatest weight while the least visited site received the smallest weight.\(^9\)

As a final step in the process, travel distances from the center of each origin zip code were calculated to the geographic coordinates for each of the 29 county-level sites using the USDA computer program ZIPFIP. Travel distances were converted to travel cost by multiplying by a constant per mile cost of vehicle operation, $0.142 per mile, the estimated variable cost of operating a sport utility vehicle in the year 2001 (American Public Transportation Association).

*County Level Site Attributes.* As noted in the description of the travel cost model, two key attributes of site-choice decisions are (1) the amount of area available for ATV activities and, (2) the miles of ATV 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, etc.) and measures of proposed land uses such as the amount of land that advocacy groups have proposed for wilderness designation.

State GIS data were initially classified into four major categories: public land, private land, reserved Indian land, and water. Public lands were further subdivided into six categories: lands administered by the military, wildlife refuges, designated wilderness areas, wilderness study areas (WSA), areas included in BLM wilderness inventory (WIA), and all other public land (Table 1).\(^{10}\) All other public land includes national and state parks, monuments, national

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\(^9\) Maps depicting the disaggregated and aggregated site locations are available upon request.

\(^{10}\) Those who are familiar with frequently reported state geographic statistics will immediately notice a discrepancy with the figures in Table 1. For example, the area in designated wilderness areas is actually 803,000 acres (versus 769,000 in the state GIS database), the total amount of WSA land is 3.26 million acres (versus 3.49 million in the database), and the BLM WIA land is 2.6 million acres (versus 2.96 million). All told, the State GIS database identifies only 7.76 million acres in designated or \textit{de facto} wilderness, not 9.1 million acres as commonly cited. The explanation is two-fold: first, the actual use for land within any given GIS polygon may "fit" more than one classification (e.g., a polygon that is 35% private and 65% public), but can be placed in only a single category. Second, land use classifications were conducted by different teams across the state, each of which may have used slightly different classification protocols. State officials note that this error is within expected bounds for this type of data (personal communication with Cindy Clark, SGID Administrator.)
and state forests, and other land administered by local, state, and federal agencies not otherwise included in the previous five categories. Public lands were subsequently aggregated into two categories: land open to ATV use and public land closed to ATV use. Public lands open to ATVs included land in Indian reservations, wildlife refuges, and land administered by a myriad of state and federal agencies: Bureau of Land Management, U.S. Forest Service, U.S. Bureau of Reclamation, and the National Park Service. Public lands closed to ATV use were those lands with official wilderness designation and those managed as *de facto* wilderness. This includes all U.S. Forest Service and BLM land classified as WSAs or WIAs, and additional BLM land proposed as wilderness by wilderness advocacy groups. Although not managed to the “non-impairment” standard of WIA land, this acreage is also covered by the Utah-DOI settlement.

The distribution of WIA acreage across the state is highly uneven (Figure 1). With the exception of Sevier County, the central portion of the state from Cache and Rich Counties in the north to Piute County in the south has no WIA acreage. The largest concentrations are in the southeastern portion of the state, with six counties accounting for 80% of the WIA acreage scheduled for release. Only modest amounts of WIA acreage are located in counties elsewhere in the state.

Other site attributes are also 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.” The dunes at Little Sahara (Juab County) and Coral Pink Sand Dunes (Kane County) suggest a unique and highly desirable site attribute that may contribute to that site being selected, all else equal. Similarly, the red rock country of Southern Utah is world-renowned, stretching from Washington and Iron counties in southwestern Utah, across Kane, Garfield, Wayne, and Emery Counties eastward to Grand and
Section 3. Econometric Modeling

Model Specification. The RUM site-choice model is estimated using two specifications that differ only in the treatment of access to public lands. The first specification treats access to public lands in a negative way, that is, this model includes the proportion of a county managed as wilderness and therefore closed to ATV use. The variable, Proportion of County Managed as Wilderness Lands, includes all designated wilderness, WSA, WIA, and additional land proposed by wilderness advocacy groups. The second specification treats access in a positive way, that is, this model includes the proportion of a county designated as non-wilderness public lands. The variable, Proportion of County Open to ATV Use, is the complement of the previous variable, and includes all public land not managed as wilderness or de facto wilderness. All else equal, one would expect to observe a negative relationship between the proportion of land in wilderness and observed ATV recreation (specification #1) and positive relationship between land open to ATV use and observed ATV recreation (specification #2).

All remaining variables are used in both specifications. Travel Cost is simply the roundtrip distance from the zip code of origin to the county site multiplied by $0.142 per mile. A negative sign is expected—as recreation sites become more distant they are less likely to be visited. Dunes is a 0-1 dummy variable indicating the presence of significant dunes within a county. Red Rock Country is a 0-1 dummy variable indicating the county has significant amounts of the classic southern Utah sandstone canyons and cliffs. These last two variables

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11 These measures of access to public land are relatively coarse—land is simply wilderness (closed) or non-wilderness (open). In fact, non-wilderness public lands managed by federal agencies have portions that are closed to ATV use but the available data do not allow such fine distinctions in land use. Regardless, our model provides useful information with respect to patterns of ATV use and economic value under changing access conditions.
capture uniquely desirable attributes of trips to such counties so that a positive relationship is expected. Given that the majority of ATV users reported traveling some distance along established trails, a positive relationship between *Miles of Jeep Trail* and site selection is anticipated. The final variable controls for the size of a county (*Total Area of County*). All else equal a positive relationship is expected.

**Results.** The econometric models conform to the expectations outlined above remarkably well (Table 2). Turning first to Model #1, *Travel Cost* is negative and statistically significant, as expected—all else equal, as distance to a site increases it is less likely to be selected for recreation. *Dunes* and *Red Rock Country* are positive and statistically significant. All else equal, the presence of sand dunes or sandstone canyons and cliffs makes a site more likely to be selected for ATV recreation. *Miles of Jeep Trail* is positive and significant—the more miles of A50 roadway in a county the more likely it is to be selected for ATV recreation. In an unexpected outcome, the *Total Area of the County* is negative and significant. Finally, the *Proportion of County Managed as Wilderness* is a negative and statistically significant—as the proportion of land in a county managed as wilderness increases, that county is less likely to be selected for ATV recreation.

The second specification in Table 2 is identical to the first except that *Proportion of County Managed as Wilderness* is replaced with *Proportion of County Open to ATV Use*. The statistically significant sign on this variable is positive—all else equal, the greater the proportion of a site that is open to ATV use, the more likely that site is to be visited. Some of the variables in this specification retain the same sign and level of statistical significance as in Model #1 (*Travel Cost* and *Red Rock Country*) while other variables either lost some degree of statistical
significance (*Dunes*) or were insignificant at conventional levels of probability (*Miles of Jeep Trail* and *Total Area of County*). This suggests that Model #1 is the preferred specification.

**Section 4. Analysis of the Utah-DOI Wilderness Settlement**

The Utah-DOI settlement releases all BLM inventory land (WIA) from wilderness management, as well all BLM land proposed for wilderness designation by public advocacy groups. Under current access conditions, the state GIS database shows some 7.76 million acres managed as wilderness and about 31.57 million acres of public land open to ATV use (about 4.1 acres of open for every acre of closed public land). Following the agreement, approximately 3.50 million acres cease being managed according to the non-impairment standard of *de facto* wilderness. The settlement results in 4.26 million acres of wilderness closed to ATV use and 35.08 million acres of open access public land (8.2 acres of open for every acre of closed public land), effectively doubling the amount of open public land relative to closed public land.

*Changing Patterns of ATV Recreation.* The RUM model measures the demand for recreation through a measure of the probability of site selection using equations (1) and (2). For each of the twenty-nine sites, one simply evaluates the equations at the observed values of the explanatory variables to obtain the estimated probability of a visit to a given site. Using specification #1 under the status quo, Utah County (18.4%) and Juab County (11.57%) are the most likely site destinations on any given choice occasion. The reasons for the high probabilities for these sites are a relative abundance of public land and relatively low travel costs. Utah County is within the Wasatch Front population center of the state, whereas Juab County is nearby and also has a major sand dune destination (*Little Sahara Recreation Area*).\(^{12}\) The county with the lowest

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\(^{12}\) Nearly 80% of the state’s population resides in Davis, Salt Lake and Utah counties.
probability of visitation is Daggett County (0.33%), a small county that is difficult to access from population centers and one that enjoys no special features (dunes or red rock country).

The Utah-DOI settlement was modeled by converting all WIA land and proposed wilderness land to the “Open to ATV Use” category. The net change in the probability of visitation was calculated as the difference between the probability of visitation under the settlement and the status quo probability (Table 3). Southeastern Utah is the region with the greatest change in accessibility and is where the model predicts the greatest increase in visitation; in fact, only the six counties of this region benefit from increased visitation. Emery County is the largest “gainer,” with a 6% increase in probability of visitation (from 8.4% under current management to 14.4% under settlement conditions). This county is relatively close to the population center of the state, has special features valued by ATV users, and will enjoy much greater access to public land under the settlement. Despite possessing red rock country and having the greatest amount of land released under the settlement, San Juan County is relatively remote and therefore enjoys only a modest increase in probability of visitation (0.2%).

Twenty-three of the twenty-nine counties will lose ATV visitors to the southeastern portion of the state. Note that all the counties along the western edge of the state gain in accessibility under the settlement, yet these sites either do not have the special features valued by ATV riders (e.g., Box Elder and Tooele Counties) or are distant from major population centers resulting in high travel costs (Washington County). Given the decreased probability of visitation on any given choice occasion, the only way in which these “losing” counties have a chance to maintain current levels of visitation is if the total population of ATV users increases.

Estimates of Net Economic Value. Similar to calculating the probability of visitation as described above, one may use equations (1) and (3) to estimate the value of an ATV trip under
current access conditions. For the preferred specification #1, the estimated economic value of an ATV trip is $80.51 (Table 2). There are a variety of ways to think about this estimate of economic value. One interpretation is that, on average, ATV recreationists would be willing to pay an additional $80.51 before foregoing the trip altogether. An equivalent interpretation is that, on average, ATV owners receive a “surplus” of $80.51 above and beyond what they had to pay for the trip.

Using specification #1, the effect of the settlement is to reduce the proportion of land in a county managed as wilderness, thus benefiting ATV owners. Following equation (4), the net change in economic value (“willingness to pay” for improved access, or WTP) is estimated to be $5.08 per trip. That is, the economic value of an ATV recreation trip increases by $5.08 under the improved access conditions for ATV recreation, an increase of approximately 6.3% in economic value over current access conditions.

Section 5. Conclusions, Qualifications, and Future Research

The RUM approach to modeling ATV recreation in Utah has permitted analysis of the Utah-DOI settlement on management of what are currently de facto wilderness areas. The net effect of the settlement is to release approximately 3.5 million acres of land from a non-impairment standard of management to one that would permit motorized recreation. The bulk of the land to be released is located in six counties in southeastern Utah, and it is these counties that will gain ATV visitation under the terms of the settlement whereas other regions of the state will lose ATV riders. Another finding of this study has been that ATV owners have an economic value of about $80 per trip. In terms of access to public land, the empirical models indicate that ATV owners would benefit by approximately $5 per trip under the improved access conditions promised by the settlement.
From a policy perspective, the shift of ATV visitation to the southeast portion of the state implies that positive economic impacts (i.e., increases in income, employment and tax revenues) resulting from the release settlement would occur there, with the rest of the state's counties having very modest (or even negative) economic impacts. Southeastern Utah has experienced relatively low incomes and high unemployment as a result of a large reduction in mining activity over the past 20 years, so the settlement may be a boon in this region. However, the economic benefits often touted by local and county officials in other regions of the state are unlikely to occur unless the population of riders increases. In addition, the likely expansion of areas that are, in principle, open to OHV driving may also increase political pressure on BLM, the Forest Service, and the State of Utah to designate open OHV areas and trails on their lands. Federal agencies are currently cooperating on with the State of Utah on state ATV trails, so the agreement may be timely for these broader OHV management activities.

There are important qualifications to these estimates of economic value. First, the estimates are restricted solely to owners of ATV vehicles and do not apply to other ATV enthusiasts in the state who do not own ATVs. The very fact of ownership implies that ATV owners have found the satisfaction derived from ATV recreation to be worth the investment in an ATV. Non-owners either do not enjoy ATV recreation as much as ATV owners do, or they are income constrained. In either event, these enthusiasts have not purchased an ATV. Both factors imply that non-owners have lower economic values than owners and would benefit less from the Utah-DOI agreement.

Second, this study has reported economic values associated only with recreation use by ATV owners, one of many potential uses of public land. A complete accounting of benefits must

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13 Economic value is defined by both preferences for a good (ATV recreation) and ability to pay.
include changes in economic value accruing to other recreationists enjoying improved access as well as any welfare changes associated with agricultural and mining activities. On the cost side, one must include the lost recreation value to wilderness users, as well as the potentially large non-use values associated with wilderness. Information obtained from a review of the literature suggests that wilderness use values are at least as large as OHV use values, and could be as much as twice as large.\textsuperscript{14} Thus, our focus on ATV recreation is only part of a fully informed analysis of the economic tradeoff associated with the Utah-DOI settlement.

Wilderness Study Areas, road designations, and OHV use are important and interrelated issues for public land management in the U.S. Cooperation between land management agencies, local and state officials, and environmental and recreation stakeholders will be needed to address these complex issues in coming decades. A full accounting of the economic costs and benefits of alternative road and land management strategies will provide important information for policy makers, because management decisions have implications for rural communities and environmental quality throughout the Western United States.

\textsuperscript{14} Walsh (1981) estimated both OHV and wilderness use values for Forest Service regions in Wyoming and Colorado, reporting the value of a day of OHV use as $12.47 while the economic value of a day of wilderness use as $27.08 (constant 2000 dollars). Englin and Shonkwiler (1995) report the economic value for wilderness use as $36.28 per day; the Bergstrom et al. estimate for California OHV use is $35.68 (constant 2000 dollars).
Table 1: Utah Land Use, by Area (1000 acres)\textsuperscript{a}

<table>
<thead>
<tr>
<th>Classification</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>54,312</td>
</tr>
<tr>
<td>Private</td>
<td>11,573</td>
</tr>
<tr>
<td>Reserved Indian</td>
<td>2,378</td>
</tr>
<tr>
<td>Water</td>
<td>1,566</td>
</tr>
<tr>
<td>Public Land</td>
<td>38,253</td>
</tr>
<tr>
<td>Military</td>
<td>1,837</td>
</tr>
<tr>
<td>Wildlife Refuge</td>
<td>469</td>
</tr>
<tr>
<td>Designated Wilderness</td>
<td>769</td>
</tr>
<tr>
<td>Wilderness Study Areas (WSA)</td>
<td>3,487</td>
</tr>
<tr>
<td>BLM Wilderness Inventory Areas (WIA)</td>
<td>2,965</td>
</tr>
<tr>
<td>Proposed Additional Wilderness</td>
<td>537</td>
</tr>
<tr>
<td>Other Public</td>
<td>28,726</td>
</tr>
<tr>
<td>(BLM, USFS, USBR, USNPS, State land)</td>
<td></td>
</tr>
</tbody>
</table>

\textsuperscript{a} Rounding error in sum.
Table 2: Random Utility Model Results\textsuperscript{a}

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Model 1 Beta\textsuperscript{a}</th>
<th>Model 2 Beta\textsuperscript{a}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel Cost</td>
<td>-0.046</td>
<td>-0.058</td>
</tr>
<tr>
<td>(9.024)</td>
<td>(-9.661)</td>
<td></td>
</tr>
<tr>
<td>Dunes</td>
<td>1.300</td>
<td>0.410</td>
</tr>
<tr>
<td>( (1=\text{present, 0 otherwise}) )</td>
<td>(6.393)</td>
<td>(1.872)</td>
</tr>
<tr>
<td>Red Rock Country</td>
<td>1.821</td>
<td>0.878</td>
</tr>
<tr>
<td>( (1=\text{yes, 0=no}) )</td>
<td>(5.294)</td>
<td>(4.648)</td>
</tr>
<tr>
<td>Miles of Jeep Trail</td>
<td>0.005</td>
<td>0.001</td>
</tr>
<tr>
<td>( (A50 \text{ roadway}) )</td>
<td>(2.539)</td>
<td>(0.692)</td>
</tr>
<tr>
<td>Proportion of County Managed as Wilderness</td>
<td>-4.148</td>
<td></td>
</tr>
<tr>
<td>(4.112)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of County Open to ATV Use</td>
<td></td>
<td>3.959</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(6.194)</td>
</tr>
<tr>
<td>Total Area of County</td>
<td>(-2.3\times10^{-4})</td>
<td>(-2.810^{-5})</td>
</tr>
<tr>
<td></td>
<td>((-1.816))</td>
<td>((-0.243))</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-684.174</td>
<td>-658.953</td>
</tr>
<tr>
<td>Economic Value per Trip</td>
<td>$80.51</td>
<td>$93.28</td>
</tr>
<tr>
<td>( (95% \text{ Confidence Interval})\textsuperscript{b} )</td>
<td>($63.60–$100.80)</td>
<td>($78.27–$111.95)</td>
</tr>
<tr>
<td>Net Change in Economic Value</td>
<td>$5.08</td>
<td>$4.16</td>
</tr>
<tr>
<td>Under Utah-Interior Settlement\textsuperscript{b}</td>
<td>($2.23–$8.63)</td>
<td>($2.88–$5.60)</td>
</tr>
</tbody>
</table>

\textsuperscript{a} Numbers in parentheses are the ratio of the coefficient to its asymptotic standard error. Standard errors were derived from White's robust variance-covariance matrix.

\textsuperscript{b} Confidence intervals calculated using the method of Krinsky and Robb.
<table>
<thead>
<tr>
<th>Western Counties</th>
<th>Change in Probability</th>
<th>Central Counties</th>
<th>Change in Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Box Elder</td>
<td>-0.37%</td>
<td>Cache</td>
<td>-0.36%</td>
</tr>
<tr>
<td>Tooele</td>
<td>-0.52%</td>
<td>Rich</td>
<td>-0.07%</td>
</tr>
<tr>
<td>Juab</td>
<td>-1.15%</td>
<td>Weber</td>
<td>-0.36%</td>
</tr>
<tr>
<td>Millard</td>
<td>-0.08%</td>
<td>Morgan</td>
<td>-0.20%</td>
</tr>
<tr>
<td>Beaver</td>
<td>-0.06%</td>
<td>Davis</td>
<td>-0.40%</td>
</tr>
<tr>
<td>Iron</td>
<td>-0.59%</td>
<td>Salt Lake</td>
<td>-0.17%</td>
</tr>
<tr>
<td>Washington</td>
<td>-0.29%</td>
<td>Utah</td>
<td>-3.05%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wasatch</td>
<td>-0.37%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sanpete</td>
<td>-1.47%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sevier</td>
<td>-0.83%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Piute</td>
<td>-0.10%</td>
</tr>
<tr>
<td>Eastern Counties</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summit</td>
<td>-0.62%</td>
<td>Emery</td>
<td>+6.01%</td>
</tr>
<tr>
<td>Daggett</td>
<td>-0.01%</td>
<td>Grand</td>
<td>+0.11%</td>
</tr>
<tr>
<td>Duschesne</td>
<td>-0.23%</td>
<td>Wayne</td>
<td>+2.17%</td>
</tr>
<tr>
<td>Uintah</td>
<td>-0.03%</td>
<td>Garfield</td>
<td>+1.45%</td>
</tr>
<tr>
<td>Carbon</td>
<td>-0.07%</td>
<td>Kane</td>
<td>+1.44%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>San Juan</td>
<td>+0.21%</td>
</tr>
<tr>
<td>Southeastern Counties</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 1: Acres in Wilderness Inventory Areas (1,000 acres).
(11 counties have no WIA acreage)
References


