

FINAL SNAKE RIVER CONTINGENT VALUE METHODOLOGY STUDY REPORT

Prepared For:

**Dr. Roy Allen, Economist
Luis Maestas, Contracting Officer
Bureau of Land Management
Wyoming State Office
5353 Yellowstone Road
P.O. Box 1828
Cheyenne, WY 82003-1828**

Prepared By:

**Dr. John Loomis, Economist
2930 Silverwood Drive
Fort Collins, CO 80523
(970) 491-2485**

April 2001

TABLE OF CONTENTS

Page #

EXECUTIVE SUMMARY	3
1. STUDY OBJECTIVES	5
2. DEVELOPMENT OF THE CONTINGENT VALUATION METHOD SURVEY	7
2a. Development of the Alternatives and Effects of the Alternatives	7
2b. Preliminary Survey Design and Focus Group Material	8
2c. Focus Groups	9
2d. Pre-Testing of the Survey	11
3. SURVEY IMPLEMENTATION	13
3a. Format and Structure of Final Questionnaire	13
3b. Visitor Contact Procedures	14
3c. Mailing Procedure for Household Surveys	17
3d. Sample Design and Sample Sizes	17
4. SURVEY ANALYSIS AND RESULTS	19
4a. Response Rate by Sample Strata	19
4b. Descriptive Statistics for Demographics, Desirable Uses, Characteristics of Recreation Trips, and Preferred Management Strategies	20
4c. Statistical Analysis of Willingness to Pay Responses	27
4d. Graphical Depiction of WTP Curves and Median WTP	31
4e. Testing Significance of Strategy Attributes and Attitudes on WTP	33
4f. Interpretation of Logit Equations as WTP Equations	40
4g. Economic Value of Recreation Use of the Public Lands along the Snake River	45
5. CONCLUSIONS	49
6. LITERATURE CITED	52
Appendix A Copy of Contingent Valuation Method Survey Booklet	

EXECUTIVE SUMMARY

To support the Bureau of Land Management's (BLM) development of a Resource Management Plan for its scattered tracts of land along the Snake River through Jackson Hole, a supplemental public involvement process was employed. To this end, a survey was developed to portray four possible management strategies. Four focus groups were conducted to refine the survey instrument, and then it was pretested with households and visitors.

The 12 page mail-back survey booklet was given to a random sample of visitors at four locations along the Snake River in Jackson Hole. The same 12 page survey booklet was first-class mailed to a random sample of Teton County, rest of Wyoming and rest of U.S. residents with a personalized cover letter and \$1 bill attached as an incentive to increase return rates. After the first delivery of the survey, a reminder postcard was sent to all recipients. After one month, a second mailing of the survey was sent to visitors and households not initially returning the survey.

The survey (see Appendix A for a copy) contained six main parts:

- information about the management trade-offs between selling the 26 parcels and retaining them for management according to one of three management strategies
- map insert of providing the location of the 26 parcels
- rating of the desirability of 15 possible uses of the lands along the Snake River
- three contingent valuation method, willingness to pay questions, one for each of the three alternative management strategies
- recreation trip information, including recreation activities, expenditures and net willingness to pay
- demographics

Overall Response Rate 52%

- On-Site Visitor Intercept Survey is 65%
- Teton County Residents is 59%
- Rest of Wyoming Residents is 52%
- Rest of U.S. Residents is 34%

Top Three Most Desirable Uses of the Lands along the Snake River

- Fish and Wildlife Habitat, especially bald eagle nesting
- Non-Motorized Recreation
- Open Space

Three Most Undesirable Uses of the Lands along the Snake River

- Sell for Housing Development
- Motorized Recreation
- Sand/Gravel Mining

○ Eighty four percent of Teton County residents and about 50% of visitors and Wyoming residents had heard of the BLM lands along the Snake River, with newspapers being the primary source of information.

Preferred Management Strategies with Percent of the Four Samples Supporting

○ Management Strategy C: Increased Wildlife Habitat Management to Maintain Habitat (45% to 59% favored)

○ Management Strategy B: Increased Recreation Use (25% to 29% favored)

○ Management Strategy D: Sand/Gravel Mining and Expanded Livestock Grazing (9% to 22% favored)

○ Management Strategy A: Sale of Lands to Private Landowners (2.4% to 6% favored)

Willingness to Pay for Management Strategies

○ Management Strategy C had the highest household WTP. The WTP for this strategy ranged from \$52 (rest of Wyoming residents) to \$245 for Teton County residents and \$288 for visitors. Rest of U.S. households that responded would pay \$68 per year.

○ Management Strategy B had the second highest household WTP. The WTP for this strategy ranged from \$5 for rest of U.S. residents to \$177 for Teton County residents, with the highest amount (\$202) reported by visitors.

○ Management Strategy D had the lowest WTP, being at most \$40 for visitors and Teton County residents. Half of the rest of Wyoming and rest of the U.S. residents would not pay for this management strategy, perhaps feeling that commercial uses such as sand/gravel mining and livestock grazing should be paid for by the users.

Recreation Activities, Expenditures and Net Economic Benefits Received by Visitors

○ Hiking, bird watching, wildlife viewing and rafting were the four most popular recreation activities engaged in by visitors to the BLM administered lands along the Snake River through Jackson Hole.

○ Visitor auto related expenses averaged \$55, while total trip costs of those making long distance trips and staying in hotels, averaged \$250. Commercial float anglers spent an average of \$480 per day on their trips while scenic river rafters averaged \$158.

○ Net willingness to pay over and above these expenses (on a per person, per day basis) averaged \$30 per day, and was \$47 per day for commercial rafting, \$72 for private rafting and \$22 for hiking.

DRAFT SNAKE RIVER CONTINGENT VALUE METHODOLOGY STUDY RESULTS

1. STUDY OBJECTIVES

Assessing public attitudes and economic values for different public land management options can provide managers with valuable insights regarding the advantages and disadvantages of these management options prior to an agency formulating a proposed action in an EIS or Resource Management Plan.

The objective of this survey and analysis is to quantify attitudes and economic values toward alternative ways of managing, selling or trading scattered tracts of BLM-administered lands along the Snake River in the Jackson Hole, Wyoming.

This information is designed to supplement the traditional public involvement process conducted as part of the Resource Management Plan and EIS process. However, the survey reaches visitors and a broad geographic array of residents who may not typically participate in BLM's open houses. That is, the survey effort reflects BLM reaching out to the public, rather than requiring the public to come to BLM's meeting locations. Attendance at public meetings is often inconvenient for occasional visitors to the BLM's recreation sites who frequently live long distances from the relevant BLM office. It is also inconvenient for residents of states outside the state where the resource is located, as most public involvement activities focus on the state where the resource is located.

Specific Objectives

1. To identify the desirable and undesirable uses of the BLM-administered lands along the Snake River using a series of numerically scaled rating questions.

2. To estimate the dollar amount households and visitors would pay for:
(a) increased recreation; (b) increased wildlife habitat; (c) increased sand/gravel mining and livestock grazing.

3. Display the resulting attitudes and economic values to respondents living in different geographic location (visitors, Teton County residents, Wyoming residents and rest of U.S. residents) and visitor status to characterize those supporting and opposing different management options.

This approach builds upon successful contingent valuation method surveys of public values toward Wilderness lands in Colorado (Walsh, Loomis and Gillman, 1984), wetlands in California (Hanemann, Loomis and Kanninen, 1991) and open space in Loveland, Colorado (Loomis, et al, 1999). These were all contingent valuation method surveys that estimated both attitudes and economic values households held for protecting natural lands.

2. DEVELOPMENT OF THE CONTINGENT VALUATION METHOD SURVEY

2a. Development of the Alternatives and Effects of the Alternatives

In September of 1999 an initial kick-off meeting was held in Cheyenne with a follow-up meeting held in Jackson, Wyoming. The Jackson meeting involved a public presentation at the Teton County Commissioners office for public, related state and federal agency personnel on the objectives and time frame of the survey. This provided these groups with an opportunity to comment on our approach and provide suggestions.

The BLM Field office in Pinedale then took the lead, with assistance from Bob Ross, Joe Patti and Roy Allen in developing the basic direction for the Snake River RMP. This included the project charter for the RMP and the Management Situation Analysis. These documents along with the description of the public lands in the Snake River Corridor and court decisions regarding the lands set the starting point for the analysis. A list of information needs that focused on what the possible management actions would be for these lands, the multiple use resources that would be affected by these actions and the environmental consequences was developed by the author and forwarded to the BLM planning team. Bob Ross took the lead in coordinating the resource specialists in developing a tentative set of three management strategies. These were: (a) no action or continuation of current management; (b) expanded recreation use/facilities and mineral development; (c) wildlife habitat protection with reduced recreation use levels. The resource management actions associated with each of these management strategies and the environmental effects of each strategy on the multiple use resources were detailed and circulated for team review.

In March of 2000, a team meeting was held at the Pinedale Field Office with the author as well as Joe Patti from the Wyoming State Office and Bob Ross via phone. The review meeting refined the management actions and clarified the environmental consequences of each management strategy. The results of this meeting were summarized by the author into two synoptic comparisons that focused primarily on multiple use resources that changed across

strategies. Given the space constraints even in a 12 page mail survey booklet, it was necessary to focus primarily on the resources that change across strategies. This was circulated to the BLM planning team and minor revisions were made as a result of clarifications by resource specialists.

2b. Preliminary Survey Design and Focus Group Material

Following the Pindedale meeting and refinement of alternatives and effects, the author drafted a survey that had four major components: (1) respondent rating of desirability of different possible uses of the BLM-administered lands along the Snake River (e.g., wildlife habitat, commercial rafting, motorized use, etc.); (2) Respondent willingness to pay for alternative management actions; (3) Recreation use and valuation questions; (4) demographic questions.

This survey was circulated to the BLM planning team and the author reviewed the basic structure with environmental economists who do CVM surveys. Different ways of structuring the willingness to pay questions were discussed.

A series of emails and conference calls with the BLM team and the author led to several revisions. First, the dichotomous choice willingness to pay question could not be stated as a voting question nor could it be unequivocally stated that the respondent's answer would determine what BLM would do. Further, the survey alternatives could not be called alternatives as that is a term BLM reserves for its planning process and EIS. We agreed to call the survey alternatives, management strategies.

BLM also expressed a desire to have the survey facilitate respondents identifying which features of plans they desired, rather than having them bundled into just two alternatives. Thus, the biggest change came after the second conference call, in which Roy Allen in the Wyoming State Office suggested the survey no action alternative could be sale of the BLM administered lands to private landowners. This would be contrasted with more disaggregated alternatives. The author took this suggestion and separated the increased recreation feature and increased mining feature

of the original alternative B. The survey alternative B retained the expanded recreation emphasis, and a new alternative D was developed that emphasized allowing sand/gravel mining as well as leasing lands for livestock grazing.

The revised version of the survey was circulated to the BLM team prior to the focus groups. Only editorial suggestions were received.

At the time of the survey development, the author worked with Roy Allen and the GIS mapping staff at BLM to develop maps depicting the management strategies. It became clear from this effort that we would not be able to obtain the consistent parcel specific detail for all three management actions for each resource. In part this was due to these being the type of details that would emerge from the planning process and it was premature to make such decisions at this stage. Therefore, one general map was developed which showed the locations of the 27 parcels of BLM-administered lands along the Snake River. The map was in color and was 11x17 in size, such that sufficient detail on the BLM-administered lands, existing boat ramps and important landmarks could be provided.

2c. Focus Groups

A total of four small (8-10 people) discussion groups were preformed to solicit feedback on the survey and map. The basic format of the focus group involved giving respondents a page of the survey and having them mark it up as well as fill out worksheets asking their feedback on the map or page. During the focus groups, people asked questions of clarification which pointed out ambiguities or inconsistencies in the survey. Further, round table discussions of the alternatives were performed and recorded on flip charts. The survey pages, worksheets and flip chart pages were used by the author to revise the survey after the focus groups.

The first two focus groups were preformed in Jackson. The first one (May 31,2000) involved a sample of Jackson residents who indicated to the phone recruiter that they were frequent visitors

to this section of the Snake River. The second focus group was held the following night with Jackson residents that were not frequent visitors to this section of the river.

The two focus groups identified needed clarification in wording and suggested that the costs of BLM management be added in the side-by-side comparison of alternatives. The focus group participants also identified additional information they thought was useful in understanding why increased taxes were needed or why a particular effect would occur.

The following day, the recreation portion of the survey was pretested at three of the four sampling sites. At this time, we sat down with visitors and had them fill out the recreation portion of the survey, review the map for suggestions and fill out the desirable uses page of the survey. Discussions with visitors at each sampling point also provided useful suggestions for improving this part of the survey.

These visitor intercept pretests also served as training for the on-site interviewer. The location of visitor intercepts, the sampling protocol (only one person from each party, over 21 years of age, alternate male/female, avoid foreign visitors as the willingness to pay question uses federal taxes) and the logistics of surveying at each site were tested. Discussions with river guides and locals aided in determining when and where to survey at each site.

The suggestions from the first two focus groups and the visitor survey pretest were used by the author in developing the revised survey for the second two focus groups. The revised survey was circulated to the Pinedale field office and the Wyoming State Office. The third focus group was a random sample of Cheyenne residents conducted on June 8th. The following weekend a sample of Denver residents were used for the final focus group.

2d. Pre-testing of the Survey

Two sets of formal pretesting occurred during June. The first was ten, in-depth, personal

interviews lasting about one hour each. On June 17th, ten Cheyenne, Wyoming residents that were selected to represent a broad cross section of the public were interviewed, one-on-one using the survey booklet. These individuals ranged in age from 28 to 57. There were five males and five females. Their occupations included receptionists, truck driver, retired firefighter, teacher, homemaker and self-employed. Each person was paid \$50 for participating.

Each individual was given a copy of the survey and map. They were asked to read, mark-up and comment on each page as they completed it. They were prompted about whether they had questions about wording, layout, correspondence between the text and the map, etc. They were also observed filling out each page of the survey to look for non-verbal cues. After they completed the entire survey, they were further prompted for any overall thoughts or final suggestions.

Most people were quite complimentary about the survey layout, balanced presentation of material and wide range of management options. We did obtain numerous suggestions for refining the question wording, clarifying several points in the survey and improving the map. Suggestions included the following:

- (a) Clarifying that there was existing commercial rafting
- (b) That this was the first management plan BLM was preparing for the river
- (c) Clarifying several of the potential resource use descriptions in the rating question (e.g., changed to Sale for Housing Development and put that prior to leave as undeveloped for open space to clarify both of these by putting them next to each other).
- (d) Clarifying that camping, was boat-in camping
- (e) Adding instruction that the respondent was to read the two pages and then answer the question at the bottom of the next page.
- (f) Changed River Recreation Use Levels to River Rafting Use levels
- (g) People wanted to answer whether BLM should sell lands or not first at no cost, so we made what was a rhetorical question into a formal question with a Yes/No answer.

- (h) Clarified that willingness to pay question and recreation visitation/expenditure questions applied to their household.
- (i) Added a skip pattern out of remaining recreation questions if they had not visited the Snake River in the last 12 months, as recall of trip details was extremely difficult for trips more than a year old.
- (j) Added Colorado State University's name and address on back page to clearly identify that this survey was not from BLM and in case people lost their return envelope to facilitate mailing the survey back.

We also tested the long version of the survey that repeated the description of Strategy A, sale to private landowners versus, the shorted version that describes this program in only the first comparison and refers the respondent back. All of the individuals either indicated they preferred the shortened version or would not mind the shortened version. One person commented that by not repeating the details of Strategy A, land sale three times, it help reduce the appearance that we were pushing this as the preferred alternative.

These changes were made to the survey and then the survey was expressed mailed to the on-site interviewer in Jackson, who used the same protocol to perform 6 in-person interviews with randomly selected Jackson residents. After these pretests, the survey was finalized and reviewed by Roy Allen and Kelly Roadifer prior to printing.

3. SURVEY IMPLEMENTATION

3a. Format and Structure of the Final Questionnaire

The survey booklet was 12 pages in length, with a color cover with a locational map of the area. The survey contained an 11x17 color map insert of the study area and identified all 27 of the BLM parcels, in color and by number.

There was an introductory section of the survey on the inside cover. This described the lands, the issues before BLM and four possible management strategies. This was followed by a series of questions asking the respondent to rate what were the desirable uses of these 27 BLM parcels along the Snake River.

The majority of the survey asked respondents if they would pay for retention and increased management of the BLM administered lands along the Snake River. This is the heart of the contingent valuation survey: would you pay the higher costs for BLM to actively manage these lands. A dichotomous choice contingent valuation question was used as recommended by the NOAA panel on contingent valuation (Arrow, et al., 1993).

Based on the focus groups and pretesting, one of fifteen different dollar amounts were written on the surveys as the dollar amount the household would have to pay in higher taxes. Specifically, the wording of the willingness to pay question was "Would your household pay \$XX increase in federal income taxes each year for 20 years into a BLM Snake River Management Fund to be used only for managing these lands according to Management Strategy (B,C,D) instead of having BLM sell these lands?"

The \$XX was replaced with one of the 15 dollar amounts (\$2,3,5,7,10,15, 20, 30, 40, 50, 70, 90, 125, 175, 295). These amounts were selected such that at the low end we hoped that respondents receiving the \$2-3 amount would agree to pay that amount for one of the public land retention programs (B,C,D). At the high end we hoped that none or very few of the respondents would pay

the \$295 each year. If this pattern is achieved it would help to give well defined horizontal and vertical intercepts of the logistic willingness to pay function.

Four management strategies (A,B,C,D) were described in the survey:

Strategy A was sale of lands to private landowners. This was the "no action" strategy. If individuals did not want to pay additional for greater management, 26 of the 27 BLM parcels would be sold to private landowners (the one retained parcel was the existing rafting put-in at Wilson Bridge).

Strategy B was to keep lands in public ownership (retaining 19 parcels and trade up to 8 parcels for more accessible lands or lands adjoining remaining BLM lands), develop recreation facilities at South Park and manage for increased visitor use (up to a 50% increase in river rafting use).

Strategy C was to keep **all** 27 parcels in some form of public ownership, emphasize wildlife habitat management by limiting river recreation (reduce river rafting by 25%).

Strategy D was to keep most lands in public ownership (retaining 19 parcels and selling up to 8 parcels), manage for gravel mining, livestock grazing and existing recreation use levels.

Thus there were three scenarios that asked respondents to choose between: (1) A vs B; (2) A vs C; (3) A vs D;. Finally, they were asked to simply select the alternative they preferred if there were no cost to them.

The next to last section of the survey was a set of questions about visits to the Snake River. Finally, the questionnaire concluded with demographic questions. A black and white copy of the survey is included in Appendix A.

3b. Visitor Contact Procedures

To survey visitors, on-site contacts were performed during 21 days of the main summer recreation season (August through Labor Day weekend). Respondents were given the survey booklet as they returned to their vehicles or the rafting companies shuttle vehicle.

Visitors were given the opportunity to complete them on-site (cold drinks and clipboards were provided as well as a folding table). However, given the windy and hot conditions most visitors took our option of taking the survey home to allow them to read it carefully, think about their answers and mail it back in the enclosed stamped envelope.

The four sampling sites were chosen so as to represent both local users and tourists as well as river based users and levee users. Our intercept locations included the Wilson Bridge Boat Ramp, vehicle accessible levees on the southwestern side of Wilson Bridge, Emily Ponds on the northeastern side of Wilson Bridge and South Park Bridge (Von Gontards Landing). All four of these provide access to BLM parcels most frequently used. The Wilson Bridge Boat Ramp and the South Park Bridge Boat Landing allow us to intercept river rafters, float anglers and kayakers. Some of these are locals, but many are individuals on commercial raft trips (often called scenic trips). The Emily Ponds intercept allowed us to intercept mostly local users who use the levees for hiking, jogging or dog walking.

Given the sampling period of August through Labor Day, there were three weekend days and three weekdays sampled each of the four sites. This provided a good opportunity to sample local visitors and tourists on week long vacations.

The interviewer approached the visitors as they exited the river with the following statement: "Hello, I am working with Colorado State University on a study about the management of the BLM-administered lands that you were just visiting. The BLM is developing a management plan for these lands along the Snake River and they would like your opinions on what you think are desirable and undesirable uses of these lands. I would like you to take a survey packet home with you and fill it out. There is a nice colorful map of the Snake River that you can keep (show them sample of the map). All responses are confidential. There is a stamped, pre-addressed envelope for you to mail the survey back in.

In case we don't receive a survey back, I need you to put your name and address on this card, so we can send you a replacement survey."

Since an introduction must be made to each visitor and their name and address obtained, there was an upper limit on how many visitors could be contacted depending on the spacing of boat landings. In addition, if the company's shuttle vans were independent of the boat shuttle vehicle in some cases we only had a few minutes to contact visitors before they departed. In other cases, there was ample opportunity to conduct intercepts while the guides loaded the boat or the visitors waited for the shuttle bus to arrive. To facilitate this process, the interviewer would talk with the shuttle driver ahead of time to inform him or her that he would be intercepting several visitors to be interviewed. Along with notifying the guide, this aided in obtaining visitor and guide cooperation.

For intercepting boaters the following specifications were used: (a) over 18 years of age; (b) alternating male/female; (c) one survey per family; (d) avoiding foreign visitors; (e) no repeat visitors, i.e., if they previously received one, they were not given another one.

The interviewer kept track of refusals on-site so as to allow for calculation of the overall survey response rate. The number of refusals was 19. This is quite low given that 655 surveys were successfully handed out. The refusal rate represents about 3% of all the surveys handed out, so the on-site cooperation was quite good.

A total of 655 surveys of the 800 target were handed out over the 20 days. This is close to the number we had hoped for. The slightly lower than expected hand-out rate per day was sometimes due to bad weather at the site (e.g. rain, thunderstorms), the well publicized summer forest fires in adjacent states of Idaho and Montana that may have kept some visitors away from the Jackson Hole area and the low visitation at sites like the levees southwest of Wilson Bridge.

Even at Wilson Bridge, most visitors were putting in for their trips, not taking out, so few anglers and rafters could be surveyed there. Based on our sampling in August and September, there are far more rafters putting in at Wilson Bridge and taking out at South Park than there are putting in at Moose in Teton National Park and taking out at Wilson Bridge.

3c. Mailing Procedure for Household Surveys

As specified in BLM's solicitation, the mailing procedure for local residents, Wyoming residents and rest of U.S. residents followed a repeat mailing approach with a first mailing, with personalized cover letter, first class stamped return envelope for return the survey and a respondent incentive. It should be noted that leading survey researchers have found that using a small monetary incentive (such as \$1) increases response rates. Our past use of \$1 has increased our survey response rates from 45% to the 60% range. The \$1 incentive was attached to the front of the cover letter of all the surveys. A reminder postcard was mailed one week after the survey is mailed. A second mailing of the survey to households who fail to return the first mailing was conducted (but without the \$1).

3d. Sample Design and Sample Sizes

As specified in BLM's solicitation, three resident or household samples of about 800 were developed, one for each geographic region.

The household sample was a random sample of Teton county, the state of Wyoming and the rest of U.S. residents. The household sample was drawn by Survey Sampling, Inc. This company has been used on several previous surveys and they provide names, addresses and mailing labels in a very timely manner to geographic specifications down to the county level.

The first mailing of the 2,400 household surveys took place on Friday, September 22nd and Monday, September 25, 2000. The timing of the second mailing was based on two factors: (a) waiting for the returns of the first mailing to slow to a trickle, so as to minimize contacting households who were in the process of sending their first mailing survey back; (b) waiting until after the November 7th presidential election as many households were receiving vast amounts of campaign materials. Thus our second mailing went out the day after the election.

4. SURVEY ANALYSIS AND RESULTS

4a. Response Rate by Sample Strata

Table 1 provides the number of surveys mailed, returned and undeliverable as well as the associated response rate.

Table 1. BLM Survey Response Rate Analysis					
		Household Survey			
	Teton County	Rest of WY	Rest of US	Visitors	Total
Surveys Mailed	800	800	800	657	3057
Undeliverable	165	50	44	16	275
Deceased	4	10	6	0	20
Net Sample	631	740	750	641	2762
Returned	372	386	254	418	1430
Response Rate	59.0%	52.2%	33.9%	65.2%	51.8%

The large number of undeliverables in Teton County was due to differences between street addresses and post office boxes in Teton County. Survey Sampling Inc., provided the listings from phone books which were street addresses. Several of these were identical. Checks with the Jackson Hole Post Office indicated they were deliverable addresses. However, when the surveys were mailed, the Jackson Hole Post Office returned the surveys indicating that there was no mail receptacle there. Phone calls indicated two of these were trailer parks and one a condominium complex. Phone calls to the manager of the condominium complex indicated that about 60 of the 64 units were vacation properties that were rarely occupied. At one of the larger trailer park, the manager provided the post office boxes for the tenants for whom we had names/street addresses. These surveys were hand addressed and remailed to the tenants of the trailer park.

The somewhat lower response rate for the rest of U.S. sample is expected as the issue was of less direct salience to them than say visitors or Teton County residents. In addition, the survey was somewhat long at 12 pages. Further, the second mailing followed on the heels of the long election season with residents receiving dozens of campaign mailings, followed by the continued uncertainty over the election outcome.

4b. Descriptive Statistics of Demographics, Desirable Uses, Characteristics of Recreation Trips, Preferred Management Strategies

Prior to computing the descriptive statistics and beginning formal statistical analysis, the data was error checked. Specifically, the maximum and minimum values for all of the variables was calculated to ensure that each observation was within the defined range of the variable. For example, all responses to Yes/No questions had to be either one (yes) or zero (no). Answers to the Desirable Uses of BLM-Administered Lands questions had to be consistent with the original coding. Likewise visitor expenditure levels and demographics had to be within plausible ranges.

Sample Demographics

Sample demographic are provided in Table 2.

SAMPLE STRATA	Age (Years)	Education (Years)	Income
Visitors	46.20	16.28	\$95,539
Teton County Households	51.03	15.86	\$91,975
Rest of Wyoming Households	52.5	14.52	\$56,436
Rest of U.S. Households	53.62	14.84	\$76,042

The sample household mean income figures compare to the 1999 estimates of mean income from the 1999 U.S. Census Bureau for rest of U.S. households of \$54,842, and rest of Wyoming (\$54,177). The rest of Wyoming is quite close, while our sample income is much higher than rest of U.S. household income.

Prior Knowledge of BLM Administered Lands Along the Snake River

The survey asked whether the respondent had heard of the BLM administered lands along the Snake River. Eighty four percent of Teton county residents had, while about 50% of visitors and Wyoming residents had. Those that knew about the BLM administered lands typically found out from newspapers (30% for visitors, 33% for Wyoming residents and 51% for Teton county residents). Friends were the other major sources of information, followed by radio, television, and then magazines.

Desirable Uses of BLM Administered Lands Along the Snake River Through Jackson Hole

Table 3 presents the four subsample responses to the desirability of different uses of the BLM administered lands along the Snake River. The responses were scored on a Likert scale that ranged from one for not desirable to four indicating very desirable. This is a relative measure, so care must be taken not to over-interpret the results. They are most meaningful when items are compared to each other. Thus, bird nesting, wildlife, fish habitat, non-motorized recreation along with open-space rank as the most desirable uses while houses, grazing, motorized recreation,

sand/gravel mining rate as the least desirable uses.

Table 3. Desirable Uses of BLM-Administered Lands along the Snake River
(Scale: 1= Not Desirable, 2=Somewhat Desirable, 3=Desirable, 4= Very Desirable)

RESOURCE/USES		GROUPS	SAMPLED		
	Visitors	Teton County	Rest of Wyoming	Rest of USA	Overall
		Residents	Residents	Residents	Average
Grazing	1.7	1.8	1.9	1.8	1.8
Eagle Nesting	3.8	3.7	3.3	3.6	3.6
Other Bird Nesting	3.7	3.6	3.3	3.5	3.5
Other Wildlife	3.8	3.7	3.5	3.5	3.6
Private Rafting	3.1	3.0	2.6	2.4	2.8
Com Rafting	2.6	2.3	2.1	2.0	2.2
Fish Habitat	3.8	3.8	3.6	3.5	3.6
Motorized Rec	1.3	1.4	1.8	1.6	1.5
Non-Motor Rec	3.6	3.4	3.1	3.2	3.3
Sand& Gravel	1.3	1.7	1.5	1.4	1.5
Houses	1.1	1.1	1.1	1.2	1.1
Open Space	3.5	3.4	3.1	3.0	3.2
Snowmobiling	1.5	1.6	1.9	1.8	1.7
Public Access	3.3	3.3	3.2	2.8	3.1
Boat-in Camping	2.4	2.5	2.7	2.5	2.5

Recreation Trip Profiles

Most Frequent Recreation Activities

Table 4 presents the percentage of visitors that participate in each of the possible activities along the Snake River. Hiking/walking and bird/wildlife viewing are the most popular activities on

these lands, although private rafting trips is quite popular with Teton county residents as well.

Table 4. Percentage of Snake River Visitors Participating in each Activity				
Recreation Activity	Visitors	Teton County	Rest of WY	Rest of US
Commercial Rafting	42.9%	25.2%	35.7%	10.2%
Private Rafting	32.7%	52.8%	27.1%	2.0%
Kayaking/Canoeing	22.7%	27.3%	8.5%	2.0%
Bird Watching	50.8%	42.9%	32.8%	16.3%
Hiking/Walking/Running	61.0%	70.2%	52.7%	24.5%
Dog Walking	38.3%	40.7%	8.5%	0.0%
Private Float Fishing	28.8%	39.4%	18.6%	2.0%
Wildlife Viewing	40.4%	41.0%	48.8%	12.2%
Biking	28.6%	26.7%	8.5%	2.0%
Swimming	21.4%	18.1%	8.5%	2.0%
Commercial Float Fishing	17.3%	9.3%	0.8%	2.0%
Fishing from Shore	37.0%	47.8%	38.0%	6.1%
Driving for Pleasure	17.1%	16.5%	40.6%	14.3%
Picnicking	21.2%	30.7%	44.5%	6.1%
XC Skiing	34.4%	45.5%	10.9%	2.0%

Geographic Distribution of Visitors to the Snake River

Table 5 presents characteristics of trips by visitors intercepted on-site as well as residents of Teton County and Wyoming. While we present the result for rest of U.S. residents, the very small number of these residents actually taking trips (only 1-3 reported costs), makes the information of limited value. Annual number of visits to the Snake River by visitors intercepted at the site is quite high at nearly 27 a year or more than two a month.

This is similar to Teton County residents, who were the most represented in our visitor sample at 182 returned surveys. The rest of Wyoming residents returned 26 surveys, just slightly more than the next largest state, California with 22 visitor surveys. New England had 10 visitor surveys while New York-New Jersey had 9, with Pennsylvania having 11. The remainder of the Atlantic seaboard states had 11 surveys returned. The southeastern states of Alabama, Florida and Georgia had 16 surveys. The states of Michigan, Indiana and Ohio had 15 surveys, while Minnesota and North Dakota had 11. Illinois, Kansas, Missouri and Nebraska had a total of 18 visitor surveys returned. Other western states such as Colorado had 11 surveys, while, Idaho had 6 and Utah had 14. Washington and Oregon had five and six visitor surveys returned, respectively. With one visitor from Alaska, residents from nearly every state in the U.S. (other than Hawaii) visit the Snake River.

Most visitors and residents of Teton county spend a full day on-site when visiting the Snake River. Other Wyoming residents spend an average of two days on each trip to the Snake River. Across the entire sample of visitors an average of nearly 500 miles are traveled to reach the Snake River, although this is heavily influenced by those travelling great distances from New England, the southeast and California.

Table 5 also provides trip expenditure information. Given the 477 mile average distance and average gasoline costs of \$55, the average cost per mile is quite reasonable at 11.5 cents. A trip to the Snake River costs the typical group of four that fly's out or rents a car, stays in a hotel and has a guided trip down the Snake River, \$1064 or about \$250 per person. Those living in Teton county are the other extreme with very minimal trip costs. However, as the willingness to pay analysis indicates below, these residents still derive a substantial economic value, in part because they can visit this nationally renowned resource at such low costs.

Commercial float anglers had a higher level of expenditures than average with a group total trip costs of \$3,264, which works out to \$480 per person per day of their two day trip. This compares with commercial scenic rafters, which had a group total trip expense of \$1,648, representing \$158 per person, per day.

Table 5 Snake River Visitor Trip Characteristics

ATTRIBUTE	Visitors	Teton Cnty	Rest of WY	Rest of US
Trip Characteristics				
Annual Visits	26.7	24.2	1.8	0.1
On Site Time (Hours) 8.1	6.9	15.8	6.5	
Travel Time (Hours)	5.9	0.4	11.9	31.5
Travel Distance	477.0	10.9	282.4	1066.7
Group Size	4.1	2.9	4.3	2.0

Trip Expenditures				
<i>Gasoline Expenses</i>	\$55.08	\$3.48	\$62.45	\$76.67
Per person per day	\$13.58	\$0.86	\$7.70	\$18.90
<i>Food Expenses</i>	\$120.84	\$4.69	\$111.38	\$100.00
Per person per day	\$29.80	\$1.16	\$13.78	\$24.66
<i>Guide Fees</i>	\$102.02	\$8.91	\$5.08	\$0.00
Per person per day	\$25.16	\$2.20	\$0.63	N/A
<i>Lodging Costs</i>	\$302.72	\$0.00	\$109.00	\$186.67
Per person per day	\$74.64	N/A	\$13.44	\$46.03
<i>Air Fare/Rental Car</i>	\$482.95	\$0.00	\$0.71	\$70.00
Per person per day	\$119.08	N/A	N/A	\$17.26
Sample Size	263-328	251-276	56-74	1-3

Most Frequently Preferred Management Strategies at No Cost

After respondents had a chance to vote on pairwise comparisons of Strategy A versus B, then Strategy A vs C and finally, Alternative A vs D, we provided them with an opportunity to simply vote for the management strategy they preferred if there was no cost to them as taxpayers. As can be seen in Table 6, the majority of all samples preferred Strategy C if there were no monetary cost to the household. This management strategy emphasizes wildlife protection at the expense of slightly reducing recreation use, eliminating livestock grazing and prohibiting sand/gravel mining. Strategy B which emphasized increased recreation use and facilities, was the second most popular if there were no cost. Strategy D received the third highest level of support, especially among residents of the rest of Wyoming. Strategy A involving sale of the BLM administered lands was uniformly the least preferred management strategy.

Table 6. Management Plan Preferences				
Strategy	Visitors	Teton County	Rest of WY	Rest of US
A	2.4%	2.4%	4.0%	5.7%
B	29.0%	25.4%	29.1%	26.0%
C	59.5%	54.9%	45.1%	55.1%
D	9.1%	17.4%	21.7%	13.2%
Total	100.0%	100.0%	100.0%	100.0%

Statistical Analysis of Willingness to Pay Responses

Since respondents simply answer "Yes" or "No" to a single dollar amount, it is necessary to estimate a statistical model to infer what their maximum willingness to pay is for each management strategy. Specifically, if a respondent answers Yes to \$10, we know their WTP is greater than \$10. How much more they might pay must be determined evaluating the percentage of Yes responses at each dollar amount across the full range of dollar amounts asked of the sample. This involves estimating a multiple regression, with a particular distribution known as the logistic distribution. The logistic distribution is chosen because it limits the range of the dependent variable of the regression to between zero and one. Since our responses (and the estimated probabilities that a respondent will pay) must be between zero and one, this is an appropriate statistical distribution to use. The logistic distribution is the most commonly used statistical distribution for estimating willingness to pay from a dichotomous choice CVM question. The basic format of the simple logistic regression is:

$$(1) \log(\text{Yes}/1-\text{Yes}) = B_0 - B_1(\text{Dollar Bid Amount})$$

where B_0 is the intercept or constant term and B_1 is the slope coefficient on the dollar amount households were asked to pay. We expect as the dollar amount households were asked to pay increases, that the probability they would pay that amount would decrease, hence the negative sign on the B_1 coefficient.

The median WTP can be calculated as B_0/B_1 . The median represents the dollar amount that 50% of the households surveyed would pay. This number can be negative if more than half the households would not pay anything and would in fact have to be compensated for implementation of that management strategy. The negative WTP, means that implementation of that management strategy makes them worse off than the current situation.

The mean WTP accounts for the fact that some people have very high positive values for some of the management strategies. The mean is calculated as $(\text{natural log}(1+\exp(B_0)))/B_1$.

Table 7 presents the results of the simple logit regressions as well as the median and mean WTP. The t-statistics indicate whether the coefficients are significantly different from zero. A t-statistic larger than 1.645 indicates that the coefficient is statistically significant at the 90% level, meaning there is only a 10% chance the true coefficient is really equal to zero. T-statistics larger than 1.965 indicate significance at the 95% level, while T-statistics larger than 2.56 indicate statistical significance at the 99% level. As can be seen in this table, all of the coefficients on the bid amount are negative and statistically significant at the 95% to 99% level. This indicates the higher the dollar amount respondents were asked to pay, the lower the probability they would pay. This demonstrates that respondents seriously considered the amount of money they were asked to pay, as those asked to pay the higher dollar amounts were less likely to vote in favor of that management strategy than those asked to pay a lower dollar amount.

The pattern of mean WTP shows that Strategy C has the highest WTP for all four samples, while Strategy B has a slightly lower WTP. The mean and median WTP for Strategy D is considerably lower than both Strategy B and C. In fact, the median WTP for Strategy D is negative for the rest of Wyoming and rest of U.S. sample, indicating that 50% of households in these two samples would have to be compensated for this management plan as compared to the current situation. The sample distribution of WTP per household is sensible, with visitors and Teton County residents having the highest WTP, while rest of Wyoming and rest of the U.S. samples, having lower mean WTP per household. However, total societal WTP would be dominated by the rest of U.S. households as there are 100 million households in the rest of the U.S., and only 184,000 households in the rest of Wyoming and 6,000 in Teton County. Thus, while U.S. households would pay half as much per household as Teton County, there are millions of them as compared to thousands of households in Teton County.

Table 7. Simple Logit Estimates of Willingness to Pay

Table 7a. Visitors				
Strategy	Constant	Bid Coefficient	Median WTP	Mean WTP
B vs A	1.465	-0.007244	\$202	\$231
(t-stats)	9.35	-4.813		
C vs A	1.757	-0.006097	\$288	\$314
(t-stats)	10.39	-4.045		
D vs A	0.1744	-0.004477	\$39	\$175
(t-stats)	1.32	-2.961		
Table 7b. Teton County Residents				
Strategy	Constant	Bid Coefficient	Median WTP	Mean WTP
B vs A	0.99344	-0.005605	\$177	\$233
(t-stats)	6.57	-3.91		
C vs A	1.02168	-0.00417	\$245	\$319
(t-stats)	6.69	-2.92		
D vs A	0.215	-0.005848	\$37	\$138
(t-stats)	1.505	-3.515		

Table 7c. Rest of WY				
Strategy	Constant	Bid Coefficient	Median WTP	Mean WTP
B vs A	0.457	-0.009243	\$49	\$103
(t-stats)	3.197	-5.047		
C vs A	0.3658	-0.006969	\$52	\$128
(t-stats)	2.576	-4.314		
D vs A	-0.3005	-0.006433	(\$47)	\$86
(t-stats)	-2.053	-3.4487		
Table 7d. Rest of U.S.				
Strategy	Constant	Bid Coefficient	Median WTP	Mean WTP
B vs A	0.01918	-0.004224	\$5	\$166
(t-stats)	0.111	-2.36		
C vs A	0.31183	-0.004576	\$68	\$188
(t-stats)	1.782	-2.622		
D vs A	-0.58342	-0.005414	(\$108)	\$82
(t-stats)	-3.109	-2.257		

4d. Graphical Depiction of WTP Curves and Median WTP

To provide additional insight regarding the WTP relationships among management strategies, Figure 1 traces out the probability a household would pay as a function of the dollar amount the household was asked to pay. The probability can be thought of as the percentage of households in that sample that would pay the specific dollar amount. As all of these curves demonstrate, the percentage of households paying decreases as the dollar amount they are asked to pay increases, hence the downward sloping curve. These WTP curves are loosely parallel in concept to demand curves for each management strategy, i.e., the higher the tax price, the fewer people that would vote in favor of that management strategy. The curve on top has a greater percentage of households that would pay for that management strategy. The consistent order in all of these graphs is that Strategy C is higher than Strategy B, while Strategy D is consistently the lowest. There is a portion of the WTP curve that is in the negative quadrant of the graph indicating that some fraction of the sample would prefer Strategy A, sale of lands. This fraction is the largest for Management Strategy D, and for the Rest of Wyoming and Rest of U.S. samples. This indicates this fraction of people would prefer the lands to be sold, rather than pay for a management strategy that involves grazing and sand/gravel mining. The perception may be that taxpayers should not have to pay for managing for commodity production, as this should be self-financing from the private beneficiaries.

Further insight regarding the derivation of the median WTP figures in Table 7 can be gained by reviewing these logit WTP curve. Referring to Figure 1a there is a .3 probability or 30% of the visiting households would \$400 a year for Strategy C (instead of the default Strategy A), while 30% of visiting households would only pay \$200 for Strategy D. The median is the dollar amount that 50% of the households would pay. In Figure 2a, 50% of the visiting households would pay roughly \$300 for Strategy C (\$288 to be exact) while, 50% of visiting households would barely pay above zero each year for Strategy D (\$39 per year to be exact). Mean WTP is calculated as the geometric area underneath the respective logit WTP curve.

INSERT FIGURE 1A-1D.

4e. Testing Significance of Strategy Attributes and Attitudes on WTP

Logit Equations

While the characteristics of each of the four management strategies were chosen to adequately describe and differentiate them, we also tested to see if they had a statistically significant influence on the probability of voting for the management strategy. We are limited in our ability to do this since, many of the characteristics such as whether to allow motorized access and to allow camping, were only present together. This makes them perfectly correlated and both variables cannot be used together. Likewise, since improving wildlife habitat in Strategy C involved reducing visitor use, these two features are nearly perfectly correlated across strategies ($r=.98$). Since our survey was not specifically designed to systematically vary the levels of the attributes across strategies, the following analysis is more an extension or exploratory in nature. In addition, this equation tests for the influence of respondent education and attitudes on the probability of voting for a particular program (income could not be tested as there were a sizeable number of respondents who left this blank). Nonetheless, converting the logit equations into WTP equations where the coefficients can be interpreted as dollars does provide some useful insights at the incremental WTP provided by each feature.

Tables 8a-d provides the multivariate logit models for Teton County residents, rest of Wyoming residents, rest of U.S. residents and on-site visitors, respectively. The acres retained in public ownership was the only statistically significant strategy attribute variable. ACRES was perfectly correlated ($r=-1$) with presence or absence of sand/gravel mining and was highly correlated with presence or absence of livestock grazing ($r=-.86$). Given the negative correlations, the incremental WTP for additional acres of public lands in the Snake River corridor may also be reflecting WTP **not** to have sand/gravel mining and livestock grazing as well.

Interpretation of Signs and Significance of Variables: Indications of Internal Validity

Table 8a-d does indicate that people were more likely to vote in favor of a strategy the more

desirable they thought: (a) using the Snake River for wildlife habitat (WILDLIFE variable); (b) if they visited the Snake River (VISITOR) and the higher their education level was (EDUC). Table 8a-d indicates they were more likely to vote against a strategy: (a) the higher the dollar amount they were asked to pay (MGMTBID); (b) the more they thought motorized recreation was a desirable use (MOTOREC); (c) the more they thought selling the public land for housing development was an appropriate use (HOUSES).

This pattern of signs and significance of the variables provides some evidence of internal validity of the results. That is, it is quite sensible that those that thought selling the public land for houses was more desirable were *less* likely to vote for Management Strategy B, C and D and thus implicitly favor Management Strategy A. It is sensible that Teton County and Wyoming residents that visit the Snake River would tend to favor Management Strategies B and C which retains public lands. Further, the consistent statistical significance of the Acres variable in all of the regressions demonstrates the results pass an internal scope test, whereby respondents were more likely to vote in favor of a management strategy the more acres of public land were retained. As before, the higher the cost of the management strategy the less likely they are to vote in favor, indicating they took the dollar amount of the cost seriously.

Special Variables in On-Site Visitor Sample Logit Model

In Table 8d it is worth noting that the on-site visitor sample had a slightly different specification of the logit model, in which the VISITOR variable had to be replaced (since it was obviously equal to one for every person in the visitor intercept sample) with the number of recreation activities engaged in at the Snake River (TREACTIVE). The hypothesis is the same as with the original visitor variable: those that use the river for more recreation activities, are more likely to vote in favor of management strategies involving retention of public lands than those that engage in a few recreation activities at the Snake River.

It is also interesting to note that on-site visitors are more likely to pay for management strategies

that have lower total recreation use levels (TRECUSE). This may suggest that current users perceive existing use levels as crowded and would pay to reduce crowding. Alternatively, since the TRECUSE variable is nearly perfectly negatively correlated with wildlife habitat quality, that even on-site visitors favor Management Strategy C which gives more emphasis to wildlife habitat than visitor use levels. It could also be that both of these factors are at work and reinforce each other.

Other attitude and demographic variables not shown in Table 8a-d were generally statistically insignificant, meaning they appear not to have a systematic effect on the decision to vote in favor or against a particular management strategy. One possible reason that some of the attitude variables dropped out was there may have been very little variation in them (e.g., everyone rated them as a desirable use) or they were highly correlated with another included variable.

Table 8a. Teton County Residents Multivariate Logit Equations

```

=====
Dependent Variable: MGMTPAY
Method: ML - Binary Logit
Observations: 960
=====
Variable          Coefficient Std. Error t-Statistic  Prob.
=====
C                 -10.01485   1.408899  -7.108278   0.0000
MGMTBID           -0.006283   0.000931  -6.745429   0.0000
ACRES             0.004881   0.000765   6.377090   0.0000
WILDLIFE         0.537315   0.113025   4.753943   0.0000
MOTOREC          -0.214582   0.088341  -2.429021   0.0151
HOUSES           -0.621433   0.178951  -3.472645   0.0005
VISITOR          0.864030   0.245096   3.525276   0.0004
EDUC             0.106113   0.030166   3.517636   0.0004
=====
Mean dependent var  0.609375   S.D. dependent var 0.488145
Log likelihood      -557.3117   Restr. log likelihood
-642.2658   LR statistic (7 df) 169.9081   Probability(LR stat)
0.000000
=====
Obs with Dep=0      375   Total obs          960
Obs with Dep=1      585
=====

```

Table 8b. Rest of Wyoming Residents Multivariate Logit Equations

```

=====
Dependent Variable: MGMPAY
Method: ML - Binary Logit
Observations: 933
=====
Variable      Coefficient Std. Error t-Statistic  Prob.
=====
      C          -7.362347   1.319734  -5.578660   0.0000
      MGMTBID    -0.007433   0.001038  -7.163769   0.0000
      ACRES       0.003469   0.000760   4.565983   0.0000
      WILDLIFE    0.365551   0.099993   3.655753   0.0003
      MOTOREC    -0.117474   0.072083  -1.629706   0.1032
      HOUSES     -0.250942   0.152366  -1.646976   0.0996
      VISITOR     0.476946   0.149194   3.196821   0.0014
      EDUC        0.091513   0.027901   3.279939   0.0010
=====
Mean dependent var    0.455520   S.D. dependent var 0.498285
Log likelihood        -578.9972   Restr. log likelihood-643.0096

LR statistic (7 df)  128.0247   Probability(LR stat) 0.000000
=====
Obs with Dep=0       508       Total obs           933
Obs with Dep=1       425
=====

```

Table 8c. Rest of U.S. Residents Multivariate Logit Equations

```

=====
Dependent Variable: MGMPAY
Method: ML - Binary Logit
Included observations: 656

=====
Variable          Coefficient Std. Error t-Statistic  Prob.
=====
C                 -8.809305   1.530825  -5.754613   0.0000
MGMTBID           -0.004383   0.001131  -3.876508   0.0001
ACRES             0.004496   0.000926   4.854458   0.0000
WILDLIFE         0.682238   0.130788   5.216367   0.0000
HOUSES           -0.482411   0.176814  -2.728350   0.0064

=====
Mean dependent var    0.417683   S.D. dependent var 0.493554
Log likelihood        -402.2374   Restr. log likelihood
-445.7737   LR statistic (4 df)  87.07251   Probability(LR stat)
0.000000

=====
Obs with Dep=0          382   Total obs          656
Obs with Dep=1          274

=====

```

Table 8d. On-Site Visitor Multivariate Logit Equation

```

=====
Dependent Variable: MGMPAY
Method: ML - Binary Logit
Observations: 1080
=====
Variable          Coefficient Std. Error t-Statistic  Prob.
=====
C                  -11.41234   1.287684  -8.862687   0.0000
MGMTBID            -0.006533   0.000930  -7.023690   0.0000
ACRES              0.007227   0.000762   9.488668   0.0000
TRECUSE           -1.70E-05   8.20E-06  -2.071464   0.0383
MOTOREC           -0.160012   0.094780  -1.688255   0.0914
TRECACTIVE        0.132575   0.024096   5.501907   0.0000
EDUC              0.075550   0.031235   2.418766   0.0156
=====
Mean dependent var  0.679630   S.D. dependent var 0.466835
Log likelihood      -589.7347   Restr. log likelihood
-677.3202   LR statistic (6 df) 175.1709   Probability(LR stat)
0.000000
=====
Obs with Dep=0      346   Total obs          1080
Obs with Dep=1      734
=====

```

4f. Interpretation of Logit Equations as WTP Equations

The logistic regression equations in Tables 8a-d can be converted (technically reparameterized) into more intuitive willingness to pay equations. By dividing all non-bid logit coefficients by the logit coefficient on the bid amount, this translates all the other coefficients into willingness to pay coefficients (Cameron, 1987). Thus in Table 9a. the logit coefficients are converted to incremental WTP amounts with the following example interpretations: (a) each Teton County resident would pay \$.78 or 78 cents for an additional acre of public land; (b) people who visit the Snake River (VISITOR=1) would pay \$137.52 more per year for each management strategy than non-visitors and each additional year of education (EDUC) increases a resident's WTP by nearly \$17 (\$16.89).

Per Household Dollar Values Per Acre of Public Land

Table 9b, provides similar interpretations for rest of Wyoming residents, while Table 9c does likewise for rest of U.S. residents. By converting the logit coefficients into incremental WTP, it aids in the comparison of results across the sample. For example, Tables 9a for Teton county residents, Table 9c, for rest of U.S. and Table 9d for on-site visitors have higher incremental WTP for an additional acres of public land than rest of Wyoming residents (Table 9b). There is a reasonable degree of consistency across these three subsamples with the value of an additional acre being at least 78 cents to \$1.11 per household. While this may not seem like much, there are millions of households in the rest of the U.S., and certainly thousands of visitors the Snake River. Thus each additional acre of public land along the Snake River is worth millions of dollars to citizens of the U.S. and visitors, since protection of such land is a pure public good. That is, all citizens in the U.S. can simultaneously enjoy knowing that there is public land along the Snake River through Jackson Hole.

Visitor WTP to Reduce Congestion

In Table 9d, the incremental WTP of 3 tenths of a cent per visitor could be interpreted as their WTP to reduce congestion. That is, for every 100 additional visitors each year to the public lands along the Snake River, each existing visitor would have their annual benefits reduced by about 30 cents. Thus, while there appears to be a statistically significant crowding effect, it may be of a smaller magnitude than the additional use. As discussed in the next section on recreation benefits, the average value per day is \$30. Thus an additional 100 visitor days would be worth \$3,000. There would have to be a crowding loss of the 30 cents to more than 10,000 visitors to make it economically inefficient to allow the additional 100 visits (e.g., if there were 15,000 existing visitors, the loss would be \$4,500 from the 100 additional visits, while the gain from the 100 additional visits would be just \$3,000).

TABLE 9 REPARAMETERIZED LOGIT WILLINGNESS TO PAY EQUATIONS

TABLE 9A. Teton County Residents WTP Equations			
Observations		960	
	Variable	Coefficient	Incremental WTP
	Constant	-10.0149	(\$1,594)
	ACRES	0.004881	\$0.78
	WILDLIFE	0.537315	\$85.52
	MOTOREC	-0.21458	(\$34.15)
	HOUSES	-0.62143	(\$98.91)
	VISITOR	0.86403	\$137.52
	EDUC	0.106113	\$16.89
	MGMTBID	-0.00628	

Table 9b. Rest of WY Residents WTP Equations			
Observations		933	
	Variable	Coefficient	Incremental WTP
	Constant	-7.36235	(\$990)
	ACRES	0.003469	\$0.47
	WILDLIFE	0.365551	\$49.18
	MOTOREC	-0.11747	(\$15.80)
	HOUSES	-0.25094	(\$33.76)
	VISITOR	0.476946	\$64.17
	EDUC	0.091513	\$12.31
	MGMTBID	-0.00743	

Table 9c. Rest of U.S. Residents WTP Equations			
Observations		656	
	Variable	Coefficient	Incremental WTP
	Constant	-8.80931	(\$2,010)
	ACRES	0.004496	\$1.03
	WILDLIFE	0.682238	\$155.66
	HOUSES	-0.48241	(\$110.06)
	MGMTBID	-0.00438	
Table 9d. On-Site Visitor Sample WTP Equations			
Observations		1080	
	Variable	Coefficient	Incremental WTP
	Constant	-11.4123	(\$1,747)
	ACRES	0.007227	\$1.11
	TRECUSE	-1.70e-05	(\$0.003)
	MOTOREC	-0.16001	(\$24.49)
	TRECACTIVE	0.132575	\$20.29
	EDUC	0.07555	\$11.56
	MGMTBID	-0.00653	

4g. Economic Value of Recreation Use of the Public Lands along the Snake River

To estimate the net economic value or net WTP that visitors intercepted at the four sampling points along the Snake River receive, a dichotomous choice CVM question was asked:

"If the cost of this most recent visit to this section of the Snake River had been \$ ___ higher would you have made this visit? Yes No"

The blank dollars was filled in with an amount ranging from \$1 to \$150. We expected most people receiving the \$1 or \$2 amount to say yes, and those receiving the \$90 to \$150 amounts to say no.

Overall, 72% of those asked said they would pay a higher cost to make this trip to the Snake River. A logistic regression model similar to that used to estimate the WTP for the management strategies was also used to estimate visitors' net WTP. Table 10 provides the simple logit model for on-site visitors.

Table 10 Simple Logit Model for On-Site Visitors (n=359)

Variable	Coefficient	T-statistic	Median WTP per Group Trip	Mean WTP per Group Trip
Constant	1.466	8.66	\$107	\$119.55
RecBid	-.0141	-4.62		

With an average group size of 4 people, per person per day WTP is \$29.66 or roughly \$30 per day. This is an average across all activities, however. To evaluate the WTP across activities, a multivariate logit model is estimated that tested if there were differences in WTP by activity. Table 11 provides the logit equation with significant activity shift (dummy) variables for hiking (HIKE) and significant bid slope interaction terms for commercial rafting (RECBIDCRAFT) and

private rafting (RECBIDPRAFT). No other activities had a separate statistically significant effect and commercial and private rafting had insignificant logit curve intercept shifters.

Table 11. On-site Visitor Recreation Value Logit Equation

Dependent Variable: RECPAY

Method: ML - Binary Logit

Observations: 359

```

=====
      Variable      Coefficient Std. Error z-Statistic  Prob.
=====
           C          2.003148   0.280484   7.141767   0.0000
      RECBID         -0.019380   0.004715  -4.109977   0.0000
  RECBIDCRAFT        0.011427   0.004922   2.321618   0.0203
  RECBIDPRAFT       -0.011182   0.005681  -1.968355   0.0490
           HIKE         -0.646597   0.284728  -2.270930   0.0232
=====
Mean dependent var    0.721448   S.D. dependent var 0.448912
S.E. of regression    0.423538   Log likelihood     -190.6135

Restr. log likelihood-212.3773   LR statistic (4 df)  43.52749
McFadden R-squared  0.102477   Probability(LR stat) 8.04E-09
=====
Obs with Dep=0          100   Total obs          359

Obs with Dep=1          259
=====

```

WTP by Recreation Activity

As with the management strategies, we can calculate WTP by using the logit equation. Table 12 displays the results of this, and provides estimates of the value per day per group trip and per person per day. As can be seen, the rafting trips have the highest value per day. While the value per group trip is similar for commercial and private rafting, the value per person, per day trip values for private rafting/kayaking is substantially larger than commercial values, once the differences in group size are accounted for. This may be due to the privates not having to pay a guide fee and hence having higher consumer surplus.

Table 12. Median WTP per day, per person

	<u>WTP per Group</u>	<u>Group Size</u>	<u>WTP per person per Day</u>
Commercial Rafting	\$252	5.3	\$47.55
Private Rafting/Kayaking	\$244	3.4	\$71.76
Hiking	\$70	3.2	\$21.87

Using WTP Logit Curves and Data to Calculate Alternative Fees

The logit equations can be graphed or the results put into tabular form to show the percent of visitors that would pay a particular increase in trip cost. Table 13 presents this information in tabular form, while Figure 2 presents this information graphically. As can be seen, 75% of rafters would pay \$21-\$32 more and 90% of the private rafters would pay \$2 more per person, per day, while the remaining 10% would not pay more. Thus, even a \$2 launch fee would reduce use by about 10%. Hikers are more price sensitive, with only 75% that would pay a \$4 fee or more, and the remaining 15% would not pay anything more.

Table 13. Percent of Visitors That Would Pay Each Fee

Percentage of	Commercial Rafters	Private Hikers Rafters	
10%	99	150	57
20%	80	121	44
30%	67	102	35
40%	57	86	28
50%	47	72	21
60%	38	57	15
70%	27	41	8
75%	21	32	4
80%	14	22	0
85%	6	9	
87%	2	3.50	
90%	1	2	
100%	0	0	

Insert Recreation Logit Figure

5. CONCLUSION

Overall the survey was quite successful at obtaining attitudes, preferences, willingness to pay and recreation trip behavior of visitors to the BLM administered lands along the Snake River, as well as residents of Teton County, rest of Wyoming and the rest of the U.S.

The on-site visitor intercept, mail-back survey had a response rate of 65% and Teton County resident mail survey had a response rate of 59%. The response rate for rest of Wyoming was a respectable 52%, and only the rest of the U.S. sample had a response rate that was on the low side with 34%. Overall, the total survey response rate was 52%.

The most desirable uses of the Snake River was for fish and wildlife habitat, especially eagle nesting, followed closely by other bird nesting and non-motorized recreation. The least desirable uses were for housing development, sand/gravel mining and livestock grazing.

Four alternative management strategies were presented to respondents. These ranged from sell the lands to the private sector (Strategy A), increase recreation management (Strategy B), maintain existing wildlife habitat (Strategy C), and increased emphasis on livestock grazing and sand/gravel mining (Strategy D). In response to the question regarding which of the four management strategies they would prefer if there were no cost, the majority of respondents in all four samples indicated Strategy C (45% to 59%), even though it would reduce recreation use and access to maintain current wildlife habitat quality. Strategy A, received the least support (2.4% to 4%).

Households were asked if they would vote in favor of management strategy B versus A, C versus A, and then D versus A, where all management strategies other than A entailed paying higher annual taxes to fund that management strategy. The dollar amount that each household was asked to pay varied from \$2 to \$295. Fifty percent of Teton County households would pay \$245 for Management Strategy C, while 50% of rest of Wyoming residents and rest of U.S. residents

would pay \$52 and \$68 annually, respectively, for Management Strategy C. Fifty percent of visitors intercepted on-site would pay \$288 per year for Management Strategy C. Management Strategy B had the second highest WTP, with 50% of Teton County resident being willing to pay \$177, while 50% of Wyoming residents would pay \$49 (nearly identical to Wyoming residents median WTP for Management Strategy C). Strategy D had the median WTP. The geographic distribution of WTP suggests that Teton County residents have a relatively high value for retaining BLM administered lands along the Snake River through Jackson Hole, especially for management strategies maintaining current wildlife habitat.

A ballpark estimate of the national economic value can be approximated by multiplying the median WTP of rest of U.S. households times the 100 million households nationwide. Doing so, the economic value of managing the BLM administered lands in the Snake River for wildlife habitat is worth as much as \$680 million to at least \$230 million even if non-responding U.S. households have no economic value for maintaining public lands or wildlife habitat along the Snake River through Jackson Hole.

In terms of recreation use values, we reported both visitor expenditures and their net WTP in excess of actual expenditures. Visitor expenditure for vehicle costs averaged \$55, while full trip costs including hotel and food averaged \$250. The net willingness to pay beyond these expenses per person per day of commercial rafting was \$47, while for private raft trips the net WTP was \$72 per person per day. A day of hiking had a net WTP averaging \$22.

In sum, the survey information from a representative sample of visitors and residents of Teton County, Wyoming and the rest of the U.S. provides much valuable information to BLM for developing a preferred management alternative in the Resource Management Plan. The information on desirable and undesirable uses of the river, and the relative values of each management strategy should be quite helpful at identifying the features a broad cross section of the public desires BLM to manage for. Further, the information on the public's willingness to pay

for each management strategy should be useful in determining how much budgetary resources are economically efficient to spend managing these lands.

6. LITERATURE CITED

Arrow, K., R. Solow, P. Portney, E. Leamer, R. Radner and H. Schuman. Report of the NOAA Panel on Contingent Valuation. Federal Register 58(10):4602-14. 1993.

Cameron, Trudy. 1988. A New Paradigm for Valuing Nonmarket Goods Using Referendum Data: Maximum Likelihood Estimation by Censored Logistic Regression. *Journal of Environmental Economics and Management* 15: 355-379.

Hanemann, Michael, John Loomis and Barbara Kanninen. 1991. Statistical Efficiency of Double Bounded Dichotomous Choice Contingent Valuation. *American Journal of Agricultural Economics*, Volume 73(4): 1255-1263.

Loomis, John. 1989. Test Re-test Reliability of the Contingent Valuation Method: A Comparison of General Population and Visitor Responses. *American Journal of Agricultural Economics*, Volume 71(1):76-84.

Loomis, John. 1990. Comparative Reliability of the Dichotomous Choice and Open Ended Contingent Valuation Techniques. *Journal of Environmental Economics and Management*, Volume 18(1): 78-85.

Loomis, J. 1993. "An Investigation into the Reliability of Intended Visitation Behavior." *Environmental and Resource Economics*. 3:183-91.

Loomis, John. 1993. *Integrated Public Lands Management: Principles and Applications to National Forests, Parks and Wildlife Refuges, and BLM Lands*. Columbia University Press, New York, NY.

Loomis, John and Douglas Larson. 1994. Total Economics Values of Increasing Gray Whale Populations: Results from a Contingent Valuation Survey of Visitors and Households. *Marine Resource Economics*, 9:275-286.

Loomis, John. 1996a. Measuring the Economic Benefits of Removing Dams and Restoring the Elwha River: Results of a Contingent Valuation Survey. *Water Resources Research*, 32(2):441-447.

Loomis, John. 1996b. How Large is the Extent of the Market for Public Goods: Evidence from a Nationwide Contingent Valuation Survey. *Applied Economics* 28:779-782.

Loomis, John and Armando Gonzalez-Caban. 1996c. The Importance of the Market Area Determination for Estimating Aggregate Benefits of Public Goods: Testing Differences in Resident and Nonresident Willingness to Pay. *Agricultural and Resource Economics Review* 25(2):161-170.

Loomis, John and Richard Walsh. 1997. *Recreation Economic Decisions: Comparing Benefits and Costs*. 2nd, Edition. Venture Press, State College.

Loomis, J., K. Traynor and T. Brown. in press. Trichotomous Choice: A Possible Solution to Dual Response Objectives In Dichotomous Choice Contingent Valuation Questions. forthcoming Journal of Agricultural and Resource Economics, December 1999.

Park, T., J. Loomis and M. Creel. 1991. Confidence Intervals for Evaluating Benefit Estimates from Dichotomous Choice Contingent Valuation Studies. *Land Economics*, Volume 67 (Feb, 1991).

Pate, Jennifer and John Loomis. 1997. The Effect of Distance on Willingness to Pay Values: A Case Study of Wetlands and Salmon in California. *Ecological Economics* 20:199-207.

Walsh, Richard G., John B. Loomis, and Richard S. Gillman. 1984. Valuing Option, Existence and Bequest Demand for Wilderness. *Land Economics* 60(2):14-29.