THESIS

THE ECONOMIC VALUE OF WHITEWATER SPORTS IN THE CACHE LA POUDRE CANYON, COLORADO

Submitted by

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ABSTRACT

THE ECONOMIC VALUE OF WHITEWATER SPORTS IN THE CACHE LA POUDRE CANYON, COLORADO

This thesis estimates the non-market benefits associated with non-commercial Whitewater Sports in the Poudre Canyon of the Cache la Poudre River. We used a Contingent Valuation Model (CVM) and a Travel Cost Model (TCM) to estimate benefits to all non-commercial users at two different river locations. Using CVM, we found the consumer surplus estimates to be between $55.36 and $93.36 per trip, depending on the model specification. This equates to a per season consumer surplus of between $596,283 and $1,005,581 for a 30 day season and between $1,192,620 and $1,917,894 for a 60 day season. For the TCM, consumer surplus was estimated at either $88.01 or $129.41 depending on the specification. This equates to ranges of per season consumer surplus of $947,956 and $1,393,875 respectively for a 30 day season and $1,895,999 and $2,787,880 respectively for a 60 day season.

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CHAPTER ONE: INTRODUCTION

Importance of Valuing River Based Whitewater Sports

Most river based whitewater sports, like other outdoor recreation activities, is considered a non-market good. Similar to activities such as fishing and mountain biking, it is an activity that users and participants draw value from, but rarely pay direct, on-site costs to participate in on public lands. Proper valuation of the benefits derived from these activities is needed in order to both compare them against other goods and to understand their piece of the total value within the system or market in which they operate in.

There are many users of the Cache la Poudre River who gain value from its natural features and flows. Whitewater sports and the paddlers who participate in it form a piece of the puzzle that is the total value of the Cache la Poudre River and the Poudre Canyon. Without a proper valuation of all users of the river such as paddlers, fisherman, commercial whitewater ventures, and those who enjoy its supported ecosystem, decisions regarding water rights, flow levels, and the allowable activities may be made without the proper knowledge of all the costs and benefits.

A simple example of this would be if total value derived from the Cache la Poudre is $10,000 per acre-foot for all users (paddlers, fisherman, water rights etc.) and the city is selling off water rights that lower the water level for $6000 per acre-foot. In

this case the city is depleting the river levels at a cost well below the derived benefits from maintain natural flows. If water rights are sold off without taking into account all of the uses, including the non-market values, they could be sold at a loss because now the paddlers and fishermen can no longer use the river. This example illustrates why it is important for all benefits to be accounted for when dealing with systems that contains both market and market goods.

Whitewater sports are unique in the sporting world in that they require distinctive river features and water flows in order to participate. Much like alpine skiing, participants will travel to destination in order to take part in the features unique to that site. The Cache la Poudre River is a perfect example of this as it offers world-class rapids ranging from Class II to Class V as it flows through a scenic canyon on its way east towards its confluence with the South Platte River. It was designated a Wild and Scenic River by Congress on October 30, 1986 and it is the only river in the State of Colorado to hold this designation (National Wild and Scenic Rivers). The Wild and Scenic designation was put into place in order to, "preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations." It is because of this reason and its proximity to the City of Fort Collins that make the Cache la Poudre a destination location for whitewater paddlers.

Because of its importance to the people of the region and ongoing initiatives regarding the water rights of Cache la Poudre, proper valuation of the river, its waters, and all activities and recreation opportunities it supports must be done. Without this, decisions and policies could be made without being able to properly weight and compare

the costs to the benefits. This thesis will serve as just one piece of the puzzle that is the full value of the Cache la Poudre in the Poudre Canyon, but it is a piece that is both highly valued by the regional community and one that carries the consistent threat of having its major requirement (water) allocated away to other uses.

CHAPTER TWO: LITERATURE RIVIEW

Previous Studies on Valuing River Based Whitewater Sports

In reviewing the literature, there have only been a few studies done to uncover the demand curve for whitewater sports. The most prominent are Johnson et al. (1990), Hynes and Hanley (2006), and Ready and Kemlage (1998). The lack of more studies on the valuation of whitewater sports leads us to two important points. Firstly, this is an area of the literature, which will surly benefit from this, and other studies pertaining to value gained by whitewater paddlers through the availability and preservation of natural whitewater areas. The second point, which is highlighted in each of the following reviewed papers, is that each of the rivers that are studied offers features that are unique to that site, which make them only roughly comparable to one another. Couple this with the differences in data collection methods and valuation models, leads us to a literature review of the economic value of whitewater sports that gives us insight but not direction. This study relies on contingent valuation and travel cost method studies of other recreation resources in order to properly build our study and models.

Johnson et al. (1990) is the most comparable study to the one presented in this paper. The authors used a mail survey of non-commercial whitewater users on the Rogue River in southwest Oregon to gather the data for both a contingent valuation and

travel cost model. Using a zonal travel cost model they found the consumer surplus paddlers on the river to be $34.99 - $64.87 per trip, depending on the specification of the model. They found consumer surplus for the open-ended and dichotomous choice contingent valuation question to be $54.17 and $89.60 respectively. Though they utilized the same models as this paper, their TCM methodology is now dated, but does give us a proxy value from which we can base our study off of.

Hynes and Hanley (2006) used the Travel Cost Model to estimate the demand for whitewater kayaking in on the Roughty River in Co Kerry, Ireland. They utilized a pooled data set of internet and on-site surveys to populate their sample. The authors chose this combined format of sampling in order to reduce the effects of endogenous stratification. As stated in Hynes and Hanley, "if data from an on-site survey can be pooled with a non-site-based survey – in our case, via the internet – then the problem endogenous stratification may be avoided."

Hynes and Hanley's 2006 study utilized a truncated negative binomial model, which yielded a consumer surplus of $128.48 per trip. Respondents to their survey also reported that they took 2.83 average, annual trips to the Roughty River, thus yielding an annual consumer surplus of $385.44. This is the most comparable to study to the one presented in this paper, but given specific nature and location of each project, their values may only be generally comparable.

Ready and Kemlage (1998), used a zonal travel cost model to estimate demand for recreation sites that require prior experience in the Gauley River National Recreation Area in West Virginia. In their study, they utilized a zonal travel cost model

due to the utilized data set. They estimated their model off a 1991 survey by the National Park Service that was conducted of all whitewater participants along a stretch of the Gauley River over three consecutive Saturdays. As stated in their paper, "Useful for our purpose was a question asking for the home zip code of each paddler. No demographic information was obtained in the survey, and no attempt was made to account for multiple visits made over more than one weekend, so estimation of an individual observation model was no feasible." Their study yielded a value for consumer surplus of $95.18 per trip, for private whitewater participants on the Gauley River. Once again, these values are interesting to note and do provide insight into the demand for whitewater sports, but due to nature of data collection and again the specific nature of the site in question, the results are only generally comparable to our study here.

Other studies within the literature for the demand and value for whitewater sports include McKean and Taylor (2000), Bowker et al. (1996), and English and Bowker (1996). McKean and Taylor's (2000) study dealt with modeling the total outdoor use and value derived from the Snake River Basin in central Idaho. This study included whitewater kayaking and rafting as two, of many, activities that can be done on the Snake River. They estimated consumer surplus to be $95.18 per person, per trip, with the average number of trips from home to the basin being 2.76, thus giving an annual willingness-to-pay of $263. This study is interesting in regards to this paper as similar to the Snake River Basin of Central Idaho, the Cache la Poudre River and Poudre Canyon offer a variety of outdoor recreation activities including both private and commercial whitewater sports, fishing, hiking, camping, off highway vehicle recreation and concerts at the Mishawaka Amphitheater. The study within this paper aims to be a piece of this

puzzle to help uncover to true value of Cache la Poudre River and the Poudre Canyon and may be used in the future for a study like this one.

Though relevant, it should be noted that both Bowker and English (1996), and Bowker et al. (1996) deal with commercial, guided trips in the southeast United States. In Bowker et al. (1996) they utilized a TCM on the Chattooga and Nantahala Rivers to estimate per trip economic surplus. They found it to be between $171- $411 and $128 - $275, respectively.

In Bowker and English (1996) and as stated in the paper, " we used zonal TCM to assess the per trip economic surplus of outfitted whitewater rafting day use on the Chattooga River, which forms the northernmost portion of Georgia's boarder with South Carolina." Utilizing the same 1993 survey as above, they found average per trip surpluses to range between $30 and $201 depending on the specification of the model used. The findings of the literature review are summarized below in Table 2.1

Table 2.1: Summary of Literature Review

Author	Activity	Location	Model Used	Uncovered WTP
Johnson et al.	Non-commercial users	Rogue River, OR	TCM & CVM	$34.99 - 64.87 / trip = TCM; $54.17 or 89.66 / trip = CVM
Hynes & Hanley	Kayaking	Roughty River, Ireland	TCM	$128.48 / trip
Ready & Kemlage	Non-commercial users	Gauley River, WV	TCM	$95.18 / trip
McKean & Taylor	Rafting & Kayaking	Snake River Basin, ID	TCM	$114.48 / trip
Bowker et al.	Commercial Users	Chattooga & Nantahala Rivers, GA	TCM	$171 - 411 / trip = Chattooga; $128 - 275 / trip = Nantahala
English & Bowker	Commercial Users	Chattooga River, GA	TCM	$30-201 / trip

Non-Market Valuation Techniques: The Contingent Valuation Method

The contingent valuation method is a popular method of uncovering individuals' demand schedules for non-market goods. It does this by uncovering their responses to willingness-to-pay questions regarding a good in question. The underlying basis for it lies in uncovering the maximum a user of the non-market good would be willing to pay to for the good until they stop visiting all together (Mitchell and Carson, 1989). It was first proposed by Ciriacy-Wantrup in 1947, but the theory was validated by Hanemann (1984) and then after the Exxon-Valdez oil spill of 1989, a Blue Ribbon panel concluded that CVM studies can provide reliable estimates as long as guidelines for survey design and implementation are followed. (Arrow et al, 1993).

In a CVM study, a survey is used in order to elicit users' responses on their willingness-to-pay for either a certain non-market good, or a change in that good. These surveys may be in the form of an in-person interview, telephone interview, mail surveys, or in the case of this study, a hybrid where respondents were contacted at the recreation site but given a mail back survey. The format of the survey and questions there in, are vital to the survey and it giving dependable results. For CVM studies, the willingness-to-pay question may be asked one of two ways:

It may be an open-ended question, such as:

"*How much, in addition to your stated expenses, would you be willing to pay to make this same trip for the purpose of whitewater paddling, to the Poudre Canyon." $*_____

Or, in the case of this study it may be closed-ended or dichotomous choice:

"If <u>your</u> share of the total cost of this most recent trip had been $_____ higher would you have made this trip to this river where you received this survey?"

Circle one: YES NO

In the actual survey, the dollar amount in the dichotomous choice question would be filled in with a varying and randomly assigned amount.

Both formats have their individual advantages and disadvantages, but the closed ended, dichotomous choice format was chosen due to a few factors. First, giving the respondents a dichotomous choice helps to control for exaggerated response that may be given in the open-ended format. Secondly, it more closely resembles an actual market transaction where a person pays for a good or service and thirdly, Loomis (1990) found that the results from a dichotomous choice CVM study were at least as reliable as the results from an open-ended choice study. This is also in keeping with the recommendation of the Blue Ribbon panel, which suggested the use of dichotomous choice questioning as a way to minimize hypothetical biasness in the responses.

For a dichotomous choice CVM study, we are looking to uncover the users' maximum willingness-to-pay for visitation to the recreation site through the use of a logit regression model. This model estimates the probability of a "yes," answer to the willingness-to-pay question where we expect probabilities to be near one for smaller bid amounts and zero for the higher bid amounts. A logit regression model is most

appropriate for this form of questioning because it compares the probabilities of each answer at differing dollar levels and then makes probabilistic inferences about how much more each respondent would pay before their response would change to a "no," and they would no longer visit this site (Loomis, 1988). Furthermore, the logit model is used over a linear model as it restricts the probability of response to positive values. A linear model allows for both probabilities less than zero and greater than one, which is inappropriate for our study.

The Travel Cost Method (TCM)

The Travel Cost Method is another technique used to value non-market goods. Opposed to the stated preferences of a contingent valuation method, the TCM instead utilizes a revealed preference method. This means we are looking at what respondents actually spent in order to visit the recreation site, opposed to asking them how much more they would spend. This model is based around the premise that the number of trips to a recreation site will decrease as the distanced traveled to get to the site increases (Walsh, 1986).

By assuming that the costs of visiting a recreation site vary directly with the distance to the site, we are able to estimate a demand curve for recreation at the site. The costs associated with visitation are used as a proxy for the price of visitation since, like with all non-market goods, there is no direct entrance price charged to use the Cache la Poudre River.

Following Freeman's paper (1993), several assumptions must be addressed within the data in order for the TCM results to be considered valid. The first assumption is that for costs associated with visitation to the recreation site to be valid measure of price, they must occur as part of a single destination trip to the recreation site. For example, costs associated with taking a half-day trip on the Cache la Poudre on the way to visit Steamboat, CO would be over stating the true costs as the trip as in this case it is a multi-destination trip. For a TCM to give valid results, the trip to the Poudre Canyon must be the only destination in conjunction with the associated costs for that day. Secondly, we must assume that there is no utility, or enjoyment, from the travel time itself. All costs and time spent must be for the sole purpose of reaching the recreation site and not valued as a good themselves.

Endogenous Stratification/Truncation in the TCM

A specific issue that arises in a Travel Cost Model is that of endogenous stratification and truncation of the data due to the sampling method. As stated above, and will be detailed in the methodology section, the sampling for this study was done on-site with the surveys then returned by mail. By sampling on-site, you restrict the data to people taking at least one trip to the recreation site and therefore no zero trip responses are observed. This accounts for the truncation of the data at one trip and must be accounted for in the estimation techniques.

As detailed by Englin and Shonkwiler (1995), endogenous stratification occurs when the likelihood of a certain person being sampled is related to the frequency of their

visits to the recreation site. This introduces biasness into the data, as the only people sampled are those who were recreating on the days that sampling occurred. In order to properly value whitewater sports in Poudre Canyon, we would ideally need a sample that includes people who are avid whitewater participants to people who never personally go. This "avidity bias," must be corrected for and can be done so in the Poisson travel cost model by subtracting one from the stated number of trips (Englin and Shonkwiler, 1995). Without correction of these two biases, the data will provide incorrect estimation of the calculated willingness-to-pay and consumer surpluses.

CHAPTER 3: STUDY METHODOLOGY

The following section will detail the aspects used in planning the project, designing and implementing the survey, analyzing the data, and the estimation of the models. For the planning of this project, the survey was designed to both gather data about potential visitation to the proposed Fort Collins Whitewater Park and to gather the data needed to perform a CVM and TCM study. The following section will discuss the Fort Collins Whitewater Park while each section of the survey will be discussed in more detail in the survey design section.

The Fort Collins Whitewater Park and Initial Planning of the Project

The initial planning for this project was started in the spring of 2010 to evaluate the visitor potential for a whitewater park on the Cache La Poudre River as it flows through the Old Town area of Fort Collins. Before finalized planning or construction of the whitewater park can begin, the investors and project planners requested an economic assessment of the visitation and use of the proposed Fort Collins Whitewater Park (FCWP). This assessment would answer the questions of how many people would potentially use this resource, as well as give indicators of the financial gains the city might expect from the expenditures of the additional visitors to the area. The hope of the

FCWP proponents was that through the building of the FCWP, the town could attract tourism dollars from whitewater paddlers from the North Colorado and Southern Wyoming regions, while also keeping expenditure dollars in town from whitewater paddlers that travel to out-of-town whitewater parks.

The findings and results of this survey will be used by the Save the Poudre Foundation and the City of Fort Collins in determining whether or not to build the FCWP. This study could also have importance to local and regional policy makers as the water rights in the Cache la Poudre are being debated in regards to the Northern Integrated Supply Program (NISP). The potential gained revenues from the tourism and visitation to the FCWP could be a key point to the determining the overall value derived from current water levels in the Cache la Poudre as it flows through town, and thus could impact decisions made in the future regarding the water rights and storage of waters from the Cache la Poudre.

The discussed values of the Cache la Poudre in the Poudre Canyon presented in this paper and the value of the waters through town should be kept separate. Even though it is the same river and only about 20 miles separate the locations, there are many water diversions and water rights projects between the two segments, which shape each section of the river. Anywhere along the Cache la Poudre, you will encounter varying flows and water levels, and differing ownerships of the water rights depending where on the river you are. The derived value of whitewater sports in the Poudre Canyon and its connection to the to the total value of the Cache la Poudre River in the canyon found in this study, is not analogous to the value of the river through town, even though it encompasses many of the same activities.

As will be detailed more in the results section, the data from the survey was then used to create an economic report for the city and Save the Poudre. This report gave estimates on the number of potential visitors, the number of trips each visitor would take, estimates of their expenditures that would be spent in town, as well as basic demographics information. This information will hopefully be used by the city council in order to make the appropriate decision regarding the building of the FCWP.

Data Needs: Sampling Methodology

Once the purpose of the study had been finalized, locations of where the surveying was to take place had to be chosen, the survey designed and then a pre-test of the survey preformed to check for errors or omissions. For this study, it was decided in the planning stages that the survey would be of non-commercial whitewater paddlers of the Cache la Poudre River since it met both requirement for the study. The location was an ideal site for a CVM and TCM study, while also serving as a great place to survey potential users of the FCWP. It was assumed that paddlers intercepted up in the Poudre Canyon would represent a representative sample of those likely to use the FCWP.

It is important to note here that the focus of this study on non-commercial paddlers. The Cache la Poudre River is a very popular destination for all types of whitewater enthusiasts and supports multiple commercial guiding services based out of Fort Collins. These companies, their customers and the value they derive from use of the river are part of the overall value of canyon, but are outside the scope of the models in this paper

By excluding the commercial users, this narrowed the scope of the study for the purposes of this thesis to the value of non-commercial whitewater sports in the Poudre Canyon. From there, it took some research and discussions with local paddlers to determine the locations along the river that would lend themselves to a high likelihood of interception with paddlers. The critical point when performing a survey is to collect a data set that is a representative of the population as a whole. For the purposes of a study on whitewater paddlers, a representative population must include all types of potential users of the FCWP; kayakers, rafters, and inner-tubers as well as cover locations, or runs, that range in difficulty so that all skill levels are surveyed.

Ideally, the survey would obtain a random sample of all whitewater paddlers who utilize the Poudre Canyon. However, we were only able to actually survey those who were intercepted along the river during the survey period of the summer of 2010. This eliminates any users visiting only before the surveying began, those who only to use the river into late summer or moved up the canyon in hopes of finding higher water levels, and those paddling on days when surveys was not being performed. However, since most paddlers use of the Poudre would overlap our sampling period, we believe we have captured the vast majority of Poudre Canyon paddlers.

The surveys were designed to be given out on-site, taken home, filled out and returned via a provided addressed and stamped return envelope. Along with taking the survey, potential respondents were asked for their home address so that non-respondents could be mailed additional surveys in order to increase the response rate. Utilizing this format meant for a large investment of time by the interviewer, but due to budget constraints and the limited section of the river being studied, it was the cheapest option.

One potential downfall of this type of survey design is the problem of item non-response bias due to lack of understanding of the questions. This did not turn out to be a problem, but was present in the responses to a few of the questions.

With this format of survey implementation and data collection, there are three problems that arise. The first is interviewer bias. The interviewer must be able to give *consistent* guidance and be able to answer any questions that may arise when dealing with potential respondents without giving any biased information that may influence the answers given. This was fortunately not a problem given that this survey was of the take-home variety, but given the dual propose (potential visitation to FCWP and valuing whitewater recreation in the Poudre Canyon), there was some needed explanation about the purpose and potential outcomes of the survey to each paddlers intercepted. The information given out in these conversations had to be non-biased and informative only. Examples of the script that was used can be found in Appendix IV.

The second problem that may arise comes from the large time investment need by the interviewer in order to properly perform the survey. Again, this was not too large of a problem as the data collected in this survey was the cornerstone of this master's thesis and its importance was understood at the onset of the project. The third problem with this style of data collection is that of "avidity bias." As previously mentioned, avidity bias occurs in surveying when respondents are intercepted on-site instead of through a more random method such as mail survey. By going directly to the recreation site, not only do you increase your chances of seeing avid users of that location, you also miss all users who do not utilize that location. This leads to Endogenous Stratification, and as detailed in Chapter Two, must be dealt with.

Sampling Location

After gathering information about available runs, their associated put-in and take-out locations and the levels of skill needed to negotiate them, two locations where chosen along the Cache la Poudre. They were the Filter Plant Run and Bridges Run, located on the stretch of the river that flows through the lower section of the canyon. Each of these locations included a put-in and take-out location. This essentially made four locations at which paddlers could be intercepted, though it was found that the take-out locations were a much more fruitful location to intercept paddlers at. These are labeled Location 1, 1.1 and 2, 2.1 respectively and in the order of put-in and take-out, in the map in Appendix II. The first location, the Filter Plant Run is one of low to medium difficulty when the river is flowing at normal spring and summer levels. This run includes Class II and III rapids through a few different sections. During the initial spring melt off, especially after a snowy winter, the levels on this stretch can reach expert levels for a period of time, but for the majority of the season this run serves all beginners to intermediate users of all disciplines (i.e. kayaking, rafting, inner-tubing, etc.).

The second location, Bridges Run, offers intermediate to expert difficulty levels with Class III-V rapids throughout the entire run. Again with this run, during spring melt off, the levels of the river may rise dramatically and the majority of this run may become expert only levels. As was the case with this study, the spring melt off came in early June, making for one to two weeks of expert only water levels on the river, which had some impact on the survey, due to the lesser skilled paddlers waiting until the water level subsided before taking to the water. Though this had to be noted, it is certainly not out of character for a mountain river, which gathers its water from the winter snow pack.

The sampling for this study began shortly before the melt off in late May and continued into late July when the water levels have dramatically decreased. By the end of the survey schedule, the Filter Plant run was only being used by inner-tubers and beginner level rafters and kayakers while those of higher experience were assumed to have either moved farther up the river or ended their season all together. This "criminally short" whitewater season as it was described to me multiple times by the paddlers meant that this study had to be completed over a very short time frame.

Survey Creation

The survey for this project was designed utilizing Dillman's Tailored Design Method (Dillman, 2000) and was tailored to meet the specific needs of this project. This included questions regarding potential visitation to the FCWP under varying water levels, expenditures made for the trip, information on how far they traveled to reach the canyon and basic demographic information.

The order of these questions and placement of graphics and information was very important to the success of the survey. As can be seen by referencing the actual survey available in Appendix III, the survey started with two pages of collecting information about the respondent's most recent trip. This included information on what was their primary activity, how far they traveled, and what their expenditures were for trip on which they were intercepted. This data was used to calculate the TCM. Along with these questions, the closed-ended, dichotomous choice question eliciting willingness to pay was asked and the data from that was used to perform the CVM model.

After those questions, an information section was provided describing the FCWP, its features and season length. This was in order to make sure the respondents had all pertinent information about the FCWP before any questions were asked about it. The question regarding the potential visitation was split into a two part question in order to uncover the users' change in visitation giving an increase in water flows through the park location. The first of the two questions asked if they would visit the FCWP under "Current Flows," then asked their primary activity that they would be doing and offered a blank area for them to explain their answers. The next page included the hydrograph which can be seen on page 73 of Appendix III. This graphic allowed for the respondents to see a visual representation of the 25-year average flows and the corresponding season length and quality of rapids that would be available. A second, hypothesized line was added to represent an "Increased Flow" year. This was described to the respondents as a representation of a summer flowing a snowy winter, or the potential river levels if less water were divert for water projects. The survey then presented a written description of what an "Increased Flow" season would provide and then asked the same question as in the first part, but in regards to the higher flows. After the second question regarding the FCWP, respondents were asked a page of basic demographic questions and then allowed to write in any comments that they wished on the back of the survey regarding the FCWP, whitewater paddling in Northern Colorado or whatever they choose.

Pretest

Once the survey was completed and in a form that was both concise and effective, a pre-test was performed in order to uncover any sections that lent themselves to misunderstandings or were unclear. The pretest was preformed over Memorial Day weekend at the annual "Paddle the Poudre" weekend. It acts as a kick off to the whitewater season where Colorado and other regional paddlers camp out along the river and take multiple runs over the weekend. It allowed for double-checking the chosen survey locations as well as easy interception of paddlers as there higher than normal numbers of them out on the river. Each location was tested by parking at the take-out site with a cooler stocked with cold drinks to help entice those intercepted to take some time out of their weekend in order to both complete and give feedback on the draft survey. Once they were handed the survey, feedback was elicited for each section to make sure of their clarity.

A total of 23 pretest surveys where completed, representing a 100% response rate. This means no one approached to take the survey declined the offer. The format of the survey used for pretest was nearly in its final form, but at the time we were open to any suggestions to would make it easier to understand and complete. The primary formatting change to the survey after the pretest was the moving of the hydrograph from page three to page four so that it was after the description of the features that would be included in the potential FCWP. The hydrograph illustrated the water levels of the Cache la Poudre under "Current," or 25-year average flows, and hypothetical "Increased" flows and their correlation to the quality of water flows for whitewater paddling.

The pretest included the closed ended dichotomous choice willingness-to-pay question in what would become the final form. Results from this question confirmed the expected range of willingness-to-pay for whitewater sports in the canyon, but the exact range and choice for bid amounts was amended slightly for the final version of the survey. Those bid amounts in the final survey, were eight different dollar amounts, ranging from $5 to $150 that were randomly distributed to participants in the canyon. This upper bound was chosen to reflect that even though the whitewater features in the canyon are at least a regional draw, there needs to be a level uncovered where the probability of answering "yes," is near zero.

In order to collect the needed data for the TCM, respondents were asked in the survey how many trips to the Poudre Canyon, for the purpose of whitewater sports, they had taken in the past 30 days. 30 days was chosen as it reflects the peak boat-able season for the Cache la Poudre. These responses were used as the dependent variable within the travel cost model and are regressed against the stated costs of the trip. The associated costs include gasoline, food, and time spent traveling to the site. As will be detailed in the methodology section, these variables were combined in differing ways and used as the independent variables. As these costs increase, we expect the number of trips to the Poudre Canyon to decrease thus giving an estimate of the demand curve from which consumer surplus can be calculated.

Data Collection

As mentioned before, surveying took place from late May until late July in 2010. Dates were carefully selected in order to make sure a representative sample of both

weekday, or after work paddlers, and weekend or destination paddlers where captured. The routine of the day was typically the same for both weekdays and weekends, though the starting and ending times varied, as well as the amount of time out on the river.

For a weekday survey session, the work day would typically start around 2:30pm with the 30-45 min drive up to the canyon to the first take-out location. Much like alpine skiing and other destination based recreation, weekends and evenings are the more crowded times on the rivers. Those looking to avoid crowds will purposely go at off times in order to have a less crowded river. This starting time was chosen as it lent itself to the possibility to intercept some of these off time users, while also allowing for ample time at each of the locations in order to catch the after work crowd.

Once in the canyon, the only plan was to spend generally half of the time at each sampling location, while still handing out as many surveys as possible. This entailed knowledge of the river, paddler habits and patience, as there was a lot of waiting for the paddlers to get out of the river. The biggest difficulty in the whole survey was timing the actual intercept itself. It was found that a typical after work paddler is in a hurry to get into the water upon finally getting up the canyon, and does not have the time or the free hands to take a survey while gearing up and arranging shuttle riders to the put-in spot. Conversely, these after work paddlers enjoyed hanging out at the take-out spots and socializing with other paddlers upon completion of their runs. This was helpful information to garner as it allowed for me to plan stops at the take-out spots later in the evenings when the probability of users both being there and having time to take survey were the highest. Typically a weekday survey session ended between 7 and 8 pm, depending on when the parking lot cleared out.

A weekend session followed much of the same protocol of spending approximately half of the day surveying at each location, but the hours surveyed were typically 11am till 6pm. For the same reasons as on weekdays, the starting time allowed for interception of morning users as they took out from the river, while also allowing for the opportunity to intercept the afternoon paddlers at both the put in and take out spots. It should be noted that like the weekdays, interception at the take out locations and at the end of the paddler's day gave the greatest amount of success.

On surveying days, I dressed in a Colorado State University(CSU) hat, and CSU collared shirt along with a nametag. Upon interception, I would approach them and introduce myself as a researcher from Colorado State University who was performing a survey in regards to the building of the FCWP. This was typically enough to initiate a conversation about the current state of the project and allowed for me to explain the importance of their participation in the survey. The FCWP turned out to be a hot topic that elicited a lot of interest in the survey. This park has been in the planning stages for a few years and many paddlers from Fort Collins are at least aware of the attempts to get it built.

After speaking about the FCWP, I would also explain that the survey would additionally help with my research about the value of whitewater sports in the Poudre Canyon and its importance and connection to both the FCWP but also all of the water rights issues in the region. I would describe to them that the survey was a take home, mail back version, with return postage included, and that they would not be required to take the survey at this time. I would then ask them if they were interested in participating

and if they agreed, I would also take down their home address so that I could mail them a follow up survey were they not to respond.

Each survey was packaged in the same way; a cover letter on official CSU letterhead explaining the purpose and importance of the project, the addressed and stamped return envelope with stamp side up, and the survey paper clipped together all in a large CSU envelope. This allowed for easy distribution of the surveys as well the order of packaging allowed for them to see that there would be postage costs to them. This packaging was also important in order to properly distribute the survey so that there were varied selections of bid amounts for the CVM question, as well as tracking who had returned their survey so that they were not mailed an unwarranted duplicate.

The take home, mail back format of this survey may have decreased the overall response rate of the survey opposed to making them take the survey on-site, but overall I feel it actually helped the response rate given that the typical person intercepted had just gotten out of cold river, had just completed something physically demanding and was carrying large cumbersome equipment. This format allowed them not feel rushed or put into a position where they were trying to read and answer a survey while being wet and out of breath. Only four people all summer refused to take the survey, and of them, two of them were in the same group and were from outside the region and were not interested in the FCWP. The response rate for this survey was 60.71%, which Dillman considers to be very good for this format (Dillman, 2000).

Finally, all whitewater participants, over the age of 16, were elicited a survey with the one caveat of trying to avoid surveying the same household or person twice. A group

of paddlers who do not live together, but shared a ride up the canyon would all be eligible, but a husband and wife, even if they had separate boats, were only eligible for one survey. Also, with spending multiple days at each location, a few paddlers were intercepted multiple times. These multiple intercepts were not eligible for additional surveys as once they had filled one out, they were ineligible to take another one. This did not prove to be a problem as there was typically enough time to speak with each group in order to avoid double surveying both households and individuals

Each survey was numbered, and that number was matched to home address given by each potential respondent. At the start of each week, new surveys were assembled, those ones received were entered into a spreadsheet and those who had taken a survey but not yet returned it had follow up surveys prepared. At most, non-respondents were mailed an additional two surveys, for a total of three. After three non-responses, it was determined that they were not interested in participation. These non-responses were accounted for in all estimates regarding visitation to the FCWP. Upon the completion of the data collection period, all addresses provided by those intercepted were then shredded in order to maintain privacy and confidentially.

Treatment of Outliers

It must be discussed that upon review of the data set, it was found that some of the received responses were unrealistic given the question asked. The three most prominent questions where this happened was when the respondents were asked how many trips they had taken to the Poudre Canyon in the last 30 days, and under the expenditures

section where they were asked for their per item expenditures for the single trip on which they were intercepted. A small subset of respondents gave answers above 30 for how many times they had visited the Poudre Canyon in the last 30 days. This may have been due to them counting each individual trip down the river they had taken, or simply just misreading the question. Either way, it had to be assumed that a person could not take more than 30 trips in 30 days. Therefore any responses to this question above 30 were adjusted down, thus making our results somewhat conservative.

Similarly, a selection of respondents gave very high (on the order of $2000) expenditures for their trip. These responses seemed to outline all expenditures need to participate in whitewater paddling, including those described as fixed costs. Even though it could have been the case that they had purchased their entire whitewater gear that day (highly unlikely), many of those cost still would have been fixed costs that are not part of their marginal trip costs. For these situations, the responses to each category were looked at and were adjusted to be more consistent with the upper end of the other responses.

The third question that gave results that had to be reviewed was within the question asking for the group size that respondent was paddling with that day. The average group size was found to be 5.44 people, which on first review is not unrealistic, but after review of the response, it was found to be inflated by five respondents who were intercepted on a group trip of 40 people. When the sample was adjusted to remove, or amend these responses, it was found that the average group size decreased to 3.7.

Unlike the other outliers, this category does not suffer from lack of understanding like the previous two, but rather from the interception of an abnormally large, single

group of users (the five responses all stated a group size of 40). It was therefore decided that these should not be removed from the sample because they are both valid responses and that the five users actually surveyed out of the group of 40 does not represent a statistically significant percent of the entire sample. Therefore, two results will be reported for TCM; one for the group size of 5.44 and one for the adjusted group size of 3.7. More detail on this will be presented in the results chapter.

Sample Expansion

The collected data represented only those who were actually intercepted alongside the river. In order to make inferences about the whitewater paddling population as a whole, sample expansion techniques had to be utilized to help fill in the gaps of days when surveying did not occur. By doing this, estimates and statements could be made that encompass the entire user population. In order to do this, careful notes were taken on each day out surveying. These notes included amount of time spent in the canyon, the number of surveys handed out, and the number of refusals.

Once this data had been entered into a spreadsheet, it was used to estimate the total number of whitewater users that would have been intercepted had surveying taken place every day. More specifically, the method of expansion followed looked at the number of surveys handed out in the time spent at each location. This rate was then expanded to cover the full day at both locations, since the interviewer was either at the Filter Plant location, or Bridges location thus giving us an estimate of the total amount of paddlers on the river that day.

These per day estimates where then used to expand the sample to cover the other days when surveying did not take place. Weekdays were only expanded into other weekdays and weekends days to other weekends. For example, if ten surveys were handed out on the first weekday of survey, this meant it was assumed that there would be at least ten users per weekday on each of the days when surveying did not take place.

Furthermore the expansion factors were always updated given the next day of actual surveying. For example, if surveying took place on Monday, Thursday and Saturday of week, then Monday's numbers would be used to expand the sample for Tuesday and Wednesday. Then Thursday's numbers would be used to expand each of the weekdays until the next weekday of Survey. Using this same technique, Saturday's sample would be used for Sunday and any weekend days until the next weekend survey day. This technique worked well as the amount of surveys handed out roughly matched the whitewater season with the numbers peaking in the latter half of the season and diminishing by mid-July. The numbers from this were aggregated up in order to estimate a total number of unique, individual users of the Poudre Canyon.

Results from this expansion were heavily used in the report for Save the Poudre and are used in this thesis to estimate the total number of per season users of the Poudre Canyon. This number allows us to calculate the total consumer surplus for Cache la Poudre in the Poudre Canyon.

CHAPTER FOUR: MODELS

To uncover the value of whitewater sports and activities in the Poudre Canyon, we will build off the methods of the previous studies of Johnson et al. (1990) and Hynes and Hanley (2006). We utilize the contingent valuation and travel cost methods in order to assess the consumer surplus or net willingness to pay for whitewater sports in the Poudre Canyon. These methods help to revel several characteristics of consumer preferences in order to estimate a demand curve. From this demand curve we can calculate the consumer surplus that is reaped by paddlers of the Cache la Poudre. This consumer surplus makes up the value of the benefits to the paddlers of the river and is itself a piece of the total value of the Cache la Poudre River and the Poudre Canyon.

Because of their underlying methods of estimating demand in each of the models, many economists prefer the travel cost method to the contingent valuation method. This is due to the fact that the travel cost method utilizes revealed preference for the users willingness to pay (i.e. they state the amount of money they did pay to take the trip) instead of hypothetical net willingness to pay in the contingent valuation method (the CVM question in the survey asks for the respondent if they would still take the trip if their costs were $___ more). Even with this fact, both models have been proven to provide reliable results when valuing non-market goods such outdoor recreation.

Since there is no entrance or user fee charged to paddle the Cache la Poudre River, the before mentioned value of the benefits are all from consumer surplus. This surplus describes the difference between a consumer's maximum willingness to pay and the actual travel costs associated with the trip and makes up the benefits to the user. The consumer surplus will vary from user to user, depending on a group of exogenous variables describing the characteristics of the location in question and the preferences of the users.

For a more detailed example of consumer surplus, imagine a whitewater paddler taking a trip to the Cache la Poudre. On this trip, the user spends $50 on gasoline and drives one hour to the put-in location on the river. In this scenario the user values his time at $20 per hour. Therefore, the user's travel costs were $70, but if his maximum willingness to pay for this same trip is $150, then his marginal consumer surplus would be $80. For this study, we attempt to estimate this average consumer surplus for all whitewater users of the Cache la Poudre in the Poudre Canyon.

In both the contingent valuation and travel cost models, river attributes, and demographic information are combined with the costs of travel or stated willingness to pay figures in order to estimate the model. Fixed costs associated with whitewater paddling are <u>not</u> included in study like this. Examples of these fixed costs include the price of the kayak or raft, paddles, helmet, wet suit, and carrack. Since these items do not represent a per-trip, or marginal cost to whitewater paddle at the Cache la Poudre, then they must not be included in travel cost to the specific site, as they are associated with all whitewater trips taken by the user.

In theory, the demand for whitewater recreation should follow the Law of Demand. As the price, or cost, to participate in whitewater recreation increases, we expect to see the amount of trips taken to decrease in the same fashion that as a price of a good increases, less will be purchased. But in following this theory, we see that there are other variables that will affect and influence the demand for whitewater recreation. These variables include the users' skill level, age, gender and other demographic variables collected from the surveys.

Contingent Valuation Model

For the contingent valuation model, we are estimating the log of the odds ratio, which gives the probability of paying the increased travel cost. The contingent valuation model for this study will be constructed as follows:

$$(1) \qquad \ln\left[\frac{yPay}{(1-yPay)}\right] = \beta_0 + \beta_1*(BID) + \beta_2*(V_2) + \ldots + \beta_N*(V_N) + u$$

For this model, we will be performing a logit regression where the BID variable represents the price of participation, or the hypothetical increase in travel costs asked of each respondent in the survey. yPay represents the probability that the survey respondent indicated that yes, they would be willing to pay this increased amount to paddle the river. We expect that the coefficient on the BID variable to be negative, thus showing that as the price, or cost, of travel to the site increases, the probability that they would take the trip should decrease. In the above equation $V= (V_2,\ldots,V_N)$ is the vectors of independent

variables describing the location and demographics of the users. The exact model estimated will be presented in the results chapter, Chapter 5.

Consumer surplus can be calculated from the results of this regression by finding the Median Willingness to Pay (MWTP), through the use of the following equation (Hanemann, 1984):

$$(2) \qquad \text{MWTP} = \frac{-[\beta_0 + \beta_2*(\bar{V}_2)+\cdots+ \beta_N*(\bar{V}_N)]}{\beta_1}$$

In the above equation, $\bar{V}$ represents the vector of the mean of each of the independent variables. We can show the derivation for median willingness to pay by starting at the original logit specification and deriving as follows:

$$(3) \qquad \ln\left[\frac{yPay}{(1-yPay)}\right] = \beta_0 + \beta_1*(\text{BID}) + \beta_2*(V_2) +\ldots+ \beta_N*(V_N) + u$$

From the above equation, we can see that at the median, the probability of either a yes or no answer is 0.5, or 50%. That means that at the median, the dependent variable will be the ln (0.5 / 0.5) or ln(1) = 0

Therefore we can rewrite equation (3) as:

$$(4) \qquad 0 = \beta_0 + \beta_1*(\text{BID}) + \beta_2*(V_2) +\ldots+ \beta_N*(V_N)$$

By performing some algebraic manipulation on the above equation, we can arrive at an equation that describes the BID amount at which half the users will say yes and the other half will say no, or the MWTP equation:

(2) $$\text{MWTP} = \frac{-[\beta_0 + \beta_2*(\bar{V}_2)+\cdots+ \beta_N*(\bar{V}_N)]}{\beta_1}$$

In order to more accurately match the potential shape of the willingness to pay curve and to rule out portions of the WTP curve being in the negative quadrant, the independent variable BID may be logged. For this situation, our functional form is now:

(5) $$\ln\left[\frac{yPay}{(1-yPay)}\right] = \beta_0 + \beta_1*\ln(\text{BID}) + \beta_2*(V_2) +\ldots+ \beta_N*(V_N) + u$$

For this case, to calculate the median willingness to pay formula must be exponentiated.

(6) $$\text{MWTP} = \exp\{\frac{-[\beta_0 + \beta_2*(\bar{V}_2)+\cdots+ \beta_N*(\bar{V}_N)]}{\beta_1}\}$$

To find the marginal effects on the willingness-to-pay for each variable, me must divide the coefficients from each independent variable, by the BID coefficient. This gives us the following equation for the linear model:

(7) $$\frac{\partial WTP}{\partial(V_N)} = \frac{-\beta_N}{\beta_1}$$

For the logged model containing the logged BID variable and all other variables linear we get:

(8) $$\frac{\%\partial WTP}{\partial(V_N)} = \frac{-\beta_N}{\beta_1}$$

It is the same calculation as equation (7), but must be interpreted as the percentage change in willingness-to-pay per unit change in the other independent variables opposed to the marginal change in equation (7).

In econometric models such as these, we can see differences between the median and mean willingness-to-pay figures so therefore we will calculate and report both for these models. Again, we do not expect any negative values for the mean willingness-to-pay figures since the respondents willingly took the trip from home to the Poudre Canyon. Thus, the mean, net WTP can be calculated for the logit model, with a linear price variable via the formula found in Loomis (1999):

$$\text{(9)} \qquad \text{Mean WTP} = \ln[1+\exp(\beta_0 + \beta_2*(\bar{V}_2)+ \ldots + \beta_N*((\bar{V}_N))] * \frac{1}{\beta_1}$$

Similar to calculating the median willingness-to-pay, we need a different equation for mean willingness-to-pay when estimating a model with a logged BID, or price variable. For the model specified in equation (5), we use the following to calculate mean willingness-to-pay (Hanemann, 1984):

$$\text{(10)} \qquad \text{Mean WTP} = \exp\{\frac{-[\beta_0 + \beta_2*(\bar{V}_2)+\cdots+ \beta_N*(\bar{V}_N)]}{\beta_1}\} * [\frac{\frac{\pi}{\beta_1}}{sin\frac{\pi}{\beta_1}}]$$

Travel Cost Model

The functional form for the travel cost model will follow some of the same characteristics as the CVM when choosing independent variables. These variables will be ones such as skill level, the number of annual whitewater trips taken, and general demographics. The number of stated trips to the recreation site in the last 30 days, is used as the dependent variable and while costs associated with that specific trip are used and, at times, combined as the proxy for price. The TCM functional form is as follows:

$$(11) \quad \text{\# of trips} = \beta_0 + \beta_1*(TC) + \beta_2*(V_2) + \ldots + \beta_N*(V_N) + u$$

Where TC equals the travel costs of the trip and again, $V= (V_2,\ldots,V_N)$ is the vectors of independent variables describing the location and demographics of the users. As mentioned above, the TCM uses a proxy for the price paid to use the Poudre Canyon. Examples of which data can be utilized to populate this variable are the total amount spent on gasoline to reach the destination, the total cost of the entire trip, the amount of time taken to travel or, in the case of this study, a constructed variable incorporating all travel costs and the wage rate of the respondents.

For our model, we will use the variable, named tcmWageRate, which is equal to TC in equation (11), as our proxy for price. This variable is constructed in by combining the respondents stated total trip costs, the stated travel time to the destination, and their wage rate in form:

(12) tcmWageRate = Total Trip Cost + $\frac{1}{3}$*[wage rate * travel time]

From above, wage rate is:

(13) Wage Rate = $\frac{\frac{Income}{\#\ of\ income\ earners\ in\ household}}{2080}$

It should be noted that the Total Trip Cost in equation (12) is the summation of all stated costs of the trip, divided by the stated number of people sharing the expenses. This construction of the price variable, equation (12) was used because it incorporates both the costs of transportation and value of time (Loomis et al, 2001). The travel costs are captured by the reported expenditures made on all items, while the value of time is captured by calculating one-third of the wage rate, multiplied by the time taken to travel to the destination site. By incorporating travel time into the variable, we can account for the disutility that driving further to the site has in reduced trips. The incorporation of the one-third of the wage rate is within the recommended range in the US Water Resources Council guidelines for federal agencies performing TCM and is consistent with valuing time in the transportation literature (Cesario, 1979) and was further supported in the recreation literature by Englin and Shonkwiler (1995). Ideally, travel time would be included as a separate, independent variable. However, it is often highly correlated with travel cost as it is in out data. Therefore we combine it with travel cost to form one variable.

A Poisson Count Data distribution will be used to estimate the model and to calculate the average consumer surplus per paddler. Our expectations are for a negative

coefficient on the travel cost variable, which indicates as the costs of the trip increase, we expect the number of trips taken to decrease. To calculate the mean consumer surplus, per trip, from this specification of the TCM, we use the following equation:

$$(14) \quad \text{CS per Trip} = \frac{-1}{\beta_1}$$

CHAPTER FIVE: TESTS AND RESULTS

General Results and Demographics

Before calculating and evaluating the mean and median WTP values for whitewater sports in the Poudre Canyon, we must first look at the collected sample as a whole. This is done to assure that the sample is representative of the population of interest. To be assured of this an unbiased survey must be created and then implemented in an unbiased manner. An unbiased survey is one that encompasses all potential respondents, while only giving necessary, non-influencing, information. Along these lines, the unbiased implementation of the survey is accomplished by not targeting, nor excluding any particular respondents, other than those to whom the survey is pertinent.

After intercepting an individual and explaining to them the purpose of the survey, they were asked if they would be interested in participating. Those that declined were again told that the survey was in the, "take home, mail back format" and that there was nothing required of them at that time. If they still declined, they were marked as a refusal and surveying continued with the next person. Of the 145 users intercepted, only five refused to take this survey with them. This meant 140 surveys were distributed along the Cache la Poudre River, and of those 85 were returned. To obtain these 85, many individuals intercepted along the river where mailed follow-up survey to help enlist their

participation. The 85 out of 140 represents a 60.71% response rate for this sample. Table 5.1 shows the days surveyed, how many were handed out, and how many refusals there were, while Table 5.2 shows the total number handed out, the total number returned and the calculated average response rate.

Table 5.1: Days Surveys and Refusals

Day	Date	Total Handed Out	Refusals
Pretest	**29-May**	**23**	**0**
1	10-Jun	12	0
2	14-Jun	3	0
3	15-Jun	19	1
4	24-Jun	19	0
5	26-Jun	11	0
6	29-Jun	8	2
7	4-Jul	21	0
8	8-Jul	8	0
9	9-Jul	7	0
10	11-Jul	19	2
11	16-Jul	13	0

Table 5.2: Response Rate

Total Handed Out	Total Returned	Response Rate
140	85	60.71%

An important qualifying question in the survey asked respondents to state whether the purpose of their visit to the river was the primary, secondary, or tertiary reason for travel that day. The question was presented in the following format:

Was your trip to this river: (check only one):

____ *The primary purpose or sole destination of your trip from home?*

____ *One of many equally important reasons or destinations for your trip from home?*

___ *Just an incidental stop on a trip taken for other purposes or to other destinations?*

These questions represent the primary, secondary, and tertiary trip purposes respectively. For our study, we were interested in the primary and secondary users only due to the assumptions made in order to calculate the TCM. This assumption postulates that in order for costs of travel to be a good proxy for price, they must be spent on trips made explicitly to the recreation site in question. For our data set, there was only one respondent who answered that they were intercepted at the river on a tertiary trip from home and this data point was not used in either the CVM or TCM models.

The survey was designed to target the three most prominent users of the Cache la Poudre River for whitewater sports. Those users are: kayakers, rafters, and inner-tubers. Table 5.3 summarizes the percentages of each type of user who were intercepted during the sampling period.

Table 5.3: Primary Purpose of Trip

Kayaking	Tubing	Rafting	Watching Others	Other
79%	8%	20%	15%	6%

As can be seen, kayaking is the preferred activity of non-commercial users of the river and this is in keeping with intuition. River kayaks are single person boats, often smaller than a lake or sea kayak and offer the users' mobility as well as ease of

portability to get it into and out of the water. While it is not considered safe, and is not often practiced, a kayaker could theoretically participate in a day's worth of paddling solo. Though the kayakers intercepted were usually in groups of 2-10, these small, personal boats still are easily shuttled from take-outs to put-in with ease and were by far the most popular of users. In addition, safety often requires 2 – 4 paddlers in a group so that a "flipped" boat can be rescued if he is unable to roll back over and most swims out of the boat.

In comparison, rafts require anywhere from two to nine people to fill, more paddles, an experienced paddler steering the craft, and a trailer and/or air pump to be able to transport or inflate the boat for use. These combined make private rafting a much more expensive activity, in both equipment and man hours required, and thus not as popular with the private paddling community.

Contrasting rafting, inner-tubing is very inexpensive and only requires basic swimming and river skills. It is popular with the college age crowd in Fort Collins, though up in the canyon where there is whitewater, precautions must be taken in order to be safe. It is because of the river condition that I think we saw such low numbers of inner-tubers in this study. The majority of the sampling was done in June 2010, when the river was running at higher than average levels. These uncharacteristic levels had unfortunately caused the drowning death of an inner-tuber in May 2010, and had heighted awareness for river safety. Many inner-tubers chose the more relaxing runs through the town of Fort Collins until late July when the levels of the Filter Plant Run allowed for sections of calmer waters. Had sampling been able to be continued into late July, more inner-tubers may have been intercepted.

The next section of the survey uncovered the respondents' stated expenditures for the trip on which they were intercepted. This section of the survey was broken down into twelve subsections where the respondent stated they expenditures for each one, and whether or not these expenditures had been made in the City of Fort Collins or outside of it. The data was needed for both the TCM and for use in the final report prepared for the Save the Poudre foundation as a proxy for possible expenditures made by visitors to the FCWP. This section of the survey can be seen on page 70 in Appendix III.

The next section of the survey asked about the river attributes and the respondents' preference for them. This question asked the respondents to rate, on a scale of one to four, the importance of certain features on their decision to visit a particular river. This section can be seen on page 70 Appendix III. The results from this question are summarized in the following figure, Figure 5.1.

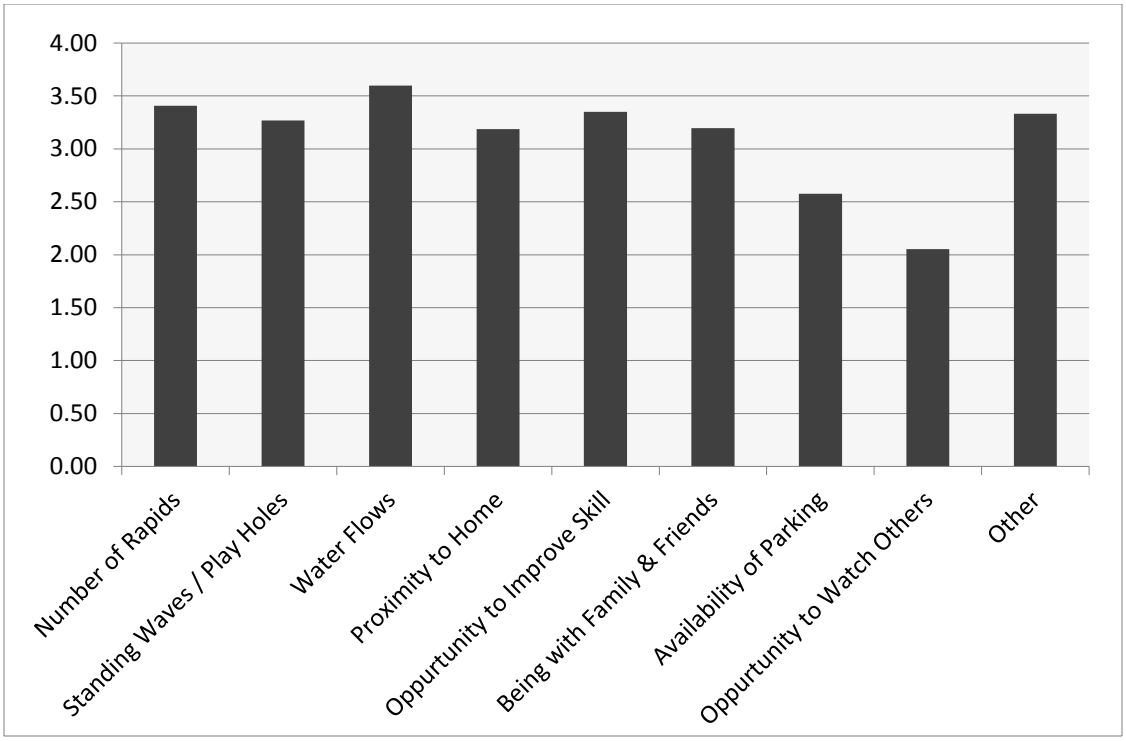

Figure 5.1: Importance of Different Features When Choosing a Whitewater Destination

We can see that "Water Flows" are most important attribute of river when a paddler is choosing a destination. Furthermore, we can see that most of the attributes are considered important by respondents. Other than the "Opportunity to Watch Others," and "Availability of Parking," all options received above a three, out of four rating. It can be discerned from this that users of the river are looking for stretches of river that offer good water flows, rapids and waves as well as the opportunity to improve their skill through varied terrain. Due to its "Wild and Scenic," designation, the Cache la Poudre River in the Poudre Canyon offers all of these and thus is a destination location for paddlers across Colorado and into Wyoming.

Demographic data was collected for each respondent at the end of the survey. We found that 78% of whitewater paddlers where male, while the average age was 36 years

old. 85% of the population was employed, mostly full time, while 2% were retired. The average respondent had a bachelor's degree level of education and an average household income of $80,500. This is above the average income for Larimer County, which was $74,900 as of 2010 (Compass of Larimer County, 2010). These results can be seen in Table 5.4.

Table 5.4: Demographic Information

Demographic Variable		Percentage or Number
Male		78%
Female		22%
Age		36 years
Employed		85%
Retired		2%
Education		16 years
Income		$80,564

Fort Collins Whitewater Park Results

The second purpose of this study was to estimate usage of the potential FCWP. These use estimates were reported to the Save the Poudre foundation in order to help them and the City of Fort Collins make decisions on whether or not to go forward with planning and construction of the park. Information that was collected for inclusion in the final report included estimates of the number visits to the park, the number of trips per season, as well as expenditures estimates to forecast potential revenue for the city.

As stated, each survey asked whether or not the respondent would visit the FCWP under both "Current Flows," and "Increased Flows," and what would be their primary activity. These numbers were then combined with the expanded sample, which was discussed in the methodology chapter, in order to estimate the total number of potential

visitors. To reiterate, the expanded sample was estimated by looking at each day of sampling to see first how many users were intercepted at each location. This number was then weighted with number of hours surveyed and then used to populate the estimated usage of the river on days when surveying did not take place. The sample expansion led to the estimate that there were 1163 unique, individual whitewater users of the Poudre Canyon over the duration of the whitewater season. This is a conservative estimate given the expansion techniques used but does represent a viable estimate.

This estimate of the number of individual users to the FCWP, the number of unique visitors was first separated into the three categories of their primary activity at the river; kayaking, rafting, and inner tubing. This was done to first eliminate anyone from the sample who had taken a survey, but was only there to watch other participants. It turns out, that this did not eliminate anyone from our sample, as they were all intercepted on trips where they were participating. To then estimate the total visitors to the FCWP, these categories were then evaluated against first, the stated percentage of respondents that would visit the FCWP and then secondly on the overall survey response rate to estimate the total number of visitors to the park. This was done to control for those who did not return their survey. It had to be assumed that if they did not return the survey, they would not use the park. This estimate can be seen in Table 5.5.

Table 5.5: Percentage of Respondent Who Would Visit and Individual Users of the FCWP

Percent of Respondents Who Would Visit FCWP	49%
Estimated Number of Individual Users of the FCWP	812

Also estimated was the number of total trips through the park. This was simply done by taking the estimated number individual visitors and multiplying that by their stated average number of visits to the FCWP, as collected from the survey. This was done for the results for both "Current Flows" and "Increase Flows," as were described in Chapter 3. This is seen in the following table, Table 5.6.

Table 5.6: Estimated Number of Trips Per Visitor and Total Estimated Trips to the FCWP

	Current Flows	Increased Flows
Number of Trips to the FCWP per Respondent	16	18
Total Number of Trips	12992	14616

It can be discerned that the City of Fort Collins can expect high usage of the park, if it were to be built. Nearly 13,000 individual trips were estimated to be taken under the "Current Flows," while an increase to nearly 15,000 trips was estimated for years in which the level of river were increased, thus increasing the number of days in the whitewater season. This is a conservative estimate because it does not include those who paddle at other whitewater parks around the region (i.e. Lyons, CO) who might visit the FCWP as well as, it does not include any potential visitation that may result from competitions or other events that the park may be able to support.

Though it is hard to put an accurate estimate on it from the data collected in this survey, it can be inferred that the building of this park will both retain tax revenue that is lost to other cities when Fort Collins residents visit their parks, as well as bring in new revenue from those visiting the park from outside areas. This is an important fact for the city to take into consideration when proposing the building of this park, as the bottom

line of every city project must include a proper tabulation of the cost and benefits. As described in this paper, some of the benefits include the consumer surplus derived by the users of the park, but also these new tax revenues. And to some on the city council, it may be hard to make policy decisions about the FCWP without some estimation of all these benefits of the system.

CVM Results for the Poudre Canyon

As presented earlier, the contingent valuation question was presented in the survey as follows:

"If <u>your</u> share of the total cost of this most recent trip had been $_____ higher would you have made this trip to this river where you received this survey?"

Circle one: YES NO

The elicited increase in total trip cost ranged from $5 to $150. The dollar increments and the percentage of "Yes," answers for each are presented in Table 5.7. It can be seen, as expected, that as the dollar amount increased, we see a decrease in the percentage of "Yes" answers decrease.

Table 5.7: Percent Yes at Different Bid Amount

Price	Percent Yes	N
$ 5	100%	9
$ 15	64%	11
$ 30	71%	14
$ 50	27%	11
$ 70	11%	9
$ 90	9%	11
$ 120	33%	9
$ 150	14%	7

As seen in Figure 5.2, the net willingness to pay is graphed along with the percentage of "Yes" response. Following basic economic principles, we have the bid amount along the vertical axis and the percentage of "Yes' answers representing the quantity along the horizontal axis.

CVM Model Results

For the CVM, we used a logit specification due to the shape characteristics of the data, as described above. For our model, BID represents the amount asked of the respondent as the hypothetical increase in travel costs while YPAY represents the probability of the individual answering, "Yes," that they are willing to pay the increased cost in order to paddle in the Poudre Canyon. V is the vector of river and paddler characteristics and attributes that are added to the model as additional independent variables to help fully explain the model. Examples of these independent variables include skill level, amount of crowding, gender, education, income as well as preference variables such as water flows and number of rapids.

For our model, none of these independent variables were found to be significant. Typically this is not reasoning enough to exclude them from a model, because econometric training tells us to first specify the model, estimate it, and then explain the results. But in order to retain degrees of freedom due to a small sample size, the basic model of yPay and BID will be presented here. Income was also found to be significant and will also be presented in the models where the natural log of BID was estimated. Income should not be included in non-logged of bid models because it falls out of the utility difference formation (Hanemann, 1984). Those results are summarized below in Table 5.8:

Table 5.8: CVM Logit Results

Variable	Logit Model 1	Logit Model 2	Logit Model 3
Constant	**1.30**	**5.12**	**4.34**
Std Errors	*0.44*	*1.32*	*1.36*
BID	**-0.028**		
Std Errors	*0.007****		
lnBID		**-1.44**	**-1.46**
Std Errors		*0.34****	*0.36****
Income			**0.01**
Std Errors			*.005***
Pseudo R^2	0.189	0.25	0.28
N	82	82	75

* indicates significance at 10%
** indicates significance at 5%
*** indicates significance at 1%

As expected, the BID variable is negative and significant at the 1% level in all of the models. We also found Income to be significant at the 5% level within the third model. As mentioned, a full model was estimated and found BID to be of correct sign

and significant, but none of the independent variables were found to be significant. That model can be found on in Appendix I.

Using the equations derived in Chapter Three, the median and mean willingness-to-pay figures are presented in the following table.

Table 5.9: Median and Mean Willingness to Pay Figures

	Median Net WTP	Mean Net WTP
Logit Model 1	$46.72	$55.36
Logit Model 2	$35.02	$93.36
Logit Model 3	$34.79	$88.85

Now focusing on Logit Model 2, we can construct confidence intervals around the median and mean WTP figures. We choose to focus on Logit Model 2 for two reasons: (1) As a whole, it has a larger sample size than Logit Model 3 due to item non-response on the income question; (2) By utilizing a model with the log of bid insures that the entire distribution of WTP will be positive. This makes sense, as all respondents already revealed that they had positive WTP for paddling the Cache la Poudre since they traveled there.

In order to calculate the 90% and 95% confidence intervals around the median and mean WTP figure for Logit Model 2, we utilize a procedure developed by Park, Loomis, and Creel (1991). This method uses the coefficients and variance-covariance matrix to generate a distribution of coefficients from which the 90% and 95% confidence intervals can be calculated. These are summarized in Table 5.10.

Table 5.10: 90% & 95% Confidence Intervals Around the Mean & Median Net WTP Estimates of Logit Model 2

	Lower Bound	Median	Upper Bound	Lower Bound	Mean	Upper Bound
90% C.I.	$ 24.13	$ 35.02	$ 48.00	$ 64.00	$ 93.36	$ 128.00
95% C.I.	$ 21.42	$ 35.02	$ 51.13	$ 57.00	$ 93.36	$ 136.00

In order to estimate the total consumer surplus of all paddlers of Cache la Poudre, for the whole season, we utilize the sample expansion techniques discussed in Chapter Three. It was estimated that there were 1163 unique visitors to these two sections of the Cache la Poudre during the whitewater season. In the survey, respondents were asked how many trips they took to the Poudre Canyon within the last 30 days. This time frame was chosen as it represents the length of the peak whitewater season but many paddlers stated that they would try and paddle the river over a 60 day season. Therefore, the aggregate consumer surplus for both models will be reported for both a 30 and 60 day season.

On average, these users are taking 9.26 trips every 30 days to the Poudre Canyon thus equating to at least 10,771 user days in 30 day season and 21,543 users days in a 60 day season. By taking these aggregated user days and multiplying them with the minimum and maximum mean net WTP figures, we can construct a conservative range that describes aggregate consumer surplus for paddlers in the Poudre Canyon. This range is reported in Table 5.11:

Table 5.11: Total Consumer Surplus for the Poudre Canyon

	Lower Bound	Median	Upper Bound
30 day season	$596,283	$800,932	$1,005,581
60 day season	$1,192,620	$1,555,257	$1,917,894

From the three logit models, we can construct a distribution showing the range of BID values that correspond to the percentage of the sample that would pay this increase in travel costs. These are summarized in Table 5.12.

Table 5.12: Range of BID Values and the Percentage that Would Pay

% that would Pay	Logit Model 1	Logit Model 2	Logit Model 3
1%	$211.68	$852.52	$801.45
5%	$152.43	$270.82	$259.70
10%	$125.60	$161.16	$155.93
15%	$108.99	$116.86	$113.70
20%	$96.49	$91.75	$89.64
25%	$86.16	$75.13	$73.65
30%	$77.14	$63.09	$62.04
35%	$68.95	$53.84	$53.09
40%	$61.28	$46.42	$45.89
45%	$53.93	$40.26	$39.90
50%	$46.72	$35.02	$34.79
55%	$39.52	$30.46	$30.34
60%	$32.17	$26.42	$26.38
65%	$24.50	$22.78	$22.80
70%	$16.31	$19.44	$19.51
75%	$7.28	$16.33	$16.43
80%	-	$13.37	$13.50
85%	-	$10.50	$10.65
90%	-	$7.61	$7.76
95%	-	$4.53	$4.66

These predicted probabilities are also graphed below in Figure 5.4.

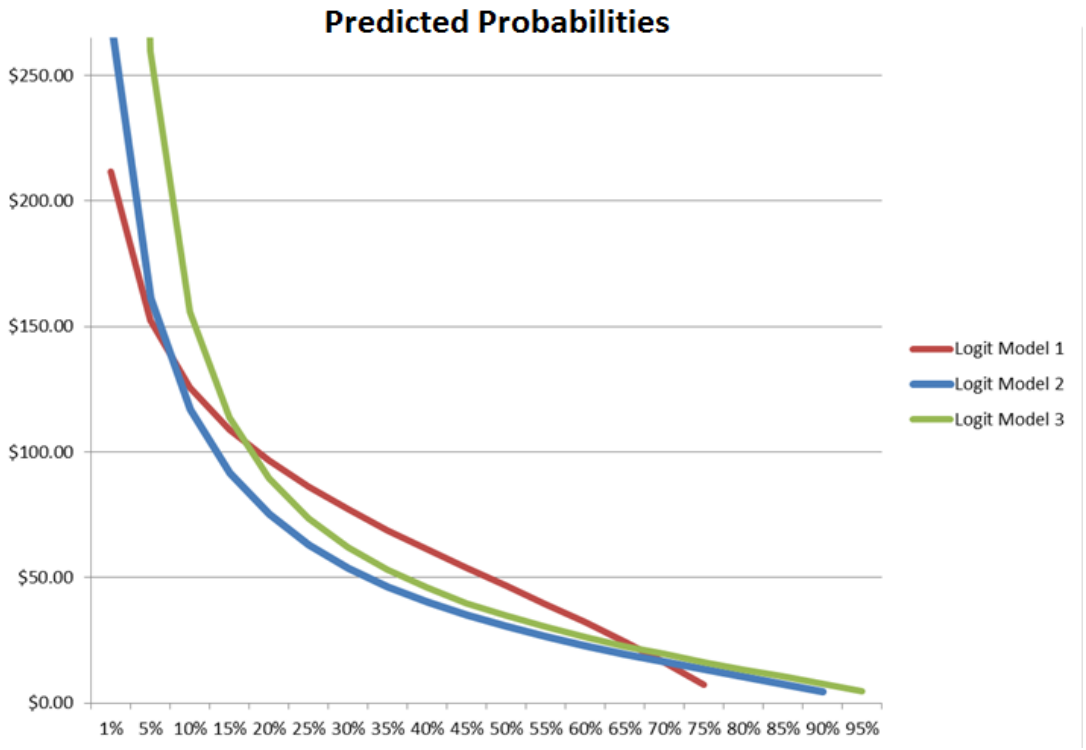

Figure 5.4: Predicted Probabilities

As was defined in Chapter Three, we can look at the marginal effects of the significant variables on the user's net willingness to pay. Given that we only have one model with a significant variable, we are looking at how a 1% change in income will change the net WTP by a given amount. It must be reported as a percentage since the BID variable is logged in that model. For Logit Model 3, we see that 1% change in the paddler's income will result in 0.68% change in the probability of paying the higher amount.

TCM Results for the Poudre Canyon

The TCM also focuses on price as the independent variable of interest in this model. But unlike the CVM, we are now dealing with reported travel costs opposed to a hypothetical increase in travel costs. For this model, the dependent variable is the reported number of trips to the Poudre Canyon in the last 30 days. We again add in a set of independent variables in order to control from one respondent to the next and regress these with our proxy for price variable, tcmWageRate. This variable is constructed in by combining the respondents reported total trip costs, and the reported travel time to the destination, times their wage rate. We expect a negative sign on tcmWageRate due to the theory that as the total cost of taking a trip, time included, increases, we expect fewer trips to be taken.

The chosen set of independent variables includes stated skill level, age, gender, level of education, and number of annual whitewater trips taken. These are the same variables that were included in the full model for the CVM. The stated number of annual whitewater trips to other sites is included as a proxy for the price of a substitute good to control for the users' having other whitewater destination to pick from (Smith, 1993).

Our presented model utilizes a Poisson distribution adjusted for Endogenous Stratification in order to estimate the model. These results are presented below:

Table 5.14: TCM Poisson Results

Variable	Poisson
Constant	**2.81**
Std Error	*0.296*
tcmWageRate	**-0.0021**
Std Error	*0.0006***
Skill level	**0.0274**
Std Error	*0.057*
Age	**-0.007**
Std Error	*0.0044**
Gender	**-0.269**
Std Error	*0.104****
Education	**-0.013**
Std Error	*0.015*
Annual WW Trips to Other Sites	**-0.002**
Std Error	*0.001*
Pseudo R^2	0.19
N	70

* indicates significance at 10%
** indicates significance at 5%
*** indicates significance at 1%

We found the expected negative relationship between the price variable, and number of trips taken. This confirms the theory that as trip costs increase, we see a decrease in the amount demanded. Two independent variables, age and gender, were also found to be significant. We can infer from this information such as that as respondent get older, they are less likely to take higher number of whitewater trips. This is consistent to the finding of the survey, which showed the average age of paddlers to be 36 years old. We also found gender to be significant at the 1% level and carrying a negative sign. This tells us that if the paddler is a male, they are more likely to take a higher number of trips to the Poudre Canyon. This is also in keeping with our findings given that 78% of the sample was male. The other independent variables were found to be insignificant and

any level below 10%, though it is important to keep them in the model as they do help to explain the model as a whole.

From equation (14) in Chapter 4, we can calculate the per trip consumer surplus from this model. This figure is calculated by dividing negative one by the coefficient for tcmWageRate and then divided by the average group size. Average group size was found to be 5.44 from the responses, and 3.7 when adjusted for the outlier responses that were discussed in Chapter 3. Each of these models is labeled TCM 1 and TCM 2 respectively.

Both 90% and 95% confidence intervals were calculated around these means. The confidence intervals are estimated using the equation β_1 + 1.645(standard error of β_1) and β_1 - 1.645(SE of β_1) for the 90% C.I. and β_1 + 1.96(standard error of β_1) and β_1 - 1.96(SE of β_1) for 95% C.I. These results are summarized in the following table:

Table 5.15: 90% & 95% Confidence Interval Around the Mean Consumer Surplus for the TCM

Model		Lower Bound	Mean CS	Upper Bound
TCM 1	90% C.I.	$59.03	$88.01	$172.86
TCM 1	95% C.I.	$55.53	$88.01	$212.00
TCM 2	90% C.I.	$86.80	$129.41	$254.17
TCM 2	95% C.I.	$81.65	$129.41	$311.72

Utilizing the sample 1163 users and both the 30 and 60 day whitewater season, we can estimate total consumer surplus for each of the means for the TCM specification. These are summarized below in Table 5.16.

Table 5.16: Total Consumer Surplus from the TCM

Model	Season Length	Mean	Total Consumer Surplus
TCM 1	30 day season	$88.01	$947,956
	60 day season	$88.01	$1,895,999
TCM 2	30 day season	$ 129.41	$ 1,393,875
	60 day season	$ 129.41	$ 2,787,880

Comparisons of CVM and TCM

Since our TCM yields a mean WTP, we are able to compare this figure to the mean WTP from the CVM model. This can be seen below in Figure 5.5. We can see from the figure that our confidence intervals overlap, which tells that there is no statistical difference at the 5% level in our two models. This suggests a degree of convergent validity between the two models and their estimation of the WTP.

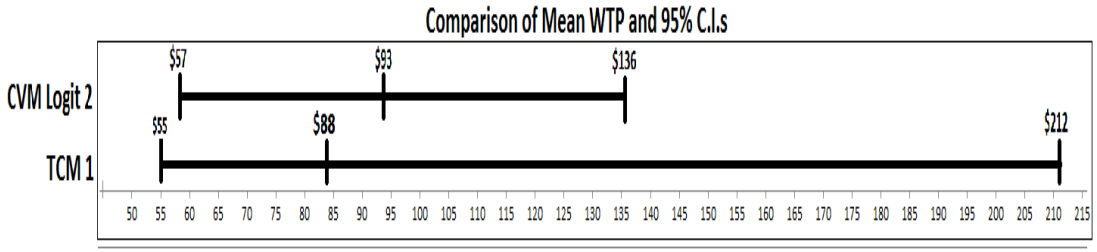

Figure 5.5: Comparison of Mean WTP and 95% Confidence Intervals

Our findings in this paper are also within the range of values uncovered from the literature review. The previously presented table is again shown, but now has the findings of this paper included. We can see that our estimates fall right within the range of per trip estimates from the other studies.

Table 5.17: Summary of Literature, Including this Study

Author	Activity	Location	Model Used	Uncovered WTP
Johnson et al.	Non-commercial users	Rogue River, OR	TCM & CVM	$34.99 - 64.87 / trip = TCM; $54.17 or 89.66 / trip = CVM
Hynes & Hanley	Kayaking	Roughty River, Ireland	TCM	$128.48 / trip
Ready & Kemlage	Non-commercial users	Gauley River, WV	TCM	$95.18 / trip
McKean & Taylor	Rafting & Kayaking	Snake River Basin, ID	TCM	$114.48 / trip
Bowker et al.	Commercial Users	Chattooga & Nantahala Rivers, GA	TCM	$171 - 411 / trip = Chattooga; $128 - 275 / trip = Nantahala
English & Bowker	Commercial Users	Chattooga River, GA	TCM	$30-201 / trip
McTernan	Non-commercial users	Cache la Poudre River, CO	TCM & CVM	$88.01 & $129.41 / trip = TCM; $55.36-93.36 / trip = CVM

CHAPTER SIX: CONCLUSION

The aim of this thesis was to uncover the net willingness to pay, or consumer surplus for non-commercial whitewater sports in the Poudre Canyon. The goal was realized as we found and estimated mean consumer surplus to be $93.36 with the dichotomous choice CVM and $88.01 under the TCM specification. This equates to a consumer surplus of $1.9 million for both the CVM and the TCM. Given the design the survey, we are able to use these figures to describe the value derived from whitewater paddlers at the two selected river locations.

These values can be used as a piece of the total value of the Cache la Poudre River in the Poudre Canyon and used whenever policies regarding the water rights and management practices of the river are being evaluated. It is the hope that through the proper valuing of all of the activities and enterprises supported by the Cache la Poudre River, that all of the benefits of the system can be maximized while still preserving and conserving the only Wild and Scenic River in all of Colorado.

We can also look at the finding regarding the potential building of the FCWP. It was found, and reported that the park would certainly be a local draw and given the number of features and design, would even have the ability to bring regional paddlers into town. It was conservatively estimated that at least 812 individual users would visit

the park, representing 12,992 trips through the park. This potential usage is influential in the City of Fort Collins' planning as it should be viewed as another attraction for the Old Town area of town, as well as adding to the value derived by the city and its residents from having the river flow through town at its natural levels. With projects such as the Glade Reservoir are being discussed and planned, it is important to note all of the uses and benefits from the river before policies are implemented that have drastic effects on the river and its water levels and flows.

Limitations and Extensions

As with any study, there were some areas, which, in hindsight, became troublesome in this project. The first is the very small sample size for these models. Though surveying took place over both June and July, only 140 surveys were distributed. A good response rate was received, showing interest of the respondents, but if the total amount handed out had been higher, it would have been advantageous. Additional days surveying, or additional surveyors could have accomplished this, though the maximum number of days and surveyors were scheduled given the budget.

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APPENDICIES

APPENDIX I: CVM FULL LOGIT MODELS

Variable	Logit Model A-1	Logit Model A-2
Constant	0.839	4.668
Std Errors	*2.051*	*2.534*
BID	-0.027	
Std Errors	*0.007*	
lnBID		-1.41
Std Errors		*0.387*
Skill level	-0.095	-0.225
Std Errors	*0.366*	*0.387*
Age	0.007	0.007
Std Errors	*0.028*	*0.033*
Gender	-0.229	-0.458
Std Errors	*0.727*	*0.816*
Education	0.031	0.009
Std Errors	*0.094*	*0.101*
Annual WW Trips to Other Sites	0.002	0.004
Std Errors	*0.008*	*0.009*
Income		0.01
Std Errors		*0.006*

APPENDIX II: MAP OF THE SURVEYING LOCATIONS

1. FILTER PLANT PUT-IN

1.1 FILTER PLANT TAKE-OUT

2. BRIDGES PUT-IN

2.2 BRIDGES TAKE-OUT

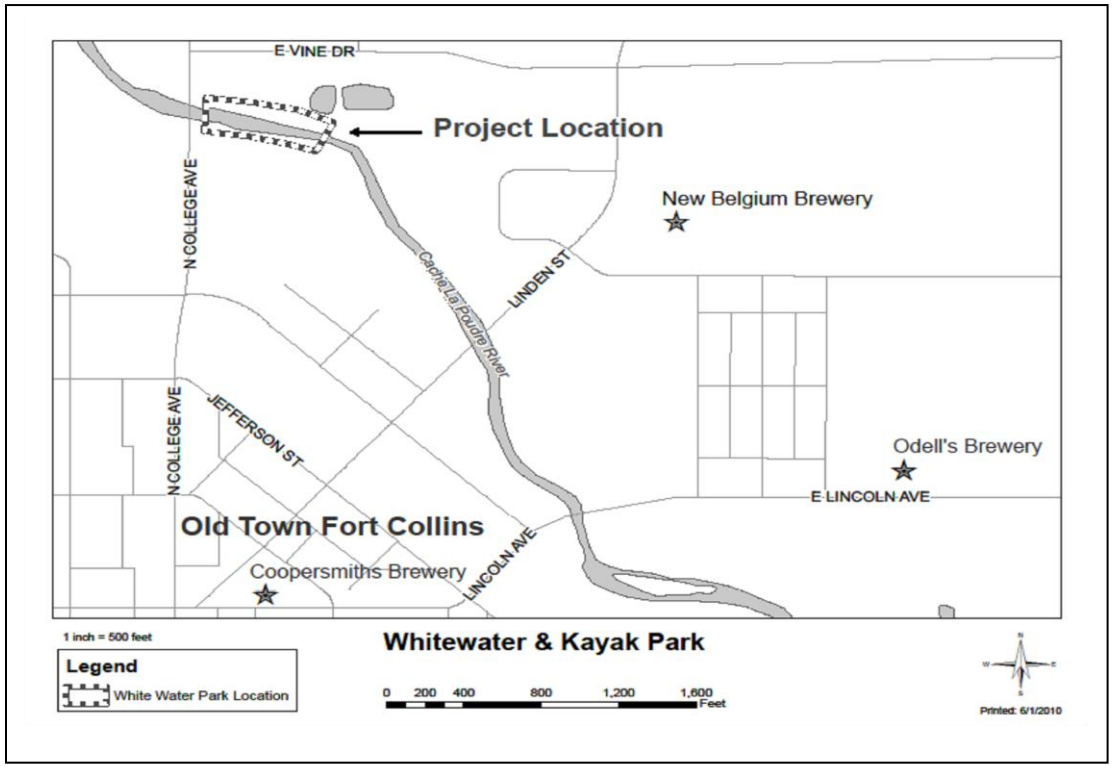
287
287
14
Poudre Canyon Hwy
14
Poudre Canyon Hwy
14
1.1
14
Poudre Canyon Hwy
14
Poudre Canyon Hwy
1
14
Poudre Canyon Hwy
14
Poudre Canyon Hwy
2.1
Poudre Canyon Hwy
14
Poudre Canyon Hwy
14
Poudre Canyon Hwy
2

APPENDIX III: THE SURVEY

Fort Collins Whitewater/Kayak Park

If They Build It, Would You Come?

Actual Survey version had four photos: 3 of kayakers & 1 of tubers but where omitted from Thesis due to file size.



Thank you for agreeing to complete this survey. We need your response to accurately estimate the potential number of kayakers, tubers, and rafters that might use the proposed whitewater/kayak park in Fort Collins. Please complete the survey whether or not you think you would use the whitewater park. Before we ask you about the proposed whitewater park, we want to ask some questions about your current trip where you where contacted by our interviewer. In this survey, when we refer to a **trip** we mean a trip from your home to the location where you are kayaking, tubing or rafting.

Section A. Please tell us about your trip to where you were contacted by our interviewer.

1. On this trip, what activities did you participate in? (check all that apply):

____Kayaking ___ Rafting

____Tubing ___ Watching other participants

____Other (Please describe)_____

1a. If you checked more than one activity, which of these activities was the most important reason for your trip to this site?

Most Important Activity_____

2. What was the **total** amount of time you spent visiting the river on this trip? _____# of hours

2a. How much of that time did you **spend on the water** on this trip? _____# of hours

3. Was your trip to this river: (check only one):

__ the primary purpose or sole destination of your trip from home?

__ one of many equally important reasons or destinations for your trip from home?

__ just an incidental stop on a trip taken for other purposes or to other destinations?

4. What were your primary methods of travel to this river (circle all that apply):

Car/Truck RV Other_____

5. What was your one-way **travel time** from your home to the location where you received this survey?
_____ # hours and/or _____ # minutes

6. About how many **miles** (one-way) did you travel from your home to this location?

_____# one-way miles

7. How many people came with you on this trip? _____# of people in your group

8. How crowded did you think the river was where you received this survey?

Please circle one number representing how crowded it was.

Not at All Crowded 1 2 3 4 5 6 7 8 9 10 Extremely Crowded

9. How many river trips in the last 30 days (month) did you make to the Poudre River?
_____ # Trips to this river in the last 30 days

Most Recent Trip Expenditures

Please indicate the amount you and members of your group with whom you shared expenses (e.g., other family members, traveling companions) spent on each category on the **trip** where you were given this survey.

Expenses on Your Most Recent Trip		
Trip Expense	**Amount spent on <u>this trip</u> in Fort Collins area**	**Amount spent on <u>this trip</u> outside of Fort Collins elsewhere in Colorado**
Gas for Auto/truck	$	$
Food/drink: restaurants	$	$
Food/drink: grocery stores	$	$
Boating or Tubing Supplies/other retail	$	$
Camping on Public Lands	$	$
Camping at Private Areas	$	$
Hotel/motel	$	$
Equipment rental	$	$
Guide fees	$	$
Shuttles	$	$
Commercial or Packaged trip	$	$
Other; Please List _____	$	$

1. Including yourself, how many people in your group shared these expenses?

_____#

sharing expenses

2. As you know, some of the costs of travel such as gasoline, camping fees, hotels and restaurant meals often increase. If <u>your</u> share of the total cost of this most recent trip had been $_____ higher would you have made this trip to this river where you received this survey?

Circle one: YES NO

Section B. Important Features in Your Decision to Visit a Particular River				
Please circle one number for each item	**Importance to your decision of which river to visit**			
	Not Important	**Somewhat Important**	**Important**	**Very Important**
Number of rapids	1	2	3	4
Standing waves and/or play holes	1	2	3	4
Good water flows	1	2	3	4
Being close to where I live	1	2	3	4
Opportunities to improve my skills	1	2	3	4
Being with family or friends	1	2	3	4
Availability of parking	1	2	3	4
Opportunities to watch others users	1	2	3	4
Other activities: Please list _____	1	2	3	4

Section C: What Would the Proposed Fort Collins Whitewater/Kayak Park Offer?

This discusses the proposed Fort Collins Whitewater/Kayak Park and whether you would visit.

Where would it be located in Fort Collins? Just downstream of College Ave (US287) just north of Old Town Fort Collins, adjacent to the Poudre River biketrail. See the location map on the cover.

What type of water craft would be suitable for the Park? Kayaks (both hardshells & inflatables), Small Rafts (2 -4 person paddle), inner tubes and canoes.

What would it look like? The exact layout and design is still being refined but it is expected to be:

- About 200 yards in length (2 football fields) with an upstream slow flow area for roll practice
- Have two 12 foot wide boat chutes
- Have a series of rapids with 2-4 foot standing waves depending on the flows
- Have two drops: one of about 3 feet and one of about 5 feet.
- Two play holes & a deep pool allowing freestyle kayak moves during spring & summer run-off (500 cfs)
- Graded access path below the second boat chute for take-out, put in by the pool, and for viewing.
- Large (8-10 ft diameter) boulder in river downstream of the second drop

Rapids would be:

- Class II (novice level rapids and straightforward run) at less than 250 cfs
- Class III (intermediate level with moderate to large waves with powerful current) at 250-500 cfs
- Class III+ at 500+ cfs (Class III rapids of slightly greater difficulty)

How would the Park be Operated?

The Park would be operated by the City of Fort Collins, as it owns the land surrounding it.

- There would be NO fee to use the Whitewater/Kayak Park (it would be built with private donations)
- The Park would be open from dawn to dusk

What is the Length of the Season with <u>Current</u> Average Flows?

- Figure 1 illustrates what the flows would be like using average flows over the last 25 years. This figure also shows the minimum flows for kayaking and tubing (50 cfs), minimum flows for good or intermediate kayaking (250 cfs) and flows for excellent or expert kayaking (500+ cfs)
- Kayaking and tubing would be possible from April 15 through September 3rd (about 140 days)
- Moderate flows offering good kayaking would start May 4th and go to July 13th (a total 66 days)
- During the high peak flows (+500 cfs) from May 24th to June 30th (38 days) the Park would be suitable for freestyle kayaking and whitewater competitions, and would offer excellent kayaking
- Limited parking would be available nearby

Would you visit this Whitewater/Kayak Park under <u>Current Flows</u> if it were as described above?

☐ **Yes, I would→Expected # of Trips Per Year #____ →** <u>Primary Recreation Activity (circle one)</u>

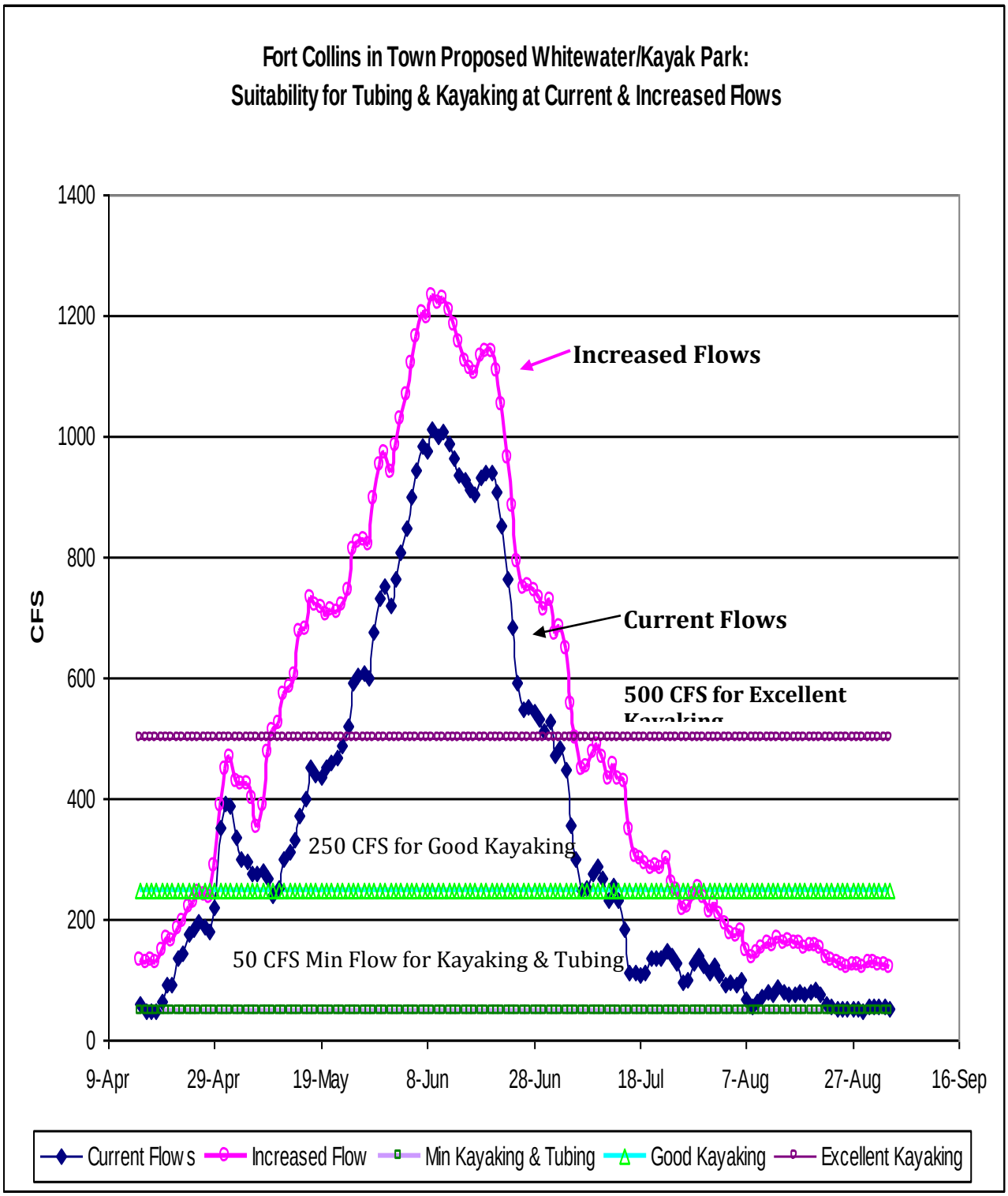
Kayaking Tubing

Rafting

☐ **No, I would not**

☐ **Unsure**

Please explain briefly your Yes or No or Unsure choice. _____


Fort Collins in Town Proposed Whitewater/Kayak Park:
Suitability for Tubing & Kayaking at Current & Increased Flows
CFS
1400
1200
1000
800
600
400
200
0
9-Apr
29-Apr
19-May
8-Jun
28-Jun
18-Jul
7-Aug
27-Aug
16-Sep
Increased Flows
Current Flows
500 CFS for Excellent
250 CFS for Good Kayaking
50 CFS Min Flow for Kayaking & Tubing
Current Flows
Increased Flow
Min Kayaking & Tubing
Good Kayaking
Excellent Kayaking

Section D: What the Whitewater/Kayak Park Would Offer at <u>Increased Flows</u>

What is the Length of the Season with <u>Increased</u> Flows?

Figure 1 also illustrates what the floating season might look like with an increase in flows.

- Good intermediate kayaking would start May 4th and now extend to July 25th . This season would be a total 78 days of at least 250 cfs, providing 12 more days of good or intermediate kayaking than Current Flows.

- With Increased Flows, the high flow (+500 cfs) season would now start May 9th and could extend to July 6th. This is 58 days, 20 more than with Current Flows. During the high flow period, the Park would be suitable for freestyle kayaking and whitewater competitions, and would offer excellent or expert kayaking (Class III+).

- Increased Flows would also provide an additional 20 more days of deep pools to allow freestyle kayak moves during spring and summer run-off (+500 cfs).

- Kayaking and Tubing be possible from early Spring through early September. This is about 150 days, 10 more days than with Current Flows.

Would you visit this Whitewater/Kayak Park under <u>Increased Flows</u> if it were as described above?

☐ **Yes, I would→Expected # of Trips Per Year #____→** <u>Primary Recreation Activity (circle one)</u>

Kayaking Tubing Rafting

☐ **No, I would not**

☐ **Unsure**

Please explain briefly your Yes or No or Unsure choice. _____

Section E. Please tell us something about yourself.

These last few questions will help us to evaluate how well our sample represents visitors to the river. **Your answers will be kept strictly confidential and will only be used for the analysis of this study. Statistics will only be reported in aggregate (average) form, and <u>you will not be identified in any way</u>.**

1. Are you? □ Male □ Female

2. In what year were you born? 19____

3. Are you employed? □ Yes (Go to #3a.) □ No (Skip to #3d.)

3a. Do you work part time or full time? □ Full-time □ Part-time

3b. Do you take time off from work to participate in outdoor recreation? □ Yes □ No 3c. How many weeks of paid vacation do you receive each year? # _____ of weeks (Go to #4.)3d. Are you retired or a student? □ Retired □ Student

4. What is your home zip code? _____

5. Do you visit other whitewater/kayak parks? □ Yes □ No

5a. If yes, please tell us which ones_____

6. How would you **rate your skill level** as a kayaker, tuber or rafter?
(Please circle <u>one category</u>)

Beginner Intermediate Advanced Expert

7. About how many *total outdoor recreation* trips do you usually take each year for whitewater recreation?

_____ Annual # of trips

8. Your highest level of formal education? (Please circle one)

Elementary School **Jr. High or Middle School** **High School** **Associates Degree** **College (B.S./B.A) or Technical School** **Graduate or Professional School**

9. How many members are in your household? _____ persons

10. How many household members contribute to paying the household expenses? _____ persons

11. Including these people, what was your approximate household income from all sources (before taxes) last year?

□ less than $19,999 □ $20,000-$29,999 □ $30,000-$39,999

□ $40,000-$59,999 □ $60,000-$79,999 □ $80,000-$99,999

□ $100,000-$149,999 □ $150,000-$299,999 □ more than $300,000

Thank you for completing the survey!

APPENDIX IV: SCRIPT FOR WHITEWATER SURVEYS

The following is the general script, or conversation that I had with paddlers as they were intercepted along side the river.

- Hello, my name is Jim McTernan and I am researcher with Colorado State University.

- I am performing a survey about the potential building of a whitewater park in downtown Ft. Collins. Would you be interested in participating?
- The survey is in a take home, mail back format, with included return postage, so there is no time commitment today.

- Along with being used to estimate usage of the FCWP, this survey will also help with my master's thesis research on the value of whitewater sports in the Poudre Canyon.

- Would it be all right if I got your home address? If I do not receive your survey within a few weeks, I will mail you another one. If I do receive yours, then your address will not be used for anything else.

- Thank you so much for your time. If you have any questions, please refer to either the phone number, or e-mail address included on the cover letter. Thanks again.