THESIS

ASSESSING THE SOCIAL BENEFITS TO STAKEHOLDERS OF PLACE-BASED FOREST RESTORATION ORGANIZATIONS IN COLORADO

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ABSTRACT

ASSESSING THE SOCIAL BENEFITS TO STAKEHOLDERS OF PLACE-BASED FOREST RESTORATION ORGANIZATIONS IN COLORADO

Collaborative forestry organizations such as the Front Range Roundtable provide goods and services to their members which have not yet been valued using economic methodology. The primary good provided by the Front Range Roundtable is quarterly stakeholder meetings where proposed landscape restoration projects are discussed and members are able to reach consensus on appropriate monitoring and implementation without resorting to legal measures. Attendance at these meetings suggests that members derive benefits from attendance and have a positive willingness-to-pay for these goods. This study contributes to the natural resource and environmental economics literature by estimating values associated with the social capital that is developed at collaborative forestry meetings, and should serve to inform the policy debate regarding funding of place-based forestry collaboratives.

Attendees at the April 11, 2014 quarterly meeting of the Front Range Roundtable were asked travel cost questions and a dichotomous choice willingness to pay question regarding membership dues for the Front Range Roundtable's quarterly meetings. Results from 50 paper and online surveys indicate that respondents would pay a minimum of $6.60 per quarter to travel to the FRR's quarterly meetings, and a maximum of $83 in membership dues to allow the FRR to continue to provide conflict mediation and resolution services. Generalizing these amounts to the sample yields an annual value of $1,241 for minimum WTP for travel expenses and an annual value of $16,609 for FRR's mediation and conflict resolution services.

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INTRODUCTION

Overview of the Front Range Roundtable

In the past 10 years, Colorado has seen a rise in community-based forestry organizations (CBOs). More than 15 of these organizations exist state-wide, and their number continues to grow. CBOs operate in the nexus between state and federal government agencies and local communities by streamlining the implementation of restoration projects on public lands and providing a means for local communities to collaborate and mitigate conflict with government agencies on land-management projects.

As commercial timber production has declined in Western states, community-based forestry organizations have taken on a more active role in the management of public lands, often supporting ecosystem restoration jobs in communities which have been negatively affected by the decline of the commercial timber industry (Davis and Moseley, 2012; Davis *et. al.*, 2012). They often act as intermediaries between governmental land management agencies and local communities by securing and leveraging governmental and non-governmental funding and organizing a diverse range of stakeholders to address land-management-related issues and goals.

These organizations have found a niche due to the complex political environment that surrounds the implementation of ecological restoration projects on public land; such projects typically cross many jurisdictional boundaries, involve many stakeholders with divergent viewpoints, and include many considerations such as wildfire risk, threat of habitat destruction, loss of biodiversity, and loss of life and property. The interplay of these many considerations and viewpoints makes it difficult or impossible for a single organization, such as a federal land management agency, to unilaterally address all stakeholder concerns. It is in this context that Colorado has seen the rise of community-based

collaborative organizations, which bring together stakeholders with differing opinions to discuss, compromise on, and implement landscape restoration projects.

The services provided by place-based forest collaborative organizations include forest project implementation and contracting, hazardous fuel reduction, ecological and forest restoration, environmental education, conflict mediation and consensus building, civic learning and service, and political action (Davis and Moseley, 2012; Davis *et. al.*, 2012). Many of these services result in the accumulation of social benefits to stakeholders in the process and to the local community, through the development of social capital, the reduction of transaction costs associated with land management activities on public lands, conflict mediation and resolution, improvement of recreational areas, reduction in fire hazards, and environmental restoration of public lands.

The quarterly meetings and smaller, more frequent working group meetings of one of these organizations, the Front Range Roundtable (FRR), have been chosen as a venue to conduct a survey on the value of collaborative activities. The FRR facilitates restoration projects conducted in ten counties along the Front Range of the Colorado Rocky Mountains. These are Boulder, Clear Creek, Douglas, El Paso, Gilpin, Grand, Jefferson, Larimer, Park, and Teller counties. Member organizations in the Front Range Roundtable include environmental organizations, local governments, federal and state land-management agencies, academic groups, and private citizens (FRR, 2014). FRR coordinators were interviewed via e-mail for a separate economic impact analysis in 2013, where they stated that the FRR receives, on average, $40,000 annually from donations from 20 Roundtable partner groups (Lund Snee, Cheng, and Seidl, 2013).

FRR's primary venue for mediation and conflict resolution is quarterly meetings, which bring together stakeholders from a wide range of backgrounds and sometimes conflicting viewpoints so that they may reach a consensus on the appropriate actions moving forward, without resorting to costly litigation. Attendees of these meetings often include members of local communities, such as mayors,

county commissioners, and interested private citizens, as well as representatives of interested organizations such as the Nature Conservancy and other environmental groups, ranchers, utility companies, restoration contractors, state and federal land management agencies, and the state legislature and US Congress. These meetings are typically used as a forum for parties with conflicting goals to discuss differing visions for the implementation of restoration projects on public lands and reach compromises on appropriate actions moving forward (Front Range Roundtable, 2014).

The Front Range Roundtable has its roots in the Front Range Fuels Treatment Partnership Roundtable (FRFTP), which first convened following the 2002 fire season, one of the worst in Colorado's history (FRR, 2014). The information gathered at the first FRFTP meetings provided a starting point for the Roundtable's 2006 recommendations on protecting communities from wildfire and restoring forest health (FRFTP, 2006). Since 2005, the Front Range Roundtable (formerly FRFTP) and its partner agencies treated an average of 33,100 acres per year of hazardous fuels along the Colorado Front Range, totaling approximately 292,000 acres by the end of 2012. The Front Range Roundtable also played a critical role in the selection of Colorado to receive federal funding for the Collaborative Forest Landscape Restoration Project (CFLRP), by preparing proposals, rallying political and public support, and arranging for matching funding. The Front Range CFLRP will treat 34,000 acres of high-risk forest land in the wildland-urban interface on Colorado's Front Range (Clement and Brown, 2011).

Theoretical Framework

In order to examine collaborative forestry organizations from an economic perspective, an attempt must first be made to classify CBOs within the existing theoretical framework surrounding non-profit organizations that share certain aspects of public goods. Private and public goods are typically classified by the degree of rivalry and excludability that they exhibit. A good is rival when the consumption of the good by one individual reduces the availability of the good to others. Excludability is the ability for consumers to prevent other consumers from using the good. A good that is both rival and

excludable is classified as a private good, while a good that is non-rival and non-excludable is classified as a public good. Impure public goods are those goods that are non-rival but excludable, or non-excludable but rival, or any combination in between.

One common treatment of these goods is a four-box chart, where public goods and private goods occupy the non-rival/non-excludable and rival/excludable boxes, respectively, while impure public goods occupy the remaining two boxes. Through this treatment, additional insight can be gained beyond simply classifying goods as public or private; some goods are rival and non-excludable, such as common-pool resources like public timber stands and fish stocks, while other goods are non-rival but excludable, such as club goods like country club membership.

	Excludable	**Non-Excludable**
Rival	Private Goods	Common-pool Goods
Non-Rival	Club Goods	Public Goods

An expanded treatment, by Buchanan (1967), makes use of a continuum, or two-dimensional plane, of characteristics that can be used to categorize goods and organizations. One axis represents the rivalry of the good, and the other the excludability. On such a continuum, it is simpler to imagine the effectively limitless varieties of goods that share aspects of public and private goods, but that cannot be neatly classified as either private or public (Mantau *et al.,* 2001). To address criticisms over the application of excludability to public goods, club goods were defined as a class of goods that occupy the space between pure public and private goods, sharing some characteristics of both (Cornes and Sandler, 1996).

Buchanan (1965) defines a club as "consumption ownership-membership arrangements," and McGuire (1987, in Mantau *et al.,* 2001) describes a club as "an organization which offers a shared collective good exclusively to its members, defraying the cost of the good from member's payments." A

club has the ability to exclude non-members, but club members are often able to consume the good in the same manner as public goods.

In their 1997 literature review on the state of club theory, Sandler and Tschirhart present six characteristics that distinguish club goods from pure public goods:

1. Club membership must be voluntary; benefits from membership must exceed membership costs
2. Sharing of club goods can result in congestion
3. Nonmembers are excluded from realizing benefits of the club good
4. The population is divided among the existing clubs, and competition between clubs may result
5. The presence of an exclusion mechanism, such as a club membership due
6. Membership size affects the optimal provision of the club good

A complementary perspective that informs this analysis exists in the literature on non-profits and cooperatives. Some scholars in this field construct a continuum, similar to the one described above, that delineates organizations based on the importance of monetary and non-monetary motivation, rather than by rivalry and excludability (Valentinov, 2006). On one axis is the importance of monetary motivation, and on the other the importance of non-monetary motivation; nonprofit organizations exist at one end of the continuum, near the non-monetary axis, and for-profit firms exist on the other end of the continuum, near the monetary axis. Between these two extremes lie cooperative organizations, which provide a venue for members to engage in mutual self-help, and facilitate improvement of economic standing for their members (Valentinov, 2006).

Ostrom and Ostrom (1977) state that the myriad intermediate goods that exist on the continuum between pure public and pure private goods, or organizations that exist between for-profit firms and nonprofits, will give rise to a range of cooperative nonprofit entities which “often take the form of a voluntary association with regularly scheduled meetings. Many of these voluntary associations of collective consumption and production units may be formally organized with bylaws and membership

fees or assessments to cover the cost of a small permanent secretariat that organizes information, implements decisions, and engages in entrepreneurial activities on behalf of the organization."

These organizations that exist on the hypothetical border between cooperatives and pure nonprofits have been described as "self-supplying" nonprofit cooperatives. For these organizations, supply of a good or service comes from the same individuals that demand it (Valentinov, 2006). This definition of a self-supplying nonprofit is closely in line with the concept of coproduction, where pure and impure public goods exhibit two types of producers, one of which is also the consumer of the good; these two types of users typical organize through a nonprofit cooperative organization (Parks *et al.,* 1981). These descriptions of a self-supplying nonprofit cooperatives are very similar to those presented above by McGuire and Buchanan regarding clubs.

Hansmann (1980) argues that individuals gain utility through communication and association with each other, and that such association is typically organized in the form of a club. The communication and association between individuals, and the professional and personal networks that result, can be leveraged in the future and is commonly referred to as social capital. In the literature, the development of social capital is commonly attributed to club membership through these professional and personal networks (Hansmann, 1980; Ostrom and Ostrom, 1977; Ostrom, 2000). This, and the ability of these organizations to improve the economic standing of their members, implies that an economic value can be established for the services they provide. This analysis seeks to establish an estimate of the economic value of social capital that is developed by members as they participate in the conflict mediation and professional networking services offered by the Front Range Roundtable.

The Front Range Roundtable does not directly implement landscape restoration projects, but instead serves as a coordinator for quarterly meetings where many organizations can meet to discuss and reach consensus on differing viewpoints and methodologies for restoration projects. In return for this service, member organizations in the FRR provide contributions to the collaborative.

These contributions typically take the form of 1) monetary contributions to pay coordinator contracts and meeting costs, 2) use of meeting venues owned by member organizations, and 3) volunteer time. Using the theoretical framework outlined above, the Front Range Roundtable is reasonably viewed as a self-supplying nonprofit club or cooperative whose members both supply and consume its outputs. Under this framework, monetary contributions to the FRR are best viewed as voluntary club dues.

The quarterly meetings and attendant mediation services provided by the Front Range Roundtable share many characteristics of club goods described above. Membership in the FRR is voluntary, and membership benefits exceed costs for any organization that is present at FRR meetings. Participation in these meetings may result in congestion in that there is a limited amount of time for all members to voice and address their concerns. Membership size also affects the optimal provision of the club good (meetings) by limiting the funding available to host these meetings, the venues provided by members, and the number of individuals who attend each meeting. Nonmembers are not included in the FRR mailing list and are therefore excluded from participation in quarterly and smaller, more frequent meetings. The FRR and other collaborative forestry organizations in Colorado do not compete with one another, as such. Per conversations with the Front Range Roundtable coordinators, the population is divided amongst organizations on a geographical basis, and there is very little geographical overlap among collaboratives that offer the same services.

The Front Range Roundtable does not have an explicit exclusion mechanism like a club due. This study seeks to evaluate a range of potential club dues in an attempt to establish the economic value of the club good in question: the social capital that is developed at quarterly meetings held by the FRR. As discussed above, the ability of cooperative organizations and clubs to improve the economic standing of their members implies that economic values for their activities can be estimated. Collaborative meetings are likely to result in reduced transaction costs for forest project implementation, and allow the

establishment of professional networks that may similarly reduce transaction costs. In the interest of gaining insight into the full economic value of collaborative organizations, rather than simply their expenditures and associated economic impacts, this study will measure the economic benefits from the Front Range Roundtable's quarterly meetings.

Literature Review

To date, there is little empirical research into the valuation of social capital that is developed through the professional networking, conflict mediation, land management and restoration activities of community-based forestry organizations (CBOs). A review of the social capital literature revealed only one study that attempted to estimate economic values associated with social capital from memberships in hunting clubs in Adirondack Park (Green, Grijalva and Kroll, 2004). However, this study only attempted to measure the total economic value from membership in a hunting club, rather than the social capital benefits that arise from the conflict mediation services and establishment of professional networks facilitated by CBOs. Review of the social capital literature did not uncover any economic studies that sought to value social capital developed from the participation in meetings of collaborative forestry organizations.

There are relatively few economic studies of community forestry, and even fewer that attempt to associate an economic value with the activities of community forestry organizations. One study exists on the valuation of community forestry projects in Ethiopia (Mekonnen, 2000), but defines community forestry as the forestry and timber harvesting activities conducted by local communities, rather than community-based non-profit mediation groups, as CBOs tend to be defined in the United States. To the author's knowledge, there are no studies that attempt to value specific restoration activities conducted by CBOs, or how local communities value these organizations.

Some research has been conducted on the funding and expenditures of forestry collaboratives in the Wallowa-Whitman National Forest in Oregon (Davis and Moseley, 2012; Davis *et al.*, 2012), but

has stopped short of estimating economic impacts or consumer surplus resulting from their expenditures and activities. There are also a handful of studies that estimate the economic impacts resulting from community based forestry organizations in the Wallowa-Whitman National Forest (Nielsen-Pincus and Moseley, 2013; Seidl, Cheng and Myrick, 2007), and some research into the economic impacts of fuel reduction programs in Southwestern National Forests (Hjerpe and Kim, 2008). To the author's knowledge, there is only one study that estimates the economic impacts of CBOs in Colorado (Lund Snee, Cheng, and Seidl, 2013). This last study reported an approximately $141 thousand economic impact from all of the Front Range Roundtable's activities in 2012.

A robust body of literature exists on the estimation of recreational values and passive use values arising from forest restoration activities. This literature includes papers describing methods appropriate to the valuation of ecosystem services (Loomis, 2000; Farber *et al.,* 2002), studies on topics such as the measurement of total economic value of ecosystem restoration in river basins (Loomis *et al.,* 2000), assessing willingness-to-pay for prescribed burning in the wildland-urban interface in Colorado (Kaval *et al.,* 2007), valuation of forest ecosystem protection (Kramer *et al.,* 2003), and valuation of fuel reduction treatments (Huang *et al.,* 2013). Additional studies have been conducted using spatial hedonic models to estimate the effects of forest density on property values (Kim and Wells, 2005) and the effects on property values from management practices on neighboring forests (Kim and Johnson, 2010).

It is well established in the contingent valuation (CVM) literature that budget reminders must be included in contingent valuation survey questions so that respondents recognize that responses to dichotomous choice questions should constrained by the relevant budget constraints (Arrow *et al.,* 1993). The presence of budget constraints is necessary for survey results to be consistent with established economic theory. This study will partly draw on methodologies developed in previous studies that use the contingent valuation method for the valuation of public goods where consumer budget constraints are not well defined.

A study on the value of USGS Landsat satellite imagery used a dichotomous choice question that made it clear that the relevant budget constraint was that of the project that would be required to pay for Landsat imagery (Miller *et al.,* 2013). Another study, on the valuation of Agricultural and Applied Economics Association (AAEA) conferences to individuals (Cooper and Hellerstein 2009), made an effort to disentangle the budget constraints of federal agencies from those of the individuals who worked for those agencies and attended AAEA meetings as representatives of those agencies. To accomplish this, survey respondents were asked a CVM question where the percentage of the costs for traveling to a conference would be subsidized by the agency, varying from 50-95%, indicating that the non-subsidized percentage would be paid by the individual from his/her own personal budget. This study found that individuals would have attended the last AAEA conference even if they had to pay $195-$618 (2007 dollars) from their personal budget. An earlier study by Broder *et al.* (1994) estimated a WTP of $633 (2007 dollars) for attending the 1990 AAEA conference.

Like the AAEA study by Cooper and Hellerstein (2009) discussed above, this study into the value of community-based forestry organizations also wishes to disentangle agency budget constraints from individual budget constraints. Participants in forest collaborative meetings in Colorado include representatives of federal, state, and local government agencies, as well as corporations, non-profits, and individuals, so there is something of a lack of well-defined budget constraints. In addition, the value to individuals is the result being examined, so the individual's budget constraint is the relevant one. As such, dichotomous choice questions for this survey were specified so that respondents answered relative to their private budget constraint.

Although there is extensive literature on the valuation of recreation sites, ecosystem services, forest restoration, and hazardous fuel reduction, this research has typically focused on the benefits that accrue to individuals as they visit recreation sites or areas where restoration activities have occurred. There is relatively little research into the valuation of one-time events or events that happen a handful

of times per year, such as meetings held by a collaborative forestry organization. For insight into the methodologies used to value events with a discrete beginning and ending, valuation studies in the tourism economics and sports economics literatures have been examined.

These literatures have drawn on and adapted methodologies from environmental and resource economics, in particular the travel cost and contingent valuation methodologies, to assess benefits associated with attendance of regional festivals and sporting events. Several of these studies have been helpful in formulating the methodology used in this paper. Papers utilizing adaptations of the travel cost methodology include analyses of European sporting events (Barget and Gouguet, 2007), cultural events such as Gemfest in Central Queensland (Prayaga *et al.,* 2006), and the Stan Rogers Folk Festival in Nova Scotia (King, 2003). Barget and Gouguet found an average WTP of €10.60 for women and €14.70 for men (approx. 14.50 and 19.75 in 2007 USD using the exchange rate at the time), Prayaga *et al.* reported CS estimates of $266.88 per person in 1998 and $187.06 per person in 2002 (approx. 204 and 143 USD), and King estimated average CS per person of $97.32 (approx. 80 USD).

Papers that have utilized the contingent valuation methodology include a study of benefits to attendees of music festivals in Santiago de Compostela, Spain (Herrero *et al.,* 2011), and valuations of private consumption benefits of NCAA football games in the southeastern United States (Dixon *et al.*, 2012). Herrero *et al.* found mean WTP of $51.15 for attendance of music festivals (when defined as a club good), and Dixon *et al.* estimated mean WTP of $184.87 per game. While valuations of meetings held by community forestry organizations remain firmly in the natural resource and environmental economics literature, the episodic nature of the meetings shares some distinct similarities with cultural festivals and sporting events. As such, the abovementioned literature has provided a useful foundation for the valuation of community forestry meetings.

In order to estimate the consumer surplus from services provided by forest collaboratives in Colorado, a survey methodology combining aspects of the Contingent Valuation Method (CVM) and

Travel Cost Method (TCM) has been developed. Both methodologies are survey-based approaches commonly used to estimate the economic benefits that accrue to consumers of goods and services that are not openly traded in markets or for which little market data is available. These methodologies are recommended by federal agencies for the valuation of public goods and non-market goods (U.S. Environmental Protection Agency, 2000; U.S. Water Resources Council, 1983; Dwyer *et al.* 1977).

This study will contribute to the existing literature in natural resource and environmental economics by estimating an economic value for social capital developed by attending meetings held by the Front Range Roundtable. This is arguably one of the most important activities of many smaller community forestry organizations, as this is where most of the conflict mediation, planning, and networking occurs. Because such a valuation has not been completed in the past, this will also be a valuable contribution to the literature on community forestry organizations that should serve to inform the policy debate regarding funding of these organizations.

Such research would be invaluable to place-based collaborative organizations and policymakers to understand the economic benefits of the social capital that is developed through their activities, and to build public awareness of their work. This research would also be a contribution to the existing economics literature on the non-market valuation of social capital, public goods and club goods and services, especially in areas where private budget constraints are poorly defined due to public funding of organizations for meeting attendance.

Hypothesis

The presence of 40-50 individuals at each quarterly meeting held by the Front Range Roundtable suggests that meeting attendees have a positive willingness to pay for the FRR's planning and mediation services. Participation in, and professional networks (i.e. social capital) that result from, these meetings should result in reduced transaction costs for forest project implementation.

The null hypothesis in this study is that residents of the local community and stakeholders in the collaborative forestry process have no willingness to pay for the facilitation and mediation services conducted by the Front Range Roundtable at their quarterly meetings. The alternative hypothesis is that residents have a positive WTP for these activities. WTP values will be tested to ensure that they are significantly different from zero. The controls above should reduce any bias on the willingness to pay estimates that might result from proximity to public lands, income, education, politics, age, and employment by a land management agency or CBO.

SURVEY DESIGN AND IMPLEMENTATION

Sampling Plan

The survey was conducted at the Front Range Roundtable's April 11, 2014 quarterly stakeholder meeting and used responses from private consumers and representatives of CBOs, land management agencies, local and federal legislative bodies, environmental organizations, and local utilities. Typical attendees of the quarterly FRR meetings include all the groups mentioned above; benefit estimates that are inclusive of valuations from numerous diverse stakeholder groups can be expected.

Employees of land management agencies and CBOs, as well as residents of communities where CBO-facilitated restoration work has been conducted, will probably be more familiar with the activities of the local CBO, which may help to reduce error in survey results caused by respondents being unfamiliar with the study subject. However, it is also possible that proximity to restoration projects may create an upward bias in survey results, when compared to a general survey of Colorado residents. Controls have therefore been included for these factors wherever possible.

Respondents were drawn from attendees of the Front Range Roundtable's quarterly meeting, held on April 11, 2014 at the Denver Federal Center in Lakewood, Colorado. The use of the contingent valuation method to elicit values from representatives of government agencies and attendees of professional conferences has been established by Broder *et al.* (1994) and Cooper and Hellerstein (2009). Surveys were distributed in person to attendees at the beginning of the conference, and respondents were encouraged at intervals throughout the day to fill out their survey responses, in the hope of achieving a higher response rate. Participants were asked to complete the survey at the conference and return it at the end of the day. The number of observations in this sample was heavily dependent on the number of attendees at the quarterly meeting – there were 47 attendees and not all

of them were willing to participate in the survey. As such, it was necessary to solicit additional participation after the meeting to reach the minimum feasible sample size of 50 responses.

Data Collection

A paper survey combining contingent valuation and travel cost methodologies was designed for this study (Appendix A). Both of these methodologies were included in the survey so that the responses provided one portion might be compared to responses provided on the other portion. This was done to ensure more precise results, and to anchor the results from the stated preference, contingent valuation portion of the survey with the results from the revealed preference, travel cost portion. This may also serve as a check for response bias in the responses on the contingent valuation portion of the survey.

The Front Range Roundtable operates on the Front Range of the Rocky Mountains in Colorado, and hosts quarterly meetings in various cities between Colorado Springs, Co, and Fort Collins, Co. At the time the group was chosen, in March 2014, the next quarterly meeting was scheduled to be held on April 11, 2014 at the Denver Federal Center in Lakewood, Co. In preparation for this meeting, a 1-page brief (Appendix B) was prepared at the suggestion of Dr. Tony Cheng and circulated to the directors and stakeholders of the Front Range Roundtable. This brief described the nature and purpose of the survey, and served to provide some background information on the economic valuation process and the importance of participation in the survey.

During this time, the human subjects review process for the survey was begun at the Colorado State University Institutional Review Board (IRB). The survey was approved for Category 2 exempt status by the IRB, pending the expansion of the survey cover letter to include additional information on the contact information for the principal and co-principal investigators, and the benefits and risks of participating in the study. After these changes were implemented in the cover letter, the survey was approved by IRB and the certification letter was provided.

After the IRB review process was complete, the survey was shared with the directors of the Front Range Roundtable, who suggested several small changes to several of the questions. At their request,

- The bid range was increased from $20-$100 to $40-$200 and the increment was increased from $20 to $40, to reflect the value the FRR directors felt stakeholders were likely to place on the collaborative process;
- The wording of question 2a was altered to reflect stakeholders' monthly time commitment, rather than weekly;
- Wording was included to determine if any individuals had car-pooled to the meeting;
- A category was added to question 9 to assess why an individual has 0 willingness to pay if they chose not to accept the bid amount on their survey;
- The wording on demographic question 1 was altered from "where the Front Range Roundtable has facilitated restoration work" to "within the Front Range Roundtable vision area for restoration and forest risk mitigation."

These changes were all implemented before the initial survey was conducted. Finally, the directors of FRR were concerned that federal government employees would be unable to answer question 7, the contingent valuation question, due to concerns over spending private money on government business. This concern was discussed with the thesis committee and several responses were prepared for this eventuality. However, none of the government employees present at the April 11 quarterly meeting brought up this concern.

An in-person, paper survey format was chosen because it was anticipated that a higher response rate would be achieved than with an online or mail survey. In addition, the in-person survey format allows for the importance of participation to be explained to respondents, and for reminders to be made

throughout the day. The surveys were distributed with other meeting materials in the morning, so that respondents would have all day to complete the survey. This gave participants time to carefully consider their answers to the survey questions throughout the day, but may also have given respondents the opportunity to collaborate on survey responses. Collaboration on survey responses may have introduced additional bias into the contingent valuation results, though the direction of any potential bias is difficult to predict. The survey was explained to attendees at the Roundtable meeting during the time allotted for updates and announcements, and reminders were made during the lunch break and at the closing of the meeting.

There were 47 attendees at the Front Range Roundtable Q2 meeting on April 11, 2014. Each of these individuals received a survey, and 27 completed and returned the survey by the end of the day, for an initial response rate of 57.4 percent. Participants were also solicited for any feedback regarding the design of the survey and content of the questions. One respondent raised concerns about the wording of the contingent valuation question, suggesting that it may not have made clear to participants that their responses should be constrained by their personal budget constraints, rather than those of the organizations or agencies which they represented. The wording of this question was changed in the next iteration of the survey to make it more obvious to respondents that their own personal budget constraints were the relevant budget constraints.

The 27 observations collected fell well short of the approximately 50 responses that were necessary to achieve a statistically meaningful sample. To address this, an online version of the survey was designed, using Qualtrics survey software. The new phrasing for the contingent valuation question was incorporated in the online version of the survey only. A link to the online survey was generated, which was sent out at weekly intervals to the Front Range Roundtable email mailing list over the time period spanning May 1, 2014 to June 30, 2014. During this time, 10 additional responses were collected. All online responses have been coded with a dummy variable in order to control for any differences that

may exist between the online survey and the paper version, and between the two different ways that the contingent valuation question was phrased.

Due to the very gradual rate at which the responses to the online version of the survey accumulated, additional efforts were made to collect surveys in person. Several more paper surveys were distributed at the Front Range Roundtable Landscape Restoration working group meeting held on June 11, 2014. An additional four paper surveys were collected from attendees at that meeting. Efforts were also made to conduct 'snowball sampling' of employees of the Colorado Forest Restoration Institute and the Rocky Mountain Research Station who had attended Front Range Roundtable meetings. One paper survey and two online surveys were collected in this manner. All survey responses collected in this manner were aggregated with the other survey results so as to not compromise the confidentiality and anonymity of the survey responses.

The remaining six survey responses were collected during a conference call arranged by the Colorado Department of Natural Resources (CDNR) to check in with the facilitators of many of Colorado's forest collaborative groups. The facilitator of this meeting, the Assistant Director of Parks, Wildlife, and Lands at CDNR was briefed on this survey beforehand, and permission was given to solicit participation during the conference call. A brief description of the survey was given during the call, and an email was sent out to the participants in the conference call containing a PDF of the survey cover letter and a link to the online survey. It was made clear during the call and in the subsequent email that only individuals who had participated in FRR meetings should complete the survey. A reminder was sent out one week later to the same individuals, resulting in a total of 50 completed surveys from all sources.

Front Range Roundtable coordinators report that there are currently 226 individuals on their mailing list. Using this membership, the total response rate from all survey vehicles is 22.12 percent. Some 47 individuals were given the opportunity to participate at the initial FRR meeting, and an

additional 4 paper surveys were collected afterward, totaling 51. As a result, the remaining 175 individuals on the FRR mailing list were solicited using the online version of the survey. Using this number, the response rate for the online portion of the survey was 9%.

DATA AGGREGATION

Travel Cost Data Compilation

The Travel Cost portion of the survey asked respondents for the distance traveled to attend the Front Range Roundtable meeting at the Denver Federal Center in Denver, Colorado. It did not ask respondents how much they had spent on travel to attend the meeting. Respondents were also asked what kind of vehicle they used to travel to the meeting (car, motorcycle, RV, airplane), but respondents were not asked what make of car they used. As a result, some assumptions were made in order to conduct the calculations necessary to convert the trip distance reported by survey respondents into a standardized trip cost variable.

According to the Bureau of Transportation Statistics, the average age of automobiles and light trucks in operation in the United States in 2013 (the most recent year for which data was available) was 11.4 years. Using this information, it was assumed that the average respondent drove a vehicle made in 2003. Based on this assumption, the Bureau of Transportation Statistics average miles per gallon value of 22.2 MPG for light duty vehicles in 2003 was determined to be an appropriate average value for all respondents who reported driving a car or light truck (Department of Transportation 2013). One RV and one motorcycle were driven to the meeting venue, so a value of 50 MPG was found for motorcycles using in the same Bureau of Transportation Statistics data and a value of 8.5 MPG was found at moturis.com for recreational vehicle gas mileage (Moturis 2014).

Using the data and assumptions described above, estimated gas usage for travel to the Front Range Roundtable meeting was calculated for each trip. Gas usage values were then multiplied with historic average gas prices in Colorado for the week of April 8, 2014, the week that the meeting was held (EIA.gov 2014). An attempt was made to account for spreading trip costs across multiple individuals (carpooling), so respondents were asked how many people traveled in the same vehicle with them. Total

trip costs were then divided by the number of passengers in the vehicle, to obtain trip cost per person. This is the trip cost value that was used in the travel cost analysis.

Opportunity cost of time was included in the travel cost calculation. Hourly wages were calculated by assuming annual working hours of 2087, per guidelines from the U.S. Office of Personnel Management (OPM 2015), and dividing the average income for each zone by this amount. Travel times were determined using the estimated trip time for the default route on Google Maps from the zip code of origin, and these travel times were averaged within each zone. Average round trip travel time for each zone was multiplied by 30 percent of the wage rate described above to determine the cost of travel time for each zone. This amount was added to the direct travel cost from mileage and gas consumption described above to establish the total travel cost for each zone.

The phrasing of the distance traveled question (Appendix A – Question 4) in the survey appears to have been somewhat ambiguous, because respondents appear to have provided both one-way and round-trip distances. Fortunately, survey participants were also asked to provide their starting ZIP code (Appendix A – Question 5), so trip distances were calculated using the least-distance route in Google Maps from the starting zip code to the meeting venue. These values were checked against the trip distances provided by respondents.

Trips were then aggregated by county for the zonal travel cost analysis. The ten relevant counties were determined to be the ten counties in the Front Range Roundtable focus area. These are Boulder, Clear Creek, Douglas, El Paso, Gilpin, Grand, Jefferson, Larimer, Park, and Teller counties (Front Range Roundtable 2014). For counties with multiple trips, the distances traveled for all trips that originated in that county were averaged to arrive at the distance traveled for each zone. Average income and age in the ZTCM were calculated using values reported by survey respondents. In the case of zip codes that spanned multiple counties, trips were aggregated into zones based on Google Earth

data showing which county the center of the zip code fell. Some trips originated from zip codes that did not fall into any of these counties. These observations were dropped from the aggregation as they didn't fall into counties within the FRR area.

Three counties, Clear Creek, Gilpin, and Grand, did not have any trips to the April 2014 meeting. For these counties, hypothetical trip distance was calculated from the largest city in the county. For example, Idaho Springs was chosen as a reasonable trip origin for Clear Creek County. This was done because, in all three cases, the center of the county was far away from any reasonable population centers, and unnecessarily inflated the trip distance. Census values for median income and age were entered for these counties so that these variables could be used as controls. Census median values for age and income were also entered for responses where participants had declined to provide this information.

After aggregating all trips by county, populations were found for each county using 2010 Census data (U.S. Census Bureau 2014). The trips per capita variable was calculated by dividing the number of trips that originated in each county by the total population of that county. For counties where no trips originated, the trips variable was entered as $1x10^{-11}$, rather than zero, so that natural logs could be calculated for the trips per capita variable in counties from which no trips originated.

The summary statistics from the Zonal Travel Cost model are presented in Table 1 below.

Table 1: Zonal Travel Cost Model Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
lnTripsCap	10	-17.46	11.75	-34.93	-8.68
TripCost	10	42.09	22.83	16.44	89.72
AvgAge	10	46.27	5.95	36.92	56
AvgIncome	10	86407	20396	60517	125000
CostGov	10	16.69	20.82	0	60.17

Contingent Valuation Data Compilation

The Contingent Valuation portion of the survey asked respondents a number of questions that were used to build the logit model from which mean willingness to pay was derived. Respondents were presented with a scenario in which the Front Range Roundtable would see a 10% decrease in funding due to government budget cuts (Appendix A, Question 8); the FRR would propose membership dues in order to continue to host quarterly roundtable meetings. Respondents were then asked a dichotomous choice question if they would pay one of 5 bid amounts ranging from $40 to $200, in $40 increments. Respondents were also asked what the maximum they would be willing to pay to allow the FRR to continue to host meetings (Appendix A, Question 9), and why they were unwilling to pay anything for the FRR if they rejected the bid they were presented with (Appendix A, Question 10).

In addition to the bid and willingness to pay questions, respondents were asked a number of demographic questions, which were used to code control variables for the logit model. These questions included age, education, membership in an environmental organization, volunteer status for the Front Range Roundtable, income, employment in a government agency, and if they lived within the FRR's service area. Responses to these questions were coded as dummy variables, with the exception of the age and income variables.

The null hypothesis in this study is that residents of the local community have no willingness to pay for restoration activities conducted by CBOs. The alternative hypothesis is that residents have a positive WTP for these activities. The controls above should reduce effects on willingness to pay that might result from proximity to public lands, income, education, politics, age, and employment by a land management agency or CBO, resulting in relatively unbiased estimates for mean willingness to pay for FRR's quarterly meetings.

Because only 47 people attended the April 11, 2014 quarterly meeting of the Front Range Roundtable, it was not possible to collect enough observations, even if a 100% response rate had been

achieved. As a result, additional observations were collected via an online version of the survey, for which participation was solicited by providing the survey link to the FRR coordinators, which was then emailed out to the organization's mailing list. These observations were coded with a dummy variable to distinguish them from survey responses that were collected using the paper version of the survey, and were pooled into a single logit model for the contingent valuation analysis.

Summary statistics for the contingent valuation data are presented in Table 2 below.

Table 2: Contingent Valuation Data Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Bid	50	121.6	58.25	40	200
PBid	50	76	75.05	0	200
Collaborative	50	0.86	0.35	0	1
Age	50	48.03	12.04	23	74
Income	50	96954	37454	12500	150000
Environmental	50	0.66	0.48	0	1
Grad Degree	50	0.68	0.47	0	1
GBid	50	80.8	74.28	0	200

Some values for the contingent valuation summary statistics are different than those from the travel cost model summary statistics. Average income and average age are both higher in the CVM summary statistics than in the TCM. This is because some observations were dropped from the TCM aggregation if they did not fall within FRR's 10 constituent counties, and because it was necessary to include census data in the TCM for counties where no trips had originated.

Note that some dummy variables that were dropped from the final statistical models due to insignificance are included here because they provide some insight into the makeup of the sample. The CVM summary statistics show that 86 percent of the individuals sampled contributed some volunteer time to the FRR's activities, that 66 percent were members of an environmental organization, and that 68 percent had a Master's degree or higher.

Travel Cost Model

A separate demand curve was constructed using participants' responses to travel cost questions regarding attendance of the FRR's quarterly meeting where the survey was conducted. This is valuable on its own as a revealed preference (and through that, WTP and consumer surplus) for attending conferences related to community-based landscape restoration. Typically, a travel cost model establishes a mathematical relationship between trips per capita to the site in question and the distance traveled to the site or venue, as well as a vector of control variables. With a travel cost model, the law of demand is expected to hold – as travel distances (and therefore travel costs) increase, the number of trips taken from a region should decrease. Control variables such as average income and age can be expected to have positive and negative effects, respectively, on trips from each zone.

It should be noted that there are fewer options for the addition of control variables in the travel cost model, as these variables must represent values that are relevant to the zones in question. Dummy variables that are used in the contingent valuation portion of the survey, such as membership in an environmental organization or employment in a government agency, are problematic to convert into a format that is relevant a zonal travel cost model.

The general form of the travel cost model is as follows, where X_j is a vector of the control variables that are mentioned above:

$$\frac{\boldsymbol{Trips_i}}{\boldsymbol{Pop_i}} = \boldsymbol{\beta_0} - \boldsymbol{\beta_1 Dist_i} + \boldsymbol{\beta_j X_j}$$

Results from the travel cost model will provide a useful comparison to results from the contingent valuation, stated preference portion of the survey. If responses to either valuation method are significantly different from one another, questions for one or both of the valuation methods may be incorrectly specified, or the revealed preference and stated preference portions of the survey may be

measuring different goods. A certain amount of variation can be expected due to the differences between stated preference valuation methods such as contingent valuation, and revealed preference valuation methods such as the travel cost method.

Contingent Valuation Model

Valuation of quarterly meetings conducted by the Front Range Roundtable has been conducted using a combined contingent valuation, travel cost survey. Contingent valuation responses were analyzed using a qualitative choice logistic regression model. The dependent variable is the probability that a respondent says 'yes' to a dichotomous choice question asking if the respondent is willing to pay a certain dollar amount to "allow FRR to continue to facilitate" collaborative meetings. The bid amount is the independent variable in this scenario, and controls have been included for education, income, age, membership in an environmental organization, employment by a CBO or government agency, and proximity of residence to the CBO's service area.

In the contingent valuation model, the influence of the proximity, income, education, and age variables is expected to be positive. That is, as the value of these control variables increases, willingness to pay for community forestry should also increase. Employment is also expected to be positive – if a respondent is employed by a land management agency or CBO, they will likely have a higher WTP for FRR meetings than a private citizen that is not directly involved with the collaborative process. It is less clear what the expected sign on the political control variable will be, but one might expect that respondents who are members of an environmental organization will have higher WTP for the FRR's quarterly meetings.

The general specification of a logit model using the above variables would take on the following form, where X_i is a vector of the control variables mentioned above:

$$\boldsymbol{P(Yes) = 1 - \frac{1}{1 + e^{(\beta_0 - \beta_1 P - \beta_i X_i)}}}$$

The coefficients (betas) in this model will be used to calculate mean WTP, as specified by Hanemann (1989).

Regression Analysis: Travel Cost Model

In the estimation of the regression models, variables that consistently showed no statistical significance were dropped from further modeling. The initial zonal travel cost model was a linear model of the following form:

$$\frac{\boldsymbol{Trips_i}}{\boldsymbol{Pop_i}} = \boldsymbol{\beta_0} - \boldsymbol{\beta_1 TripCost_i} + \boldsymbol{\beta_2 AvgIncome_i} + \boldsymbol{\beta_3 AvgAge_i} + \boldsymbol{\beta_3 CostGov_i}$$

Where $AvgIncome_i$ and $AvgAge_i$ represent the average income and age of respondents from zone i, respectively, and $CostGov_i$ is an interaction term that multiplies the average trip cost from zone i by the percentage of trips from zone i that were government employees. The TripCost variable is an effort to include a control for government employment, and was calculated from the data provided in the survey, as outlined in the Travel Cost Data Compilation section above.

The CostGov variable was added to the model because a large number of government employees were traveling from counties that were relatively far away from the meeting site. It controls for the percentage of the total trips from that county that were made by employees of a federal, state, or local government agency, and helps to separate agency budget constraints from private budget constraints. The addition of this variable to the model significantly increased the goodness of fit of the model overall, suggesting that government employees have a different WTP for the meetings than non-government employees.

Several other model specifications were considered, including single-log and double-log models. In the end, a log-linear model was chosen both for goodness of fit, and because the law of demand suggests that trips per capita should decline at high travel costs. Therefore, the log-linear functional form has been argued to be the most plausible for zonal travel cost models. Ziemer *et al*. (1980),

Vaughan and Russel (1982), and Strong (1983) argued that a linear travel cost model would predict negative trips at high travel costs, which is contrary to economic reasoning. In addition, the use of the natural log of visits per capita has the effect of substantially reducing any heteroskedasticity that may be present in the travel cost model (Vaughan and Russel 1982; Strong 1983). The log-linear functional form has the additional benefit of significantly simplifying the calculation of average consumer surplus (Donnely *et al*. 1985).

The final specification for the zonal travel cost model was a log-linear model, where the variables in the log-linear model correspond to those in the linear model, with the exception of the trips per capita variable, where the natural log has been taken.

Regression Analysis: Contingent Valuation Model

The contingent valuation regression analysis was conducted using a logistic regression model, the general form of which is presented above. Variables that were consistently statistically insignificant were not included in the final version of the logit model. The control variables that were included in the final regression model were Collab, Age, Income, Environmental, and Grad. The Collab variable represents the average number of volunteer hours each month that respondents contribute to the Front Range Roundtable's activities. The Age and Income variables represent the average age and income, respectively, of respondents in the sample. Environmental and Grad are both dummy variables that are coded as 1 for individuals who are members of an environmental organization (for the purposes of the survey, the Front Range Roundtable is not considered an environmental organization) or who have attained a graduate degree.

There were also two interaction terms included in the logit model – PBid, which interacts the Paper dummy variable with the Bid variable, and GBid, which interacts the Grad dummy variable with the Bid variable. The inclusion of these two interaction terms significantly improved the goodness-of-fit

of the logit model. When the PBid variable was introduced, the Paper dummy became highly insignificant, so it was removed from the final version of the logit model.

The final contingent valuation statistical model took the following form:

$$\frac{\boldsymbol{ln(Yes)}}{\boldsymbol{1-Yes}} = \boldsymbol{\beta_0 - \beta_1 Bid + \beta_2 PBid + \beta_3 Collab + \beta_5 Income - \beta_7 Grad + \beta_8 GBid}$$

Where 'yes' is the dichotomous dependent variable; 1 indicates acceptance of the bid amount, 0 indicates that the respondent declined that bid amount.

Table 3 presents the distribution of respondents who accepted the bid amount that they were presented with. It is evident that it is not a perfectly behaved distribution, likely due to the small sample sizes in each individual bid amount. With larger sample sizes, it is expected that the distribution would be better behaved; bid amounts with larger sample sizes, such as $160, seem to conform more closely to the law of demand, as would be expected with increasing bid amounts.

Table 3: Responses at Each Bid Amount

Bid	**$40**	**$80**	**$120**	**$160**	**$200**
Yes	9	3	6	6	6
No	3	3	3	8	3
% Yes	75.00%	50.00%	66.67%	42.86%	66.67%

Results: Travel Cost Model

Table 4 presents the final statistical model for the travel cost analysis.

Table 4: Log-linear regression model of trips per capita

	Coefficient	T-statistic
Constant	-32.28	-3.38*
Trip Cost	-0.15	-2.66*
Average Income ($ 1000s)	0.57	8.52***
Average Age	-0.74	-3.2*
Cost*Gov	0.34	5.51**
Adjusted R^2	0.93	

*Significant at the 0.05 level
**Significant at the 0.01 level
***Significant at the 0.001 level

The Trip Cost variable is statistically significant at the 5% level. The -0.15 coefficient predicts that a $1 increase in trip cost would result in a 0.15% decrease in the number of trips taken.

The Average Income variable is significant at the 0.1% level. The coefficient of 0.57 indicates that more trips are taken from zones with higher respondent average income than zones with lower average income; a $1,000 increase in income would result in a 0.57% increase in the number of trips taken.

The Average Age variable is significant at the 5% level. The -0.74 coefficient suggests that a one year increase in average age should be associated with a 0.74% decrease in trips taken. The sign on this variable is unexpected, but could be explained by younger individuals being more able to make trips of longer distance than older individuals.

The Average Income and Average Age variables have a correlation coefficient of 0.438. To address potential bias due to the correlation of these variables, this model was re-estimated without the Average Age variable. In this model, the Trip Cost variable had a p-value of 0.141 and the estimate of

average consumer surplus decreased slightly. There does not appear to have been a substantial difference in results with the Average Age variable omitted, but the statistical significance of the TripCost variable was reduced.

The Cost*Gov variable is significant at the 1% level. The coefficient of 0.34 on this variable predicts that a 1% increase in the proportion of trip cost borne by government representatives will result in a 0.34% increase in the number of trips taken.

The positive sign on this variable indicates that zones with a high prevalence of government organizations who participate in the collaborative forestry process (such as Larimer County or Boulder County) had a higher-than-expected number of trips, despite having higher travel costs than other zones. This suggests that agency budget constraints are playing a role in the number of trips from these zones, and that government agencies are likely not constrained by budget in the same way as private individuals when it comes to attending Front Range Roundtable quarterly meetings. Another possible explanation is that attendees from these counties disproportionately represent research institutions, and may therefore derive additional benefits from participation in collaborative meetings, such as data collection and collaboration on research studies.

Results: Contingent Valuation Model

Table 5 presents the final logit model for the contingent valuation analysis, and Table 6 presents the marginal effects from each of the variables in the logit model. A number of different contingent valuation model specifications were tested; the model that generated the most correct predictions in-sample is presented here. This model correctly predicted 46 out of 50 observations in the CVM data. The other two models under consideration predicted 45 and 44 of the 50 observations. The model presented here is also the model specification that achieved the lowest scores on Akaike's Information Criteria and the Bayesian Information Criteria.

Table 5: Logit regression model of the probability respondents would pay dues for FRR meetings			
	Coefficient	**Z-statistic**	**Mean**
Bid ($)	-0.11	-2.6**	121.6
PBid	0.03	2.8**	76
Collaborative	6.94	2.41*	0.86
Income ($1000s)	0.06	2.29*	96954.34
Grad	-11.10	-1.85	0.68
GBid	0.10	2.31*	80.8
Constant	-1.48	-0.34	
Pseudo R^2	0.68		

*Significant at the 0.05 level.
**Significant at the 0.01 level.

Table 6: Marginal effects of contingent valuation model coefficients		
	dy/dx	**Z-score**
Bid ($)	-0.007	-3.82
PBid	0.002	4.58
Collab	0.44	3.27
Income ($1000s)	0.04	3.04
Grad	-0.71	-2.13
GBid	0.01	3.00

The Bid variable is statistically significant at the 1% level. The negative coefficient indicates that the probability of a 'yes' response to the bid amounts for FRR membership dues declined as bid amounts increased. The -0.007 coefficient on the marginal effect for the bid amount indicates that a $1 increase in bid amount will result in an estimated 0.007% decrease in the probability of a yes vote, suggesting that yes votes are highly insensitive to the bid amount.

The PBid variable is an interaction term between the Paper dummy variable and the Bid variable. The positive sign on this interaction term indicates that respondents who took the paper version of the survey were more likely to respond 'yes' to the bid amounts than respondents who took the online version of the survey. This variable is significant at the 1% level. To interpret the marginal effect of the PBid variable, it must first be summed with the bid variable. Therefore, the -0.005 sum of

these marginal effects suggests that a $1 increase in the bid amount for those individuals who received the paper survey would result in a 0.005% decrease in the probability of a yes vote.

The Collaborative variable is significant at the 5% level. The positive sign on this variable suggests that respondents who had contributed volunteer time to the Front Range Roundtable organization were more likely to accept their bid amount. The 0.44 marginal effect coefficient for the collaborative dummy indicates that individuals who contribute volunteer time to the collaborative are 0.44% more likely to vote 'yes' to any bid amount than individuals who do not contribute volunteer time to the FRR.

Income is significant at the 5% level, and has a positive sign. This indicates that the probability that a respondent would accept their bid amount increased as income increased. The marginal for income suggests that a $1,000 increase in income would result in an estimated 0.06% increase in the probability of a 'yes' vote.

The GBid variable is significant at the 5% level. This variable is an interaction term between the bid amounts and the Grad dummy variable. The positive sign on this variable suggests that, as the respondent's level of education increased, so too does the probability that they vote 'yes' on the bid amount. The sum of the GBid marginal effects with the Bid marginal effects is -0.0005, which predicts that a $1 increase in the bid amount for those individuals with at least a Master's degree would result in a 0.0005% decrease in the probability of a yes vote.

The Grad variable is not statistically significant at the 5% threshold, suggesting that this variable does not have a strong effect on the probability that an individual would vote for an increase in membership dues for the FRR. The marginal effects for this variable would be interpreted in the same fashion as those above, but there is little statistical evidence to suggest that it has any effect on the probability that a survey respondent accepts their bid amount.

Benefit Estimates: Travel Cost Model

Mean consumer surplus for the travel cost model was calculated using methodology developed in the appendix of Donnelly *et al.*'s 1985 resource bulletin, Net Economic Value of Recreational Steelhead Fishing in Idaho. The proof establishes average CS as the inverse of the slope parameter on the travel cost variable:

$$CS = \frac{1}{\beta_{TC}}$$

This consumer surplus calculation assumes that the following conditions are met:

1) Demand is modeled using a log-linear functional form
2) Visitors from each zone face a horizontal supply curve, and that, due to differences in location, each zone has a different supply curve
3) A further condition, that any shifting variables in the demand equation affect the intercept and not the slope, is not relevant here because there is no 'before' or 'after' state (the original study by Donnelly *et al.* analyzed an 'after' state where managers improved the attractiveness of a recreation site).

Using this methodology, average consumer surplus per trip was calculated as $6.60. Because there are four quarterly meetings conducted every year, this equates to an annual average consumer surplus of $26.40 per person. This consumer surplus estimate has been applied to the 47 individuals who attended the quarterly Front Range Roundtable meeting on April 11, 2014, yielding an average consumer surplus per meeting of $310, and an annual consumer surplus of $1,241, assuming that an average of 47 people attend each meeting.

In an email interview conducted in 2013, FRR coordinators reported average annual meeting facilitation costs of approximately $10,600 per year, or $2,650 per meeting. All relevant onsite costs are accounted for in this estimate, including contract costs for meeting facilitators, and costs for printing of meeting materials. Refreshments are donated by member organizations, and meeting venues are provided by member organizations at no additional cost to the Front Range Roundtable.

FRR meetings are typically comprised of the same core individuals who attend most or all of the quarterly meetings. As such, it does not seem appropriate to expand the travel cost benefit estimate to a larger population, such as the total membership (mailing list) of the Front Range Roundtable. While individuals have some value for the FRR's activities, many of these individuals do not attend quarterly meetings. In the interest of conservative estimates, benefit estimates have been restricted to the number of individuals who attended the April conference, extrapolated to the four meetings held every year.

This consumer surplus estimate is somewhat smaller than expected, when compared to the estimates from the contingent valuation model. This might be due to the inclusion of the CostGov variable in the travel cost model. The interpretation of this variable is somewhat vague, though it does appear to be capturing some of the travel costs from government employees who attend the meetings. Many of the individuals who were government employees were also individuals who traveled from Larimer County, one of the zones with the highest travel cost. This suggests that these individuals may get other benefits from attending these meetings, beyond the benefits defined above. It is possible that these benefits might be associated with the numerous research studies, such as stand analysis and ecological studies, which are conducted on landscape restoration projects with which the FRR is associated.

The travel cost model was also estimated without the CostGov variable. This version of the model did not fit the data as well, and the travel cost variable was no longer significant even at the 10%

level. The coefficient on the travel cost variable was slightly larger in absolute value, yielding an even smaller average CS than the model that contained the CostGov variable. This suggests that the CostGov variable is not driving the lower-than-expected consumer surplus from the travel cost model.

The two different model specifications were also tested using AIC and BIC. The model containing the CostGov variable achieved lower scores on both tests, indicating that this model is a better fit for the data and will generate better predictions than the model which did not contain this interaction term.

Benefit Estimates: Contingent Valuation Model

Mean WTP was calculated using the formula developed by Hanemann (1989), where WTP must be greater than or equal to zero. The general formula is:

$$Mean\ WTP = \left(\frac{1}{\beta_1}\right) * \ln(1 + e^{\beta_0})$$

Where β_1 is the coefficient on the bid amount and β_0 is the grand constant. The grand constant is calculated as the sum of the estimated constant plus the coefficients on the other independent variables multiplied by their means. In the case of this model, because there are two interaction terms present, two separate β_1 values are calculated, one as the sum of the coefficients on the Bid variable and the PBid variable, and the other as the sum of the coefficients on the Bid variable and GBid variable. Because of this, the mean WTP calculation used in this study took the following form:

$$Mean\ WTP = \left(\frac{1}{\beta_{Bid} + \beta_{Int}}\right) * \ln(1 + e^{\beta_0})$$

Where β_{Int} is the coefficient on the relevant interaction term. This resulted in four mean WTP estimates, one for the subsample where no dummy variables were active (equal to 1), one for the subsample where only the Paper dummy was active, one for the Grad dummy, and one where both Paper and Grad were active. The CVM question was phrased in an annual format, so these values are annual WTP estimates. These results are presented in Table 7.

Table 7: Annual benefits by subsample				
	Annual WTP	Number	% of Sample	Annual
Neither Paper nor Grad	$29.04	7	14%	$203
Paper Dummy Only	$42.88	9	18%	$386
Grad Dummy Only	$442.17	11	22%	$4,864
Paper and Grad Dummies	$485.05	23	46%	$11,156
Total		**50**	**100%**	**$16,609**

The mean WTP values associated with the subsample with no dummy and with the Paper dummy term appear reasonable, but the value associated with the Grad dummy term is far higher than expected. As a result, the mean WTP value where both the Grad and Paper dummies are active is also far higher than would have been expected. It is reasonable to believe, however, that individuals with a graduate degree have a higher WTP for FRR meetings than other participants.

One likely explanation for this unexpected result is that many of the individuals present at the meeting who had a Master's degree or greater were also individuals who attend Front Range Roundtable meetings for purposes other than the FRR's conflict resolution and networking services. Many of these individuals are members of research organizations that regularly conduct research activities, such as stand analyses and ecological studies, which are associated with landscape restoration projects that the FRR has a part in facilitating. It is probable that the Grad dummy, and associated interaction terms, are capturing researcher values above and beyond values that are directly related with the FRR's services, thereby explaining why this dummy and its interaction terms are associated with such high WTP.

It is also worth noting that many of the individuals whose attendance of FRR meetings may be research-motivated also traveled from Larimer County, one of the counties with the highest travel cost in the sample. It is therefore reasonable to conclude that this research motivation was a driver of the higher-than-expected trips from this county.

The annual WTP benefit values in table 4 above were calculated by determining the number of respondents in each subsample. This value was then multiplied by the corresponding mean annual WTP value to arrive at the total annual benefit for that subsample. For example, the annual benefit of FRR meetings to the 'Paper only' subsample was calculated thus; $\$42.88\ x\ 9 = \$385.92$. The annual benefits for each subgroup were summed to arrive at the total annual benefit to the entire sample, $16,609. Quarterly WTP and annual WTP for the overall sample can be calculated from the total annual benefit estimate by dividing the annual benefits by 50 for annual WTP, and then by dividing the new annual WTP value by four for quarterly WTP. This yields an average annual WTP of $332 and an average quarterly WTP of $83.

CONCLUSIONS

This study attempts to measure the value of social capital created by participants in the collaborative forestry process through their participation in professional networking, conflict mediation and resolution, and planning services offered by the Front Range Roundtable at their quarterly stakeholder meetings. This article adds to the nascent body of empirical research into the economic value of social capital and participation in the collaborative forestry process.

The average consumer surplus estimated using the travel cost model is smaller than that from the contingent valuation model. This may be a result of a number of different factors. One possible explanation is that the two models are not measuring the same thing. The contingent valuation portion of the survey relies heavily on the respondent's interpretation of the question, and it is possible that the phrasing of the question led to a different good being valued than on the travel cost portion.

Another possible explanation is that the travel cost model is a lower bound on consumer WTP for FRR's quarterly meetings. It is reasonable that survey participants are willing to pay *at least* $6.60 per person per quarter for the FRR's mediation and facilitation services, and *up to* $83 per person per quarter. These values are in broad agreement with values that have been found in the relevant literature for the valuation of episodic club goods, discussed above, such as music festivals and sporting events. The somewhat divergent values in the TCM and CVM may also be partly related to the small sample sizes in the model. If a larger sample size had been achieved, or is achieved in the future, it may be that the two benefit estimates converge.

In addition to a larger sample size, another benefit of continued study of the FRR's quarterly meetings would be a smoothing effect on the unexpectedly high number of trips from Larimer County, one of the most costly zones in the travel cost analysis. The Front Range roundtable cycles its meetings

among Colorado Springs, the Denver area, and Fort Collins, CO. One can imagine that at a meeting held in Fort Collins, CO, the high number of trips from research institutions and government agencies based in Fort Collins would not have the same unexpected effect on TCM benefit estimates, due to the significantly reduced travel distance.

In future, it may be informative to draw a separate sample from residents of local communities in close proximity to areas that have benefitted from restoration projects facilitated by the Front Range Roundtable. It is likely that a sample drawn from this group would have a different perception of the activities than those who were closely involved in the collaborative process, and a survey of such a sample would likely result in different valuations than the current survey. Individuals in this hypothetical sample could be expected to have a higher value for the activities conducted by CBOs than the general public, but a lower value than stakeholders who are closely involved in the decision process. These results would be a valuable comparison to those from the population that attends FRR meetings, and could be used to evaluate what, if any, valuation differences exist between stakeholders and those who benefit from the restoration projects facilitated by FRR but who are not closely involved in the process.

Individuals in both of these hypothetical sample pools are expected to have a clearer understanding of the services provided by forest collaboratives than the general public, and as such would not be subject to some of the bias inherent in contingent valuation models due to vaguely defined goods. Because of their association with CBOs, these individuals are also expected to have a higher response rate than a sample drawn from the general public. However, as noted above, drawing samples from these sub-populations will reduce the potential external validity of the study. As such, should time and funding permit, it would be very informative to conduct a similar survey with a sample drawn from the general population. Comparison of WTP and travel cost responses among these groups would be a productive and informative exercise, and would expand the external validity of this study.

In a time where many of the major members and funding sources of collaborative organizations in Colorado are considering cutting back on the contributions they make to these groups, this research should serve to inform the policy debate regarding the actual economic benefits that arise from the planning, discussion, and mediation process provided by the Front Range Roundtable and many other CBOs in Colorado. Lund Snee, Cheng, and Seidl (2013) estimated considerable economic impacts, given the size and scope of these organizations, and this research demonstrates that additional economic benefits accrue to members of these organizations through the mediation and facilitation process.

Furthermore, this research has examined only one of the many CBOs in Colorado, all of which can be expected to provide economic benefits to the state and to their members through the services that they provide. Many CBOs offer mediation services similar to the Front Range Roundtable, and whose economic benefits could be established using similar methodology. Many of these CBOs offer additional services, including the planning of Community Wildfire Protection Plans and landscape restoration projects. Values for these services would further contribute to the benefits that CBOs appear to contribute to the local economy and to the communities that they represent.

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APPENDICES

Appendix A: Combined CVM/TCM Survey and Cover Letter

Assessing the Social Benefits to Stakeholders in Colorado's Collaborative Forestry Organizations

April 2014

Department of Agricultural and Resource Economics

COLORADO FOREST RESTORATION INSTITUTE

Colorado State University

Dear Participant,

Thank you for taking the time to participate in this survey. My name is Torsten Lund Snee, and I am a researcher at the Colorado Forest Restoration Institute (CFRI) and the Colorado State University (CSU) Department of Agricultural and Resource Economics. We are conducting research on the economic value of collaborative forestry to participants in the collaborative process, entitled *Assessing the Social Benefits to Stakeholders in Colorado's Collaborative Forestry Organizations*. The purpose of this study is to understand the benefits to participants that arise from collaborative forestry organizations. This will help establish the economic value that participants in the collaborative forestry process place on that process. The Principal Investigator is Tony Cheng, Director of CFRI and the CSU Department of Forest and Rangeland, and I am the Co-Principal Investigator.

I would greatly appreciate your participation in the enclosed survey and returning it at the conclusion of today's roundtable. The accuracy of these results depend heavily on obtaining a high response rate, so your participation is very important to the success of this study. The survey will ask for your opinion on certain aspects of collaborative forestry organizations and your participation in this conference – there are no right or wrong answers. It will take approximately 10 minutes to complete.

Your responses to this survey will be anonymous and confidential; please do not include your name on any portion of the survey. When we report and share the data with others, we will aggregate the data from all participants. While there are no direct benefits to you, we hope to gain more knowledge on the economic value that participants in the collaborative forestry process place on that process.

Participation in this survey is voluntary and you may choose not to answer any particular question. There are no known risks to participation in this survey. It is not possible to identify all potential risks in research procedures, but we have taken reasonable safeguards to minimize any known and potential (but unknown) risks. Completion and return of this survey constitutes your consent to participate.

If you have any questions or comments regarding this survey, please do not hesitate to contact myself or Tony at the phone number or email address below. If you have any questions about your rights as a volunteer in this research, please contact Janell Barker, CSU Human Research Administrator, at 970-491-1655.

Thank you very much for your participation.

Sincerely,

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Survey Instructions: Please provide your opinion on the following questions. *There is no right or wrong answer.* To ensure that your answers remain strictly confidential, please do not include your name anywhere on the survey.

1) Are you an employee of a government (federal, state, or local) agency? ____Yes ____No

    a. If you answered 'yes' to question 1 above, do you work for:

    ____Federal government ____State government ____Local government

2) Are you affiliated with a collaborative forestry organization? ____Yes ____No

    a. If 'yes', how much time do you spend working with this collaborative on an average month? _____

3) What mode(s) of transportation did you use to travel to this conference (check all that apply)?

    ____Car ____Airplane ____Bus ____RV

4) If you car-pooled, please indicate the number of people you traveled with.

    _____

5) If you traveled by car, please estimate your miles traveled to attend this conference.

    _____

6) Please write down the zip code where you started travel: _____

7) Did you stay overnight in the Denver metro area to attend this conference? ____Yes ____No

    If you answered 'yes' to question 7 above, please answer questions 7a – 7c

    a. How many nights did you stay in the Denver metro area for this conference?

    _____

    b. Please provide a dollar estimate of your lodging expenses. _____

    c. Were your lodging and travel expenses covered by your organization?

    ____Yes ____No ____Partly.

If you answered 'partly', please explain and indicate the percentage that you personally paid:

_____

_____

_____

8) The Front Range Roundtable (FRR) derives a portion of its funding from government agencies at the federal, state, and local levels. It provides many services to communities and agencies along the Front Range, including conflict mediation and resolution, community education, and political action. Many of these services are conducted or facilitated at the quarterly roundtable meetings held by the Roundtable.

   Suppose that, due to recent budget cuts at the federal and state level, government agencies will provide 10% less funding to the Front Range Roundtable in the coming years. To allow the Front Range Roundtable to continue to host roundtable meetings, membership dues have been proposed. Would you pay $200 annually to allow FRR to continue to facilitate these meetings?

   ____Yes ____No

9) What is the maximum dollar amount you would pay every year to allow FRR to continue to provide the same level of service? _____

10) (Answer only if you are unwilling to pay anything to support FRR.) Did you say zero dollars because you:

   _____ Do not support community forestry

   _____ Do not understand the service provided by FRR

   _____ Believe funding should be provided solely by government agencies

   _____ Don't believe the money will be spent for the services described above

_____ Other (please explain)

_____

_____

_____

_____

Demographic Questions: Your answers to these questions will be used for statistical purposes only and will not be shared with anyone.

1) Do you live within the Front Range Roundtable vision area for restoration and forest risk mitigation? ____Yes ____No ____Unsure
2) What is your level of education? ____High School Diploma ____Some College ____College Degree ____Graduate Degree
3) Are you a member of an environmental organization? ____Yes ____No
4) What is your age? _____
5) Check your pre-tax annual household income. ____Less than $24,999 ____$25,000 - $49,999 ____$50,000 - $74,999 ____$75,000 - $99,999 ____$100,000 - $149,999 ____Greater than $150,000

Appendix B: Collaborative Valuation Brief

Assessing the Value to Stakeholders of Place-Based Collaborative Forestry in Colorado

Purpose

In addition to implementation of forest projects, place-based collaborative groups provide other important services, including conflict mediation and resolution, consensus building, and environmental education. Economic theory suggests that these services result in benefits to local communities and land management agencies and reduce transaction costs by easing historical tensions between these groups. Many of these benefits are difficult to communicate to policymakers in a manner that is easily comparable to other goods and services, but economic methodology exists to establish a dollar value for less-tangible services such as these. Non-market valuation methodology requires the use of surveys and can be used to estimate the value of particular goods or services that are not traded in markets, and therefore do not have well-defined monetary values. Values elicited from non-market valuation surveys can then be compared to other goods and services with better-defined markets, which should enable policymakers to make better-informed funding decisions.

Objectives

The non-market valuation of the services provided by forest collaboratives will:

1) Assess the value to stakeholders of the collaborative process, in dollar terms
2) Provide a means for comparing the value of less-tangible services like conflict mediation to more easily quantifiable ones, such as project implementation
3) Synthesize and report results to CFRI, the Colorado State University Department of Agricultural and Resource Economics, and stakeholders in collaborative organizations

Methods

Collection and analysis of valuation data will include:

1) Conducting travel cost and contingent valuation surveys at one or more collaborative meetings
2) Analysis and synthesis of survey data using discrete-choice econometric modeling

Expected Results

The non-market valuation of services provided by place-based collaborative organizations will attach an explicit dollar value to services whose values are difficult to express in dollar terms. This should make it easier to demonstrate to policymakers and the general public the value of many of the less-tangible services provided by collaboratives, and allow policymakers to compare these services to others on a less subjective basis.

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