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Upper South Fork of the Flathead Users: What Social Setting Attributes are the Most Important?

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DEVELOPING INDICATORS TO MONITOR THE SOCIAL SETTING ON THE UPPER SOUTH FORK OF THE FLATHEAD RIVER USERS: WHICH ATTRIBUTES ARE THE MOST IMPORTANT?

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Previous research has shown that wilderness visitors place much value on an uncrowded social recreation setting. However, the current indicators that the Flathead National Forest has implemented to monitor this setting on the upper South Fork of the Flathead River may not satisfy several of the qualities of a good indicators, particularly "significance." In an attempt to recommend new indicators to monitor opportunities for quality experience within this social setting, this study assessed the significance or importance of several alternative social setting attributes. It also attempted to provide meaningful qualifications to these evaluations by analyzing variation in three concepts associated with a cognitive hierarchy (value-orientations, attitudes and norms, and behavior intention). The results of the study suggested that there are two dimensions of social attributes from which indicators could be developed. The first is associated with the number of encounters or user density, and monitoring camps within sight or sound was suggested for this dimension. The second was associated with the evidence of poor behavior of others. Monitoring campsite ethics violations was recommended for this dimension.

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1.0 - Introduction

A recurrent theme in protected area legislation has been the mandate to preserve areas for future generations and to keep the protected resource in a condition representative of the values or conditions for which it was designated. For example, one of the two pieces of legislation relevant to this study, the Wild and Scenic Rivers Act of 1968 (PL 90-542), states that designated rivers, "with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations (Section 1(b))." Similarly, the other piece of legislation, the Wilderness Act of 1964 (PL 88-577), requires managing agencies to administer wilderness areas "for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character…"(Section 2(a)).

Traditionally, resource managers tried to protect these wilderness or protected area values in perpetuity by establishing a carrying capacity in terms of the amount of use that would preserve both the resource and social setting characteristics (Stankey et al. 1984, Roggenbuck et al. 1993, Manning 1999). However, several limitations of this approach became apparent as many variables are now known to be better predictors of resource and social impact than amount of use. These include type of use, site durability, and visitor behavior (Roggenbuck et al. 1993). Stankey et al. (1984) refer to this as the "it all depends syndrome," as "the virtually infinite number of factors upon which the use-impact relationship depended makes it very difficult to arrive at answers that could be used by managers" (p. 34).

In an effort to improve upon the limitations of this traditional carrying capacity framework, researchers began to emphasize managing impacts on desired conditions instead of directly managing use (Stankey et al. 1984, Manning 2007). This led to the development of such resource management frameworks as Visitor Impact Management (Graefe et al. 1990), Visitor Experience and Resource Protection (National Park Service 1997), and Limits of Acceptable Change (Stankey et al. 1985). Limits of Acceptable Change (LAC) was developed for use in wilderness planning, and it has been widely adopted by the US Forest Service. Similar to the other frameworks, instead of asking how much use is acceptable, LAC instead attempts to define how much change from ideal conditions is acceptable (Stankey et al. 1984). Therefore, managers are not restricted to the single management option of limiting use; they have a variety of options available that could potentially help reduce unacceptable impacts, such as encouraging changes in behavior or modifying the recreational opportunity provided.

1.1 - The Upper South Fork of the Flathead

The Upper South Fork of the Flathead River forms the center of the 1.6 million acre Bob Marshall Wilderness Complex and it has been one of the focal points for developing the LAC framework (Stankey et al. 1984). It has been described as the "flagship" of the American wilderness preservation system as thousands of recreationists visit annually to hike, hunt, and enjoy the wild rivers (Stankey et al. 1984). The upper stretch of the South Fork cuts through the heart of the "Bob," and is used not just by floaters, but it is the major destination and travel route of land-based recreationists as well (USFS 1984).

The geography of this river segment surely can explain some of its popularity, as it makes the upper South Fork a truly unique resource. It is described as the stretch of river starting at the confluence of Young's Creek and Danaher Creek and extending downstream to the wilderness boundary near the Meadow Creek Gorge (USFS 1984). In effect, the watershed of the river lies entirely within the

Bob Marshall Wilderness, thus insulating the water resource from any degradation (aside from air pollution) that could be attributed to activities outside the wilderness. Not surprisingly, the river has "exceptional water quality and supports a high quality fishery" (USFS, 1984, pg. 81). This river segment can be characterized as meandering and relatively tame. The majority of the segment cuts through a wide flood plain and there is a moderate gradient averaging 19 feet of elevation drop per mile (USFS 1984). Therefore, once on the river, access for fishing is relatively easy by both foot and watercraft. The strictly native fishery of westslope cutthroat (*Oncorhynchus clarki lewisi*), whitefish (*Prosopium williamsoni*), and bull trout (*Salvelinus confluentus*) adds to the desirability of fishing on this segment. A recent *Outside Magazine* story listed the South Fork of the Flathead as second only to Mongolia's Eg-Uur River Basin as a resource for fishing, as it is "a spectacularly remote river that happens to offer some of the best, easiest dry-fly fishing in the world" (Streep 2010).

The remoteness provided by the wilderness buffer adds to the novelty of the segment, as it makes access to the river for floaters quite difficult. A hike or horsepack of 15-25 miles over a pass is required for the most common put-ins for floaters. Land-based travelers have it slightly easier as they can access the wilderness portion of the river through a short, relatively flat hike starting from the Meadow Creek Trailhead. However, access to the trailhead is quite difficult as it requires a 2-hour drive on a rough, gravel road. Furthermore, the river corridor upstream of Meadow Creek is quite steep and river access is rather difficult until the flood plain widens out about 8 miles upstream.

The Upper South Fork is also unique in that managers must take into account the provisions of the two pieces of protective enabling legislation mentioned above, the Wild and Scenic Rivers Act of 1968 and the Wilderness Act of 1964. The Bob Marshall Wilderness was established in original designation in 1964, and the Flathead Wild and Scenic River was established in 1976 (Public Law 94-486 – An Act to Amend the Wild and Scenic Rivers Act). The Upper South Fork is designated as a Wild River, and it is just one of seven management units listed under the comprehensive Flathead River

Management Plan, which was developed in 1980. In 1984 an additional management direction was implemented after a comprehensive river study by researchers from the University of Idaho (USFS 1984). Similar to the wilderness management in the Bob Marshall, this management plan has implemented the LAC framework in an effort to monitor and protect the river resource.

1.2 - LAC on the Upper South Fork

The Flathead's original management plan will soon be updated by the Flathead National Forest (FNF). A 1986 amendment to the Wild and Scenic Rivers Act (Public Law 99-59) requires a comprehensive river management plan (CRMP) that will "provide for the protection of the river values" and that "shall address resource protection, development of lands and facilities, user capacities, and other management practices…to achieve the purposes of this Act" (Section 3 (d)(1)). For those rivers designated before January 1, 1986, like the Flathead, the CRMP is required to be developed within 10 years, meaning by 1996 (Section 3(d)(2)). As the FNF had never established its outstandingly remarkable values (ORVs), it is in the process of developing those and is also planning on conducting river surveys in preparation for updating the current management plan and developing a CRMP.

The development of the CRMP provides a great opportunity to revisit the LAC process and reevaluate the current indicators. In addition to the almost 30 year time lapse since the last management plan, there are several reasons to be concerned with these previously developed indicators. The first involves possible increased use on the river. In a recent replication of baseline user studies in the Bob Marshall from 1970 (Lucas 1980) and 1982 (Lucas 1985), Borrie and McCool (2007) found that the floating component of South Fork use has increased. Furthermore, a new recreation trend and recent publicizing of the river may be increasing use as well. Historically, due to the geographic access impediments mentioned above, river floats were restricted by outfitter use-days allocated to drop floats and summer roving days. Not surprisingly, a University of Idaho study from

1980-1981 found that almost all floaters used outfitter services to access the river (USFS 1984). However, recent technological developments, including lightweight inflatable kayaks and pack-rafts, have allowed for a new user group (do-it-yourself floaters) that was virtually non-existent in 1984. Additionally, several high-profile stories such as the one in *Outside Magazine* story mentioned above have recently publicized the fishing opportunities of the South Fork. Therefore, it is unclear how these new issues have affected use patterns and if changes in use have also increased impacts to the social setting of the Upper South Fork.

Equally troubling is a lack of monitoring of the current indicators on the upper South Fork. As it is also part of the wilderness monitoring program, *campsite condition* is the only indicator that is currently being monitored by the Forest Service (Castren, personal communication, 2011). This brings to mind Watson and Cole's (1992) suggestion that managers have three primary problems with selecting indicators, one of which is a lack of reliable monitoring methods. Without indicators that are feasible to monitor, the whole LAC process becomes compromised.

Additionally, the current indicators and standards were designed from the perspective of a river-user as someone who floats the river (USFS 1984). This fails to acknowledge the most significant source of recreation in the river corridor, land-based users. These visitors camp, hike, and fish, and would otherwise appear to use the river and the wild and scenic river corridor as much as floaters. Therefore, it would seem that managers would want to develop standards of quality for land-based users as well as shore parties, or develop indicators that would apply to both.

Lastly, it is unclear how the five indicators were selected for inclusion in the prior river management plan. The management direction states that they "were selected to reflect the recreation opportunities" to be provided (USFS 1984, pg. 91), but it is unclear if there was any evaluation of the indicators for the desirable qualities of indicators listed in the relevant literature (Stankey et al. 1985, Merigliano 1990). In the review of the Flathead's addendum plan, McCool et al. (1983) suggest that the

selection of indicator variables is an absolutely critical stage of the LAC process, and therefore, it is important to provide additional explanation for why and how indicators were selected. There is no evidence of this explanation in the most recent management direction. Watson and Roggenbuck (1998) state managers frequently adopt indicators that have previously been selected under an assumption of significance. Although we cannot be certain that this is the case with the currently listed indicators, the following section will demonstrate that we can infer that there was not a rigorous evaluation of these indicators.

1.3 - Review of Current LAC Indicators on Upper South Fork

The FNF currently has five indicators to monitor the recreation setting on the Upper South Fork Management Unit including *campsite condition, amount of litter, encounters with shore parties, encounters with river parties*, and *experience quality index*. These were incorporated into management through the Flathead's Wild and Scenic River Management Direction mentioned above (USFS 1984). Cole (1992) relates that one of the major problems managers have in selecting LAC indicators is difficulty in selecting among known indicators because of a lack of understanding as to which indicators are most significant. This is especially important because "often a lack of significance, efficiency, or relevance of indicators is not apparent until great effort has been invested in inventorying, monitoring, and analyzing information about an indicator" (Watson et al., 2007, pg. 882). After reviewing the management direction and the relevant literature involving indicator selection, it appears that most of these indicators may lack the sensitivity, efficiency, or significance qualities of good indicators mentioned by Merigliano (1990) and Stankey et al. (1985). These three concepts are closely related as significance relates to the most important conditions of wilderness that if changed, would cause serious problems; efficiency relates to the ability of an indicator to reflect the condition of more than just itself; and

sensitivity relates to the ability of the indicator to provide an early warning of deteriorating conditions (Watson et al. 2007).

One of these indicators, *campsite condition*, will probably continue to be monitored as it is currently used to monitor the resource setting for the entire wilderness. However, this study concentrates on the social setting, and therefore, this indicator will still be evaluated for significance as an indicator of a quality wilderness and wild river experience. Manning (2010) suggests that ecological indicators of quality such as campsite condition may not be as important as social indicators at wilderness campsites. This indicator may also not satisfy two other qualities of a good indicator, reliability and cost-effectiveness. Reliability relates to the ability of the indicator to be measured precisely and accurately over time by different people (Merigliano 1990, Watson and Cole 1992), and cost-effectiveness relates to the ability of the indicator to be monitored without extensive time, money, staff, and training being required (Watson et al. 2007, Manning 2010). Leung and Marion (2001) relate that campsite condition (under the format measured in the Bob Marshall) has the limitations of being time-intensive, requiring significant staff training, and possibly not accurate and precise to measure.

Another indicator, *amount of litter,* has continually been found to be the most important setting attribute to wilderness visitors' experience (Roggenbuck et al. 1993, Manning 1999, Cole and Hall 2009). However, the sensitivity and efficiency of this indicator may be questioned as increasing litter may not be indicative of other deteriorating resource or social conditions, it could be just due to deteriorating behavior of a few users. Therefore, we expect to find litter to be a significant indicator, but judgment as to how appropriate it is based on other indicator qualities will be left up to management.

Even if monitored, the next two indicators may not provide much useful information to managers. These are two overall *encounter* measurements, one with *shore parties* and one with *river parties*. The traditional conceptual model is that encounters, or user densities, influence perceived crowding, which has been used to monitor the opportunity for solitude aspect of the wilderness

experience (Dawson and Watson 2000). Although overall encounters (or group to group encounters) have been shown to somewhat deteriorate the quality of wilderness experience, other variables such as group size, type of visitor, and behavior of the visitors encountered may have a greater effect (Roggenbuck 1993, Manning 1999). For example, Roggenbuck et al. (1993) found that the number of hiking groups encountered, which has frequently been used as a wilderness indicator, was rated among the least important potential indicators in this study. Furthermore, encounters while travelling (hiking or floating) have frequently been found to be less important than encounters in places such as campsites, trailheads, put-ins, and rapids (Vaske and Shelby 2007, Tarrant et al. 1997). Overall encounter measures fail to account for the specific attributes of encounters that have a greater effect on experience than overall numbers, and therefore, these two indicators may lack the desirable quality of significance.

Lastly, the *Experience Quality Index* (EQI) is the least effective of the current indicators. It consists of three statements to which visitors are asked to respond by evaluating the overall trip experience. In a review of the Flathead Wild and Scenic Addendum Management Plan, McCool et al. (1983) commented on the limitations of this indicator by suggesting it is not sensitive to specific changes in setting attributes as management would have no information for reasons why the index increases or decreases. It is essentially an example of an overall satisfaction measurement or overall experience evaluation, which provides little information for management purposes (Roggenbuck et al. 1993, Manning 1999, Hendee and Dawson 2002, Cole 2007). Manning (2003) describes a satisfaction measure as "so broad and course a measure that changes in recreation opportunities potentially important to visitors may simply not register in a substantive way (pg. 108)." Satisfaction essentially fails to filter out the experience components that a manager does not have any control over, such as the weather, inter-group dynamics, and visitor preparation (Borrie and Birzell 2001).

Consequently, the Experience Quality Index fails to meet many of the desirable qualities of indicators such as sensitivity, efficiency, and relevance. Relevance relates to the ability of an indicator to be managed, as indicators should represent conditions or experiences that are related to the actions of humans. However, the EQI lacks these qualities as most visitors will be satisfied with their experience, regardless of the character of that experience (Cole 2007). For example, overall trip satisfaction measures often remain high even in connection to negative setting attributes such as perceptions of crowding (Dawson and Watson 2000). So while managers, by using this indicator, "can feel good about the fact that their visitors positively evaluate management, they cannot be certain that visitors are obtaining the kinds of experiences that are most appropriate in wilderness" (Cole 2007, pg. 116).

In summary, the Flathead National Forest has recognized the importance that visitors have placed on the recreation setting of the Upper South Fork of the Flathead River. However, the previously developed LAC indicators to monitor this setting have several limitations. Particularly, they do not meet several of the qualities of good indicators (significance, sensitivity, and reliability) listed by Merigliano(1990) and Stankey et al. (1985).

1.4 - Problem Statement

Prior research has demonstrated the importance visitors place on wilderness setting attributes and the need to understand which attributes are the most important or have the most influence on visitors' experience. In an attempt to provide management with insight into indicator significance, this research will evaluate the importance and performance of several social setting attributes on the South Fork River and provide meaningful qualifications to these evaluations by analyzing variation explained by the concepts in three levels of the cognitive hierarchy (values, attitudes and norms, and behavioral intention).

Research Objectives

1) Initially evaluate social setting attributes by obtaining an importance estimate for each attribute by measuring the range of perceived influence on experience (attitudes).

2) Determine if more specific encounter/crowding measurements (while fishing, at scenic/special sites, while camping) are more important or significant indicators of a quality wilderness and wild river experience than encounters while traveling.

3) Use the importance/performance (IP) construct to further evaluate attributes. In the case of multiple setting attributes that are found to be highly significant, it will provide another criterion by which to prioritize indicator selection.

4) In an effort to alleviate the "average camper" syndrome associated with IP, segment the population by protected area value orientations (values) and other independent variables and determine if evaluations of setting attributes vary significantly based on these personal characteristics.

5) To further evaluate the setting attributes, determine if support for management actions (behavioral intention) varies significantly based on individual combinations of importance and performance scores for each attribute.

6) To further understand the South Fork users and provide managers with useful information regarding support for management actions, segment support for management actions based on personal characteristics.

The next four chapters attempt to address the problem statement and research objectives. The first discusses further literature relevant to this study including literature related to indicator selection under LAC, recreation crowding, the importance-performance construct, and the use of studying values in a recreation context. The third chapter describes the methods used to address the research objectives. Included in the methods are survey development, development of the sampling plan, data cleaning, and data analysis. The fourth chapter contains results and discussion relating to the problem statement and research objectives. Lastly the fifth chapter gives a summary of the results, provides information in regards to management implications, and offers some avenues of further study

2.0 - Literature Review

The first step in revisiting the LAC process is to address the management objectives or goals and desired conditions. Cole and McCool (1997) suggest these goals should be attained by "assembling the legal and policy mandates that will guide management of the area and developing a perspective on the significance of the area, its uniqueness, and its regional or national "niche'" (p.61). Similarly, Hendee and Dawson (2002) relate that this process is started by reviewing the area-specific enabling legislation and agency policies related to the area in question. Although the Upper South Fork management unit has the designation of both a Wild River and Wilderness, the wilderness designation has provided the basis for management within the social setting. This can be attributed to the reality that the Wilderness Act contributes more direction in terms of how the social setting should be managed than the Wild and Scenic River Act does. Additionally, the Wild and Scenic River Act provides that any portion of any river that "shall be subject to the provisions of both the Wilderness Act and this Act with respect to preservation of such river and its immediate environment, and in case of conflict between the provisions of these Acts the more restrictive provisions shall apply" (Section 10 (b)).

In the policy arena, this mandate is taken into account in the 1984 management direction as it declares, "[p]rotection of the wilderness resource must receive first priority in managing the river corridor by maintaining the natural environment and providing opportunities for primitive and unconfined recreation activities" (pg. 86). Additionally, the FNF has not officially listed the outstandingly remarkable values (ORVs) associated with designation. However, in preparing the Flathead's proposed ORVs, the Flathead Wild and Scenic River Resource Assessment does provide insight into considerations of how the river resource should be managed. It places much emphasis on the resource setting as scenery, fish, and wildlife are found to be outstandingly remarkable values (USFS 2010). Cole (2007) states that the two primary protective goals of wilderness management are to minimize biophysical impacts and provide for quality visitor experiences. The ORVs clearly provide direction as to what is

important in the biophysical or resource setting, but it doesn't provide much direction in terms of how to manage the social setting. Therefore, managers of the Upper South Fork should conduct biophysical monitoring related to objectives specific to the river resource and proposed ORVs such as water quality and fisheries and wildlife monitoring, but management of the social setting should defer to wilderness designation and protecting the wilderness character in the river corridor. The most recent management direction takes this into account by addressing user densities with the management objective of providing "for maximum isolation between float parties on the river and at least a moderate level of isolation between float parties and shore parties" (USFS, 1984, pg 89). Therefore, this study further analyzes setting attributes in order to determine what influences quality visitor experiences, particularly with regard to the social setting on the Upper South Fork.

2.1 - Indicator Selection –Theoretical Background

If an important management objective on the upper South Fork is the protection of the quality of wilderness experience by monitoring social setting attributes, the next step in the LAC process is to determine the most appropriate attributes of wilderness experience from which to develop indicators. Several methods and approaches have been used to understand the quality of wilderness experience and develop indicators and standards to monitor this quality. Borrie and Birzell (2001) analyze the merits of several approaches including satisfaction approaches, benefits-based approaches, experience-based approaches, and meanings-based approaches. Within these approaches, two broad paradigms have been used to understand the nature of wilderness experiences.

The most widely used paradigm is associated with the satisfaction, benefits, and experience approaches and has viewed recreation as a goal-oriented pursuit. It emphasizes the study of outcomes of recreation (e.g. Manfredo et al. 1983). Through this research we have gained great insight into recreation motivations (Driver et al. 1987), dimensions of wilderness experience (Watson and

Roggenbuck 1998), and influences on wilderness experience (Cole and Hall 2009). Qualitative methods (Watson et al. 2007), quantitative methods (Roggenbuck et al. 1993), and a combination of both approaches (Glaspell 2003, Cole and Hall 2009) have been utilized under this paradigm. Qualitative methods employ semi-structured interviews or open-ended questions (Manning 2010) and have the advantage of being useful for exploratory research where little is known about the significant influences on wilderness experience (Glaspell et al. 2003). Quantitative approaches typically ask close-ended questions that focus on events of the trip, and they have the advantage of being "invaluable for developing the kind of generalizable, predictive knowledge that indicator based planning frameworks call for" (Glaspell et al., 2003, pg. 62). However, they have been criticized for limiting evaluation of setting attributes to those items that the researcher thinks of (Watson and Roggenbuck 1998). The use of both approaches has been advocated by several researchers as it is believed to result in a greater understanding of visitor experiences, and therefore, better stewardship (Borrie et al. 2001, Watson and Roggenbuck 1998, Glaspell et al. 2003).

The second paradigm takes a meanings-based approach whereby understanding the nature of wilderness experience is explored in terms of the role it plays in the broader context of the visitor's life (Borrie and Birzell 2001). This approach assumes that the recreation experience is better understood as a whole, in narrative form, after the fact, and that experiences are emergent and less predictable than assumed under the goal-oriented paradigm (Patterson et al. 1998). This paradigm and the qualitative methods it employs are attractive in its flexibility and ability to more fully understand the story associated with wilderness experiences. However, Borrie and Birzell (2001) relate that this approach is not well suited for the predictive and prescriptive planning frameworks such as LAC.

Aside from what paradigm or approach is used to understand the nature of wilderness experience, there is some debate as to what indicators should monitor. They could be developed to monitor other outcomes of wilderness recreation, such as benefits or achievements of experiences, or

they could be developed to monitor setting attributes that have a high degree of impact on the achievement of those outcomes. Proponents of outcome-based indicators argue that those are the variables that are most influential on the quality of wilderness experience, and examples of such indicators would include solitude achievement or intergroup harmony (Cole and McCool 1997).

However, the achievement of these outcome-based indicators is determined primarily by factors outside the realm of management control (Cole and McCool 1997, Cole 2004). For example, Hollenhorst et al. (1994) found that solitude achievement was more influenced by variables such as the importance of solitude to the visitor's experience than crowding variables that managers could actually have some influence over. Therefore, monitoring an outcome-based indicator of experience such as solitude achievement would not give managers much useful information under an LAC framework. An increase in solitude achievement might just mean that more people who value solitude are visiting the wilderness.

Cole (2004) suggests the alternative of basing indicators on setting attributes that are subject to managerial control may be a superior approach, but cautions that it doesn't guarantee a particular experience; it just attempts to ensure an appropriate setting under which outstanding opportunities for a quality wilderness experience are provided. Dawson (2004) echoes these sentiments and relates that this would be monitoring impediments to a certain wilderness experiences and an indicator as such would not be monitoring solitude, for example, it would be monitoring an impediment to the outstanding opportunities for solitude.

2.2 - Indicator Selection – Attribute Significance and Crowding

If the objective of developing social setting indicators is to monitor the impediments to quality experience, then it is critical to determine which social setting attributes have the greatest ability to influence experience. This is essentially evaluating attributes for the "significance" quality of a good

indicator (Merigliano 1990). Early attempts to assess the significance or importance of setting attributes evaluated the degree to which various attributes (e.g. number of visitors, quality of trails, wildlife sightings) affected experience (e.g. Lucas 1980). Under this scenario visitors are evaluating a unique set of conditions associated with their trip. Therefore, this method of evaluation is essentially a performance evaluation of conditions experienced, which is limited to identifying attributes that are currently a problem.

This limitation was overcome in subsequent studies that asked respondents to evaluate how important or how much they "care about" the attribute in general (e.g. Roggenbuck et al. 1993). However, this approach is limited by a lack of context, as respondents could be evaluating different conditions, depending on what they think is possible (Cole and Hall 2009). For example, if two respondents were asked to evaluate how important the number of groups camped within sight or sound is, one could be envisioning an extreme situation to be 2 or 3 other parties while the other could be envisioning 20 other parties.

To improve upon the limitations of both these approaches, Cole and Hall (2009) developed another format to measure importance. They used a hypothetical approach that asked respondents to evaluate how various levels of each attribute would affect their experience (e.g. encounter no groups, 1-2 groups, 3-5 groups, or more than 5 groups). Under this approach respondents were now evaluating how the same set of conditions would influence experience. Importance or "significance" of each attribute was then calculated by taking the range in impact on experience within those attribute levels. There has been no shortage of studies that have used the above-mentioned methods to assess setting attribute significance in an attempt to recommend indicators. Consequently, several sources have compiled lists of indicators suggested in these studies (see Manning 2010, Hendee and Dawson 2002). However, Watson and Roggenbuck (1998) suggest it is unwise to select indicators based on an

assumption of significance from other studies. Resource specific analysis of setting attributes is paramount in the LAC process.

To gain further insight into what specific social setting characteristics may have the potential to influence experience on the upper South Fork, it would be beneficial to analyze the literature on crowding. Crowding has been studied through the use of two related concepts, perceived crowding and encounter norms. Norms are prescriptive as they are defined as evaluative standards regarding acceptable behavior or conditions in a given context (Vaske and Donnelly 2002). Perceived crowding combines descriptive information (i.e. encounter levels experienced) with evaluative information (i.e. negative evaluation of that encounter level) (Vaske and Shelby 2008). As such, these concepts are related because in theory, when encounters exceed an individual's encounter norm (tolerance limit for seeing others), perceived crowding will increase (Vaske and Donnelly 2002). Crowding has been one of the most studied aspects of outdoor recreation. A recent meta-analysis examined perceived crowding from 181 studies that used the 9-point crowding scale developed by Heberlein and Vaske (1977) (Vaske and Shelby 2008). However, normative research has been more useful under LAC frameworks as it has been used to give managers information related to developing standards for indicators of quality. It attempts to identify visitors' personal norms for how much of an impact is deemed acceptable (Patterson and Hammitt 1990). The results of all visitors surveyed can then be aggregated to test for social crowding norms, which represent the degree to which norms are shared across groups. These social norms are usually plotted graphically through the use of a norm curve. Acceptability is plotted versus the various levels of the condition of interest. The highest, or most acceptable, point (level of condition) on the curve would be considered the desired condition, while the point where the curve crosses from acceptable to unacceptable is considered the minimum acceptable condition and this would generally be the level at which a standard would be developed. Crystallization represents the

amount of agreement about the norm, and is measured by some form of variance around points on the norm curve (Manning 2010).

Through the use of both these concepts, much has been discovered as to the influences on crowding. Aside from actual numbers of groups encountered, Manning (2010) suggests factors that influence normative crowding can be grouped into three categories: personal characteristics of visitors, characteristics of other visitors encountered, and situational variables. Personal characteristics include such things as motivations for recreating, preferences and expectations for contacts, and experience level. These aspects would not be relevant to develop indicators from; however, they do represent concepts in which survey respondents could be segmented in order to explore variation in importance and performance scores.

The characteristics of other groups encountered could be used as criteria for inclusion as setting attributes. The size and type of group encountered has been shown to influence perceived crowding and encounter norms (Manning 2010). For example, Stankey (1973) found different crowding effects based on mode of travel. In that instance, there was a higher tolerance for backpacker encounters at low use levels on wilderness trails. Similarly, the behavior of those encountered tends to influence perceived crowding and encounter norms as well (Manning 2010). For example, a study in the Ottawa National Forest in Michigan found that of the visitors who perceived high use levels and negative behavior of others felt crowded 47.9% of the time, but those who didn't experience negative behavior only felt crowded 16.7 % of the time (West 1982). Specific forms of behavior that bothered respondents in this study in decreasing saliency were: noise, yelling and loud behavior, littering and polluting lakes, and noncompliance with rules.

Lastly, another important characteristic of encounters and crowding is where the encounters take place in the resource. This could be an important consideration when evaluating social setting attributes for indicator selection, as many studies have found significant differences in encounter norms

and perceived crowding. Manning (2010) relates that these studies have stressed the sensitivity of crowding at campsites compared to on the trail. Similarly, river studies have shown that encounter norms and perceived crowding are higher at places such as put-ins and rapids as opposed to just general encounters on the river (Tarrant et al. 1997).

2.3 – Importance-Performance

The combination of both the hypothetical importance evaluations and the performance evaluations of setting attributes could be promising as it would not only identify which attributes are the most important, but also those that need attention in the short-term. This combination, referred to as the importance-performance (I-P) construct, was first developed in the field of marketing to assist customer satisfaction with products and services (Martilla and James 1977). More recently it has been applied to the field of recreation to help managers get feedback on aspects of the recreation setting.

The IP approach has been used by Mengak et al. (1986) to assess evaluations of visitor centers, Hollenhorst et al. (1992) to assess state park cabins, and Hollenhorst and Gardner (1994) to assess wilderness conditions under a LAC framework. The grid format of the I-P approach has been helpful in giving managers an easily interpreted visual as a basis for determining which setting attributes need management attention (Borrie and Birzell 2001, Tarrant and Smith 2002). Tarrant and Smith (2002) caution that the use of the grid format, without the mention of standard error (i.e. Hollenhorst and Gardner 1994), might be misleading. For example, if the importance or performance score of one attribute is relatively close to the corresponding axis, the mean for that score might not be significantly different from the value of that axis, and we could not be confident that the attribute is firmly in the designated quadrant.

2.4 - Values

Borrie and Birzell (2001) criticize the importance-performance construct for its tendency to aggregate measures across users, and therefore, develop evaluations of "the average camper." Therefore, in order to give more meaning to evaluations of setting attributes, researchers often try to explain some of the variation in those evaluations through the measurement of several independent variables (e.g. Cole and Hall 2009). This segmentation can provide managers with a more complex understanding of how the public perceives setting conditions. The most basic independent variables used for this purpose are descriptive user characteristics such as type of use, age, gender, experience, and other similar variables. However, many recent studies have focused on more cognitive variables such as motivations and place attachment. For example, Kyle et al. (2004) used two aspects of sense of place, place attachment and place identity, in order to explain the variation in perceptions of social and resource conditions on the Appalachian Trail. In a recent wilderness study, Cole and Hall (2009) explored the extent to which evaluations varied based on several cognitive and descriptive variables. They found substantial variation in perceived importance of setting attributes based on knowledge, wilderness experience, attachment, and motivations.

Also in the cognitive realm, a recent trend in protected area management has been an emphasis on values. Tanner et al. (2008) relate that wide acceptance has been given to the notion that values are important determinants for public interactions and relationships with protected areas. Under a cognitive hierarchy framework described below, values are believed to be more stable, deeply held constructs that inform less strongly held cognitions such as attitudes and behaviors (Vaske and Donnelly 1999). Value orientations are patterns of basic belief (Fulton et al. 1996), and they attempt to bridge the gap between values and attitudes by giving more meaning to the fundamental values that tend to be widely shared by members of a culture (Vaske and Donnelly 1999). Value orientations related to natural resources tend to be arrayed along a continuum from anthropocentric to biocentric (Vaske and Donnelly

1999, Vaske et al. 2001). Although protected area value orientations have yet to be studied in the context of evaluations of setting attributes, it may be a promising angle to explore. These cognitions have been used previously to explain variation in support for management decisions in Yellowstone National Park (Borrie et al. 2002).

In summary, the literature related to indicators selection under LAC suggests that indicators should monitor the aspects of the social recreation setting that have the greatest ability to influence visitors' experience and that are also subject to management control. The literature on crowding suggests that the aspects of the social setting that may influence crowding more than overall numbers of encounters are situational variables such as where encounters occur and the personal characteristics of groups encountered such as their behavior, size, or user type. Lastly, the I-P approach could provide an effective framework to determine which social setting attributes are the most important, and values could be an effective way to segment the respondents' evaluations of the setting attributes and avoid the "average camper syndrome." The following chapter will discuss how these concepts were taking into account with survey development.

3.0 Methods

This chapter is divided into several sections and sub-sections that describe the methods undertaken in this study to address the objectives mentioned above. The first section describes the South Fork study area. The second section describes what the various sections of the survey attempted to measure and the rationale for including variables. The third section discusses how the study area and concepts measured were used to devise the sampling plan for the project. The fourth section describes the data cleaning process and how missing values were dealt with. The final section discusses how data analysis was used to address the research objectives of the study.

3.1 – Study Location

The upper South Fork of the Flathead River is located within the area known as the Crown of the Continent in Northwest Montana in Flathead and Powell counties (USFS 2010). More specifically, it is located south of Glacier National Park, east of Flathead Lake and the Seeley/Swan valleys, northeast of Missoula, and just west of the continental divide. The South Fork of the Flathead is one of three branches of Flathead Wild and Scenic River System (along with the North Fork and Middle Fork), which is a major tributary of the Columbia River system. The South Fork watershed can be described as a forested, undeveloped, and mountainous basin (elevation ranges from 1,045 to 2,078 meters) that is heavily dependent on snowpack for seasonal flows (Chase et al. 2012). Typical peak runoff occurs in late May to early June as can be seen by the triangles in Figure 3.1 below. Figure 3.1 below also demonstrates the abnormalities of the season in which this study took place as the high runoff occurred later than normal, and it sustained above average flows throughout the summer as well (solid line).

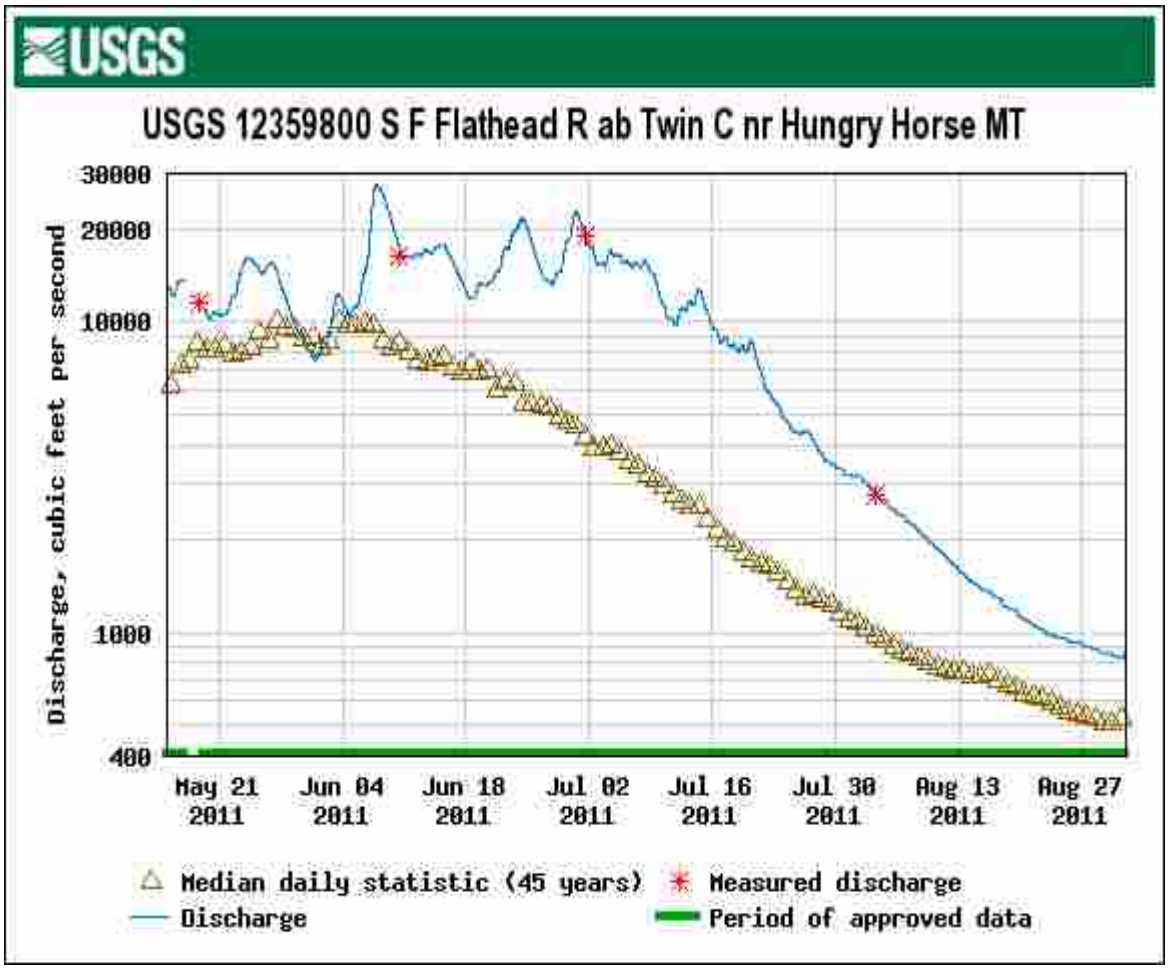

Figure 3.1 – South Fork Stream Flow at Twin Creek (Source: USGS 2012)

The upper South Fork management unit extends from the headwaters of the South Fork, where Young's Creek and Danaher Creek come together, downstream to the wilderness boundary near the Meadow Creek Gorge. This section of the river is 40.6 miles long (USFS 1984), and the Spotted Bear Ranger District of the Flathead National Forest (FNF) manages this "wild" section of river. As described in the introduction, the entire watershed of this management unit is encompassed by the Bob Marshall Wilderness, and the South Fork is one of the major travel routes and destinations for visitors to the "Bob" (USFS 1984). For the majority of the river segment there is a trail on each side of the river. Not surprisingly, the entire river corridor is managed as Opportunity Class IV under the wilderness management plan, which means there is a higher tolerance for resource, social, and managerial impacts.

The wilderness barrier makes access to the upper stretches of the river extremely difficult. At least a 15-mile hike or pack-trip in to the river is required. This also makes use patterns complicated, as visitors can access the river from at least a dozen trailheads that come from all four cardinal directions. Some of these popular entry points are from the trailheads of Benchmark (east), Holland Lake (west), North Fork of the Blackfoot (south), and Lodgepole creek (Southwest). The lower stretches of the management unit (northern end) are somewhat more accessible as visitors can reach the wilderness portion of the South Fork after a two-hour drive from Hungry Horse, MT on a gravel road and followed by a relatively short, few-mile hike. This trailhead, Meadow Creek, is the only trailhead that doesn't require going over a pass to access the South Fork. However, when accessing the river from this trailhead, the flood plain doesn't really make access for fishing or camping practical until it widens out at Black Bear Creek. At this point, the combination of trails along both sides of the river and a wide flood plain with many gravel bars makes river recreation quite easy. Not surprisingly, 187 campsites have been identified along this river management unit (USFS 1984).

3.2 - Survey Development

Researchers in protected area management often use theory to try to understand the relationships between recreationists and their motivations (Tanner et al. 2007). The theoretical framework utilized in this project was developed out of the theory of planned behavior (Ajzen and Fishbein 1980), the value-attitude-behavior hierarchy (Homer and Kahle 1988), and a theory of wildlife value orientations (Bright et al. 2000). These models all incorporate a cognitive hierarchy in which values form the base. Elements that then build on values are value-orientations, attitudes and norms, behavioral intentions, and behaviors (Vaske and Donnelly 1999). A simple illustration of this cognitive hierarchy can be seen below in Figure 3.1. Values can be defined as deeply held, less transitional cognitions that shape the formation of attitudes (Teel and Manfredo 2010). Because values are more

abstract or general, value orientations (patterns of basic beliefs about general ideas) are a useful addition to the model (Whittaker et al. 2006). Using this cognitive hierarchy, the South Fork study operates in the first, second, third, and fourth levels of the inverted pyramid (values, value-orientations, norms and attitudes, and behavioral intention). The values of interest in this study are protected area values developed by Borrie et al. (2002). Attitudes can be defined as positive or negative evaluations of some object or action (Whittaker et al. 2006). In the South Fork study, attitudes manifest as hypothetical evaluations of setting attributes (importance) and the perceived impact of those setting attributes on the visitors' wilderness experience (performance). The behavioral intention component of the study is the visitors' support for management actions. Although we are not testing the concepts inherent in this hierarchy, it does provide a valuable conceptual framework for evaluating setting attributes by analyzing variation explained within and among these elements. The specific conceptual diagram for this study can be seen in Figure 3.2.

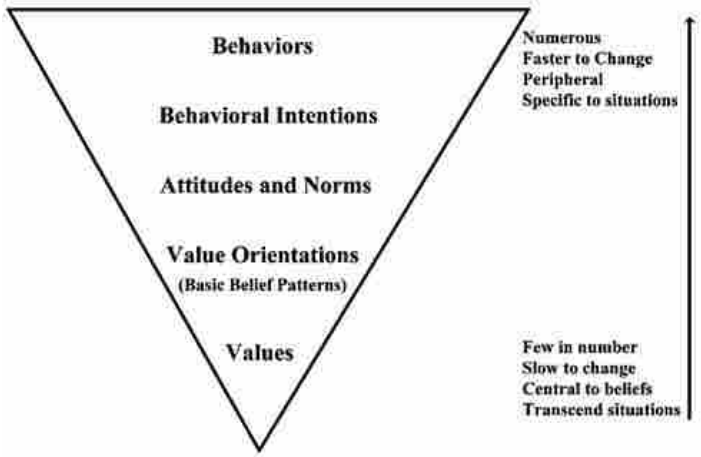

Figure 3.2 – The Cognitive Hierarchy (Vaske and Donnelly 1999)

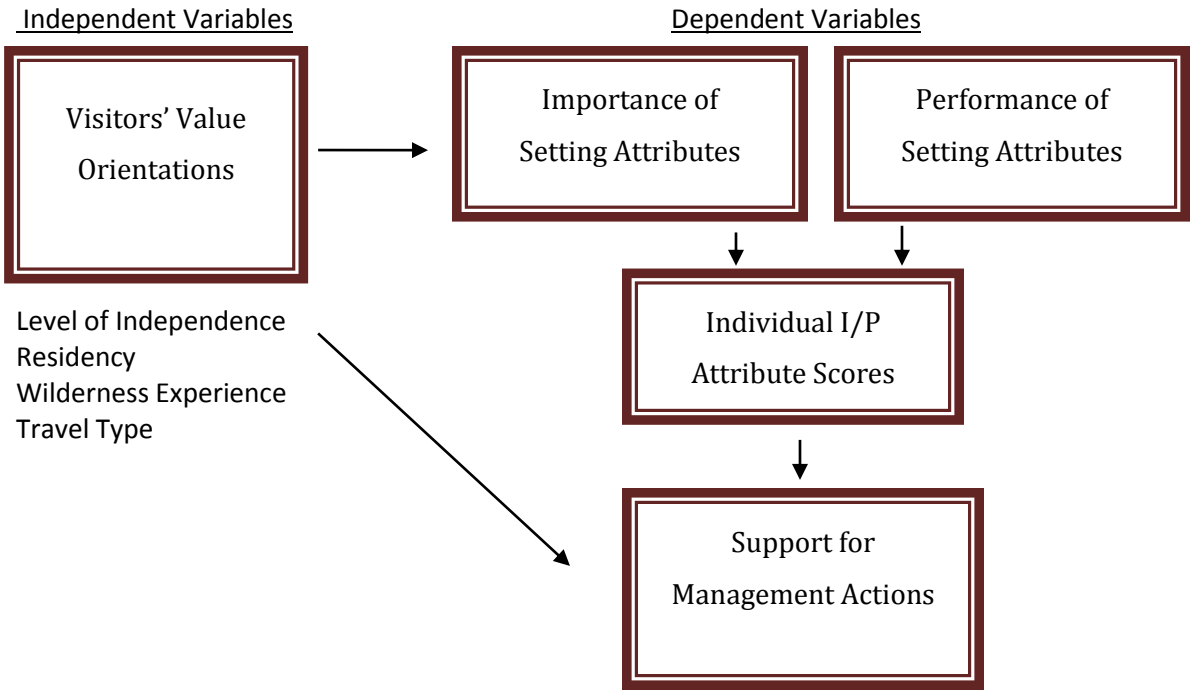

Figure 3.3 - Conceptual Diagram

As discussed in the literature review, research aimed at the development of indicators to monitor the quality of wilderness experience can employ qualitative, quantitative, or a combination of both methods. Although a quantitative-based approach has the limitation of restricting the researcher to setting attributes thought of prior to survey development (Watson and Roggenbuck 1998), it was determined that a survey instrument that heavily emphasized quantitative approaches was the most appropriate for this study. This was due to the extensive research that has previously been conducted in evaluating relevant setting attributes, as well as in other relevant concepts such as crowding. Prior research regarding the river resource of interest is also an important consideration in this regard (i.e. McLaughlin et al. 1982, Lucas 1980, Borrie et al. 2007). Therefore, the exploratory benefits of qualitative methods were determined to be not as useful in this situation, as there was not a lack of knowledge into the setting attributes that have a significant influence on wilderness experience (Glaspell et al. 2003). Lastly, the larger sample size associated with the quantitative approach is invaluable for

acquiring a representative sample and finding significant variation in responses associated with the objectives of the study. However, in recognition that qualitative measures can help identify areas of concern, one open-ended question and several comments sections were included in order to allow respondents the freedom to mention other South Fork values or setting attributes that are important or influenced their experience.

The first section of the survey was devoted to obtaining the descriptive use information that helps put a face on respondents in regards to their value-orientations and corresponding evaluations of setting attributes and support for management actions. The majority of the survey is devoted to the cognitive hierarchy concepts we were measuring (see figure 4.2). The following sub-sections describe how the questions were determined for these concepts.

Independent Variables – Demographic ,Use, and Experience

The first two pages of the survey included questions related to demographics, descriptive use information, and wilderness experience. These questions were asked in order to segment the population of interest in a meaningful way and in an attempt to explain variation in the evaluations of the elements in the cognitive hierarchy. Three demographic variables were measured including age (6 categories), gender, and zip code. The zip code information was used to break down respondents into two categories, Montana residents and non-residents.

Other descriptive information of interest in the study included variables related to user types. Therefore, we broke respondents into 3 use-related categories, two of which were used as independent variables for the analysis in this study: *method of travel within the river corridor*, and *level of independence.* The methods of travel included 3 categories (backpackers, stock users, and floaters) as did the level of independence variable (do-it-yourselfers, partially outfitted, and fully outfitted). For this last variable, we were particularly interested in seeing if do-it-yourself (DIY) groups had higher levels of

previous wilderness experience, and if they differed from outfitted groups in their values, evaluations of setting attributes, and their support of management actions.

Another visitor characteristic that was measured was the level of previous wilderness experience. This variable has previously been shown to be a significant predictor of variation in the significance evaluation of setting attributes (Cole and Hall 2009) and evaluations of depreciative behavior, and ecological impacts (White et al. 2008). It has also been found to have a positive relationship with sensitivity to crowding (Manning 2010), thus it may have an influence on how respondents evaluate crowding related setting attributes as well. We assessed this characteristic by using three domains commonly used in similar studies (Watson and Niccolucci 1992, Cole and Hall 2009). These domains are visitation frequency (number of wilderness trips per year), local experience (number of prior trips to BMWC), and general wilderness experience (number of other wildernesses visited).

Lastly, one open-ended question was asked in this first section of the survey. This question asked respondents to list the "most important characteristics or qualities of the upper South Fork that influenced your decision to recreate here." This was done in an attempt to address the limitations of survey research by allowing respondents to identify items the researcher has not considered (Watson and Roggenbuck 1998). We were particularly interested in identifying other values or setting attributes (that were not included in the next two sections) that may be important to South Fork users.

Value -Orientations

The next section of the survey measured the first concept of the cognitive hierarchy above. Specifically, this was how important respondents thought that protected area values were to the upper South Fork. Value orientations were a major emphasis of this project, as the importance of values in regards to relationships with protected areas has been gaining significant attention among researchers

(Tanner et al. 2007). Values have been called critical foundations for decision-making as they can help managers understand the range of perspectives and identify shared values (Borrie et al. 2002). For this study, value orientations are one of the key variables used for examining variation in importance scores (Research Objective 4). The questions used to assess Upper South Fork users' value orientations were originally going to be the same as those developed by Borrie et al. (2002). This 24 item "values scale" was developed from literature surrounding the national park idea, particularly the work of Henneberger (1996). Borrie et al. (2002) originally tested the scale at Yellowstone National Park. This study and subsequent studies of this values scale at 3 different protected areas were analyzed by Tanner et al. (2007) in an effort to explore how visitors' values structures compared across protected areas. The thought was that although the scale was developed within the context of national parks, "the values underlying the scale items also pertain to broader discussions of protected areas" (Tanner et al., 2007, p. 379).

The scale was considered to be at least an adequate beginning point for understanding South Fork visitors' value-orientations. However, in pre-testing the survey with a few people who had previously visited the South Fork, several criticisms were made against the scale. Particularly, respondents felt that the most important values to the South Fork, those more aligned with "wilderness" and "wild and scenic" qualities, were missing. This was not surprising as Tanner et al. (2007) suggest that the values scale is inherently incomplete and only represents a part of a value structure that is common across protected areas. Therefore, in the hopes of developing a more complete scale and tailoring it more towards the resource of interest, four "wild" river and three wilderness values statements were added to the scale. The was considered appropriate as our purpose was not to test the previously developed scale at a different protected area, but to describe the protected area value orientations specific to upper South Fork visitors. The additional statements were developed from the qualities mentioned in the respective Organic Acts. The wilderness qualities

included the South Fork as a place for primitive recreation, a place for outstanding opportunities for solitude, and a place where the imprint of man's work is substantially unnoticeable. The wild and scenic qualities included the South Fork as an unpolluted watershed, a vestige of primitive America, a free-flowing river, and a place that is accessible only by trail. The resultant 31 item scale was measured in the same manner as in the study in Borrie et al. (2002). An 8-point Likert scale was used as respondents were asked to rate their support for the value items on a scale from 8 (Strongly Agree) to 1 (Strongly Disagree). "I believe the Upper South Fork of the Flathead is particularly important as:" was the prompt statement for these questions.

Setting Attributes – Importance and Performance

The next 2 sections of the survey asked respondents to evaluate the importance and performance of the setting attributes of interest. Direction as to what attributes to include was gained from several sources. Watson et al. (2007) suggests that managers find direction for assessing setting attributes from existing legislation, current agency policy, relevant literature, public input, management decisions, and research. Prior research has generated an extensive number of lists of possible indicators to use in a wilderness management setting. Compilations of these lists can be found in several sources (e.g. Manning 2010, Hendee and Dawson 2002). As has been done in previous studies (Cole and Hall 2009), only setting attributes that management can exhibit some degree of control over were assessed, as these would be more appropriate as indicators under an LAC management approach. The majority of the setting attributes chosen came from sources have previously tested their importance. Also, all of the current indicators listed in the FNF's management direction, except for the experience quality index, were included, as their significance compared to other potential indicators was paramount to this study.

Several of these attributes are traditionally thought of as aspects of the resource setting; however, they are also related to the social setting as they provide evidence of prior human behavior

and impact. Furthermore, we are assessing the impact they have on visitors' wilderness experiences as opposed to the ecological impacts on the resource setting. The first variable evaluated in this regard is one of the current indicators. The presence of litter was expected to be found significant as it has continually been found to be the most important setting attribute in facilitating a quality wilderness experience (Roggenbuck et al. 1993, Cole and Hall 2009, Manning 1999). Similar to litter, improperly disposed of human waste was assessed as it is a variable that has been receiving attention at the management unit of interest. The last attribute we assessed was the least relevant to the social setting: campsite condition. However, even this attribute contains a social aspect related to prior human behavior. Although resource impacts at campsites are generally not found to be as important as location or social conditions (White et al. 2001, Manning 2010), they have been found to be significant in some studies (Roggenbuck et al. 1993, Hollenhorst and Gardner 1994). Furthermore, this attribute represents the only indicator currently monitored on the South Fork. Its significance compared to other social conditions may be useful information for management.

Related to the more traditional social setting, several variables associated with crowding were assessed. As mentioned in the literature review, situational variables such as where encounters occur have been shown to have more influence on perceived crowding than overall use levels (Manning 2010). For example, visitors in wilderness have been found to be more sensitive to encounters at campsites than on the trail (Stankey 1973, Lucas 1980, Cole and Hall 2009). Therefore, we assessed the effect that encounters have on experience while traveling (hiking, riding, or floating) as they are two of the current indicators, but for comparison we included variables that measure the effect of encounters in more specific locations (Addresses Research Question 2). The number of camps within sight or sound (could be thought of as a continual, long-term encounter) was addressed as it has been found to be highly significant setting attribute (Hollenhorst and Gardner 1994, Cole and Hall 2009). Relevant to the resource of interest, Lucas (1980) found that 89 percent of Bob Marshall visitors preferred to have no

other camps nearby. Two other, more specific, crowding variables that were evaluated were disturbances while fishing and encounters at swimming holes, lunch spots, or other scenic river locations. These two variables take into account the resource-specific importance of the Upper South Fork. Fishing was isolated in particular as it has been found to be especially important in the past. In 1980-1981, 86 percent of floaters reported fishing during their trip and 76 percent of those people rated fishing as "very" or "extremely" important relative to other activities they pursued (McLaughlin et al. 1982). The last crowding-related variable included is the difficulty in finding an unoccupied campsite. In a study of Boundary Waters Canoe Area Wilderness visitors, Watson (1995) found that about a third of the visitors reported difficulty finding an unoccupied campsite and that this proportion could be used as a potential indicator for solitude opportunities. Similarly, other studies have found the difficulty of finding a campsite to have significant impact the quality of experience as well (Cole and Hall 2009, Manning et al. 2009).

The characteristics (type, size, and behavior) of the groups encountered have also been found to be more predictive of perceived crowding or encounter norms than the number of groups encountered (Manning 2010). Therefore, all three of the above-mentioned characteristics were addressed in an attempt to identify the more significant characteristics of groups encountered that influence experience on the Upper South Fork. An example of this can be seen in Roggenbuck et al. (1993) where it was found that horse group encounters have a greater impact on experience than hiker group encounters. The effect of encounters based on group type was measured at varying levels of the attribute only for land-based users and floaters. In an effort to avoid repetition and making the survey overly burdensome, the effect of encounters based on the more specific attributes of commercial groups, hiker groups, horse groups, and large groups (10 or more people) were only measured at one level of that setting attribute. These last attributes were not analyzed under the IP approach; they just help to give insight into the effect that the group characteristics have on perceived crowding. The last variable

assessed related to group characteristics attempts to get at the behavioral component of encounters and perceived crowding. This attribute measures the impact of encounters with groups with poor wilderness ethics (overly loud, improper use of river such as food disposal, tree scarring in campsites, litter, etc.). Manfredo et al. (1983) found a factor comprised of similar "violations" as one of the most significant attributes that negatively affected wilderness experience.

The last setting attribute of which importance and performance was measured is more closely aligned with the managerial setting, and this is the effect that filling out the survey had on the visitors' experience. This setting attribute was titled *researcher encounter.* It was assessed in recognition that having respondents fill out a nine-page survey in the middle of the Bob Marshall Wilderness is an intrusion that has the potential to detract from their experiences. Quantifying the impact of this intrusion provides an idea of the extent to which this type of sampling will affect visitors' experience and whether it would be appropriate or not in subsequent studies.

Importance of setting attributes was not measured in the traditional sense (e.g. Roggenbuck et al. 1993), instead we assessed the perceived sensitivity of experience to changes in setting attributes under the same format as in Cole and Hall (2009). The more sensitive visitors' experience is to the conditions of each attribute, the more important or significant that attribute is considered. This form of importance measurement incorporates a hypothetical approach whereby respondents are asked how they might be affected by certain conditions. Each setting attribute is evaluated in terms of the effect it has on the sense of having a real wilderness and wild and scenic river experience. This effect is measured with 2-4 varying conditions of each setting attribute that conceptually range from an "ideal" situation to an "extreme" situation. The hypothetical impact of these conditions was measured on a 7-point scale from +3 (would add a lot to experience) to -3 (would detract a lot from experience). This assessment at various attribute levels is similar to a normative assessment in which respondents are asked about the acceptability of various levels of setting attributes, which is usually done in an effort to

set standards for indicators under an LAC approach (Cole and Hall 2009). However, this research was not attempting to identify the level at which conditions become unacceptable (as in a norm curve), instead it is attempting to determine the potential degree to which setting attributes can affect experience. This was done by measuring the magnitude of the difference in effect on experience between the highest and lowest values of the levels of each setting attribute. For example, if a respondent evaluated "seeing no litter" as having an effect of +3 and "seeing lots of litter in many places" as having an effect of – 2, then that respondents' importance score for the setting attribute of *litter* would be 5. Under this approach the maximum importance value that could be associated with a setting attribute would be 6.0. Wording for these questions was chosen to be as close as possible to that in the study of Cole and Hall (2009), and for setting attributes not analyzed by that study, a format using similar wording was adopted.

Performance of the same attributes was measured in a manner similar to importance. However, instead of a hypothetical approach this measurement asked respondents to evaluate how the unique set of conditions that pertained to their trip affected their experience (e.g. Lucas 1980). It is important to note that this performance measurement is not assessing actual conditions, but the perception of impact that those conditions are having on visitors' experience. In order to maintain consistency with the importance measurements, performance was measured on the similar 7-point scale from +3 (added a lot to) to -3 (detracted a lot from). Therefore, a positive score would represent favorable performance for the current conditions of a setting attribute and a negative score would indicate unfavorable conditions.

Management Actions

The final part of the survey addressed the behavioral intention component of the project. Behavior intention in this case manifests as respondents support for management actions. Thirteen

management actions were chosen to represent a range of possible actions that could be implemented if conditions were deemed unacceptable. The 13 management actions chosen were taken mostly from statements previously asked in the Bob Marshall wilderness in studies mentioned in Borrie et al. (2007), Lucas (1980), and McLaughlin et al. (1982).

In order to address Research Question Number 5, these statements were asked in terms of the respondents' willingness to support the actions based on the conditions they have experienced during the trip. These evaluations were intended to be in the same context as the performance evaluations, otherwise there would be little relevance in explaining variation in levels of support based on evaluations of setting attributes. Our final analysis will then assess how the independent variables mentioned above influence value orientations and how they both influence evaluations of setting attributes (Research Objective 4) and the support for management actions (Research Question 6).

3.3 - Sampling Design and Survey Implementation

The first step in survey implementation was to determine whether it should be administered on-site or if a mail-back approach would be appropriate. Several considerations were taken into account in this regard including cost-effectiveness, sample size estimates, and whether or not the concepts we were measuring would be influenced by recall bias. It was determined that administering the survey on-site would maximize the positive factors mentioned above. Primarily we were concerned that the experience related questions (performance) might be subject to memory decay, and therefore, we might be measuring constructed memories of how conditions influenced experience and not the actual experiences (Borrie et al. 1998). This method was also determined to be more cost-effective as multiple mailings would be avoided.

The next sampling dilemma involved how to implement an on-site sampling plan. A probability sampling design was necessary for this project due to the nature of the problems addressed. The target

population was all Upper South Fork river recreationists. The main academic interest involved understanding a representative sample of river users' evaluations of the importance of setting attributes and the perceived impact of actual conditions on experience quality. Therefore, to avoid selection bias, it was necessary to obtain a representative sample by giving every user an equal chance to be sampled. Because there was not much knowledge of the important characteristics of the target population, getting a representative sample by other means such as quota sampling would have been difficult (one of the benefits of this project is that it will help provide this descriptive use information for the Upper South Fork).

Several approaches for contacting and sampling visitors for the study were considered. These included sampling at trailheads, at strategic points along the river, at campsites, and by roving up and down the river during the day. The physical setting of the South Fork made random sampling difficult. If we had just sampled floaters (eg. McLaughlin et al. 1982), it would have been easy to get a representative sample, as almost all floaters take out at the Mid Creek Gorge. However, a South Fork river user was defined as anyone recreating in the river corridor. For the majority of the river corridor there is a trail on each side of the river. By roving during the day, visitors might be missed if they were traveling the same direction or on the other side of the river. There are also several main trails accessing the river corridor, which made it necessary to cover the whole river and not just sample at strategic points. Also, all but one of the major trailheads in the area has a significant portion of users who do not access the Upper South Fork. Therefore, sampling at trailheads would not have been an efficient use of time as the population of interest at trailheads would be few and far between. Considering the limitations of these other sampling approaches, the approach that was chosen was to sample people in their campsites in the evening. This allowed us to be fairly confident that we could contact everyone in the area we were sampling that evening, which would help with sample size and representativeness issues. Therefore, the unit of analysis for the study was the individual river

recreationist, who was now defined as any hiker, stock-user, or floater who spends enough time recreating in the river corridor to camp within.

Other criteria for who could be sampled involved age and the visitors' purpose for being on the river. Due to approval requirements and the cognitive elements we are evaluating, it was decided that potential survey participants would have to be at least 18 years of age. Respondents would also have to be recreationists as their primary purpose for being on the South Fork had to be recreational. This meant that outfitters, guides, FS employees, and members of volunteer groups were not eligible to fill out the survey. However, if the abovementioned people were on days off, recreating, and camping along the river, they were allowed to fill out a survey.

To finalize the sampling plan the river was broken down into 5 sections or sampling units (A, B, C, D, and E). Visitors were sampled in their campsites in three alternating sampling units (A, C, and E) on consecutive nights during the first week of the study. This alternation was done in order to reduce the chances of resampling groups of visitors. Because the sections of river are all about 8 miles in length, the hope was that by skipping a section there would be less chance that a party sampled one night will have moved over 8 miles up or down the river by the next night. The last 2 sections (B, D) were sampled 5 days later. Again, the thought was that the 5 day break would be long enough to avoid most resampling issues. This seemed reasonable, as the 1984 Management Direction states that the median trip length was 5.9 days for floaters, thus indicating that at least the majority of floaters would have moved on (USFS 1984). The next sampling period commenced another 5 days after the last river section was sampled. Therefore, there was a 5 day gap between each set of consecutive nights of sampling. This resulted in a 15 day sampling period in which all 5 river units were sampled.

Sampling started on the most downriver segment during each sampling period. This was done to eliminate the possibility of resampling float groups. There was still the possibility of resampling land-based groups, but their use patterns are much more flexible and resampling would only occur if they

were traveling up the river in the exact same manner as the researcher. Sampling each evening started with hiking up the river section and then floating back down. Floating was last as it was easier to contact groups from the river, and we wanted to have a better chance of contacting late arrivals to camps. Potential respondents were given the night to complete the survey, and then the researcher hiked back up the river section in the morning. Surveys were picked up and checks were made to make sure no additional parties had entered the river section. In the hopes up increasing the overall sample size and response rate, participants were given an incentive in the form of a chance to win a prize for completing the survey. All participants who filled out a raffle ticket were entered to win one of 20 prizes, and the winners could choose between a Bob Marshall Wilderness Complex Map (South Half) or a Bob Marshall t-shirt made by the Bob Marshall Wilderness Foundation.

Overall, this sampling plan seemed to have the best combination of being able to acquire a potentially large sample size and being able to achievable randomization. Randomization was achieved with this systematic sampling plan by randomly selecting the starting day in the week starting June 12th. The start date of June 18th was chosen through the use of random number generator for the integers 1-7. To further facilitate the collection of a large sample size, all adult members of the groups contacted were asked to complete the survey. This is similar to a study conducted by Heywood (1993) in which the social setting was assessed in a wildland-urban interface setting. The study consisted of a total of 8 sampling periods, which meant that October 17th was the last day of sampling.

After devising this sampling plan, one major consideration needed to be taken into account. This was the researcher's intrusion into the visitors' campsites and the potential negative effect this would have on their wilderness and wild river experience. Although Cole and Hall (2009) found that campsite intrusions detracted more from visitors' wilderness experience than many other attributes, it was assumed that many variables contribute to this negative reaction, including the type of user and the behavior of the users who are intruding. However, in acknowledgement that this sampling approach

will disrupt visitors' experience, we attempted to quantify its impact by assessing it as one of the setting attributes of interest.

After implementing this sampling plan and conducting the research this past season, several limitations need to be mentioned. The first involves the environmental abnormalities of the field season. An above-average snow pack and late, sustained runoff severely restricted use. Side creeks were not fordable and passes were not crossable (with stock) until several weeks later than normal. As a result, no potential respondents were contacted during the first sampling period. The first group was not contacted until July 5th. Several outfitter supported trips were cancelled at the very least. The effect that this had on other users is not clear, however, it is probable that other trips were cancelled as well. Also, two large fires (5000+ acres) in or near the river corridor became an issue later in August. Although the river remained open to floaters, a section of one of the main trails along the river was closed for some time, as was the Big Salmon Trail (which is one of the main access routes to the South Fork). Overall, the effect that the closures and these environmental factors had on South Fork use is unclear. Therefore, we recommend caution when interpreting use numbers and use patterns.

A second limitation involved the inability to contact hunters and lack of visitors in the fall. Hunters tended to be away from camp much later in the evening and earlier in the morning. This hampered the ability to contact at least one group. Also, overall use dropped off dramatically after the first week or two of hunting season. Therefore, an abbreviated sampling method was used for the last sampling period, whereby the river was just hiked up once. No parties besides outfitters without clients were contacted during this sampling period.

Lastly, another limitation we need to recognize is that by defining the target population of the study as visitors who camped overnight, we excluded a segment of all South Fork Users, day-users. However, this segment of the population is probably small, as Meadow Creek is the only trailhead from which visitor's can day hike or ride to the Upper South Fork. Furthermore, access for fishing doesn't get

very good until about 8 miles upstream. Still, this is a relevant segment of the entire upper South Fork population of visitors, and further study may want to target the opinions of this group as well.

3.4 - Data Cleaning

This section describes the approach that was taken to deal with missing data prior to data analysis. The advice and guidelines presented in Hair et al. (2006) was used as a reference in this regard. The first step taken in data cleaning was to explore several surveys that were incomplete or had data that did not make sense. A conservative approach was taken for survey and data removal in which it was assumed that respondents were answering honestly. However, in a few cases data were removed that was too incomplete to provide any meaningful analysis or if it was deemed to be thoughtless or nonsensical. Hair et al. (2006) suggest this can be advantageous if the missing data is concentrated in a few cases, as it will substantially reduce the extent of the missing data. This was the case with the missing data in this study, and therefore, data from four surveys was removed. In two cases all scale items were deleted and in two cases just a few of the importance items were removed. A more detailed look at the data cleaning within each section of the survey follows:

Wilderness Experience

For the second response question (number of times you have been to the Bob Marshall in your lifetime), responses of zero were changed to 1 as all respondents were contacted in the Bob Marshall. If respondents gave a range, the mean (rounded to the nearest integer) was used. If respondents added a plus to the end of a numeric value, the plus was dropped due to a lack of knowledge of how many more visits or wildernesses a plus should signify.

For non-numeric data, the wording of responses was analyzed in order to gain some insight into what the respondents might mean in a numeric sense. Three categories were developed of similar

responses out of 13 cases of verbal responses. Numeric responses were then entered with the numeric percentile values that seemed most appropriate for that category. The first involved four cases where the wording involved an extreme response such as "too many" or "too many to count." In these cases the responses were replaced with the values of the 95th percentile of responses for those wilderness experience variables (14 for visits per year, 40 for Bob visits in lifetime, and 20 for other wilderness in lifetime). This was a conservative estimate of what would be considered extreme verbal responses, but being located in the 95th percentile would indicate that these responses are still on the very upper end of all responses. Another category of non-numeric responses consisted of 8 cases where terms such as "a lot," "numerous," and "many" were used. These responses were considered to represent the high end of all responses as well; however, this wording is clearly not as extreme as in the category above. Therefore, these responses were changed to the numeric values of the 90th percentile of the numeric responses (10, 25, and 12). The last category of non-numeric responses included 2 cases that used the word "several." This was considered to represent a lower amount than the wording in the second category. Therefore, the percentile values that were considered representative of this wording were those at the 80th percentile (5, 10, and 8).

Lastly, after the above adjustments were made, there were three missing values in two cases that had to be dealt with in the wilderness experience questions. One case involving two of these missing values was discarded as this respondent's scale data was also discarded. In this case a "hot deck" substitution method was employed (Hair et al. 2006), whereby the missing value was replaced with the value of the median (which was also the mode) for similar cases.

Values

Prior to using the values variables for data analysis three cases were removed completely as they were either completely or mostly missing. This removed the majority of missing data, as

afterwards only 18 individual value variables were missing. Also, no value variable had more than 4 cases (out of 204) missing and none of the remaining respondents or cases had more than one missing value variable. Therefore, it was determined that substituting these values with the variable means for data analysis would be an adequate option as this represents very low levels of missing data (Hair et al. 2006).

Importance

After the removal of the data mentioned above, a few missing values were computed for setting attribute questions in the three cases where the respondents missed one response category within one setting attribute. In all three cases the respondent answered all other questions; it just appeared that they accidentally skipped over the one question. In these cases a "hot deck" substitution method was used similar to the wilderness experience missing value mentioned above. In this case the median and mode was preferred over the mean as an integer would be a more accurate response for these variables and would result in a more realistic importance score for those cases as well.

Miscellaneous

Subsequent to the above mentioned data cleaning, there were still a few cases with missing values for some of the importance scores, performance scores, and management action questions. This did not cause too much concern as factor or cluster analysis was not conducted on these variables. Further analysis using these variables just utilized the "pairwise" or "analysis by analysis" function in SPSS in order to keep as much information as possible in the analysis.

3.5 - Data Analysis

Values

Similar to Borrie et al. (2002), the reduction of the value item data on the Upper South Fork study was accomplished through exploratory factor analysis (principal components). Factor analysis is a process in which the primary purpose is to define the underlying structure of the variables in the analysis, and it produces groups of variables (factors) that are assumed to represent dimensions within the data (Hair et al. 2006, Watson and Niccolucci 1992). For the purposes of this study, we did not want to force previously developed values dimensions (e.g. those in Tanner et al. 2007) on the values responses in the South Fork study. We were more interested in uncovering the unique values dimensions of the South Fork respondents. Therefore, principal components factor analysis was utilized (in SPSS v. 20.0) as no assumptions were made as to the underlying structure of the data (Watson and Niccolucci 1992). In order to keep the resultant value dimensions distinct, principal components analysis with varimax rotation was used as it produces uncorrelated factors (orthogonal) (Hair et al. 2006). Several criteria were used in order to determine which variables and factors to retain. For inclusion of the individual variables an iterative process was used in which variables with communalities (amount of variance accounted for by the factor solution) below .5 (Hair et al. 2006) and factor loading below .6 were removed. For retention of factors or principal components, Kaiser's rule (Kaiser 1960) was followed along with the Scree Test criteria (Hair et al. 2006). Kaiser's rule relates that with principle component analysis each variable contributes a value of 1 to the total eigenvalue, and therefore any factors with variance less than 1 contains less information than one of the original variables and are not worth retaining (Jolliffe 2001, Hair et al. 2006). The Scree Test criterion plots the eigenvalues "against the number of factors in the order of their extraction, and the shape of the resulting curve is used to evaluate a cutoff point" (Hair et al., 2006, p.120). Specifically, the point where the curve straightens out

and becomes approximately horizontal is the point where the maximum number of factors should be extracted.

Following the above-mentioned criteria, a solution was derived containing 5 factors that consisted of 16 of the original 31 values variables. However, another important criterion for selecting a final factor solution is to conduct a reliability analysis on the factor scales. A reliability analysis measures the "degree of consistency between multiple measurements of a variable" and in this case refers to the internal consistency among the variables in a summated scale (Hair et al. 2006). Reliability of the scale items was assessed using the Chronbach's alpha coefficient measure of internal consistency. This is the most commonly used measure of scale consistency, however the researcher has some discretion as to what alpha level should be a cutoff for factor retention (Hair et al. 2006). The size of the alpha is determined by both the number of items in the scale and by the mean inter-item correlations. As such, lower alpha's represent higher inter-item correlations with scales with few items (Cortina 1993, Gliem and Gliem 2003). Tanner et al. (2008) relates that an alpha of .60 is often used as a cutoff for factors with less than 6 variables. Another consideration for an alpha cutoff is whether the research is exploratory or confirmatory. Hair et al. (2006) suggest a similar cutoff of .60 for exploratory research, with .70 being the general cutoff. Therefore, because the principal components analysis in this study is exploratory in nature and because all the factors contained less than 6 items, the .6 cutoff was used. The result of conducting this reliability analysis was the removal of the fifth factor. It contained 2 variables and had originally passed the eigenvalue and scree tests, but was dropped as its Chronbach's alpha was only 0.55. This resulted in four factors being retained.

Factor scores were created for each case by using the summated scale approach by which the scores for the individual variables were summed and then that total was divided by the number of variables in the factor (Hair et al. 2006). The resultant factors scores were then used to assign value-orientations through cluster analysis. Cluster analysis was performed in SPSS v. 20.0 as well, utilizing the

K-means cluster option. Solutions with 2 to 6 clusters were analyzed, and the number of clusters kept was decided on through the use of conceptual judgment and discriminant analysis. The best fitting model conceptually was one in which three clusters of respondents were created. Adding a fourth cluster just made one group very small. This solution also held up well to a discriminant analysis whereby group membership was predicted based on linear combinations of the factor scores. This resulted in 95% of the original grouped cases being correctly classified, which suggest a good fit.

Importance-Performance

In order to address Research Objective Number 3, the importance and performance measurements for each setting attribute were combined and placed in the appropriate quadrant of the two-dimensional importance/performance grid (see Hollenhorst and Gardner 1994). For example, attributes with high importance and low performance would land in the upper left, "concentrate here" quadrant. For the attributes that landed in this quadrant, it would be suggestive of increased importance as visitors would view the attribute as not only important, but currently at conditions unacceptable for wilderness and wild and scenic river experiences as well. The *researcher encounter* attribute was not included in this analysis because it's extremely low importance score represented an outlier, and it is also not an attribute that is prevalent or could be recommended for an indicator to monitor on the South Fork. Also, because most of the importance and performance scores were relatively high (above the median of the scale) the mean was used for the midpoint line or axis for importance and performance scores. This allowed to us to see how the attributes performed relative to each other and not the midpoint of the original scale.

Variance Explained

In order to address Research Objectives 4 and 5, variation in importance scores, performance scores, and support for management actions was explored based on several independent variables. These included residency, user-type, level of independence, wilderness experience, and value-orientations. Variation in support for management actions based on importance and performance scores was also analyzed. Significant variation in mean scores was tested through the use of one-way ANOVA's with a cutoff of p=.05 for significance. For non-categorical data such as wilderness experience, categories were created (in this case high, medium, and low). In a few instances, we were interested in comparing 2 categorical variables. In these cases the non-parametric, Chi-square likelihood test was employed. This tests the independence of two categorical variables by comparing expected to observed frequencies within each group or combination of variables (George and Mallery 2003).

The results of this data analysis will be discussed in the following chapter.

4.0 – Results and Discussion

This chapter contains several sections and subsections that display the results of this study. The first three sections contain basic results related to visitor characteristics and elements of the cognitive hierarchy, and the last three sections explore variation in those cognitive hierarchy elements. A few of these sections are directly related to the research objectives (4.3, 4.5, 4.6,), and the others provide basic results and information that supports the analysis of the research objectives (4.1, 4.2, and 4.4). The first section describes response rate, visitor characteristics, and how the visitor characteristics used for independent variables are interrelated. The second section addresses visitors' value orientations. The third section addresses research objectives 1-3 as it analyzes importance and performance scores. The fourth section evaluates the overall support for management actions. The fifth section addresses research objective number 4 (variation in evaluations of setting attributes) and the sixth section addresses research objectives 5 and 6 (variation in support for management actions).

4.1 - Response Rate, Visitor Characteristics, and Independent Variables

Completion of the sampling plan in this study resulted in contact or knowledge of 70 groups camped along the river. These 70 groups accounted for a total of 411 people, resulting in a group size of 5.96. These groups can be broken down into the following user types: backpack (22 groups - 34.9% of total groups), float (20 – 31.7%), stock (16 - 25.4%), backpack/stock mix (2 – 3.2%), stock drop (2 – 3.2%), and backpack/stock drop mix (1 - 1.6%). Out of the above groups, seven were not able to be surveyed (5 backpack, 1 stock, and 1 float). Three were not eligible to be surveyed as they were two Wilderness Treatment Center groups and one outdoor education group. Three groups were eligible to be surveyed, but contact failed to happen, and one was not receptive to being surveyed. The remaining groups that were given the opportunity to be surveyed were comprised of 360 people. Of these, 250

people were eligible to fill out the survey. The others were either too young or their primary purpose for visiting was not recreation. Of the 250 people given a survey, 207 returned the survey with some degree of usable information. This resulted in a response rate of 83%. These 207 responses represent the sample used for this study.

Respondents were asked a few demographic characteristics in order to obtain a basic description of these respondents which could be applied to the population of interest. This was also necessary in order to describe respondents that fell into the different categories and groupings associated with the variables of the cognitive hierarchy (See Table 4.1 below and Figures 4.1-4.3 in the Appendix for a summary of these characteristics). Of the 207 respondents, 38 were female (18.4%) and 169 were male (81.6%). This low number of female respondents was somewhat surprising as the most recent Bob Marshall Wilderness study conducted in 2004 (Borrie et al. 2007) reported that 29% of the respondents were female. However, the target populations of the study were significantly different (all Bob Marshall users vs. South Fork overnight users), which may explain the smaller percentage of female visitors. For example, Manning (2010) reports that day hiking is more evenly split gender wise, but backcountry visits, especially those emphasizing hunting and fishing, have been dominated by male visitors. Similarly, Roggenbuck and Lucas (1987) report that at larger, more horse-oriented wildernesses, percentages of male visitors tend to be on the high end to 70-85% range for wildernesses in general.

Montana residents represented 46% of the sample, while non-residents comprised 54%. Non-residents visited the South Fork from 24 other states and 2 foreign countries. California had the most non-resident visitors with 15 or 7.2% of the sample. The age representation of the respondents in this study is displayed in Figures 4.3. The most represented age range consisted of those people who were between the ages of 50-59 (25.1%). The next most common age ranges were 40-49 (21.3%), 60-69 (18.4%), 18-29 (17.4%), 30-39 (13.5%), and 70+ (4.3%). Therefore, 47.8% of the respondents were 50 or

older, which gives further support to the findings in Borrie et al. (2007) that visitors to the "Bob" are becoming older. That study found that 50% were over the age of 45 in 2004 compared to only 26% and 21% in the Lucas studies of 1970 and 1982. Because the age range of 40-49 contained 21.3% of the respondents, it would be reasonable to assume that the percentage of those over 45 is higher than 50%. Again, caution should be emphasized when comparing the sample population in this study to Bob Marshall visitors in general.

Residency	Montana Residents	Non-residents	Total				
N	95	112	207				
%	45.9	54.1	100				
Gender	Male	Female	Total				
N	170	37	207				
%	82.1	17.9	100				
Age	18-29	30-39	40-49	50-59	60-69	60+	Total
N	36	28	44	52	38	9	207
%	17.4	13.5	21.3	25.1	18.4	4.3	100

Table 4.1 – Demographic Characteristics

Another characteristic that is useful for differentiating respondents is by their user types. Respondents were broken down into user types based on three different categories of criteria. The first involved how respondents accessed the river. In this case 32.4% were self-supported backpackers, 25.6% were fully guided by outfitters, 20.3% were dropped off by outfitters, 19.3% used personal pack or riding stock, 1.4% used a combination of backpacking and personal stock, and 1.0% used a combination of backpacking, personal stock, and outfitter stock (see Figure 4.4).

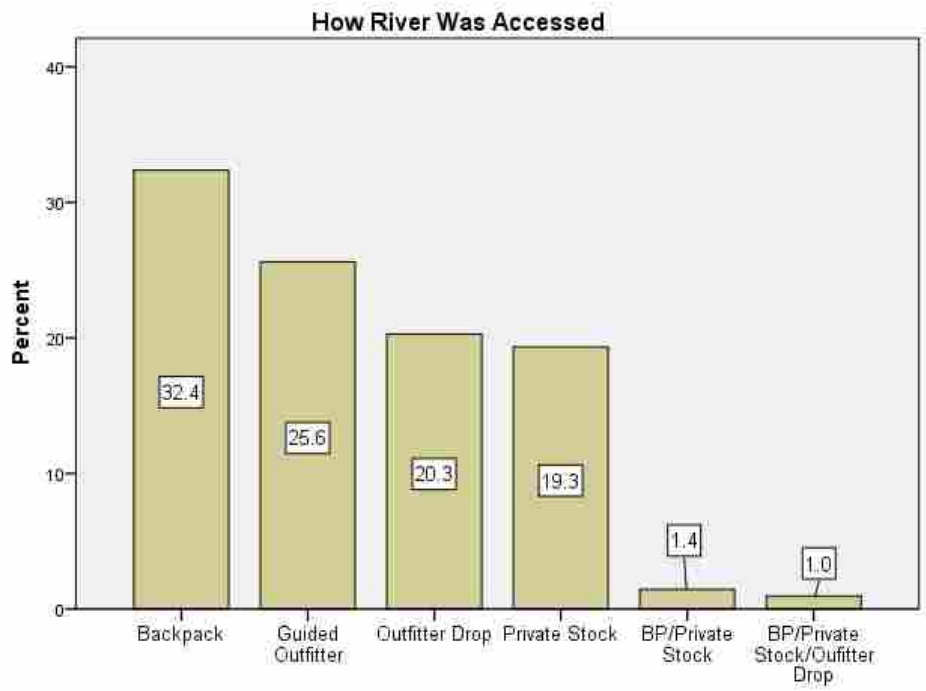

Figure 4.4 – Method of River Access

Another manner in which respondents were grouped was by their primary mode of travel within the South Fork river corridor (Figure 4.5). This variable is different from the above classification because it now breaks out the floaters who had to access the river in one of the methods mentioned above. Backpackers made up the largest percentage of the respondents within this variable at 34.8%. This was followed by stock users (31.4%), floaters (28.5%), those who used a combination of backpacking and stock support (2.9%), and those who had a camp dropped for them using stock (2.4%). These last two categories were dropped and those cases were added to either the stock or backpacker group for much of the analysis by travel type in this study. This was done in order to make interpretation easier and in order to have enough cases in each category. This resulted in 74 stock users (36.3%), 72 backpackers (35.3%), and 58 floaters (28.4%).

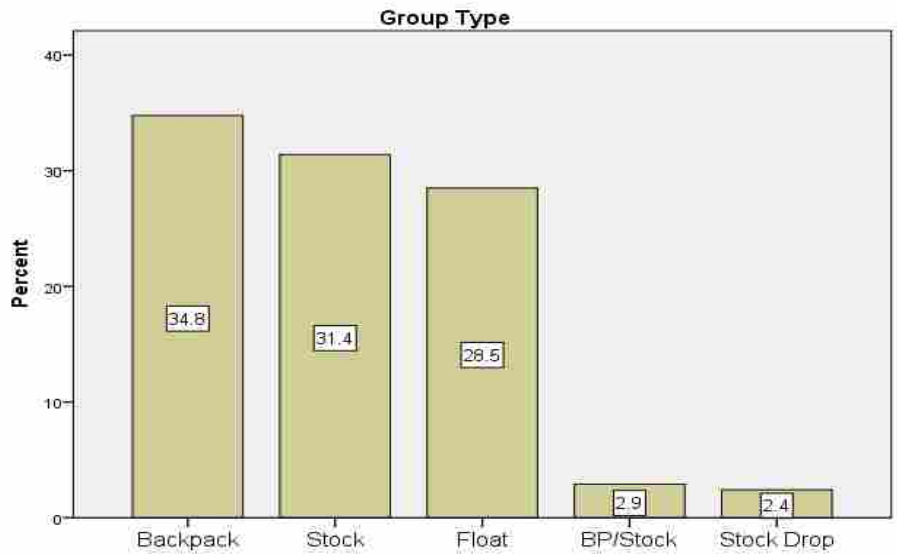

Figure 4.5 – Group Type

Lastly, respondents were grouped by their level of independence. Three categories were created in this regard: those who were fully guided by outfitters (25.7%), those who were partially supported by outfitters (21.7%), and those who were self-supported or DIY (52.7%). The percentages of these user types can be seen visually in figure 4.6. This category was created explicitly as an independent variable to see if respondents had different values, attitudes, and support for management actions based on the level of independence they sought for their trip.

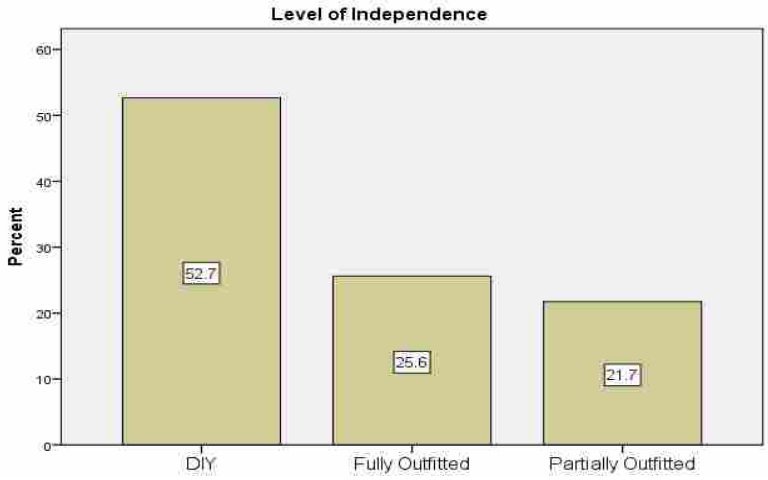

Figure 4.6 – Level of Independence

Also of interest with the float groups, was the type of craft used and level of independence, as there was an interest in seeing if the emergent trend mentioned in the introduction (do-it-yourself floaters) is very prevalent on the South Fork. Of the 63 respondents who reported floating the river, 65.1% used large, multi-person rafts, 20.6% used packrafts, 9.5% used inflatable canoes or duckies, and 4.8% used a personal pontoon type craft. If these floaters were broken down by the *level of independence* variable mentioned above, partially outfitted floaters (drop floats) made up the highest percentage of floaters at 52.4%. Fully outfitted floaters were next at 34.9%, and the DIY floaters were 12.7% of the total. Although this DIY segment is a relatively small percentage of the floaters, it still is significant and we can assume it is a larger segment than it was in the 1980-1981 where almost all floaters used outfitter services (FNF 1984). However, the sample size of floaters is too small to make too many generalizations about this trend. Therefore, the Forest Service should, at the very least, watch for increases in this DIY segment in years to come.

Patterns in Visitor Characteristics

Prior to analyzing the cognitive hierarchy variables, Pearson's Chi-square likelihood analyses were run to determine if any patterns existed among the independent variables, as we were interested to see if there were any connections between these use and demographic variables. These independent variables were residency, level of independence, travel type, and the three wilderness experience variables. The three domains of wilderness experience were: number of visits to wilderness per year, number of visits to the Bob Marshall, and number of other wildernesses visited in your lifetime. For simplicity's sake we termed these variables in the same manner as Cole and Hall (2009): visitation frequency, local experience, and general wilderness experience. Each of these variables was broken down into a high, medium, and low category.

At the p=.05 level there were several categorical distributions that were significantly different than expected. In the *level of independence* variable, the do-it-yourselfers (DIY) had more respondents with a high level of visitation frequency and less with a low level. The DIY visitors had a slightly higher level of local experience, and they also had more visitors with a moderate level of general wilderness experience and less with a low level. The partially outfitted visitors tended to have more moderate levels of visitation frequency and local experience with fewer visitors than expected with a high level of visitation frequency and a low level of local experience. The fully outfitted group tended to have more members in the low end of the three experience domains. However, for visitors with high general wilderness experience, there were an expected number of each DIY, partially outfitted, and fully outfitted respondents.

Not surprisingly, the DIY group tended to have more Montana residents, a much higher percentage of backpackers, and a much lower percentage of floaters than expected. The partially outfitted group was proportionally represented based on residency, but these visitors were almost exclusively floaters. The fully outfitted group tended to be comprised more of non-residents, and as expected, contained no backpackers.

Residency did not vary significantly based on *travel type*; however, Montana residents were more likely to have a higher level of visitation frequency and local wilderness experience than non-residents. A representative number of each group had a high level of general wilderness experience; however, residents had a higher percentage with moderate general wilderness experience, and non-residents had a higher percentage with low general wilderness experience.

Wilderness experience also varied based on travel type. Floaters were more likely to have lower levels of all three experience domains, while backpackers were more likely to have high levels of general wilderness experience and wilderness visitation frequency, but moderate to low levels of local

experience. The stock users were more likely to have more local experience, but less general experience.

To summarize, DIY visitors tended to be from Montana, be either stock-users or backpackers, and visit the Bob Marshall and other wildernesses more frequently than outfitted groups. The partially outfitted visitors tended to have moderate to high levels of local experience but visit wilderness a little less often than the DIY visitors. They are equally likely to be Montana residents or from out of state, and they were mostly floaters. The fully-outfitted visitors were either floaters or with stock parties, they tended to be non-residents, and they visit wilderness rather infrequently, particularly the Bob Marshall.

Open-Ended Question – Important Qualities of the South Fork

Prior to looking at South Fork Visitors' value-orientations and their evaluations of setting attributes, it would be useful to look at how respondents answered the open-ended question that asked, "[w]hat are the most important qualities or characteristics of the upper South Fork that influenced your decision to recreate here?" This question was asked in recognition of the limitations of the quantitative methods employed in this study. Specifically, we were curious to see if there were other values or social setting attributes of the South Fork that might have been overlooked. Responses to this question were broadly coded into several themes. Some of the more prevalent themes are listed below with the percentages of respondents who mentioned that quality (Figure 4.7). The main thing that stands out is the importance of fishing to South Fork visitors as 61 percent of respondents mentioned this quality. This suggests that the fishing resource on the South Fork is one of the most important aspects of the recreation setting, and therefore, this adds justification for including "encounters while fishing" as a social setting attribute in this study. Although not relevant to the social setting, this also suggests that management would be well served to monitor the quality of the fishery in the form of a resource setting indicator. This quality is also indirectly covered as a value in the values

scale as respondents were asked to rate how important the South Fork is as a "protector of fish and wildlife habitat."

Other qualities that were mentioned relatively frequently were qualities related to scenic beauty (26%), remoteness (17%), and solitude (14%). If thought of as protected area values, these were certainly covered by the 31 values statements as well. The next theme was related to the South Fork designation as either a Wild River or as Wilderness (11%), which is indirectly related to several values or setting attributes. It suggests that some people are influenced to recreate on the South Fork because of the qualities that designation encompasses, which suggests added justification for including the extra designation specific values items to the original scale developed in Borrie et al. (2002). Some respondents also mentioned the pristine or unspoiled quality of the South Fork (8%). Lastly, several respondents (5%) mentioned that the South Fork is important because of its supportive setting for horse use. This included such things as good graze and good trails for horseback riding. This horse-oriented quality is not mentioned in any of the values items included in the next section, which suggests this is an area specific quality that may add something to a more specific protected area values scale. This also suggests another resource setting attribute that the Forest Service might want to monitor (graze).

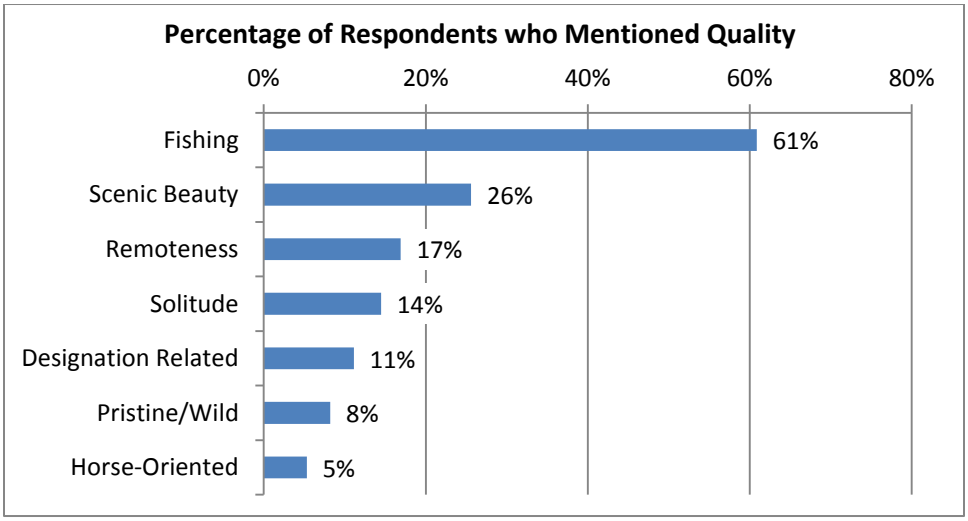

Figure 4.7 – South Fork Qualities That Influenced Decision to Recreate

4.2 - South Fork Users' Value Orientations

The first two levels or elements of the cognitive hierarchy (values and value-orientations) were addressed through the portion of the survey that asked visitors to rate how important 31 protected area values were to the upper South Fork of the Flathead. The mean ratings for these 31 items are displayed in Table 4.2. Overall, the values associated with wilderness and wild rivers appear to be the most important to visitors of the South Fork, along with protection of fish and wildlife habitat and scenic beauty. Less important were most of the protected area values included in the *personal growth and development* and *symbolic and historic* factors or value dimensions discussed in Borrie et al. (2002). These include such values for the South Fork as a historic place, a family tradition, a place to develop my skills and abilities, and a place everyone should see at least once. The least important values of the South Fork to visitors were as a social place, as a tourist destination, and as an economic resource. These were the only values in which the mean score represented that visitors disagreed with the statement that they were important on the South Fork.

I believe the upper South Fork of the Flathead is particularly important	Mean	Std. Dev.	N
A place of scenic beauty	7.55	.814	204
A place without most types of commercial development	7.26	1.223	204
A free-flowing river	7.21	1.106	203
An unpolluted watershed	7.14	1.264	204
A protector of fish and wildlife habitat	7.04	1.249	204
A place for wildness	7.03	1.662	203
A place that is accessible only by trail	7.00	1.510	204
A wildlife sanctuary	6.89	1.618	204
A place for outstanding opportunities for solitude	6.84	1.539	204
A place for primitive recreation	6.84	1.537	204
A place for the use and enjoyment of the people	6.58	1.475	204
A vestige of primitive America	6.58	1.649	203
A place for recreational activities	6.57	1.512	204
A protector of threatened and endangered species	6.55	1.656	204
A place where the imprint of man's work is substantially unnoticeable	6.53	1.533	204
A place to renew my sense of personal wellbeing	6.50	1.662	200
A preserve of natural resources for future use	6.37	2.077	201
A place for all living things to exist	6.35	1.879	204
A historic resource	6.28	1.669	204
A display of natural curiosities	6.23	1.633	201
A symbol of America's identity	6.13	1.769	204
A place to be free from society and its regulation	6.12	2.017	203
A place for education about nature	5.81	1.861	204
A family or individual tradition	5.77	1.932	204
A sacred place	5.70	2.279	202
A place everyone should see at least once	5.65	2.407	203
A place to develop my skills and abilities	5.53	1.904	203
A place for scientific research and monitoring	5.27	2.120	204
An economic resource	4.06	2.185	204
A tourist destination	3.72	2.021	204
A social place	3.31	1.906	204

Table 4.2 – Protected Area Values Scores - *asked on a scale from 8 (strongly agree) to 1 (strongly disagree).

In order to reduce these 31 values variables to a smaller number of dimensions that represent the underlying patterns in how respondents value the South Fork, principal components factor analysis was utilized as described in the methods section. This resulted in the retention of 4 factors containing 14 of the original 31 variables (see Table 4.3). The first factor consisted of items that heavily emphasized values associated with wilderness, and therefore, it was labeled *Wilderness*. Respondents

that scored high on this factor placed much importance on the South Fork as a place for wildness, a place where the imprint of man's work is substantially unnoticeable, a place for outstanding opportunities for solitude, a place for primitive recreation, and as a vestige of primitive America. The second factor consisted of variables that were more related to the symbolic values of *National Parks*. Respondents who scored high on this factor value the South Fork as a sacred place, as a display of natural curiosities, and as a symbol of America's identity. The only value variable that didn't conceptually fit well in this factor was as a place to develop my skills and abilities. However, it can be assumed that respondents who valued the South Fork for those symbolic characteristics also see it as place for this personal growth related value. The third factor consisted of two "wild" river values (as a free-flowing river and as an unpolluted watershed) and the value of the South Fork as a protector of fish and wildlife habitat. Together these values suggest the importance of the South Fork as a wild river and a fishing resource, and therefore, this factor is labeled *South Fork Wild.* Respondents that scored high on the last factor valued the South Fork as a place to be used and enjoyed and as a place for recreational activities. Thus, this factor was labeled *recreational use*.

Overall, this factor model explained 63.5% of the overall variance in value item responses, which is considered an acceptable solution for the social sciences (Hair et al. 2006). The Chronbach's alpha coefficient measures for internal consistency of the scales for the first 3 factors were between .80 and .70 which is considered acceptable for with factors less than 6 items (George and Mallery 2002, Gliem and Gliem 2003). The fourth factor had a Chronbach's of .67, which is good for a factor with only 2 variables.

In looking at the values structures reported in Tanner et al. (2007), it was interesting to note how the values structures for South Fork visitors differed from those of the visitors to the other 4 protected areas that used the original values scale. By adding questions that addressed the South Fork's "wild and scenic "and "wilderness" values to the previous developed protected area values scale (Borrie

e al. 2002), it would appear that the majority of the national park values have been deemphasized. Particularly, the second factor in this study (national parks) combines values from multiple factors from the other studies as it appears to be a composite of previously developed dimensions associated with national parks (i.e. *symbolic* and *personal growth*). Also, the fourth factor (recreational use) was similar to other factors developed in two of the other protected areas studies. However, in the South Fork study, this use and recreation factor seemed to be a stand-alone values dimension as items such as "a tourist destination" did not load on this factor. Lastly, the first and third factors seem to represent more distinct values dimensions associated with the resource of interest. Overall, this seems to support the statement in Tanner et al. (2008) that the previous scale represents part of a common protected-area values structure, but by adding additional items, other dimensions might develop that add to the variance explained and produce a more complete model.

Protected Area Variables	Factors and Factor Loadings*			
	Wilderness	National Parks	South Fork Wild	Recreational Use
A place for wildness	.714			
A place where the imprint of man's work is substantially unnoticeable	.658			
A vestige of primitive America	.721			
A place for outstanding opportunities for solitude	.604			
A place for primitive recreation	.704			
A display of natural curiosities		.702		
A symbol of America's Identity		.810		
A place to develop my skills and abilities		.689		
A sacred place		.620		
A free-flowing river			.759	
A protector of fish and wildlife habitat			.750	
A unpolluted watershed			.774	
A place for the use and enjoyment of the people				.806
A place for recreational activities				.855
Percent of Variance explained	34.6	12.1	9.1	7.7
Chronbach's Alpha	.794	.757	.735	.665

Table 4.3 – Protected Area Value Factors. *Factor loading below .6 were suppressed

After creating the factors, factor scores were created for each respondent case using the summated scale approach mentioned in the methods section. The cluster analysis of the four factors scores resulted in the segmentation of respondents into three groups with distinct value-orientations. Cluster 1 (labeled *Bob Marshall enthusiasts*) scored high on all four of the values factors. This was the largest group as it consisted of 102 respondents. The second largest cluster (61 respondents) scored relatively low on the *wilderness*, *national park,* and *South Fork wild* factors, but relatively high on the *recreational use* factor. This cluster was therefore labeled *use-oriented*. The third cluster consisted of 41 respondents that scored moderately on the *wilderness* and *national park* factors, low on the *recreational use* factor, and high on the *South Fork wild* factor. This cluster was labeled *river enthusiasts* as the factor representing river values was the most important to these respondents. Table

4.4 below shows the breakdown of respondents on these clusters and the cluster centers for each factor. Figure 4.7 provides a visual display of the differences in factor scores based on cluster membership. Caution is emphasized in interpreting this line graph as it does not represent continuous data between the points.

Factors	Cluster Centers		
	Bob Marshall Enthusiasts	Use-Oriented	River Enthusiasts
Wilderness	7.3961	5.7311	6.6585
National Parks	6.83	4.42	5.57
South Fork Wild	7.5392	6.2022	7.4309
Recreational Use	7.3	6.5	4.9
Number	102	61	41

Table 4.4 – Value Orientations Cluster Centers

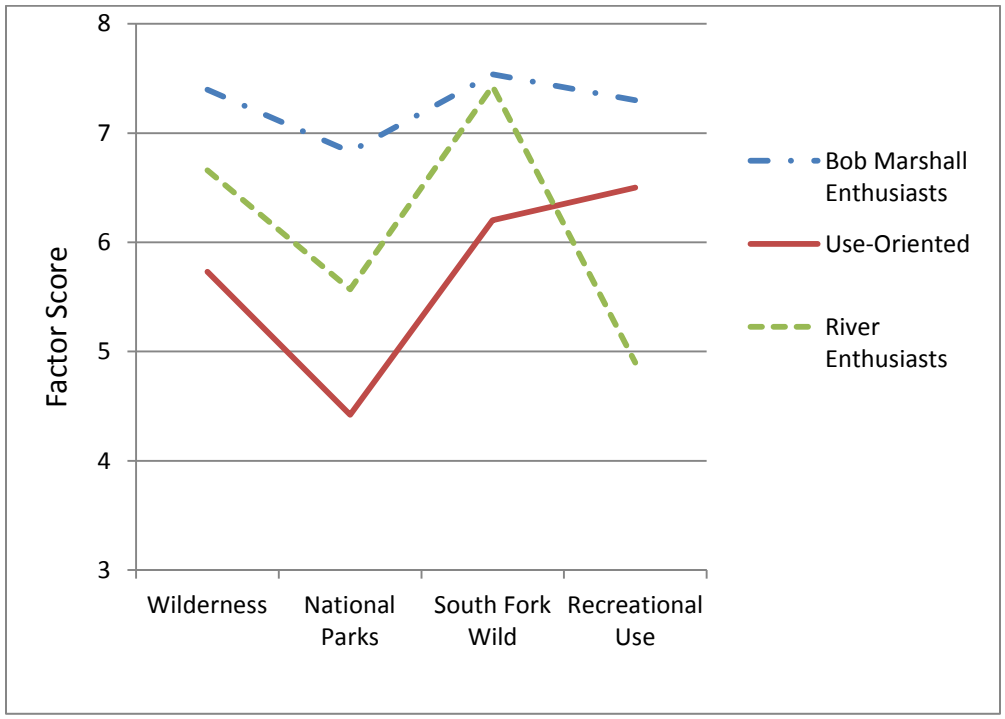

Figure 4.7 – Factor Scores Based on Cluster Membership

Lastly, for value orientations we were interested in being able to identify who the members of the three value clusters were in terms of the above-mentioned independent variables. However, using a Chi-square likelihood test, none of these variables had significantly different distributions based on values cluster membership at the p=0.05 level. This suggests that South Fork users' protected area value orientations are not dependent on the user characteristics of travel type, residency, level of independence, and the three levels of wilderness experience. It appears that within these categories there are a representative number of visitors who value the South Fork for one of the following: recreation and access, its wild river qualities and fish and wildlife habitat, or all of the distinct values dimensions associated with the river.

4.3 – Research Objectives 1-3 - Perceived Effects of Setting Attributes on Experience

This section is broken down into several sub-sections of results and discussion related to the survey questions evaluating setting attribute importance and performance. This is essentially assessing the cognitions associated with the "attitudes and norms" level of the cognitive hierarchy. In this case attitudes are being assessed as respondents are asked to positively or negatively evaluate an object or condition (Whittaker et al. 2006). The first sub-section gives an initial analysis of the perceived effect that the individual levels of the setting attributes could have on experience. The second sub-section discusses the importance scores for these setting attributes as it addresses research questions number 1 and 2. The third sub-section looks at the setting attribute performance scores, and the fourth section addresses research objective 3 through the use of the importance-performance matrix.

Highest and Lowest Level for each Setting Attribute

Before creating the overall importance scores, the perceived effects of setting attributes were analyzed at the individual levels of each attribute. This was done to see if some attributes had more

ability to add to experience than they did to detract, and vice-versa. A visual display of these results can be seen in Figures 4.8 and 4.9 below. The attributes that had the highest mean potential to detract from one's sense of having a real wilderness and wild river experience were the three attributes related to the evidence of the poor behavior of other users. "Seeing many instances of improperly disposed of human waste each day" had the highest potential to detract from experience as it was rated -2.80 on a scale from +3 (would add a lot to your experience) to -3 (would detract a lot from your experience). This was closely followed by "seeing many pieces of litter in many places" each day (-2.78 mean effect) and "encountering many groups with poor wilderness ethics each day" (-2.72 mean effect).

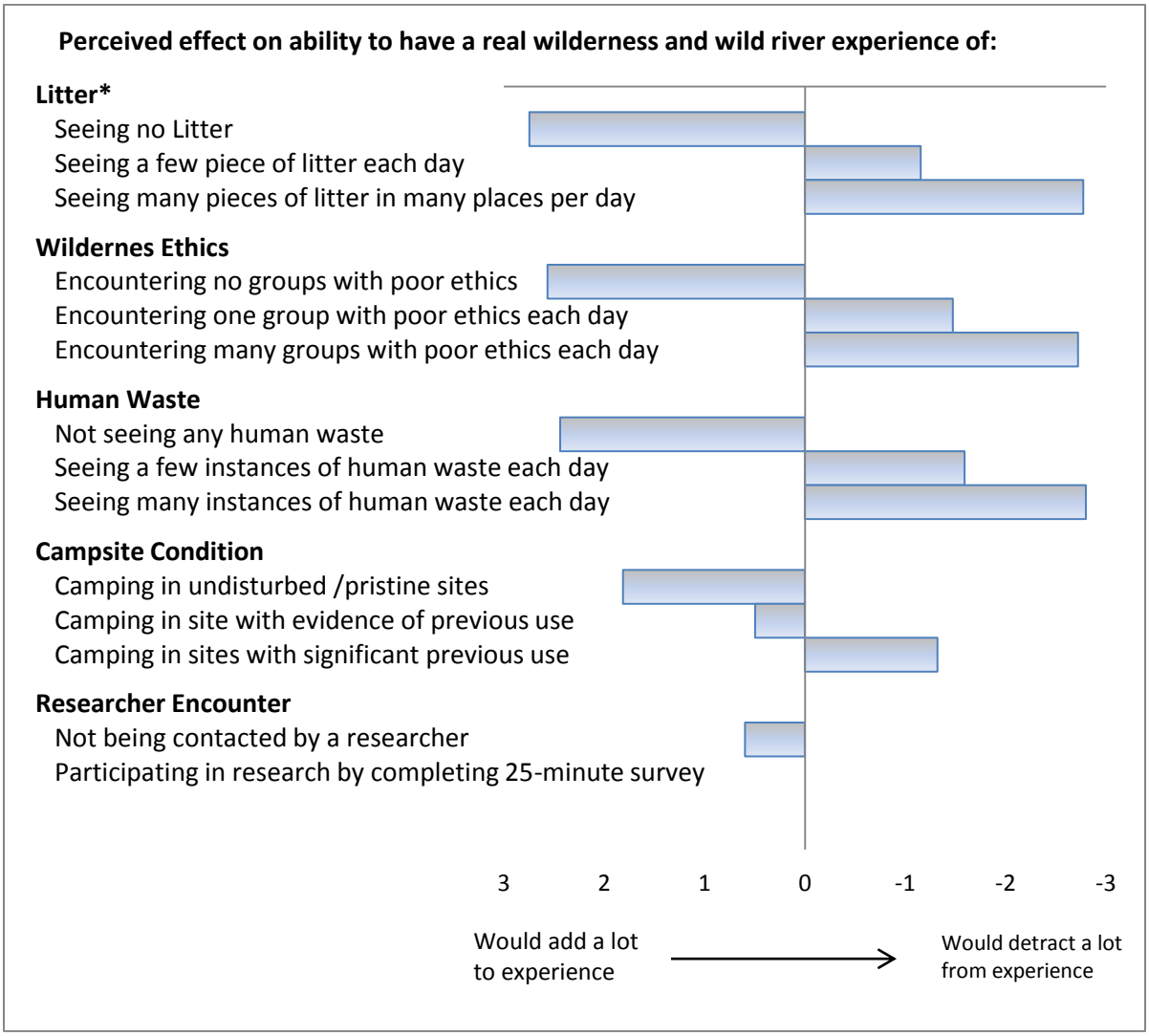

Figure 4.8 – Effect of individual behavior related attribute conditions on experience

*Wording for several attribute conditions was shortened

Setting attributes related to crowding had a slightly lower mean potential to detract from experience with "camping within sight or sound of many other groups each night" being the highest (-2.49 mean effect). This was followed by "people walk or float through your fishing spot many times per day" (-2.47) and "sharing swimming holes, lunch spots, or other scenic or special river locations with many other groups" (-2.40). Slightly less problematic were high levels of the overall encounter measures as "encountering more than 5 float groups while hiking, riding, or floating each day" had a mean effect of -2.15, and "encountering more than 5 land-based groups while hiking, riding or floating each day" had a mean effect of -2.00. Having the lowest potential to detract from experience of the attributes related to crowding was "having to travel more than a mile further than planned in order to find an unoccupied campsite" (-1.57 mean effect).

Aside from the researcher encounter setting attribute, which was solely asked in order to quantify the burden of the project on respondents, the setting attribute that had the least potential to negatively affect visitors' experience was campsite condition. The most extreme level of this attribute, "camping in campsites with significant previous use" had a mean effect of -1.32. The mean rating in the researcher encounter attribute for "being contacted by a researcher and asked to complete a 25-minute questionnaire while in your camp or on the river" was 0.00. This signifies that, on average, the research burden of this project would have no influence on the visitors' ability to have a real wilderness and wild river experience.

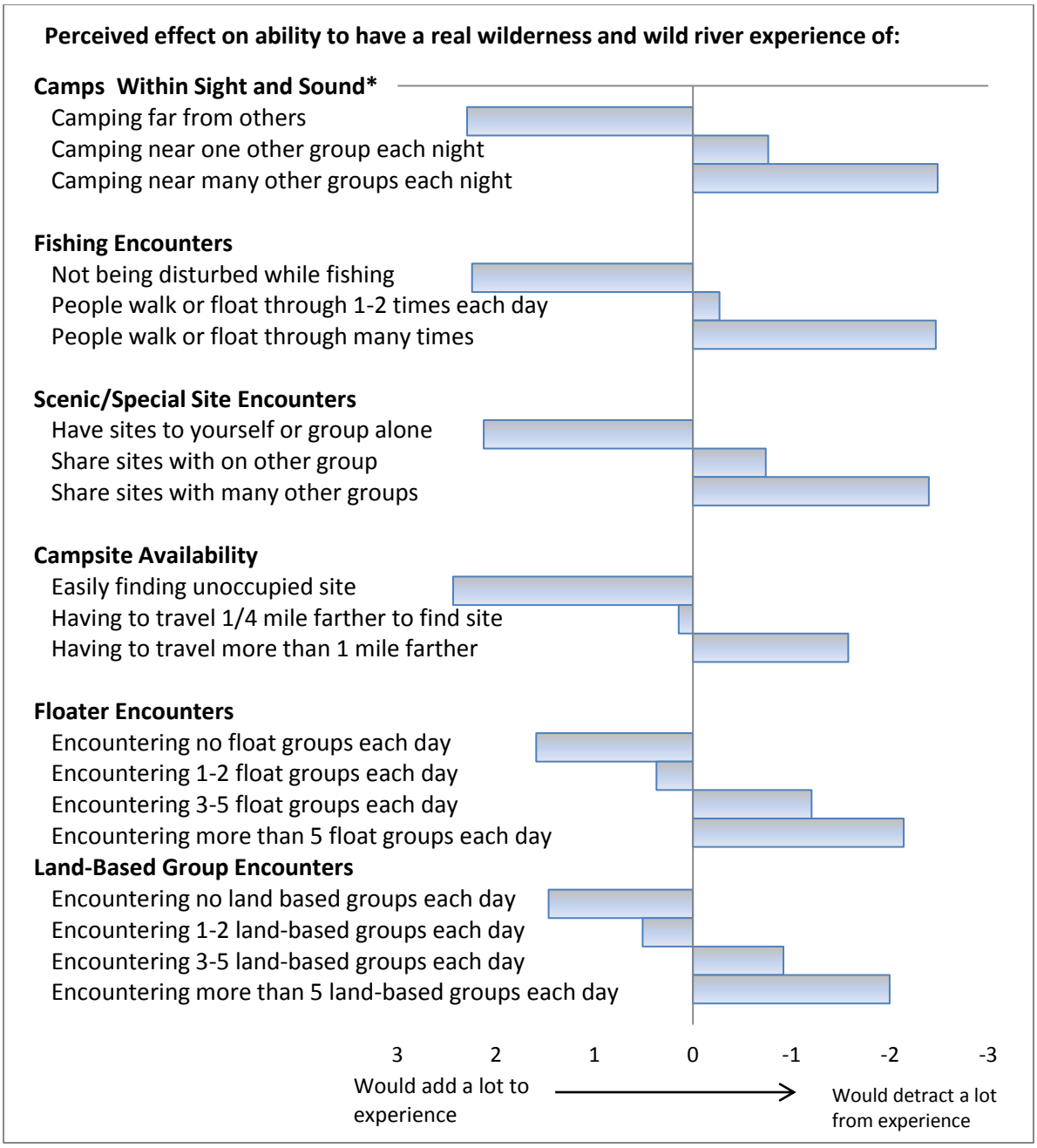

Figure 4.9 – Effect of individual encounters/crowding attribute conditions on experience

*Wording for several attribute conditions was shortened

With the exception of *campsite availability,* the lower or more positive levels of the setting attributes had the ability to add to visitors' experience in a similar fashion as they detracted at higher or conceptually negative levels. Encountering no litter had the greatest ability to add to visitors' experience (mean effect of +2.75). This was followed by "encountering no groups with poor wilderness

ethics" (+2.57), "not seeing any improperly disposed of human waste (+2.46), and "easily finding an unoccupied campsite" (+2.46). This high positive rating for this *campsite availability* attribute is rather surprising as the higher level of the attribute had a much lower ability to detract from experience. Other setting conditions with a high potential to add to experience were "camping far from other groups each night" (+2.38), "not being disturbed by others while fishing each day" (+2.33) and "having swimming holes, lunch spots, or other scenic river locations to yourself or your group alone" (+2.11). Having a significantly lower ability to positively affect visitors' experience were the more positive levels of the *campsite condition, floater encounters,* and *land-based encounters* setting attributes (+1.80, +1.58, and +1.46, respectively). The *research encounter* setting attribute had the lowest ability to influence experience with a mean effect of only +0.39 for "not being contacted by a researcher and asked to fill out a questionnaire while in your camp or on the river."

Research Objectives 1 and 2 - Setting Attribute Importance Scores

In order to address research objective number 1, the importance scores (perceived sensitivity of experience to changes in setting attributes) were calculated in the manner mentioned in the methods section. See Table 4.5 for a summary of these scores. The three setting attributes with the highest importance scores were attributes related to the behavior of others. Similar to other studies (Roggenbuck et al. 1993, Cole and Hall 2009) *litter* was found to have the greatest perceived impact on experience (mean score of 5.52). Encountering groups with *poor wilderness ethics* and encountering *human waste* had the next highest scores (5.29 and 5.24, respectively), which were not significantly different from each other. The next six most important setting attributes were related to the number of encounters. The first three were found to be significantly higher and these were the more specific encounter measures (*camps within sight/sound, fishing encounters* and *scenic/special site encounters*). There was some overlap in the significance of the means within this group. The next three most

important attributes were *campsite availability* and the two general encounters attributes, *floater* and *land-based encounters*. It was interesting to see that the mean importance scores for these last two attributes were significantly different, suggesting visitors are more tolerant of seeing land-based groups. It is possible that this difference in means was the result of a much smaller percentage of floaters. However, running an ANOVA comparing the means of these two attribute scores among the user types showed no significant differences (p=.415 for land-based encounters, p=.291 for floater encounters). The second lowest mean importance score was for the *campsite condition* setting attribute (3.41). This was not surprising as previous research has shown that social indicators of quality may be more important at wilderness campsites than ecological indicators of quality (Manning 2010).

The least important setting attribute was for the *researcher encounter* (mean of 1.45). Although being asked to fill out the survey had the potential to negatively affect some respondents' wilderness and wild river experience, the mean potential was much smaller than for any of the resource and social setting attributes. Furthermore, because participation was voluntary, we can feel fairly confident that the effect on experience of conducting this research was not enough to cause much concern. Therefore, developers of subsequent studies that employ a similar sampling method should be less concerned about the impact this would have on experience.

Setting Attribute Importance Scores

Setting Attribute		N	Mean**	Not Sig. Dif*	Std. Deviation
(A)	Litter	200	5.52		1.160
(B)	Wilderness Ethics	202	5.29	C	1.417
(C)	Human Waste	201	5.24	B	1.450
(D)	Camps Within Sight/Sound	201	4.80	E	1.609
(E)	Fishing Encounters	177	4.73	DF	1.730
(F)	Scenic/Special Site Encounters	201	4.58	E	1.815
(G)	Campsite Availability	202	4.06	H	1.786
(H)	Floater Encounters	203	3.99	G	1.911
(I)	Land-Based Encounters	202	3.71		1.956
(J)	Campsite Condition	202	3.41		1.912
(K)	Researcher Encounter	203	1.45		1.950

Table 4.5 – Setting Attribute Importance

* The letters in this column signify the attribute importance means that are not significantly different at the $p \leq .05$ level using paired sample t-tests.

** Setting attribute importance scores are the overall mean of the individual differences between high and low scores for the individual levels of each attribute and could range from a high of 6 to a low of 0.

To address two other characteristics (group size and group type) that have been shown to influence crowding and experience, we asked a respondents to rate how encountering 4 different types of groups would affect their experience in general (see Table 4.6). Group size was not accounted for in the multi-level setting attributes mentioned above and group type was only assessed in terms of floater and land-based encounters. Therefore, four additional hypothetical questions were asked to see how other user types and group size would affect experience in a single-measure format. Meeting large groups (10 or more people in general had a high negative mean influence on experience as it was rated -1.50 on a scale from +3 (would a lot to your experience) to -3 (would detract a lot from your experience). The current group size limit is 15 people. Meeting commercial groups would also have a mean negative effect on experience (-0.47), but at a much lower level than with large groups. In general, meeting stock groups would have little impact on experience (+0.03), and meeting backpackers would have a slight positive influence on experience (+0.23). This last score was significantly different

from zero (p=.003). This difference between stock party and hiker scores supports other studies as it provides some evidence that visitors are more tolerant of backpackers than horse groups (Roggenbuck et al. 1993). However, it is important to note that significant variation (using one-way ANOVAs) did exist for these mean ratings based on some of the user type variables described above. In some cases, one user type would be more tolerant of their own kind at a statistically significant level. For example, the mean rating for seeing commercial groups was -0.95 for do-it-yourself visitors, + 0.55 for fully outfitted visitors, and -0.47 for partially outfitted visitors (F=22.0, p<.001). Similarly, seeing stock groups would have a mean effect of -0.47 on backpackers, but a +0.52 mean effect on stock parties, and a +0.12 effect on float parties (F=5.78, p<001). Therefore, caution is emphasized when comparing the overall means for these group characteristics. Also important to note is that there weren't significant differences in mean ratings based on user type for seeing visitor groups with the other two characteristics (backpackers and large groups).

Group Type General Effect on Experience

	N	Mean*	Std. Deviation
Large groups (10 or more people)	203	-1.50	1.287
Commercial groups	203	-0.47	1.463
Stock groups	203	+0.03	1.258
Backpackers	203	+0.23	1.071

Table 4.6 – Perceived General Effect on Experience of Encountering Different Group Types
*****Effect was measured on a scale from +3 (would add a lot to experience) to -3 (would detract a lot from experience) and all means were significantly different from each other at the P≤.05 level.

In order to further analyze the attribute importance scores for possible indicator selection, several limitations must first be recognized. First, several pairs of scores were not significantly different in a statistical sense and a large number of attributes were found to be at least moderately important. Second, several of the attributes might be highly intercorrelated in their occurrence on the South Fork. For example, it would stand to reason that if several parties are camped in close proximity to each

other, there would also be a higher level of encounters while fishing, at scenic river location, or on the trail. It wouldn't make sense to monitor all these attributes as indicators under an LAC management plan. Therefore, in order to address these limitations, factor analysis was employed to identify the patterns in importance scores. In a similar study, Roggenbuck et al. (1993) relate that factor analysis is useful for reducing a set of items to unique dimensions that explain the most overall variance in scores. Indicator selection then becomes easier as managers have information on what attributes are not only highly important, but also the best representatives of the unique dimensions produced by factor analysis.

The factor analysis employed on the setting attributes importance variables in this study was same as that used to reduce the protected area values variables. Varimax rotation was utilized and criteria for keeping variables were communalities above 0.50 and factor loadings above 0.60. This resulted in the retention of 8 of the 11 setting attribute variables and the creation of 2 factors (see Table 4.7. This factor model explained 69.6% in the overall variation in importance score, which is considered good for the social sciences (Hair et al. 2006). The variables that were removed were the researcher encounter, campsite condition, and campsite availability. These variables had the first, second, and fifth lowest importance scores, respectively. This suggests that although they represent distinct dimensions, they may not have a significant enough impact on experience to justify the creation of an indicator. Furthermore, the least important attribute variable, the researcher encounter, was only included in order to quantify the perceived impact on experience of our research and was never meant to be analyzed as a potential indicator of quality.

The two factors that were retained included variables that were conceptually similar. One factor consists of variables that are related to the evidence of poor *behavior* of other users, and the other consists of variables related to the number of encounters with others (*Encounters/Density*). The *encounters*/*density* factor variables include encounter levels with float groups, encounter levels with

land-based groups, number of camps within sight and sound, encounter levels at scenic or special sights, and encounter levels while fishing. The Cronbach's alpha reliability measure of internal consistency for this factor scale is 0.875, which is considered very good (Gliem and Gliem, 2003). The *behavior* factor variables include the level of improperly disposed of human waste, the level of litter, and the level of adherence to wilderness ethics of the groups encountered. The alpha measure of reliability for this factor was also good at 0.827. Therefore, this suggests that these factors represent unique dimensions from which one attribute could be selected to be monitored as an indicator under an LAC management approach.

	Factors and Loadings*	
	Encounters/Densityy	Behavior
Floater Encounters	.859	
Land-Based Encounters	.830	
Special Site Encounters	.635	
Fishing Encounters	.764	
Camps Within Sight/Sound	.733	
Litter		.884
Wilderness Ethics		.748
Human Waste		.817
Chronbach's	*.875*	*.827*

Table 4.7 - Setting Attribute Importance Factors - *Loadings below .600 suppressed.

Interesting to note is how these importance scores can be analyzed through the concepts that the literature suggests influences perceived crowding. Particularly, this study identified four characteristics of encounters besides the number of groups that might influence perceived crowding, and therefore, evaluations of social conditions. These included the size of groups encountered, location of groups encountered, behavior of groups encountered, and the type of group encountered (Manning 1999, Vaske and Shelby 2008). For this project a primary emphasis was placed on whether or not encounters in specific locations are more significant (higher perceived ability to influence experience) than the overall encounter measures currently listed in the FNF's management plans (encounters with

float and land-based parties). This directly addresses research objective number 2, and the importance scores within the *encounter* factor demonstrate significant evidence that encounters at more specific locations (while fishing, camping, or in scenic/special locations) have a greater ability to influence crowding and the ability to have a real wilderness or wild and scenic river experience.

Another trend of note was that based on the high importance scores within the *behavior* factor above, it is apparent that conditions related to behavior have a substantially higher ability to influence experience than the number of encounters. In relation to the type of group encountered, a few generalizations can be made. In general, visitors are more tolerant of seeing land-based parties than float parties, and within the land-based party classification, they are more tolerant of seeing backpackers (although this depends somewhat on user type). Also, although we only asked one question related to group size, it appears this factor has a fairly high ability to influence experience and perceived crowding as well, as it had the highest mean negative influence on experience of the four single-level encounter attributes (see Table 4 above).

So far, this analysis has provided guidance in regards to the importance of these attributes and to how highly they load on the two factors. Further analysis will provide insight into attribute performance and variation in importance and performance scores based on respondents' protected area value-orientations and other independent variables.

Performance

The performance scores (Table 4.8) represent how visitors perceived that the conditions of the setting attributes on the South Fork influenced their experience. Scores were assessed on a scale of -3 (detracted a lot from experience) to +3 (added a lot to experience). Therefore, a score of 0 would indicate a mean neutral effect on experience. However, all of the setting attributes were rated positively for performance which is not surprising as most visitors tend to give high performance marks

on conditions of public resources (Hollenhorst and Gardner 1994). There also tended to be a lot of overlap in significance of the mean performance scores for setting attributes. However, the three attributes with the highest mean performance were significantly different from each other and the rest of the scores as well. These scores suggest that conditions experienced related to visitors adhering to wilderness ethics (1.07 mean rating), campsite availability (1.45), and campsite condition (1.71) added a fair amount to experience. Also of note is the lowest scoring attribute on performance, *floater encounters,* which visitors rated as having one of the lowest potentials to influence experience (Importance).

Setting Attribute Performance Scores

		N	Mean*	Not Sig. Dif.**	Std. Deviation
(A)	Floater Encounters	203	+0.16	B	1.292
(B)	Special Site Encounters	203	+0.26	ACD	1.380
(C)	Land-based Encounters	204	+0.36	BDEF	1.333
(D)	Campsite Proximity	203	+0.44	BCEFG	1.766
(E)	Human Waste	204	+0.47	CDFG	1.746
(F)	Fishing Encounters	180	+0.53	CDEG	1.515
(G)	Researcher Encounter	204	+0.63	DEFH	1.316
(H)	Litter	204	+0.75	G	1.732
(I)	Wilderness Ethics	204	+1.07		1.311
(J)	Campsite Availability	203	+1.45		1.493
(K)	Campsite Condition	203	+1.71		1.311

Table 4.8 – Setting Attribute Performance

*Attribute Performance was the "impact that the conditions in the following areas have had on your experience to this point" and was scored on a scale from +3 (Added a lot to) to -3 (detracted a lot from).

**Letters for performance indicate that these means are not significantly different at the p=.05 level using paired sample t-tests.

Research Objective Number 3 - Importance-Performance

In order to address research objective number 3 and further evaluate the setting attributes for potential selection as indicators to be monitored, the importance and performance scores were

combined in the I-P matrix displayed in Figure 4.10. As described above, this matrix provides an easily interpreted tool by which to further analyze the setting attributes. The quadrant labeled "concentrate here" is the area of most concern as these attributes are important and may need attention in the short-term as well. Four attributes fall into this category. Three of these fall into the encounter/crowding factor mentioned above (*fishing encounters, camps within sight or sound, and scenic or special site encounters*. The other attribute falling in this category was the *level* of improperly disposed of *human waste*. However, Tarrant and Smith (2002) caution against interpreting what attributes fall into each quadrant without including a measure of variance. They suggest that this will increase the validity of the results, and therefore, we compared the mean attribute scores to the overall mean importance and performance scores. It was discovered that the mean performance score of *scenic or special site encounters* was not significant from the overall mean of 0.72 using a one sample t-test with a 95% confidence interval (p=.107). Similarly, the mean importance scores for *fishing encounters* and *scenic or special site encounters* were not significantly different from the overall mean importance score of 4.53 (p=.128 and p=.713, respectively). Therefore, the only attributes of which we are 95% confident that the true population importance and performance means lie within the "concentrate here" quadrant are *human waste* and *camps within sight/sound*. This offers additional evidence that suggests that these attributes would make good candidates to develop indicators out of. Further supporting this is that they represent one variable out of both importance factors mentioned above (*behavior* and *encounters/crowding*). However, we have still yet to consider other criteria of good indicators (Merigliano 1990) such as cost-effectiveness or capacity for reliable monitoring (Watson and Cole 1992).

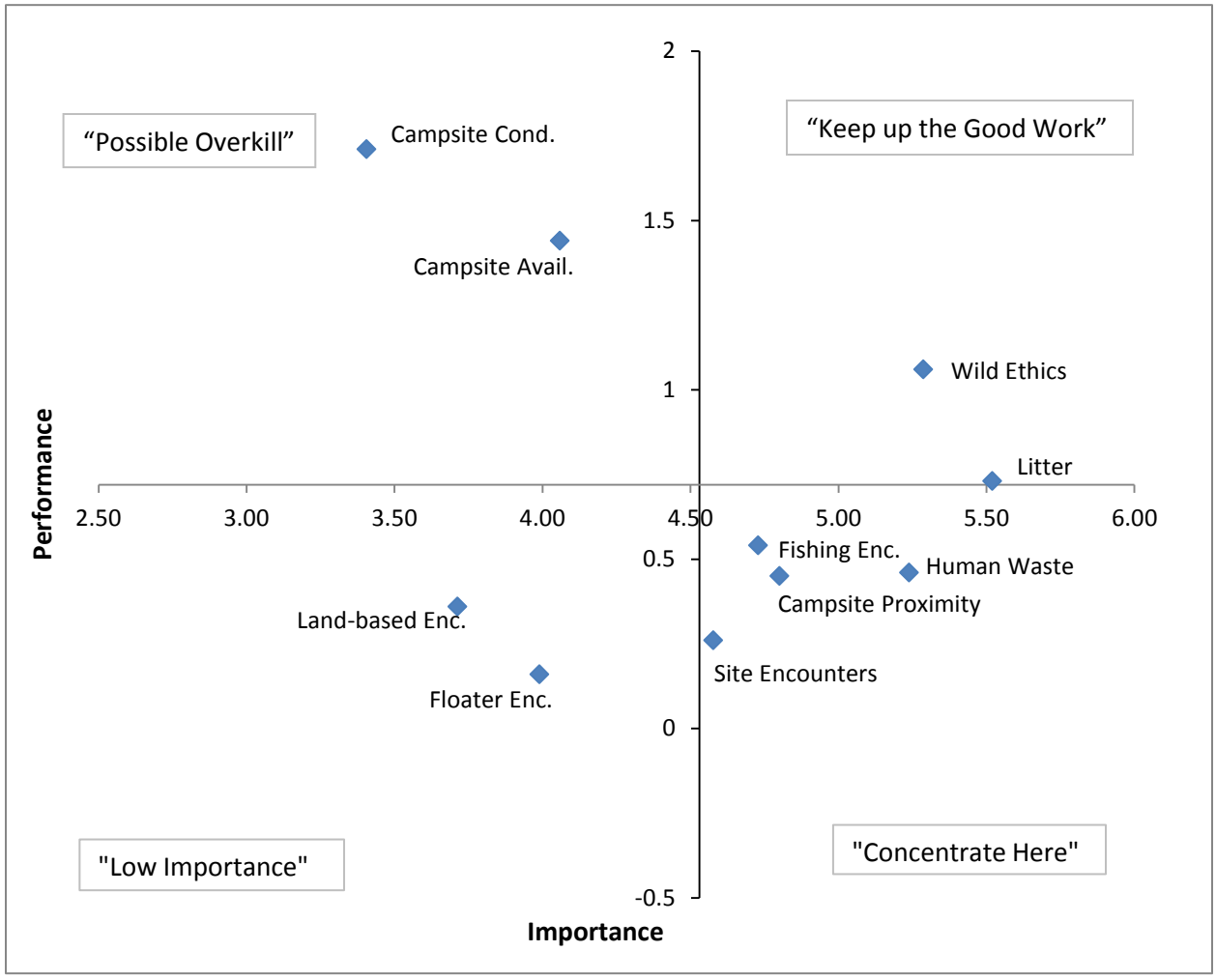

Figure 4.10 – Importance/Performance Grid

4.4 - Overall Support of Management Actions

The behavioral intention component of this study looked at visitors' support for thirteen potential management actions. Respondents were prompted to rate support for these management actions with the statement: "[b]ased on the conditions I have experienced in the Upper South Fork, I would be willing to support." Respondents were asked to rate this support on a scale from +3 (strongly agree) to -3 (strongly disagree), with zero being a neutral response. Table 4.9 displays the mean scores for visitors' support of these actions and indicates which mean scores are not significantly different.

Overall, respondents were willing to support 5 of these actions to some degree, while the other 8 were not supported.

The action that visitors were most willing to support was "regulations and fines for wilderness ethics violations," which was given an average rating of +1.23. This reinforces the findings that visitors place much importance on the setting attributes related to the behavior of others as those were the attributes with the highest mean importance scores mentioned above. There was also moderate overall support for a "group size limit of 10 people" (+0.72 mean rating) and "avoiding promotion of the river by the Forest Service" (+0.68 rating mean rating). These results are consistent with previous studies on the South Fork and in the Bob Marshall wilderness. In particular, McLaughlin et al. (1982) found support for avoiding promotion of the river to be supported by 61.3 percent of the floaters surveyed, with only 12.9% disapproving and 25.8% having no opinion. If looking at percentages in this study, support would not be considered as strong, as 45% approved, 21% disapproved, 34% had no opinion.

Similarly, Borrie et al. (2007) found that support for a less restrictive group size limit (12 people) than was assessed in this study (10 people) was strong in the Bob Marshall with only 19 percent of respondents viewing it as undesirable. This level of support was similar to the studies of Lucas (1980) and (1985) where only 19 and 22 percent of respondents thought the same group size limitation was unfavorable (Borrie et al. 2007). In this study, a slightly higher percentage of respondents rated support of the stricter group size limit as unfavorable (27%). However, 60% of the respondents agreed with the statement of support, at least to some degree. This overall support is not surprising as encountering large groups in general had the highest ability to affect respondents' experience in a negative way of the 4 group types mentioned above (-1.51 mean effect on experience).

Slight overall support was given for "restrictions on the number of float groups on the river" (+0.40 mean rating) and "requiring all visitors to register when entering" (+0.24 mean rating), although

the latter was not significantly different from zero using a t-test and 95% confidence interval for the mean (p=0.105). This latter result was slightly surprising as Lucas (1980) found strong support for requiring all visitors to register with only 8 to 15% of respondents disapproving among all 9 wilderness areas studied (including the Bob Marshall). Manning (2010) also relates that a majority of visitors to backcountry and wilderness areas support self-registration. In this case, only a slight majority (50.5%) of South Fork river users supported this action and a much higher proportion than in Lucas (1980) disapproved (30.7%).

The management actions that visitors were most against were "issuing permits so visitors can only camp in an area assigned to them," and "fees charged for land-based river recreation" (-1.35 and -1.06 mean support, respectively). This is consistent with much prior research as backcountry visitors have tended to not support fees, fixed itineraries, or designated campsites (Manning 2010). The "issuing permits" question was also asked in the Lucas studies and in Borrie et al. (2007). In this study, 68% did not support this action which was just slightly lower than the 72-79% that found in undesirable in those Bob Marshall Wilderness studies.

South Fork visitors were moderately against "fees charged for floating the river," and "permitting use based on advanced registration" (-0.74 and -0.68 mean support, respectively). Slight negative support was given for the actions of "restrictions on the number of hiking groups camped by the river" and "requirements for floaters to pack out human waste" (-0.47 and -0.40 mean support, respectively). Also negative, but not statistically different from zero was the mean support for "restrictions on the number of horse groups camped by the river" (-0.21) and "camping restrictions at popular areas" (0.16).

Support for Management Actions

		N	Mean**	Sig*	Std. Dev.
(A)	Permits so visitors can only camp in an the area assigned to them	202	-1.35		1.793
(B)	Fees charged for land-based river recreation	201	-1.06		1.925
(C)	Fees charged for floating the river	202	-0.74	DE	2.052
(D)	Permitting river use based on advanced registration	201	-0.68	CEF	1.939
(E)	Restrictions on numbers of hiking groups camped by the river	201	-0.47	CDF	1.980
(F)	Requirements for floaters to pack out human waste	201	-0.40	DEGH	2.148
(G)	Restrictions on the number of horse groups camped by the river	200	-0.21	FH	2.050
(H)	Camping Restrictions at popular areas	201	-0.16	FG	1.948
(I)	Requiring all visitors to register when entering	202	+0.24	J	2.072
(J)	Restrictions on the number of float groups on the river	201	+0.40	IKL	2.062
(K)	Avoiding promotion of the river by the Forest Service	202	+0.68	JL	1.937
(L)	A group size limit of 10 people	201	+0.72	JK	2.199
(M)	Regulations and fines for wilderness ethics violations	202	+1.23		1.850

Table 4.9 – Overall Support for Management Actions

*Mean support for these actions were not significantly different at the p≤0.05 level using paired sample t-tests.

Overall, there seems to be some consistency in how visitors view the impact that different types of groups have on their experience and how willing they are to support management actions that restrict those groups. For example, large groups were rated as having a relatively high ability to negatively affect experience (-1.50 mean effect for encounters in general) and respondents were also somewhat willing to support a group size limit of 10 people (+0.72 mean support). Also, performance scores were significantly higher and importance scores were significantly lower for encounters with land-based groups than they were for encounters with floaters. Not surprisingly, there was significantly more support for restrictions on the number of float groups on the South Fork than there was for restrictions on horse or backpacking groups. Similarly, there was significantly less support for fees charged for land-based recreation than there was for fees charged for floating the river. Furthermore, there doesn't appear to be too much of a group type-related bias going on with these latter two results. Based on the three user type classifications, there were not significant differences in the mean support

for fees for floating the river or limits on float groups (p=.302 and p=.417, respectively, using one-way ANOVA).

4.5 – Research Objective 4 - Variation in Evaluation of Setting Attributes

In order to address research objective number 4 and the average camper syndrome (Borrie and Birzell 2001), the evaluations of setting attributes were broken down by visitor characteristics. First, the mean setting attribute importance and performance scores for the three values cluster groups were tested for significant differences using one-way ANOVAs. As expected, there was very little significant variation in performance scores based on value-orientations as conceptually this should depend more on actual conditions than values. However, the F test statistic was significant at a p=.05 level for 6 of the 11 setting attributes importance scores (see Table 4.10 in the Appendix). These attributes were the six with the highest overall importance scores, suggesting that the degree of agreement on importance depended on how important or significant the attribute was overall. There was more agreement on the less important attributes. For the more important setting attributes, a few distinct patterns in importance scores emerged. The *use-oriented* visitors generally viewed most attributes as less important than the other two groups. However, this distinction was not so clear with the behavior related setting attributes. For these three variables, importance scores for the *use-oriented* visitors and *river enthusiasts* tended to be similar and lower than the *Bob Marshall enthusiasts*. Meanwhile, for the encounters/density related attributes, importance scores for the *river enthusiasts* and *Bob Marshall enthusiasts* were similar and higher than the *use-oriented* group. Interesting to note was that the river enthusiasts rated the importance of fishing encounters higher than the other two groups (although not at a statistically significant level from the Bob Marshall enthusiasts), which is conceptually consistent with the values that are most important to this group. Figures 4.11 and 4.12 give a graphical representation of how these setting attribute mean importance scores vary based on value orientations.

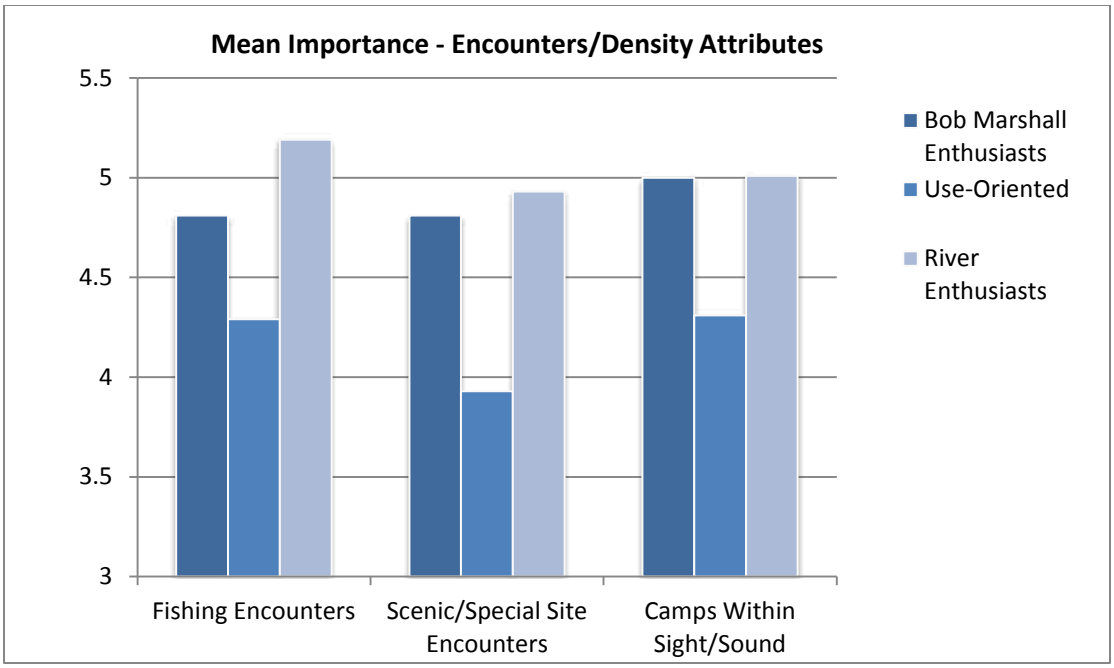

Figure 4.11 – Variation in Setting Attribute Importance Based on Values – Encounters/Density

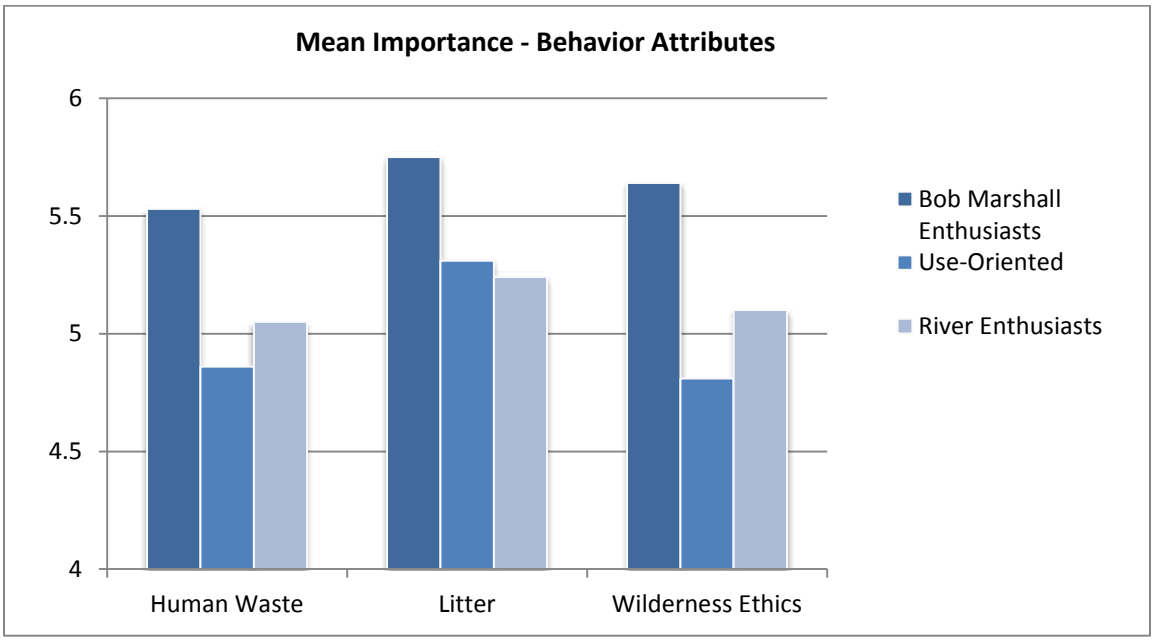

Figure 4.12 – Variation in Setting Attribute Importance Based on Values – Behavior Attributes

To generalize the results of the variation in importance scores based on value-orientations, we could say that the *river enthusiasts* care more about encounter related setting attributes, particularly fishing. This is conceptually consistent with their low rating of the values in the *recreational use* factor

as those access-related values are less important to this group, whereas they care more about the competition related attributes associated with the river. They also care relatively less about the behavior related attributes, which is conceptually consistent with their lower rating on the wilderness factor as it emphasizes the South Fork as a place where the imprint of man is substantially unnoticeable. The *Bob Marshall enthusiasts* care highly about all six of these highly significant setting attributes and the *use-oriented* visitors care a little bit less. If management were to prioritize indicators selection based on shared values, it would make sense that the views of the *Bob Marshall enthusiasts* would be held in higher regard as they view the protected area values associated with the South Fork as highly important. However, because they viewed all 6 of these attributes as highly important, this doesn't provide much useful information in regards to prioritizing these attributes for indicator selection.

Independent Variables

There was also an interest in seeing if there were any patterns in importance and performance scores based on the other independent variables. After running ANOVAs for the three demographic and use variables we found there to be some variation, particularly in performance scores. The only attribute in which importance evaluations varied significantly was the researcher encounter setting attribute. Backpackers and non-residents perceived that contact and participation with research would have less impact on their experience. Within the *level of independence* variable, there was significant variation in performance scores for 6 of the 11 setting attributes. The trend for this variation was that the partially outfitted visitors perceived conditions to be much better than both the fully outfitted and DIY visitors (See Figure 4.13). There was less variation in setting attribute performance based on *residency* as only 4 setting attributes had significant differences in means based on this grouping (See Figure 4.14 in the Appendix). For these 4 attributes non-residents perceived that conditions added more to their experiences.

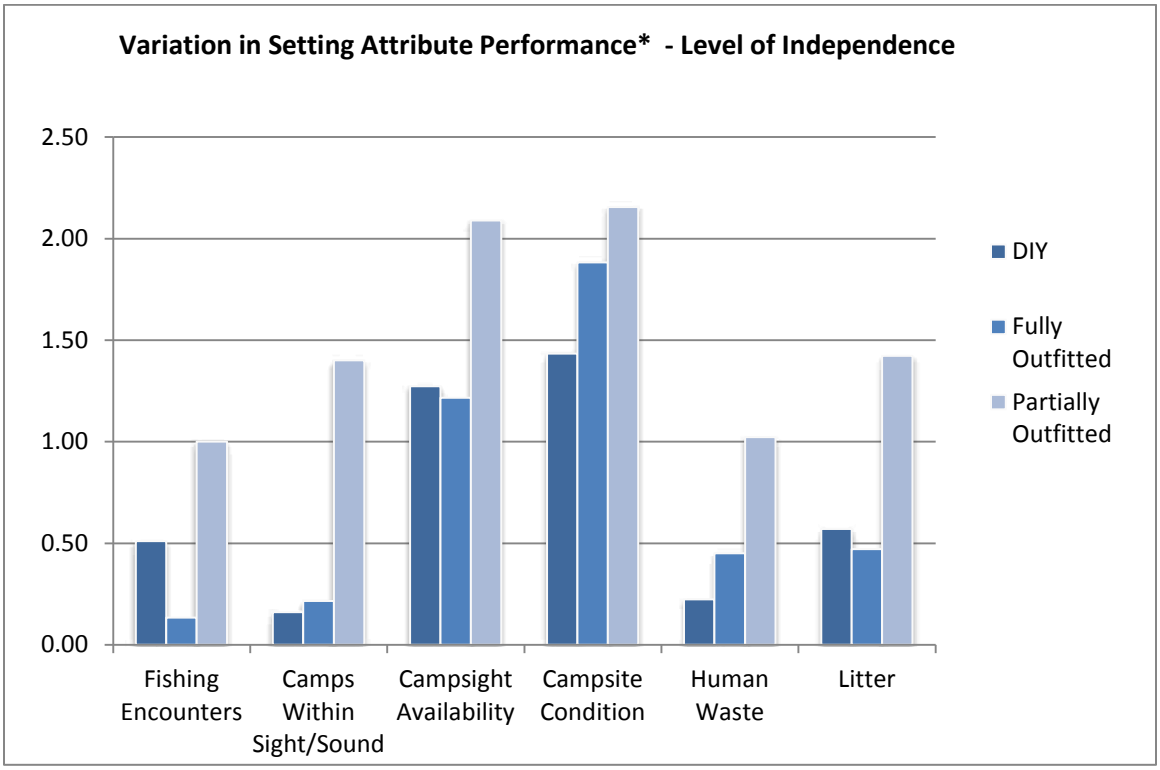

Figure 4.13 – Variation in Setting Attribute Performance – Level of Independence

***** Performance was scored on a scale from -3 (Detracted a lot from) to +3(Added a lot to experience).

The independent variable that had the most influence on how respondents perceived that the conditions of setting attributes influenced their experience (performance) was *travel type*. For 9 of the 11 setting attributes there were significant differences in the performance scores based on travel type (see Figure 4.15 below). Overall, floaters seemed to perceive that conditions influenced their experience in a much more positive way. Stock users rated the performance of attributes lower than the other users and the backpackers tended to rate performance in the middle of the other 2 groups. It is not clear whether the social setting that floaters encountered was more agreeable or if there is something else about this group that makes them evaluate performance higher. It is possible that as floaters these visitors were able to avoid more heavily used areas. However, there is a definite connection between floaters and the partially outfitted group mentioned above as membership in both groups overlaps significantly and both groups perceive conditions to be more favorable.

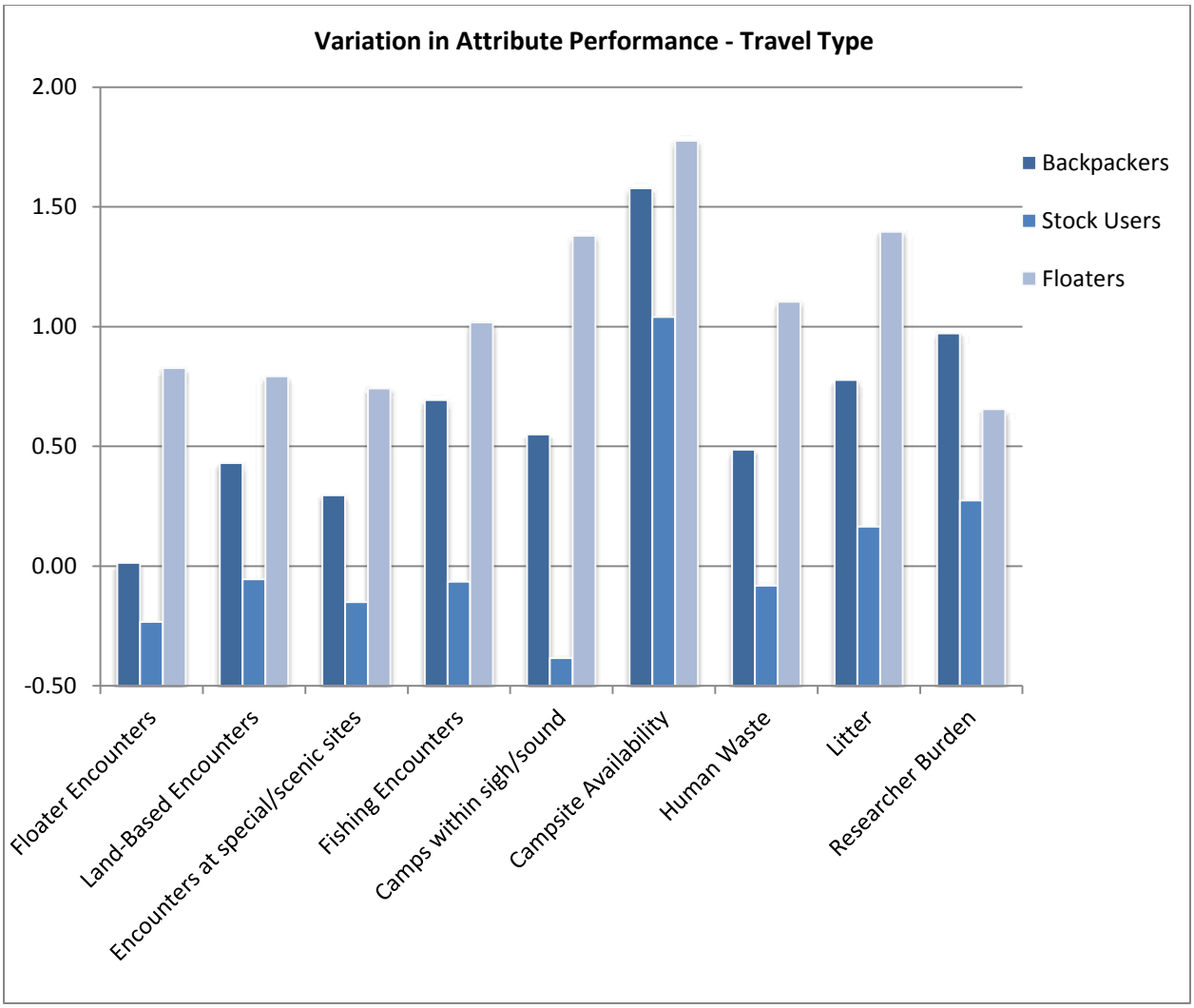

Figure 4.15 - Variation in Attribute Performance – Travel Type

Overall, the wilderness experience variables tended to have little influence on the importance and performance evaluations of setting attributes. Only two performance evaluations differed significantly based on wilderness visitation frequency. These were the number of camps within sight and sound and the level of improperly disposed of human waste (both had p=.012). In both these cases, the visitors with moderate visitation frequency perceived conditions to be significantly superior to those who had low and high visitation frequency. No significant differences were found in mean importance and performance scores based on the level of local wilderness experience. The importance of only one setting attribute varied significantly (p=.042) based on the level of general wilderness experience. In this

case visitors who had a high level of general experience perceived the impact on experience to be higher for encountering groups with poor wilderness ethics. Overall, these results suggest that wilderness experience does not have much influence on how South Fork visitors perceive the conditions of setting attributes would or did affect their experience. This is somewhat surprising as Cole and Hall (2009) found differences based on experience for many of the setting attributes assessed in that study.

4.6 – Research Objectives 5 and 6 - Variation in Support for Management Actions

This section is broken down into a few sub-sections based on what variables are being used to explain variation in support for management actions. The first section looks at variation based on the individual I-P groupings, the second looks at variation based on value orientations, and the third looks at variation based on the other independent variables.

Individual I-P Groupings

In order to address Research Objective Number 5, an individual importance-performance category was created for each case based on whether the respondent rated importance and performance for each variable as high or low. We were interested to see if support for management actions varied significantly based on these combinations as this would provide additional insight into the significance of setting attributes. For example, if a significant percentage of respondents gave the *litter* setting attribute a high importance rating, but a low performance rating, we wanted to see if they were more willing to support management actions to rectify the situation than those respondents with ratings located in the other I-P quadrants. However, this tended to be the case for only a few situations and overall with only two of the less important setting attributes.

After running ANOVAs on mean support for management actions based on attribute I-P groupings, several generalizations can be made. First, differences in mean support for at least one management

action varied significantly for every individual attribute I-P grouping ($p \leq .05$). The actions that had significant variation based on a majority of setting attribute I-P groupings tended to be those that were supported the most overall. These included a group size limit of 10 people, regulations and fines for wilderness ethics violations, and avoiding promotion of the river by the Forest Service.

Overall, support for management actions tended to vary more based on high or low importance for the attribute than on high or low performance (See Figures 4.16 and 4.17 for examples, and the Appendix for additional setting attribute I-P graphs – Figures 4.18 - 4.22). However, performance did seem to have some influence on support in some situations. It tended to influence support more at low importance levels than at high importance levels. Therefore, respondents who viewed both importance and performance for an attribute as low were more willing to support most management actions than those who viewed importance as low and performance as high. As expected, this latter group of respondents was generally the least likely to support any management action.

At high levels of importance, performance tended to have less of an impact on support as respondents in both groups tended to be more supportive of management actions. This seemed to be even more the case with such actions as limiting party size, avoiding promotion of the river, and implementing regulations and fines for wilderness ethics violations. However, there did seem to be more deviation from this general rule for management actions that were more restrictive of access, as performance tended to have more influence on support for these much more restrictive actions.

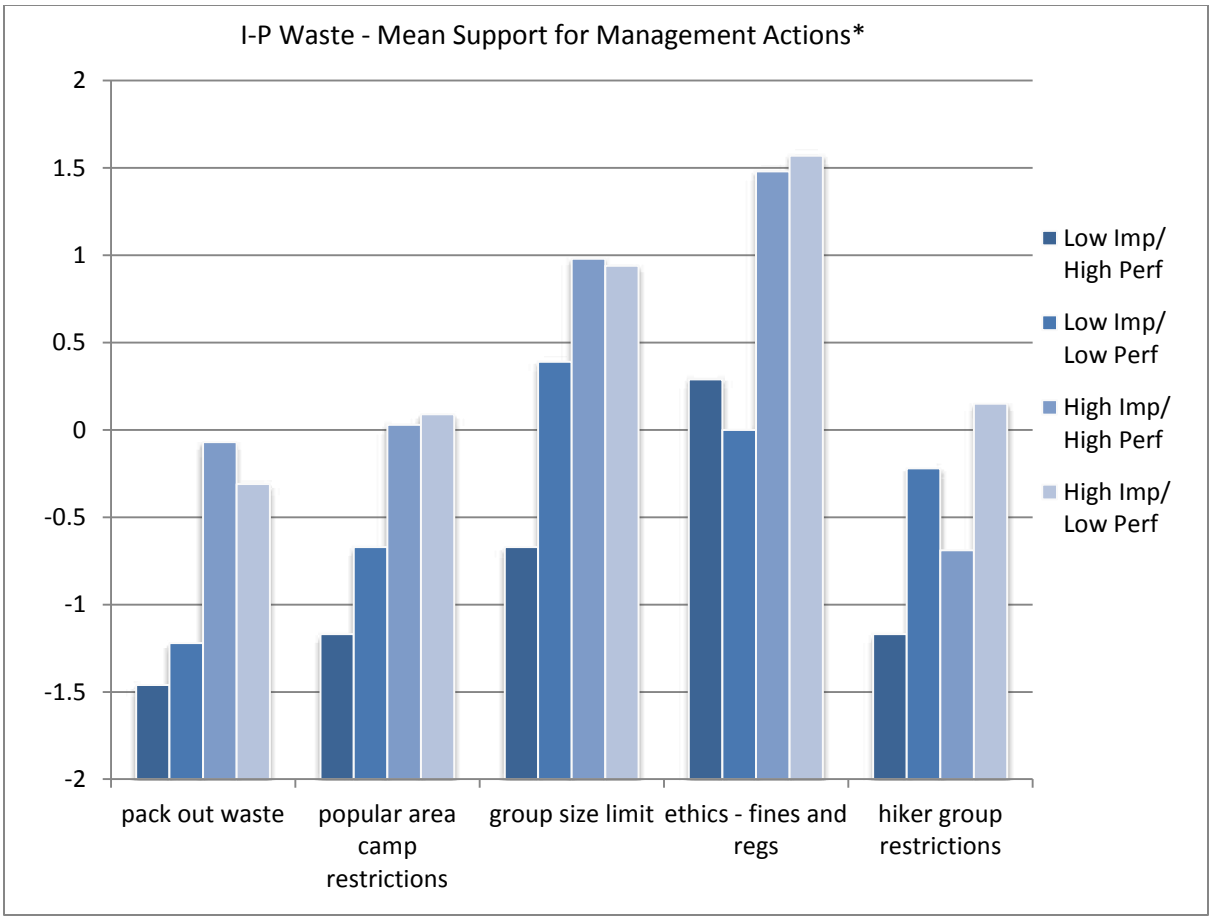

Figure 4.16 – Variation in Support for Management Actions – I-P Waste

*Only includes actions where means were significantly different at p≤.05 using one-way ANOVA.

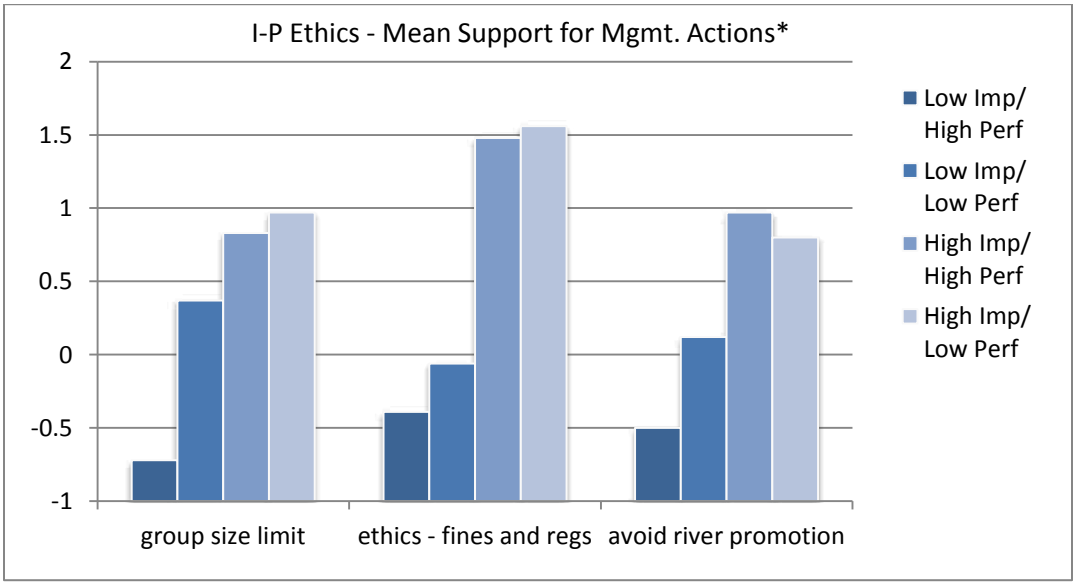

Figure 4.17 – Variation in Support for Management Actions – I-P Ethics

*Only includes actions where means were significantly different at p≤.05 using one-way ANOVA.

Rather surprisingly, performance of two relatively unimportant setting attributes tended to have the most effect on support for management actions (*Campsite Condition* and *Campsite Availability)*(see Figures 4.23 and 4.24 below). These attributes were both firmly located within the "possible overkill" quadrant of the I-P matrix as they had high performance and low importance scores overall. For *campsite availability* respondents in the two low performance categories had a substantially higher support for management actions. With *campsite condition* the respondents who perceived importance to be high and performance to be low (n=48) were substantially more willing to support all nine of the management actions with significant variation based on I-P including restrictions on numbers of hikers, stock-parties, and float parties that can could camp along the river. This suggests that overall these two campsite attributes are not very important, but there are a substantial number of visitors that do think they are important and if they view conditions in these areas as poor, they would be willing to impose actions to remedy the situation.

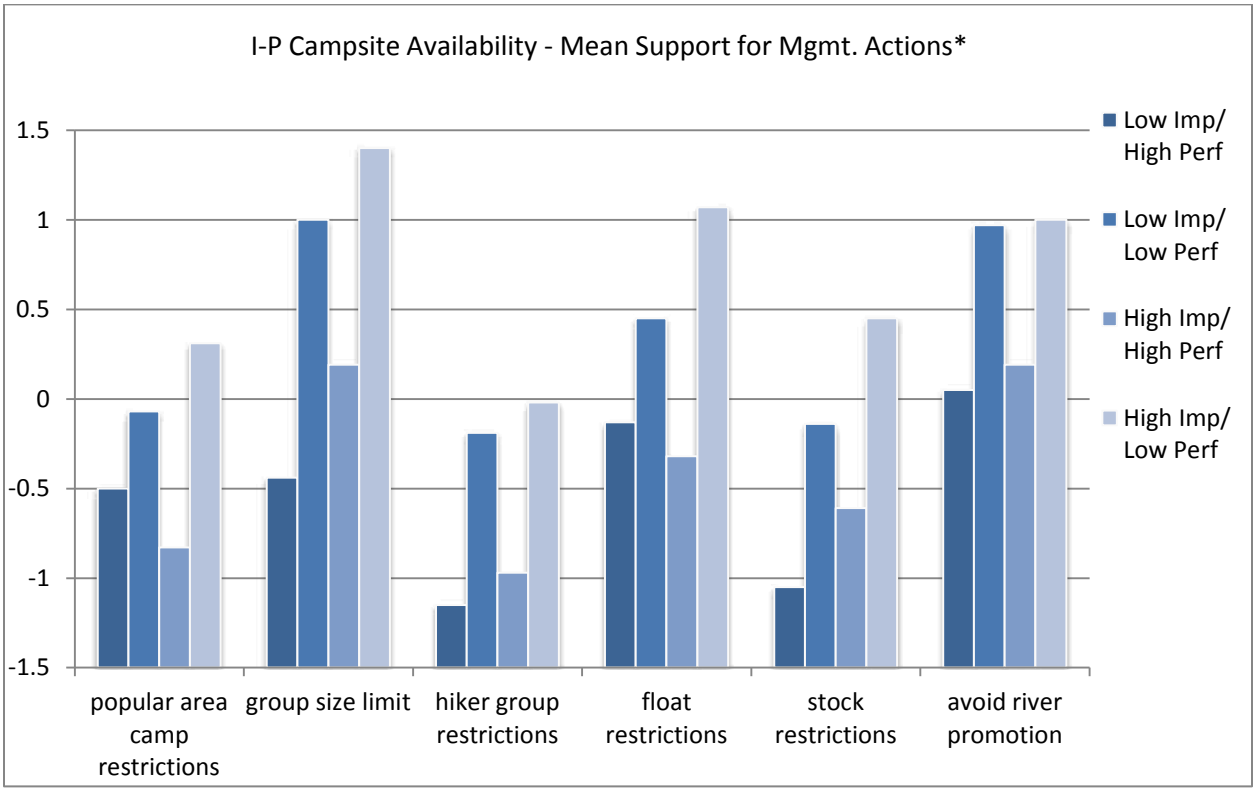

Figure 4.23 – Variation in Support for Management Actions – I-P Campsite Availability

***Only includes actions where means were significantly different at p≤.05 using one-way ANOVA.

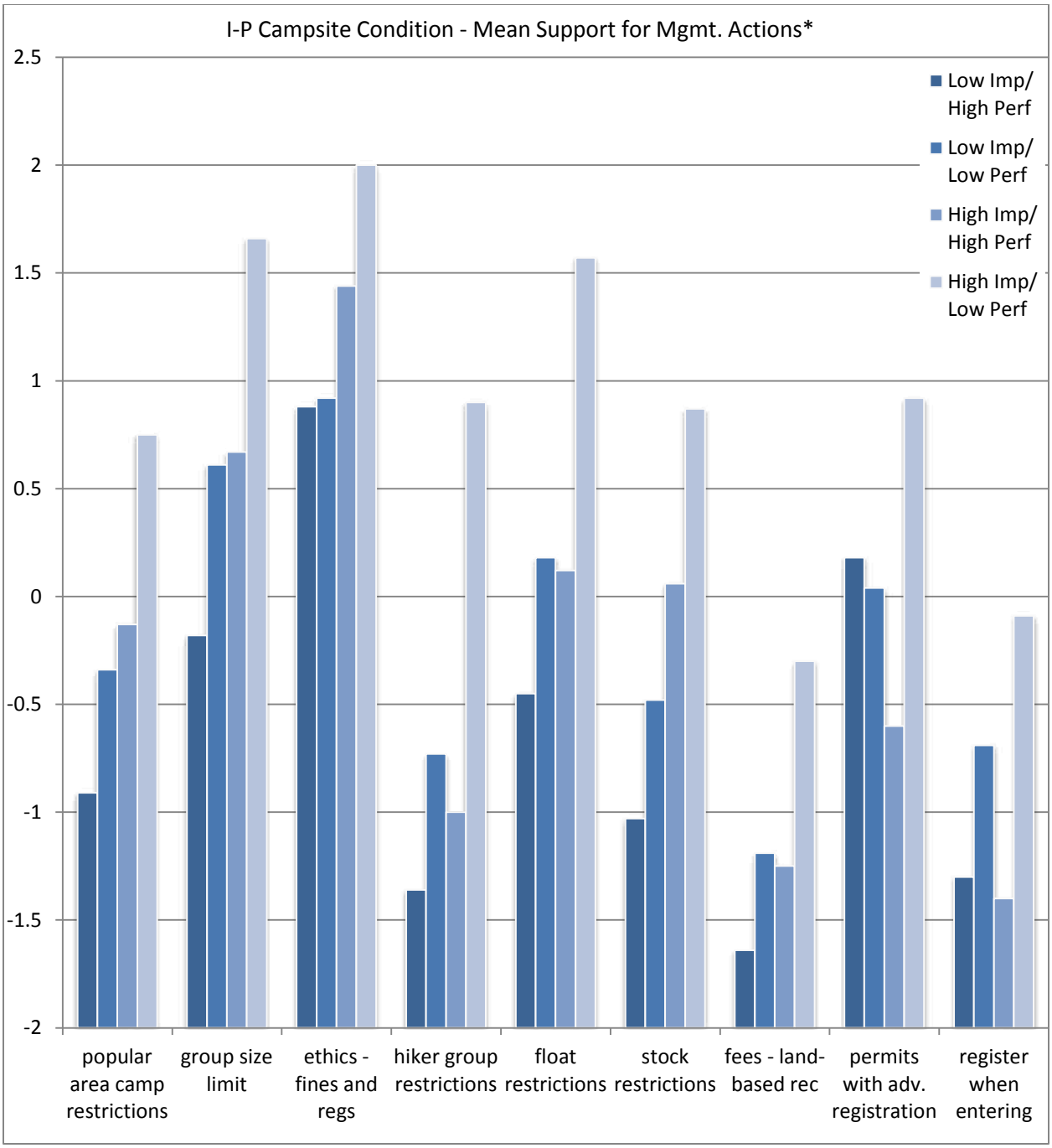

Figure 4.24 – Variation in Support for Management Actions – I-P Campsite Condition
***Only includes actions where means were significantly different at p≤.05 using one-way ANOVA.

To summarize these results, it appears that under the circumstances of this study, the importance of setting attributes has more influence on support for management actions than performance. This is not surprising as South Fork visitors tended to view the conditions of all setting

attributes assessed as favorable overall. However, support for more restrictive actions did tend to depend somewhat on performance, and this was especially apparent with the *campsite condition* and *campsite availability* setting attributes. This suggests that these attributes might deserve a little more attention than had been previously assumed by looking at just the importance and performance scores. However, the results relating to this research objective don't give much in the way of direction for further evaluation of the highly significant setting attributes.

Value Orientations

To further explore how South Fork value-orientations influence other elements of the cognitive hierarchy, ANOVAs were run to see if there was any variation in support for management actions based on cluster membership. See Table 4.11 in the Appendix for a summary of this analysis. For six of the 13 management actions there was significant variation in mean support based on cluster membership (at the P=.05 level). Overall, the *river enthusiasts* were more supportive (or less against) all of these actions and the *use-oriented* visitors were less supportive. However, support from the *Bob Marshall Enthusiasts* seemed to depend on what type of action it was. For two of the actions they had about the same level of support as the river enthusiasts. These were the two actions that weren't as directly related to restricting use, a group size limit of 10 and fines and regulations for wilderness violations. However, for the other actions the Bob Marshall enthusiasts were just as against the action as the use-oriented visitors. Figure 4.25 below shows a graphical display of these results.

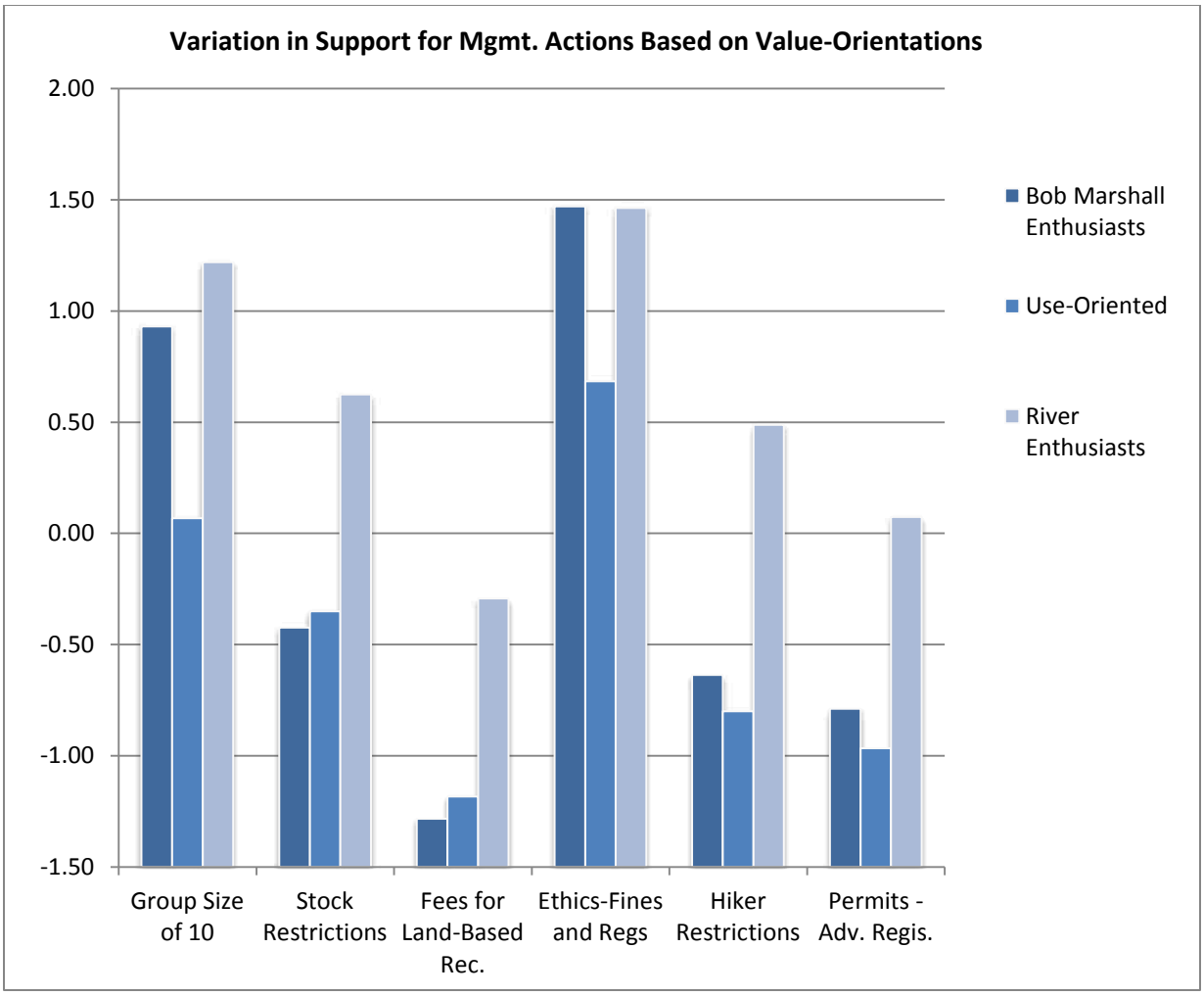

Figure 4.25 – Variation in Support for Management Actions – Value-Orientations
***Only includes actions where means were significantly different at p≤.05 using one-way ANOVA.

Independent Variables

Lastly, variation in support for management actions was explored based on the independent variables. Overall, *residency*, *level of independence,* and *local experience* tended to explain the most variation in support for management actions (See Tables 4.12 – 4.14 in the appendix). Means for support of 11 of the 13 management actions were significantly different based on residency and level of independence, and 8 were different based on local experience levels. Montana residents, DIY and partially outfitted visitors, and visitors with high levels of local experience tended to have much less

support for most of the management actions (See Figures 4.26 - 4.28 below). It is not surprising that visitors with these three characteristics tended to view management actions in a similar fashion as these three characteristics are highly correlated as evidenced by the Chi-square analysis mentioned in Section 4.1. Also as expected, the fully outfitted group consisted of a higher percentage of non-residents, with lower levels of local experience, and visitors with these characteristics tended to be more supportive of most management actions. The only actions where support didn't significantly vary between these groups was with a group size limit of 10 people and avoiding promotion of the river by the Forest Service as there was relatively equal positive support for these less restrictive actions.

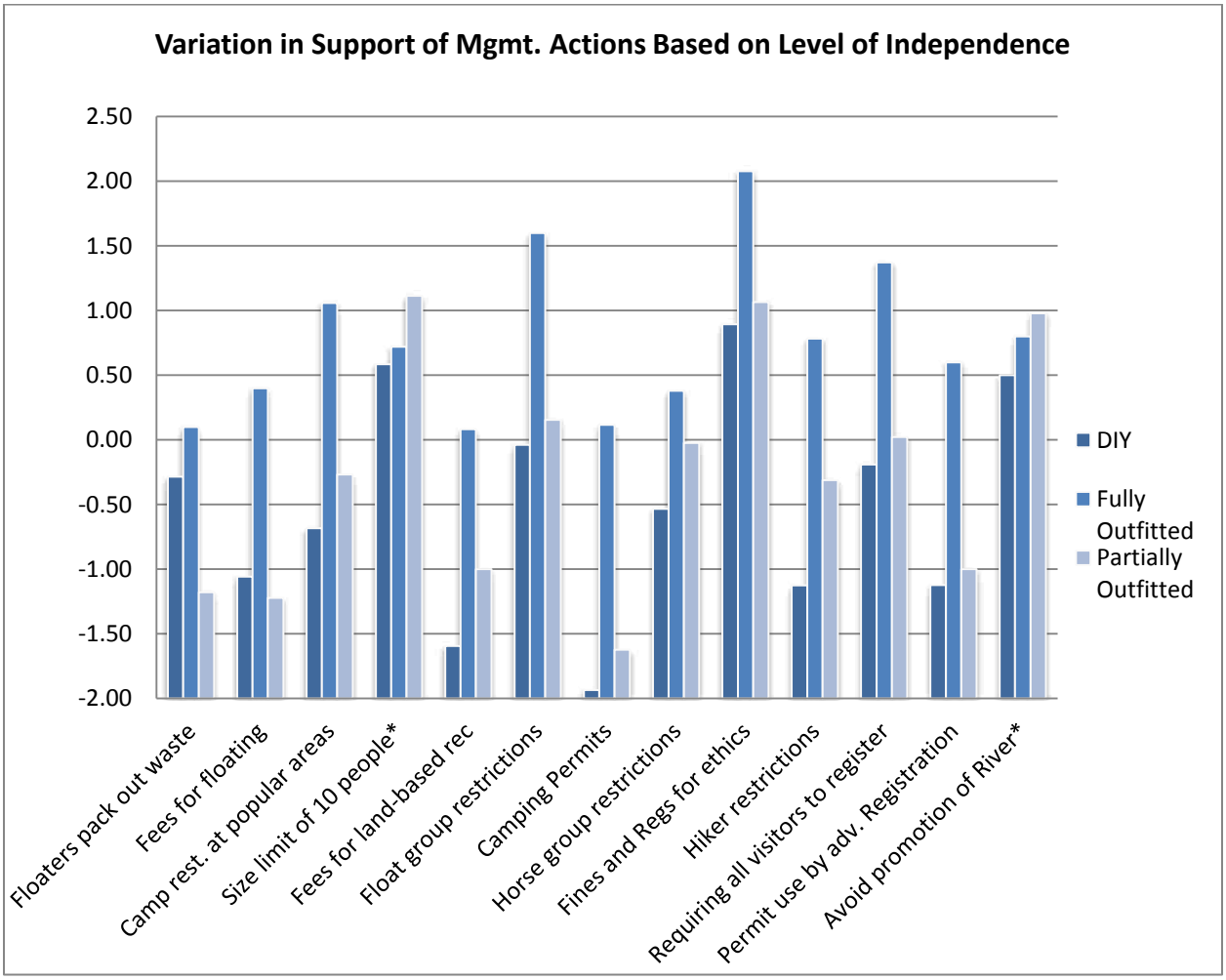

Figure 4.26 – Variation in Support for Management Actions – Level of Independence
*Differences in means for these actions are not significant at p≤.05 using one-way ANOVA

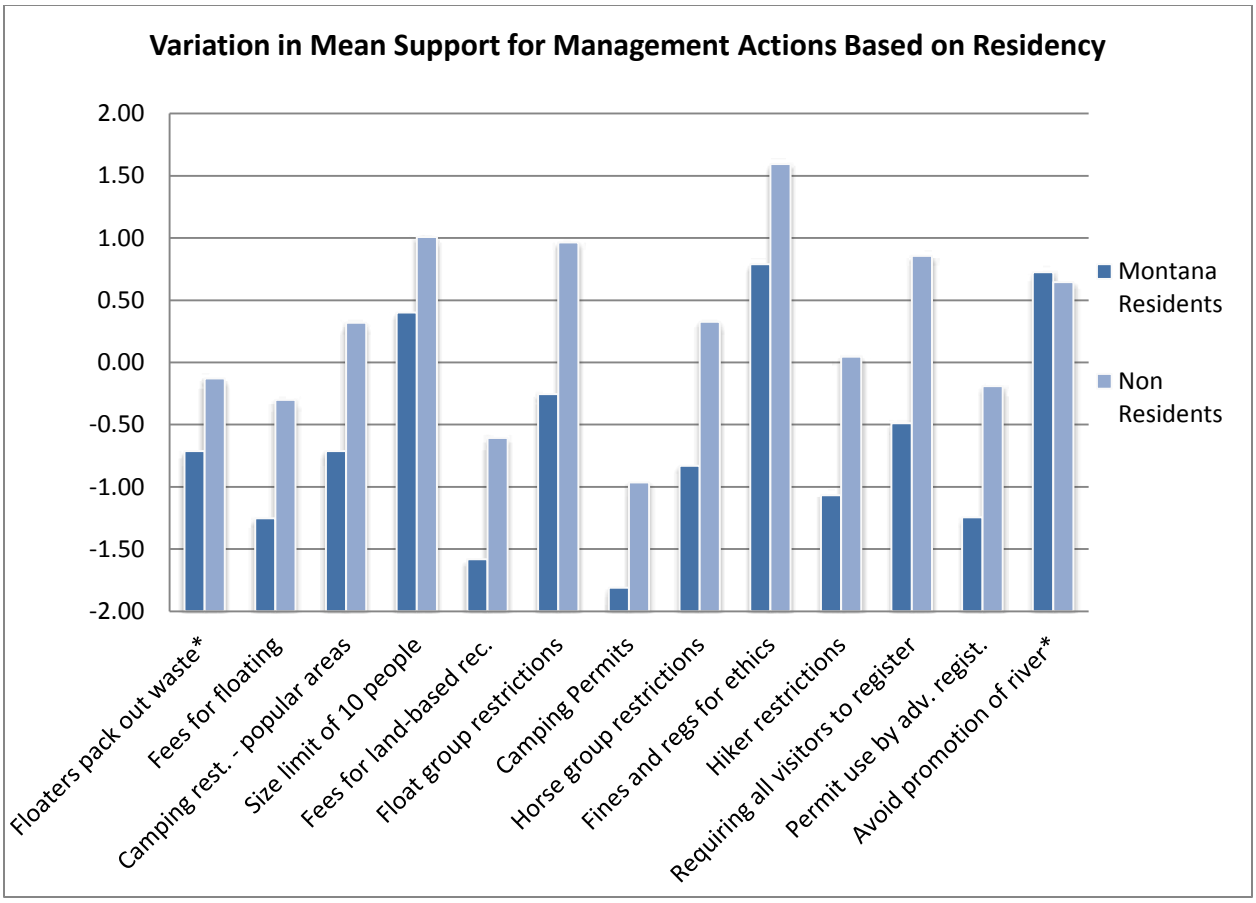

Figure 4.27 – Variation in Support for Management Actions - Residency

*Differences in means for these actions are not significant at p≤.05 using one-way ANOVA

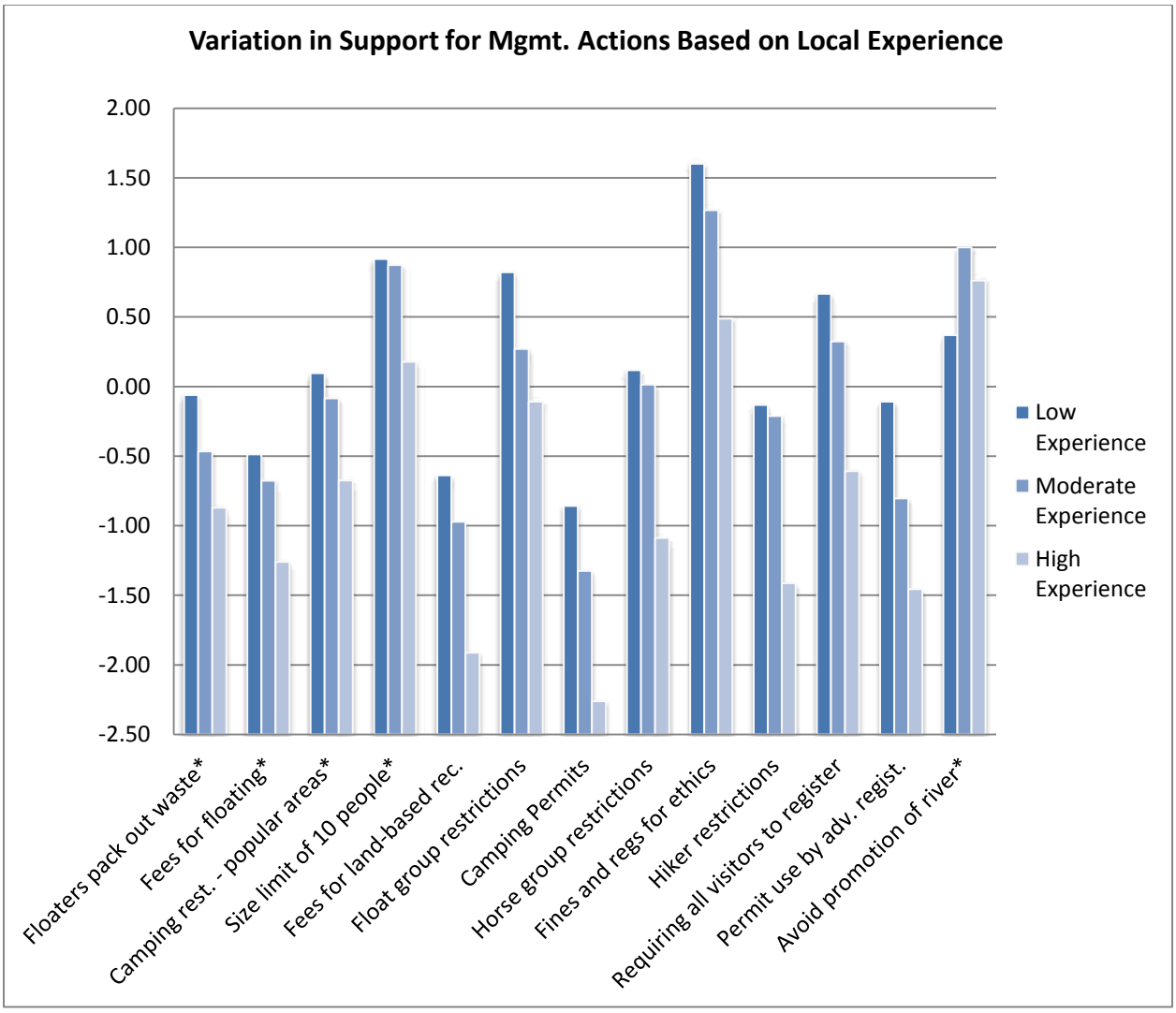

Figure 4.28 – Variation in Support for Management Actions – Local Wilderness Experience
*Differences in means for these actions are not significant at p≤.05 using one-way ANOVA

There was less variation in support for management actions based on travel type and the other two wilderness experience domains, general experience and visitation frequency. However, those with moderate and high levels of visitation frequency were significantly less willing to support restrictions on the number of hiking groups camped along the river and permits for camping in a designated area. Within the travel type groups, means for support of management actions varied for 4 of those actions. There appeared to be a group type-related bias with these varying levels of support as stock users were significantly less supportive of restrictions on the number of horse groups on the river and a party size

limit of 10. Similarly, floaters were much more against a regulation for floaters to pack out human waste (See Table 4.15 for a summary of these results and Figure 4.29 for a visual representation below). However, because there was such a difference in support for management actions between DIY visitors and fully-outfitted visitors, we also broke down the stock-user category based on this distinction. This was also done for conceptual reasons because fully-outfitted clients on horse-packing trips seem like a totally different crowd than those DIY stock users. This distinction certainly manifested itself in the support for management action between these two groups as DIY stock-users were significantly less supportive of all 13 of the management actions in this study (the majority at the p<.001 level). See Figure 4.30 and Table 4.16 in the Appendix for these results.

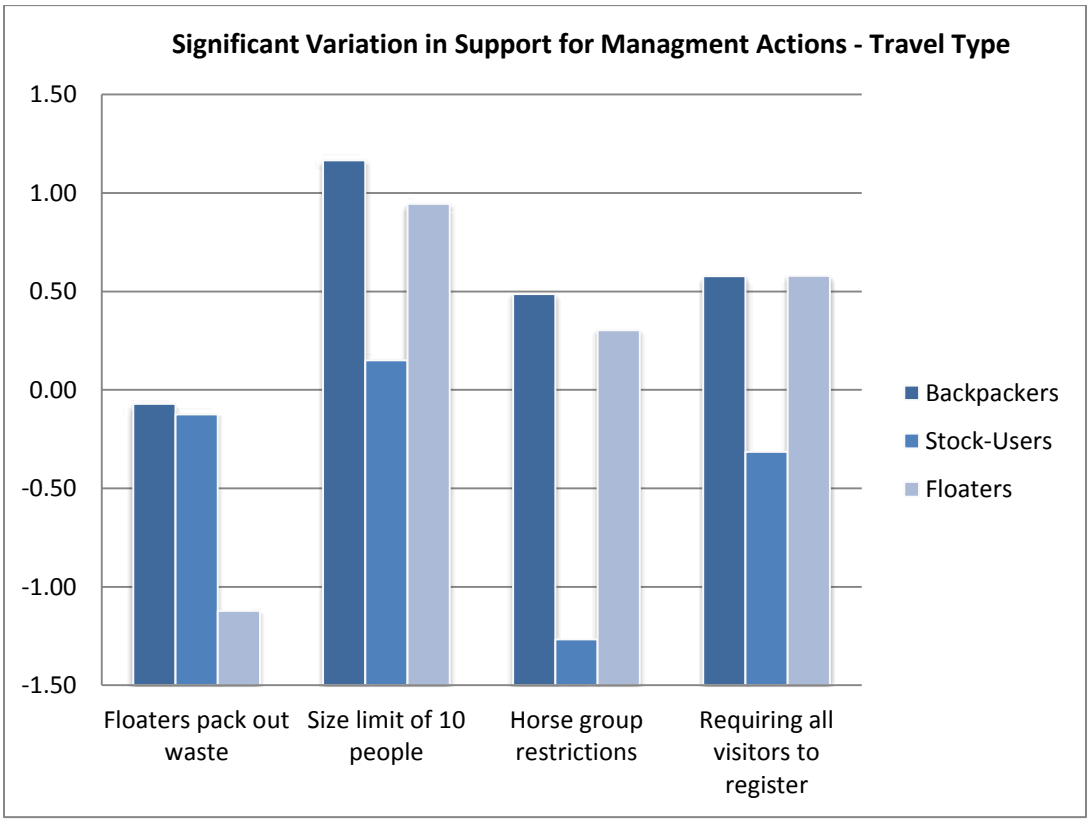

Figure 4.29 – Variation in Support for Management Actions – Travel Type

5.0 – Summary and Discussion

The previous chapters have laid out the problem statement and research objectives for this study. The introduction familiarized the reader with the upper South Fork of the Flathead River, and the need to evaluate social setting attributes in an effort to develop indicators to better manage the experiences within this resource. The literature review familiarized the reader with prior research related to selecting indicators under the LAC framework, research on crowding, and the usefulness of values for segmenting the population of interest. The methods section demonstrated how the cognitive hierarchy would be used as a framework to first evaluate the significance of setting attributes and then qualify those evaluations based on values and behavioral intention. Finally, the results section demonstrated how the elements of the cognitive hierarchy were related and how those elements varied based on demographics and descriptive use information. The following section (summary) will attempt to synthesize these results into several important themes relevant to indicator selection and management of the social setting on the upper South Fork. The next section discusses the limitations of this study and the effect they might have had on our results. The third section directly addresses the problem statement as it uses these results to recommend and discuss indicators that could be adopted to monitor the social setting on the upper South Fork. The fourth section continues this discussion by recommending further study that could that further develop these indicators and help the Flathead National Forest further develop its monitoring program and management plan. The last two sections discuss contributions of the study to the wilderness recreation field. The first discusses the key issues involved with the sampling plan used in this study and the second discusses the value of the new values scale developed in this study.

5.1 - Summary

Factors That Influence Perceptions of Crowding also Influence Evaluations of Social Setting Attributes

As expected, the attributes related to the location of encounters were perceived to have a significantly greater ability to affect experience (importance) than overall encounters. This directly addresses Research Objective Number 2 as we were interested to see if the attributes used for current encounter indicators on the South Fork were as important to visitors as other more specific attributes. This was not the case as "camps within sight and sound," "encounters while fishing," and "encounters at scenic or special river locations" were perceived to have a greater ability to influence experience than general encounters with float groups or land-based groups. This suggests these current indicators may not be as significant or relevant to wilderness and wild river experience as they could be, and perhaps the more specific attributes would make more effective indicators.

There was also significant variation in the perceived influence of encounters on experience (importance) based on the other three aspects (characteristics of those encountered) of crowding in which in the social setting attributes were segmented (group size, group type, and behavior). Overall, South Fork visitors perceived that attributes related to the behavior of others have a higher potential to influence their experience than attributes related to the number of encounters. For group type, visitors perceived that encounters with float groups had a greater ability to influence their experience than encounters with land-based visitors. Asked in a general sense, visitors viewed encounters with backpackers to be the most favorable. This was followed by stock groups, commercial groups, and large groups in descending order according to their perceived ability to negatively influence experience. The above-mentioned factors' influence on the perception of how actual conditions influenced experience (performance) was less clear. Because some of the least important attributes (general encounters) had

lower performance scores and vice-versa (wilderness ethics), it appears that performance was more dependent on actual conditions than personal characteristics and location of encounters.

The last factor that influences normative definitions of crowding that was accounted for in this study was the personal characteristics of the respondents. This factor will be addressed in the next section.

Evaluations of Setting Attributes – Visitor Characteristics

Although it wouldn't be practical to develop an indicator based on personal characteristics, this was a very useful avenue to explore in order to segment the population and avoid the "average camper" syndrome (Research Objective Number 4). The personal characteristics looked at in this study were value-orientations, residency, level of independence, and 3 domains of wilderness experience. Variation in evaluations of setting attributes was mixed based on these characteristics. South Fork value-orientations tended to explain more of the variation in the importance of setting attributes than the demographic and use related variable. Visitors classified as *use-oriented* perceived that the 6 most significant setting attributes had the potential to influence their experience much less than the *Bob Marshall enthusiasts*. The *river enthusiasts* perceived that three encounter/user density related attributes had a similar ability to influence their experiences as the *Bob Marshall enthusiasts,* but the behavior-related attributes had a lower ability to influence their experiences, similar to *use-oriented* visitors.

Setting attribute performance didn't vary too much based on personal characteristics, particularly with regard to value-orientations. However, two groups that are highly dependent, floaters and partially outfitted visitors did tend to view the conditions of most setting attributes as better than other visitors. This may be somewhat a result of the actual conditions being superior that these drop-floaters experienced, as perhaps they could easily avoid the more crowded areas that can be accessed

from trails. However, this is just speculation as it is possible that these visitors are more inclined to think conditions are better based on some characteristic not measured in this study.

Overall, this segmentation based on personal characteristics does provide some useful information for managers, but it is not necessarily too relevant for indicator selection. It suggests that the importance of setting attributes doesn't depend too much on demographics or use-related variables, it depends more on values. Those visitors who value the South Fork for recreational access and resource specific attributes also view the encounter and behavior related attributes as highly important. Also, setting attribute performance might be more dependent on conditions experienced or some other factor that was not looked at in this study.

General Conclusions – Support for Management Actions

Overall, the independent variables assessed in this study explained more variation in support for management actions than they did for values or evaluations of setting attributes. Some general trends were that DIY visitors, especially DIY stock groups, Montana residents, and those with high levels of previous visitation to the Bob Marshall Wilderness were much less willing to support many management actions, particularly those that restricted access. There was fairly broad agreement that less restrictive management actions were acceptable regardless of how respondents were segmented by personal characteristics. These actions included a group size limit of 10 people, fines and regulations for wilderness ethics violations, and avoiding promotion of the river by the Forest Service.

It was hoped that we would be able to better describe who the people were that had different value orientations (cluster memberships) in order to make generalizations about what users care about what values. However, South Fork users' value orientations did not differ significantly based on any of the demographic, use, or wilderness experience variables that were measured. This suggests that how South Fork users value the resource does not depend on any of the demographic and use characteristics

that we analyzed. The sample size limitation mentioned below might have had some impact in this regard. However, it is probable that other demographic, motivational, or experience related characteristics that were not analyzed in this study may explain some of these differences in values. One prospective avenue to explore would be to look at the motivations for recreating. For example, it appears that fishing is important to a majority of users on the South Fork. If the primary motivation for visiting is fishing, perhaps these visitors would be more likely to fall into the *use-oriented* or *river enthusiast* group.

Regardless of being able to describe membership in value-orientation groups in more specific terms, some conclusions can be made about these visitors based on their evaluations of setting attributes and support for management actions. First, the use-oriented visitors seem to value the South Fork more for recreation and less for the specific protected area values of the resource. This is manifested through their view of social setting attributes as less important than other users, and also in their lack of support for any management actions that may help protect the wilderness and wild river qualities of the resource. In analyzing the "comments" sections of the survey, the following quote (from a respondent in use-oriented visitor who strongly disagreed with all management actions) may be representative of the values and attitudes associated with these visitors:

> [The] Forest Service needs to manage the resources rather than the people…If I want a regulated experience with government employees in my face, I will go to Glacier Park or the Rocky Mountain Front, or Yellowstone. It is nice the way it is right now. (Survey Respondent 015)

The river enthusiasts on the other hand value the South Fork for its wild river qualities and a fish and wildlife resource. They care more about competition related attributes and they care less about appropriate behavior than the Bob Marshall enthusiasts. They also care much less about having recreational access, as is demonstrated by their much higher support for management actions. The following comment invokes the sentiments of one of these respondents:

> Amazing river, so crystal clear! [Please] try to keep it this way so when we come back it is just as beautiful and really good fishing too! (Survey Respondent 088)

The Bob Marshall Enthusiasts differed from the river enthusiasts as they seem to value everything resource specific about the South Fork, including as a place recreational use and enjoyment. The following comment represents the views of one of these Bob Marshall enthusiasts:

> Going into "the Bob" is like going to church. Sure, people vandalize churches, but that doesn't mean we should post armed guards, require sign in, sign out and charge admission. It is more reasonable to focus on education and personal responsibility…excess usage is not the greatest threat to wilderness: lack of use, understanding, and appreciation threaten the constituency of support that is rapidly aging. (Survey Respondent 205)

It is not surprising that these visitors view most setting attributes as highly important and that they are willing to support management actions that would protect the resource but not restrict access. Lastly, the combination of importance and performance for individual respondent cases did explain a fair amount of variation in management actions as well. Particularly relevant to the evaluation of setting attributes for indicator selection was that the visitors who perceived performance to be low and importance to be high for *campsite condition* were significantly more like to support restrictive management actions.

5.2 - Limitations

At this point several limitations of this study should be mentioned that may have influenced the results. The first limitation relates to a sample size that was smaller than expected. Several factors may have influenced this including a larger percentage of visitors who were ineligible to fill out the survey than expected, a smaller number of fall visitors than expected, the inability to contact a few groups, and environmental factors that could have limited use. As mentioned in the results, over 400 people had the

potential to be sampled as a result of the sampling plan. Contact was made with 360 of these people, but only 250 were eligible to fill out the survey due to being under 18 years of age or someone whose purpose for visiting was not recreation. The environmental conditions of the past season that could have influenced response rate by restricting use included sustained high water, snow-covered passes, and two mid-August fires. Although the amount of visitors that these events turned away is unclear, we do know that at least a few outfitted trips were cancelled.

Overall, a larger sample size would have allowed for smaller standard error associated with the means that we assessed using ANOVAs. Therefore, this could have lead to the discovery of more statistically significant differences with the result mentioned above. For example, it might have been found that the means of more setting attribute importance scores varied significantly based on independent variables such value-orientations and wilderness experience. We might also have been able to find significant differences in means of multiple comparisons within the categories of some of these variables. Basically, the statistical power associated with the data analysis of this project would have been improved. However, we still have confidence that our sample size of 207 respondents was large enough to address the research objectives of this study as several statistically significant results related to the research objectives were uncovered. Therefore, the conclusions made from these results are well justified.

Another limitation related to the environmental factors is that the data might not be representative of the target population on a normal year. Mentioned above, several outfitted and partially outfitted trips were cancelled due to high water and snow-covered passes early in the season. Therefore, the percentages of floaters and the two outfitted groups might be higher on a normal year. These environmental factors also seemed to influence temporal and spatial use distribution. Spatially, 60% of river-users started and 75% ended their trips from Meadow Creek, which we would expect to be lower in years where visitors could get over the passes sooner. Temporally, river used seemed to be

concentrated in a small window this past season. For example, 82 of the 207 respondents (40%) were contacted in the one sampling period from early to mid-August. 158 (76.4%) were contacted in the three sampling periods that spanned from mid-July to the end of August. Anecdotal evidence supports this trend as well as several respondents mentioned monitoring USGS water levels on the South Fork in order to decide when to visit.

Lastly, another limitation related to the representative nature of the data was that this study only surveyed overnight users. Therefore, the data might be representative of South Fork users as they were defined in this study (visitors who camp in the river corridor), but it does ignore a segment of all South Fork users: day users. Overall, this segment is probably fairly small due to the barriers to access mentioned in the methods section; however, these visitors might have entirely different values and attitudes towards conditions of setting attributes, and therefore, they should be targeted in subsequent research.

5.3 - Management Implications – Indicator Selection

If the managers of the upper South Fork of the Flathead River are interested in developing new indicators to monitor impediments to a quality experience within the social setting of the river, what should they chose to monitor? The results mentioned above give us a substantial amount of information on which to evaluate social setting attributes for selection as these indicators to monitor. However, there has been some confusion as to how many indicators should be selected within an LAC monitoring framework (Roggenbuck et al. 1983). Stankey et al. (1985) suggest that indicators should represent a few important resource and social conditions or dimensions of wilderness. The literature review identified three aspects or dimensions of encounters that have been shown to influence crowding and encounters norms (behavior of others, characteristics of others, and location of encounters). Through this research we have demonstrated that setting attribute importance (perceived

sensitivity of experience to changes in attribute conditions) also varies significantly based on these dimensions. It would make sense to develop a social setting indicator from one of the attributes that has the most influence on experience from within each of these dimensions. However, it would be difficult to select an indicator from the "characteristics of others" dimension without favoring one user type over another. We did find that South Fork visitors were less tolerant of large groups and that there was overall support for a group size limit of 10 people, so if management wanted to monitor an indicator based on group characteristics, this would be the most significant characteristic to monitor.

The *behavior* of others and *location* of encounters dimensions hold more promise for indicator selection. These dimensions are rather similar to the three dimensions Dawson (2004) suggests could be monitored in relation to solitude: 1) presence of others, 2) separation from sights and sounds originating outside wilderness and infrastructure within wilderness, and 3) disruption, conflict, or negative behaviors of others that reduce solitude. The second dimension isn't really relevant to the social setting on the South Fork as it is so remote and the infrastructure is more related to the managerial setting. However, the first and third dimensions are very similar to the two setting attribute importance factors that were found in this study. Therefore, choosing one indicator from each of these dimensions would probably be adequate for monitoring the social setting on the South Fork.

When selecting setting attributes for indicator selection, *significance* may be the most important quality to consider (Manning 2010). Within the *encounters/user density* importance factor, we have established that the three more specific encounter attributes are more significant than the overall encounter measures. Of these three highly significant attributes, *camps within sight and sound* was the only attribute firmly within the "concentrate here" I-P quadrant. It also loads highly on the *encounters/user density* setting attribute importance factor. Thus on first glance, this attribute seems like it would be a good candidate for monitoring as an indicator.

However, there are several other criteria by which setting attributes should be evaluated for selection as indicators. Landres (2004) suggests that aside from relevance to the wilderness quality two of the most important qualities of indicators are usefulness to local wilderness managers and feasibility of being collected with little or no extra cost as part of an existing monitoring program. Particularly relevant to the South Fork is the ability of an indicator to be worked into an existing program. Resources available to help with indicator monitoring include river rangers, trail crew members, and a few permanent rangers. The river rangers would be particularly important to any monitoring program as they complete regular patrol trips through the entire river management unit. Considering these available resources, *camps within sight or sound* might be the easiest, most cost-effective attribute to monitor. Encounters while fishing and at scenic or special river locations may be too difficult to simulate for monitoring efforts during a normal work day. However, the number of camps within sight or sound could be easily checked at popular camping areas, especially at the cabins and work center along the river corridor (Black Bear, Salmon Forks, and Big Prairie), as the river rangers and trail crew frequently stay at these places. These are also places that get a very high number of groups camped nearby. Monitoring this attribute in other popular camping areas would take a little more resources and planning as the river rangers or other employees would have to camp out or leave very early in the morning in order to check these areas. Some of these other popular spots would be at the mouth of Little Salmon Creek, the mouth of the White River, Ciraco Flats, and Hodag Flats.

Another great advantage of monitoring *camps within sight and sound* as an indicator is that it appears to have another important quality of a good indicator: efficiency. This relates to its ability to reflect the condition of more than just itself, which can serve to reduce the number of indicators that need to be monitored (Watson et al. 2007). Conceptually this might be the case as it would stand to reason that if there were several groups camped nearby in popular camping areas, then there would probably also be a high level of overall encounters, encounters while fishing, and encounters at scenic or

special river locations. One attribute we have not yet mentioned, campsite availability, might also probably be encompassed by this attribute as there might be a greater chance that some visitors would have to travel farther down the river or trail to find and unoccupied campsite.

Based on this discussion, *camps within sight and sound* is recommended as an indicator to monitor impediments to quality wilderness and wild river experience within the social setting of the upper South Fork. It is highly significant, loads well on the *encounters/user density* factor, is located within the "concentrate here" I-P quadrant, and has several other qualities of good indicators including reliability, cost-effectiveness, and efficiency.

Within the *behavior* importance factor there were three attributes that could potentially monitor impediments to quality experience within the social setting of the South Fork (*Litter, Human Waste, and Wilderness Ethics*). Overall, these were the three most significant attributes that we assessed, suggesting that conditions within this dimension have the greatest potential to influence experience. All three variable also loaded fairly high on the on this importance factor. Only one of these, *human waste*, was located within the "concentrate here" I/P quadrant. Another, *litter*, is supposed to be monitored through the existing management plan. However, both *litte*r and human *waste* may lack the efficiency quality of good indicators; they may not reflect the conditions in more than just themselves. They also might not be easily monitored without a significant increase in staff or resources (cost-effective).

The other attribute in this factor, adherence to *wilderness ethics*, might be logistically easier to monitor. It also seems to encapsulate both these other attributes, so perhaps it would provide a better basis for indicator development. However, as an attribute measured for importance and performance in this study, what it actually constitutes is rather vague. One option to monitor this attribute would be to set a standard related to enforcement of wilderness violations related to resource damage. For example, Dawson (2004) suggests one of the indicators to measure a similar social setting dimension

could be “number of enforcement citations issued per year within an area” (pg. 13). This might be especially effective if the wilderness law enforcement officers had more discretion to write tickets for more than just resource damage and if the parties responsible could even be contacted to be given a ticket. Perhaps monitoring situations where tickets could have been written would be even more effective. Another option for monitoring the condition of adherence to *wilderness ethics* would be to have river rangers or other FS personnel monitor the number of instances of camps with unacceptable levels of disturbance. This would be logistically much easier as it could be combined with their normal patrol schedule and monitoring of the *camps within sight or sound* indicator. Further study would be helpful to define what wilderness ethics violations are the most important (besides litter and human waste) and how many of these violations would be considered unacceptable.

Lastly, it should be mentioned that the attribute of *campsite condition* is currently the only indicator monitored on the South Fork. Although overall this attribute was found to have low importance and high performance, a substantial number of visitors (n=48) viewed its performance as low and importance as high, and these visitors were more willing to support many of the restrictive management actions. This suggests that there is some added importance to this attribute and perhaps it shouldn’t be dismissed as an indicator relevant to the social setting. However, as currently monitored, this attribute or indicator does have several limitations including cost-effectiveness, reliability, and efficiency issues. A better alternative might be to try to incorporate this attribute into one of the two above-mentioned suggestions for indicators. The *behavior* related attribute might be the best fit as part of campsite condition relates to poor behavior. The other parts of this composite indicator are more related to overall use, such as the barren core measurements. Furthermore, these aspects of campsite condition that are less related to behavior, are also the aspects that are less important to visitors and may actually be perceived as positive aspects of a campsite (White et al. 2001, Manning 2010). Perhaps if this ethics violations indicator also incorporated the campsite conditions that are

more relevant to poor behavior (which also tend to detract the most from experience quality) such as tree scarring, litter, and human waste, then it might be more effective at monitoring the quality of experience within the social setting of the South Fork.

5.4 - Management Implications - Further Study

Analyzing the results and limitations of this study have led to the identification of several avenues of further study that would help the FNF select indicators and standards of quality. First, as mentioned in the methods section, this study only included overnight visitors to the South Fork. The FNF might want to undertake further study in order to understand the characteristics of day-users out of Meadow Creek and how substantial of a user group this is. Because this first section of the river receives heavy use, and it is the only section of river with a trail on only one side of the river, further study of the evaluation of setting attributes from everyone who uses this section might be beneficial. Perhaps an indicator could be developed to monitor experience in this short stretch of river as well as the two recommended indicators above are mostly related to overnight use.

Second, management may want to employ normative research methods in order to help set standards for the final indicators selected. This research asks recreationists to evaluate minimum acceptable conditions for indicator variables and aggregates these personal norms for evaluation based on a social norm curve. Within this research method, visual methods have been frequently used to assess crowding norms (e.g. Manning et al. 1996). Visual methods involve asking visitors to evaluate the conditions in computer-edited photographs showing varying numbers of visitors at attractions. Manning (2010) suggests visual methods may result in a more realistic or valid measure of crowding-related norms. They also allow researchers to depict and evaluate situations that do not yet exist. This approach might be especially well suited for developing standards to monitor the acceptable number of groups camped within sight or sound. Photos of the sites that are candidates to be monitored could be

doctored with various numbers of groups camped in close proximity. Furthermore, the acceptability of different types and sizes of user groups could also be assessed if management is interested in developing a more involved standard than just overall number of groups.

It is important to note that the use of normative methods to develop standards for indicators has been criticized by several sources, as norm prevalence and crystallization have been found to be lacking in some studies (eg. Roggenbuck et al. 1991). However, the general trend has shown that there is higher norm prevalence and more agreement about encounter norms in backcountry situations (Donnelly et al. 2000, Cole and Stewart 2002, Manning 2010). Still, management should be cognizant to the degree of norm crystallization and norm prevalence if these methods are used. Furthermore, researchers caution managers not to make these prescriptive standards decisions based on onsite normative research alone. Management discretion based on such things as legal mandates, agency policy, expert judgment and other public opinion should also be utilized (Cole and Stewart 2002).

In combination with the normative research mentioned above, further evaluation of management action alternatives might be helpful for completion of the LAC process. This study suggested that there is fairly high support for management actions that attempt to improve behavior and indirectly limit use. It also demonstrated that this theme is more prevalent among visitors who feel that all the protected area values dimensions of the South Fork are important. Overall, visitors were against fees and actions that would directly limit use. However, this research asked about management actions in the context of the conditions experienced, and not very many visitors thought any of the conditions were unacceptable. Further study should analyze the acceptability of certain management actions if standards are violated in the future. This could be combined with the normative research mentioned above through some sort of analysis on tradeoffs. Cole and McCool (1997) suggest it is not sufficient to just study encounter norms without a clear understanding of the tradeoffs that would need

to be made in order to achieve acceptable conditions. Indifference curves and stated choice methods are the two most common approaches to studying norms in the context of trade-offs (Manning 2010).

Lastly, the other two aspects of the recreation setting that have not been assessed in this study should be mentioned: the resource setting and the managerial setting. Within the resource setting, it is fairly clear that the river and the fishery it supports is the most important aspect of the South Fork. This can be seen with "fish and wildlife" being proposed as an outstandingly remarkable value (USFS 2010), and with "fishing" being far and away the most mentioned important quality of the South Fork in the open-ended portion of this survey. Therefore, it would certainly be advantageous for the Forest Service to work with other agencies to ensure that this resource is being monitored for quality. Similar to the social setting, indicators would be more effective and subject to management control if they monitored the aspects of the setting (i.e. water quality, invertebrate health, etc.) instead of outcomes of recreation (i.e. fishing success). The open-ended question also identified aspects of the resource setting related to horse use as being important as well, although to a much smaller degree than with fishing. Still, the Forest Service might want to make sure that graze and other resource conditions related to this use are not being degraded too much.

Within the managerial setting, it would also be advantageous for the Forest Service to study how certain attributes influence South Fork visitors' wilderness and wild river experience. Although management related setting attributes (i.e. trail signage, presence of rangers, etc.) have consistently been found to be less important than use and crowding related attributes (Manning 2010), further study should see how these attributes influence experience as well. The open-ended comments sections of the survey identified several management related issues that may be influencing experience. These included impacts due to the presence of a "FS cop," the wilderness phone line, and the FS "let burn" policy, suggesting visitors might view some attributes in this setting as having the ability to detract to a real wilderness and wild river experience as well. However, again and especially in this setting, it should

be stressed that what is deemed appropriate should not be decided solely on the opinions of on-site visitors.

5.5 – Management Implications – Sampling Plan Contribution

One of the components of this project that may contribute valuable insight for the development of similar river studies was the sampling plan. The complexity of the South Fork study location required a very unique sampling plan in order to get a representative sample of river users. As mentioned in the methods section, the South Fork has many points of entry, trails on both sides of the river, and a variety of user groups that travel in varied patterns. Therefore, sampling visitors in their campsites was selected over more traditional approaches such as sampling at trailheads or takeouts. Sampling was done by hiking up the sampling unit in the late afternoon and floating back down in the evening, giving out surveys on both of these passes. Surveys were then picked up in the morning and checks were made to ensure that no additional parties had moved into the unit later in the evening. This plan allowed for a fair degree of confidence that everyone camped in the individual sampling unit would be contacted that evening or in the morning, which helped assure a large, representative sample.

One of the more important factors that helped achieve success with the sampling plan was having significant prior knowledge of the resource. This prior knowledge allowed for the upper South Fork management unit to be broken down into smaller sampling units that were feasible to sample in one evening. Prior knowledge of the trails system and river corridor campsites allowed for the researcher to move more efficiently through each unit and leave the raft only when necessary to check sites that were not visible from the river. The ability to store supplies at three FS cabins in the river corridor was also instrumental in allowing the researcher to move more efficiently and be less burdened with a large pack at all times.

Several other aspects of this sampling plan were crucial to its success and would be recommended for inclusion in similar plans. First, giving respondents an entire evening to complete the survey was beneficial for increasing participation and response rate. Because contact was rarely made when potential respondents were relaxed and able to fill out the survey immediately, this extra time was essential for allowing the respondents the ability to fill out the survey at their convenience. Having respect for peoples' campsites and developing rapport with potential respondents also seemed to encourage participation. Again, having personal knowledge of the resource was important in this regard as it was easy to relate to the places they had been or wanted to go on their trips, and it was also easy to offer suggestions for fishing or hiking. Taking 10 or 15 minutes to chat with potential respondents was usually all that was needed to develop this rapport. Along with developing rapport through conversation, the potential prizes also seemed to help encourage participation. The Bob Marshall t-shirts and Bob Marshall maps were both very relevant to the recreation resource and elicited very positive responses and interest from potential participants.

Although this sampling plan worked well in the South Fork study, caution should be emphasized if a managers or researchers were interested in replicating this sampling plan in similar studies. Contacting visitors in their campsites might be an effective method for capturing a representative sample of visitors on similar rivers where there is a diversity of user types and complicated access patterns, but it would probably be overkill for areas with road access and more predictable use patterns. Quantification of the influence this sampling had on visitor experience demonstrated that overall it didn't have much ability to influence experience, but some visitors were affected negatively and to a high degree. The physical burden of hiking over 20 miles a day cannot be overlooked as well as the importance of prior knowledge of the resource.

5.6 – Theoretical Contribution – Protected Area Values

One of the more interesting components of this study involves the evaluation of South Fork visitors' protected area value orientations. The South Fork's designation as wilderness and a wild and scenic river provided a great opportunity to explore how protected area values manifest in a study location different from those areas where the original values scale developed by Borrie et al. (2002) was used. Four previous studies used the original 24-item scale to assess visitors' protected area value orientation. These studies took place in Yellowstone National Park, Zion National Park, the Missouri National Wild and Scenic River, and Birds of Prey National Conservation Area. Although the original scale was developed from concepts related to national park creation, the values underlying the scale are thought to apply to a broader discussion of protected areas (Tanner et al. 2008). Thus, the scale was utilized in the two non-national parks study areas as well. The Tanner et al. (2008) meta-study utilized confirmatory factor analysis and demonstrated differences existed in values structures among these four protected areas. The "Parks Model" (originally derived through exploratory factor analysis at Yellowstone) provided excellent fit for both national parks. It emphasized values related to *learning about and protecting wildlife, tourism and recreation*, and *historic identity*. The "Conservation Area Model" provided excellent fit for the Missouri and Birds of Prey datasets and emphasized two factors describing values related to *learning about and protecting wildlife*, and *identifying with history and nature* (Tanner et al. 2008).

By adding several statements to the original scale related to wilderness and wild and scenic values, the values factors derived in this South Fork study were much different than those mentioned in the two models above and the original factors derived in each of the four other study areas. Two distinct factors emerged related to *wilderness* and the "wild" river aspects of the South Fork (*South Fork Wild).* The factors derived in the original study and meta-analysis were less prevalent as the *National Parks* factor appears to be a composite of some of the values associated with *symbolic* and *personal*

growth factors derived in previous studies. The last factor, *recreational use*, was also different from any factors in the original studies. Overall, this suggests that the wilderness and wild and scenic values were a useful addition to the original scale, and it may provide us with a better understanding of South Fork visitors' value-orientations and corresponding evaluations of setting attributes and support for management actions.

Further study could provide additional support justifying the addition of the wild and scenic and wilderness value statements. The scale was shown to have construct validity as there was significant variation in attitudes and behavioral intention based on value orientations as expected (Hair et al. 2006). For example, the *use-oriented* visitors viewed several of the social setting attributes as relatively less important than the other visitors and were less willing to support most management actions, while the *Bob Marshall enthusiasts* viewed those setting attributes as more important and were more willing to support several of the less restrictive management actions. Because this new scale has been utilized in just one protected area, reliability and validity could be further assessed with additional sampling on other "wild" rivers in designated wilderness.

Another avenue that could be explored related to the values scale is additional study in protected areas that are just wild and scenic. The South Fork of the Flathead is unique in that it has the dual protection of both designations, and it would appear that the wilderness designation might provide more of a basis for visitors' value structures. The social construction of wilderness has received much attention in academic, as well as mainstream literature (e.g. Nash 2001), and therefore, the idea of what constitutes wilderness may be manifested more thoroughly in wilderness visitors' values. However, wild and scenic river designation does not have the vast history of John Muirs, Robert Marshalls, and Aldo Leopolds that have shaped its perception in the mind of Americans. It would be interesting to see if the wild and scenic factor would manifest in the values structures of visitors to "wild" rivers that were not in wilderness, or if the emphasis would be placed more on values factors associated with the original scale.

5.7 - Conclusion

Overall, this project represents a start for revisiting the LAC management process on the South Fork of the Flathead River in preparation for updating the comprehensive river management plan. It has provided a solid scientific basis for inclusion of indicators to monitor quality experience within the social setting under that plan. Standards could be set for these indicators through a combination of manager expertise and further study of crowding norms. This process could be completed with further study of support for management actions that also accounts for trade-offs in the social setting. Aside from this more applied contribution to a specific management dilemma on the Flathead, this research also offers a theoretical contribution to the study of protected area value orientations in wilderness and wild and scenic rivers.

Appendix A – Tables and Figures

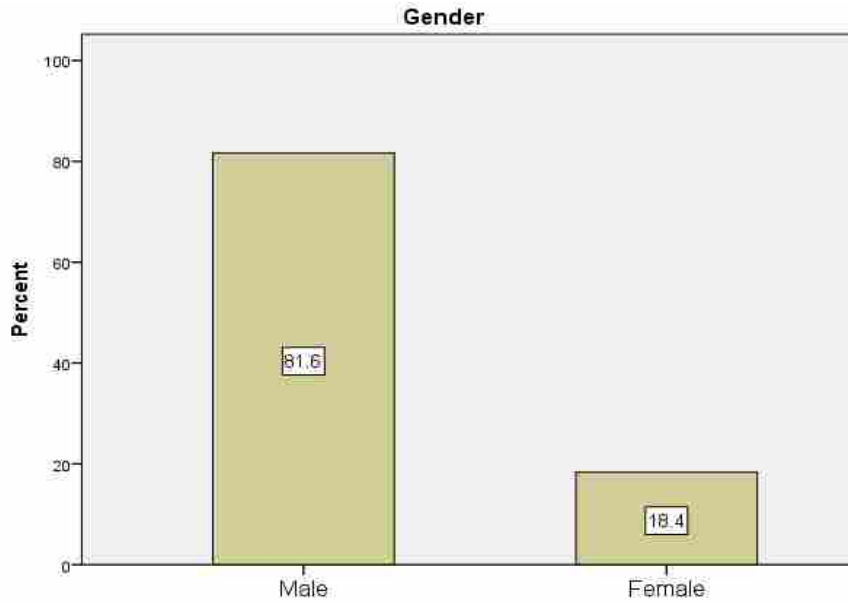

Figure 4.1 – Gender

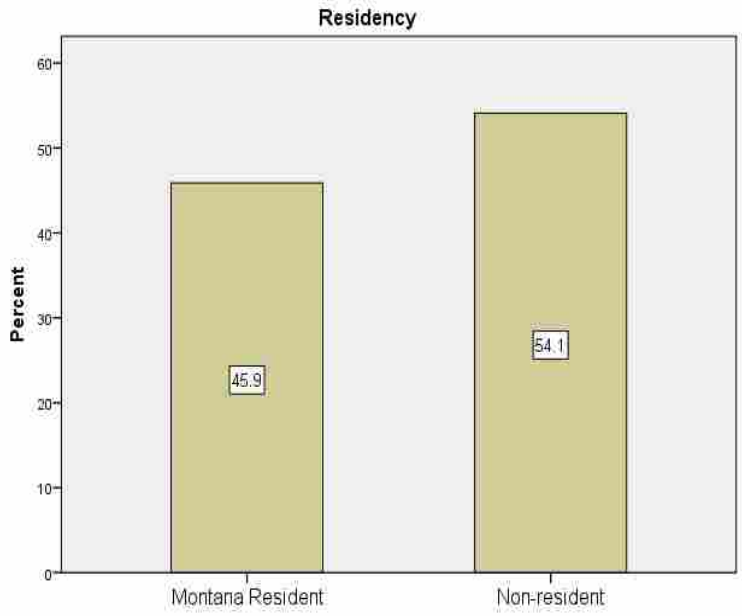

Figure 4.2 – Residency

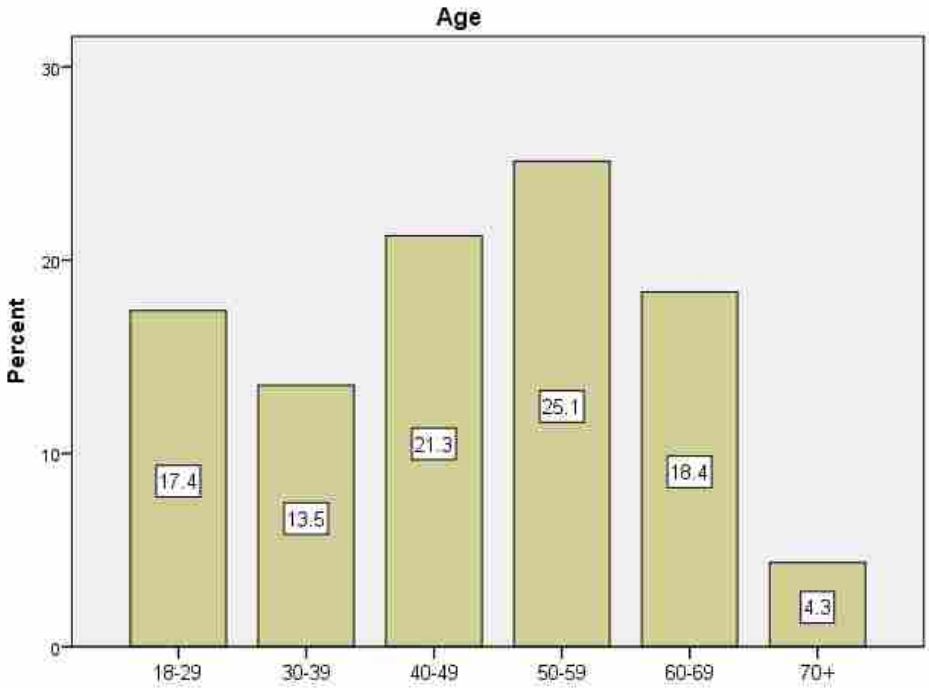

Figure 4.3 - Age

Setting Attribute	Cluster Membership						
	Bob Marshall Enthusiasts		Use-Oriented		River Enthusiasts		
	Mean [a b]	n	Mean	n	Mean	n	Sig*
Floater Encounters	4.14	102	3.73	60	4.00	41	.432
Land-Based Encounters	3.96	101	3.23	60	3.80	41	.070
Wilderness Ethics	5.64[a]	102	4.81[b]	59	5.10[a b]	41	.001*
Fishing Encounters	4.81[a b]	86	4.29[a]	55	5.19[b]	36	.041*
Scenic/Special Site Encounters	4.81[a]	101	3.93	59	4.93[a]	41	.004*
Camps Within Sight/Sound	5.00[a]	101	4.31[b]	59	5.01[a b]	41	.018*
Campsite Condition	3.39	101	3.17	60	3.80	41	.256
Human Waste	5.53[a]	102	4.86[b]	58	5.05[a b]	41	.012*
Litter	5.75[a]	101	5.31[a b]	58	5.24[b]	41	.015*
Campsite Availability	4.28	102	3.61	59	4.15	41	.065
Researcher Encounter	1.40	102	1.47	60	1.56	41	.908

Table 4.10 – Attribute Importance Based on Value Orientation

*Differences in mean importance scores for the 3 cluster groups were considered statistically significant at the p≤0.05 level

[a b] Superscripts for attributes indicate that means for paired cluster groups are not significantly different at the p≤0.05 level using Tukey's HSD (only included for highlighted attributes where statistical differences in means between groups existed).

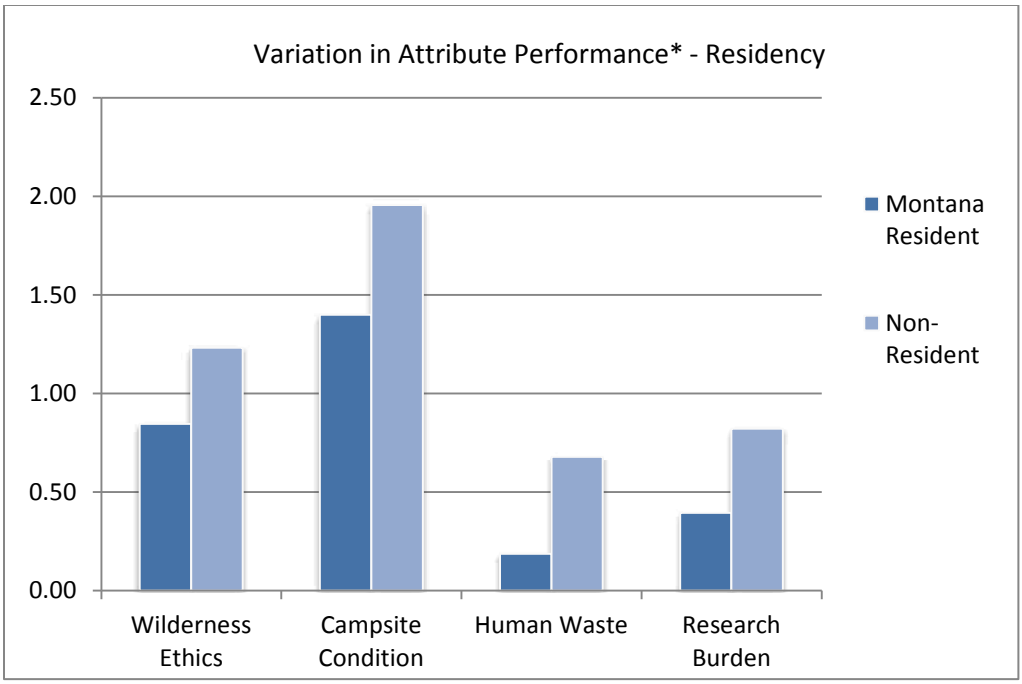

Figure 4.14 – Variation in Attribute Performance - Residency

*Performance was scored on a scale from -3 (Detracted a lot from) to +3(Added a lot to experience).

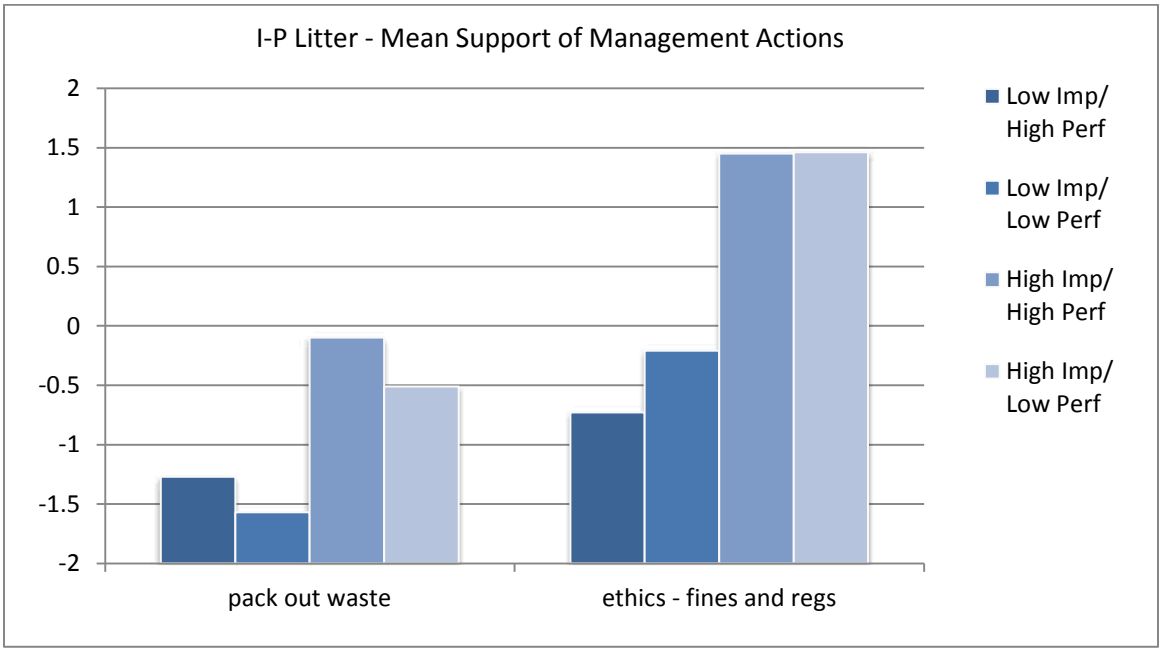

Figure 4.18 – Variation in Support for Management Actions – I-P Litter

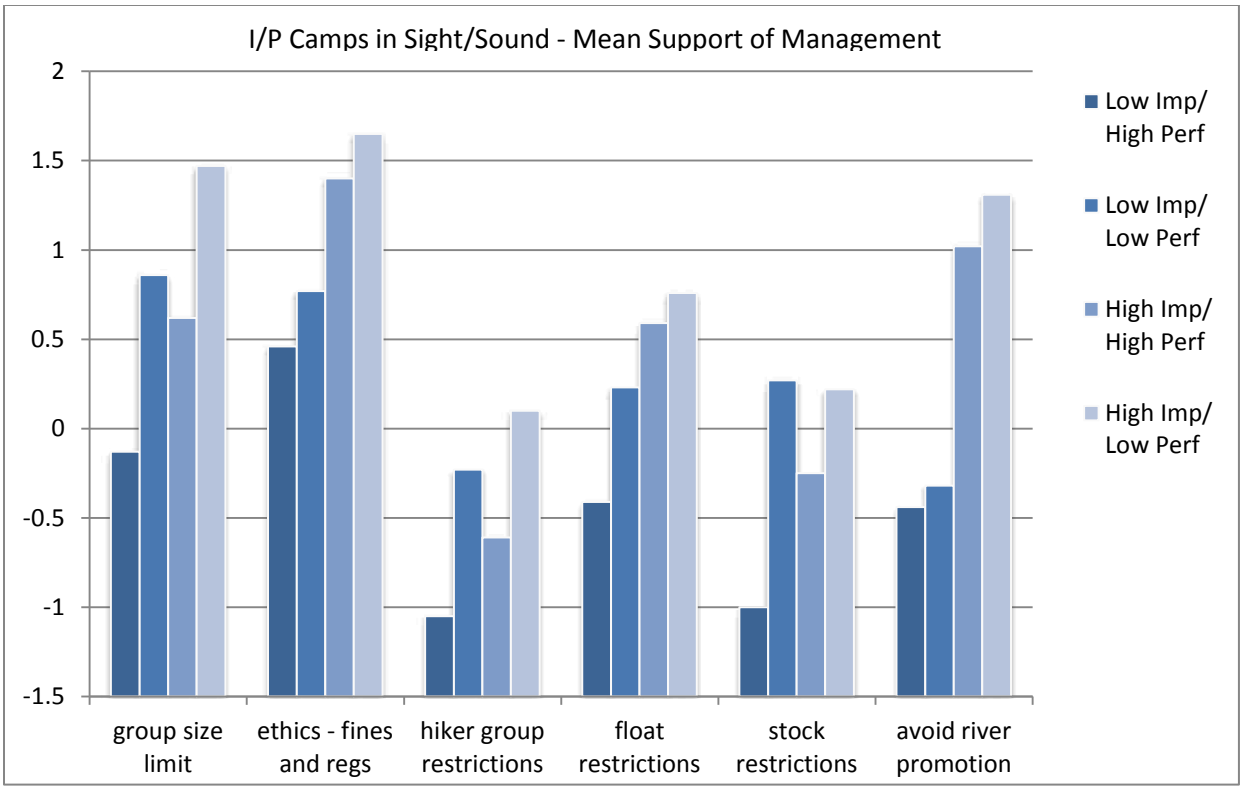

Figure 4.19 – Variation in Support for Management Actions – I-P Campsite Proximity

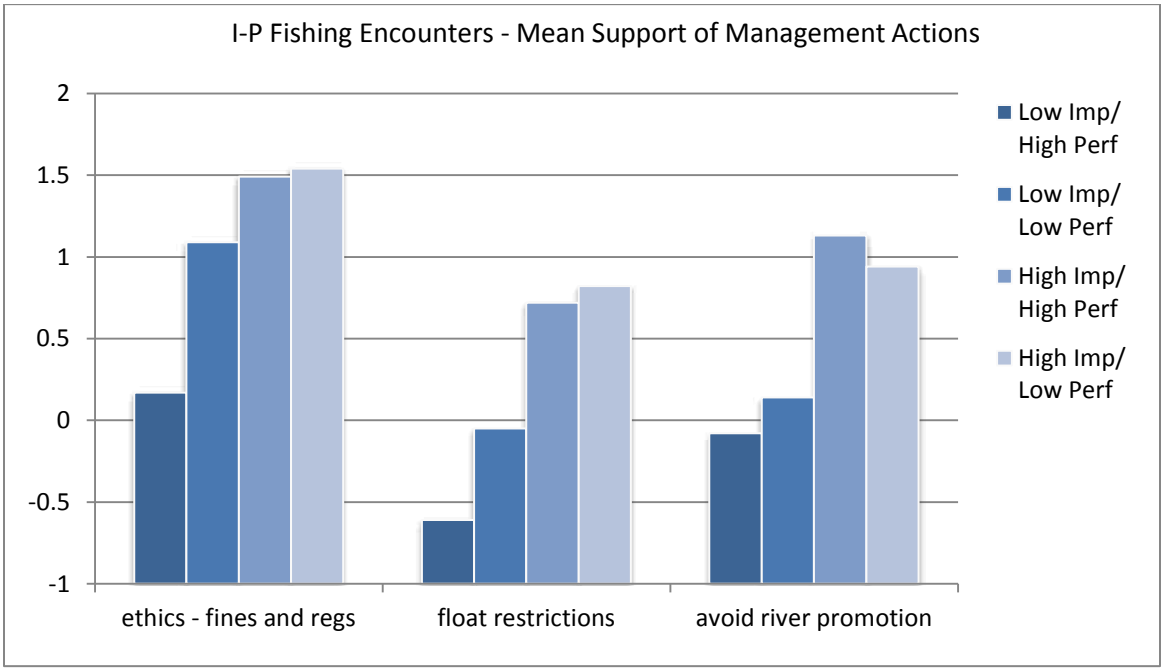

Figure 4.20 – Variation in Support for Management Actions – I-P Fishing Encounters

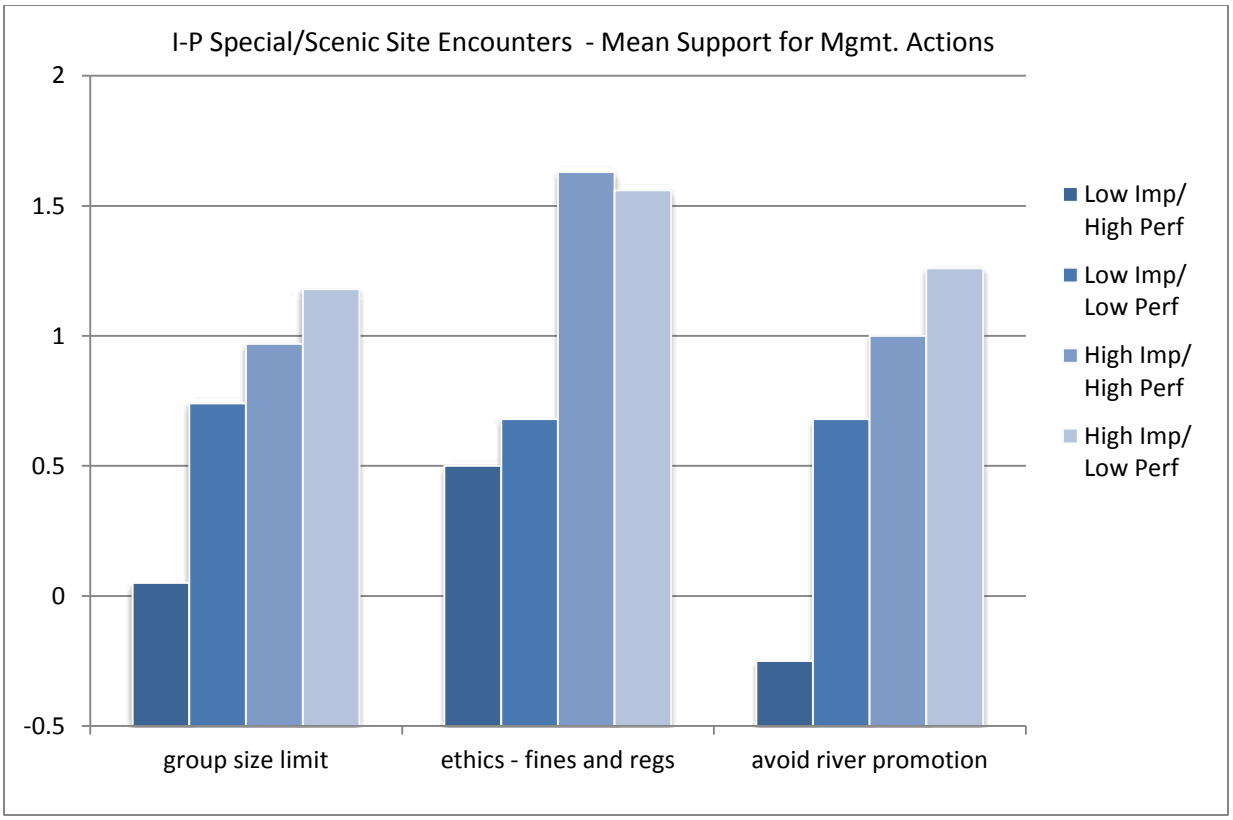

Figure 4.21 – Variation in Support for Management Actions – I-P Special/Scenic Site Locations

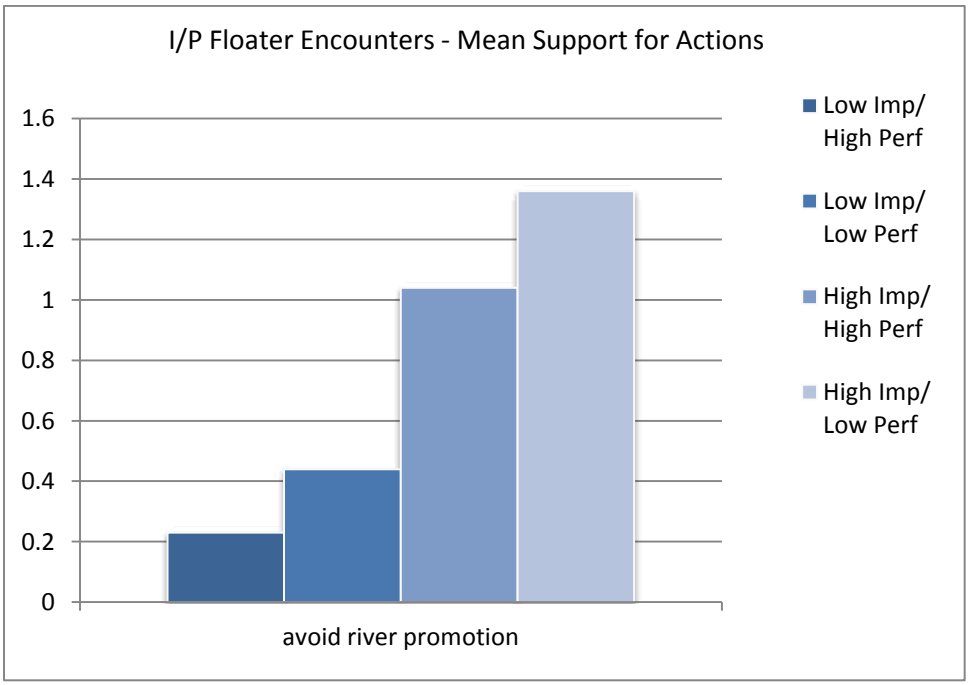

Figure 4.22 – Variation in Support for Management Actions – I-P Floater Encounters

Significant Variation in Mean Support for Mgmt. Actions Based on Value Orientations

Value Orientation	Group Size of 10		Stock Restrictions		Fees for Land-Based Rec.		Ethics-Fines and Regs		Hiker Restrictions		Permits - Adv. Regis.	
	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean
Bob Marshall Enthusiasts	100	0.93 [a]	99	-0.42 [a]	99	-1.28 [a]	100	1.47 [a]	99	-0.64 [a]	99	-0.79 [a]
Use-Oriented River Enthusiasts	59	0.07	60	-0.35 [a]	60	-1.18 [ab]	60	0.68 [b]	60	-0.80 [a]	60	-0.97 [a]
	41	1.22 [a]	40	0.62	41	-0.29 [b]	41	1.46 [ab]	41	0.49	41	0.07
Total	200	0.73	199	-0.19	200	-1.05	201	1.23	200	-0.46	200	-0.67
Significance		0.015		0.017		0.017		0.022		0.002		0.019

Table 4.11 - Variation in Support for Management Actions – Value Orientations

[a b] Superscripts for means indicate that they are not significantly different at the p≤0.05 level using Tukey's HSD

Variation in Support for Management Actions Based on Level of Independence

		DIY			Fully Outfitted			Partially Outfitted			
Management Action	Overall Mean	N	Mean	Std. Dev	N	Mean	Std. Dev	N	Mean	Std. Dev	Sig.*
Floaters pack out waste	-0.39	105	-0.29 [a]	2.0	50	0.10 [a]	2.5	45	-1.18	2.0	.011
Fees for floating	-0.73	106	-1.06 [a]	2.0	50	0.40	2.0	45	-1.22 [a]	1.9	<.001
Camping rest. - popular areas	-0.15	104	-0.68 [a]	1.9	51	1.06	1.9	45	-0.27 [a]	1.7	<.001
Size limit of 10 people	0.74	106	0.58	2.2	50	0.72	2.3	44	1.11	2.0	.405
Fees for land-based rec.	-1.05	106	-1.59 [a]	1.7	49	0.08	2.0	45	-1.00 [a]	1.8	<.001
Float group restrictions	0.42	105	-0.04 [a]	2.0	50	1.60	1.6	45	0.16 [a]	2.1	<.001
Camping Permits	-1.34	105	-1.93 [a]	1.4	51	0.12	1.9	45	-1.62 [a]	1.5	<.001
Horse group restrictions	-0.19	105	-0.53 [a]	2.1	50	0.38 [b]	2.0	44	-0.02 [ab]	1.9	.027
Fines and regs for ethics	1.23	105	0.90 [a]	2.0	51	2.08	1.4	45	1.07 [a]	1.7	<.001
Hiker restrictions	-0.46	104	-1.13	1.8	51	0.78	2.0	45	-0.31	1.6	<.001
Requiring all visitors to register	0.25	105	-0.19 [a]	2.1	51	1.37	1.7	45	0.02 [a]	1.8	<.001
Permit use by adv. regist.	-0.67	105	-1.12 [a]	1.8	50	0.60	1.9	45	-1.00 [a]	1.7	<.001
Avoid promotion of River	0.68	106	0.50	2.0	50	0.80	1.9	45	0.98	1.8	.341

Table 4.12 – Variation in Support for Management Actions – Level of Independence

*Differences in means are considered statistically significant at p≤.05 using one-way ANOVA

[a b] Superscripts indicate that means for paired *level of independence* groups are not significantly different at the p=0.05 level using Tukey's HSD (only included for highlighted attributes where statistical differences in means between groups existed).

Variation in Support for Management Actions Based on Residency

Management Action	Montana Residents N	Montana Residents Mean	Montana Residents St. Dev.	Non Residents N	Non Residents Mean	Non Residents St. Dev.	Sig.*
Floaters pack out waste	90	-0.71	2.1	110	-0.13	2.1	.055
Fees for floating	91	-1.25	2.0	110	-0.30	2.0	.001
Camping rest. - popular areas	90	-0.71	1.8	110	0.32	1.9	<.001
Size limit of 10 people	90	0.40	2.4	110	1.01	2.0	.050
Fees for land-based rec.	91	-1.58	1.7	109	-0.61	2.0	<.001
Float group restrictions	90	-0.26	2.2	110	0.96	1.8	<.001
Camping Permits	90	-1.81	1.6	111	-0.96	1.9	.001
Horse group restrictions	89	-0.83	2.0	110	0.33	1.9	<.001
Fines and regs for ethics	90	0.79	2.1	111	1.59	1.6	.002
Hiker restrictions	90	-1.07	1.9	110	0.05	1.9	<.001
Requiring all visitors to register	90	-0.49	2.2	111	0.86	1.7	<.001
Permit use by adv. regist.	90	-1.24	1.9	110	-0.19	1.9	<.001
Avoid promotion of River	91	0.73	2.1	110	0.65	1.8	.772

Table 4.13 – Variation in Support for Management Actions – Residency

*Differences in means are considered statistically significant at p≤.05 using one-way ANOVA

Variation in Support for Management Actions Based on Local Experience

Management Action	Low Experience N	Low Experience Mean	Low Experience St. Dev.	Moderate Experience N	Moderate Experience Mean	Moderate Experience St. Dev.	High Experience N	High Experience Mean	High Experience St. Dev.	Sig
Floaters pack out waste*	83	-0.06	2.05	71	-0.46	2.10	46	-0.87	2.32	.114
Fees for floating*	84	-0.49	2.07	71	-0.68	1.96	46	-1.26	2.10	.116
Camping rest. - popular areas*	84	0.10	1.96	70	-0.09	1.83	46	-0.67	2.01	.092
Size limit of 10 people*	84	0.92	1.94	71	0.87	2.20	45	0.18	2.53	.151
Fees for land-based rec.	83	-0.64 [a]	1.92	71	-0.97 [a]	1.96	46	-1.91	1.62	.001
Float group restrictions	84	0.82 [a]	1.89	70	0.27 [ab]	2.01	46	-0.11 [b]	2.28	.036
Camping Permits	84	-0.86 [a]	1.88	71	-1.32 [a]	1.70	46	-2.26	1.41	.000
Horse group restrictions	85	0.12 [a]	1.86	69	0.01 [a]	2.10	45	-1.09	2.09	.003
Fines and regs for ethics	85	1.60 [a]	1.55	71	1.27 [a]	1.80	45	0.49	2.25	.005
Hiker restrictions	83	-0.13 [a]	1.97	71	-0.21 [a]	1.80	46	-1.41	1.97	.001
Requiring all visitors to register	84	0.67 [a]	1.90	71	0.32 [a]	1.89	46	-0.61	2.37	.003
Permit use by adv. regist.	83	-0.11 [a]	1.76	71	-0.80 [ab]	1.92	46	-1.46 [b]	1.99	.000
Avoid promotion of river*	84	0.37	1.76	71	1.00	1.77	46	0.76	2.41	.125

Table 4.14 – Variation in Support for Management Actions – Level of Local Experience

*Differences in means are considered statistically significant at p≤.05 using one-way ANOVA

[a b] Superscripts indicate that means for paired *local experience* groups are not significantly different at the p=0.05 level using Tukey's HSD (only included for highlighted attributes where statistical differences in means between groups existed).

Significant Variation in Support for Mgmt Actions Based on Travel Type

Management Action	Backpackers N	Backpackers Mean	Backpackers St. Dev.	Stock-Users N	Stock-Users Mean	Stock-Users St. Dev.	Floaters N	Floaters Mean	Floaters St. Dev.	Sig
Floaters pack out waste	71	-0.07 [a]	1.88	72	-0.13 [a]	2.14	57	-1.12	2.32	0.009
Size limit of 10 people	72	1.17 [a]	1.84	73	0.15 [b]	2.31	55	0.95 [a b]	2.31	0.013
Horse group restrictions	72	0.49 [a]	1.76	71	-1.27	1.99	56	0.30 [a]	1.93	<0.001
Requiring all visitors to register	71	0.58 [a]	1.86	73	-0.32	2.28	57	0.58 [a]	1.88	0.012

Table 4.15 – Variation in Support for Management Actions – Travel Type

[a b] Superscripts indicate that means for the paired *travel type* groups are not significantly different at the p≤0.05 level using Tukey's HSD

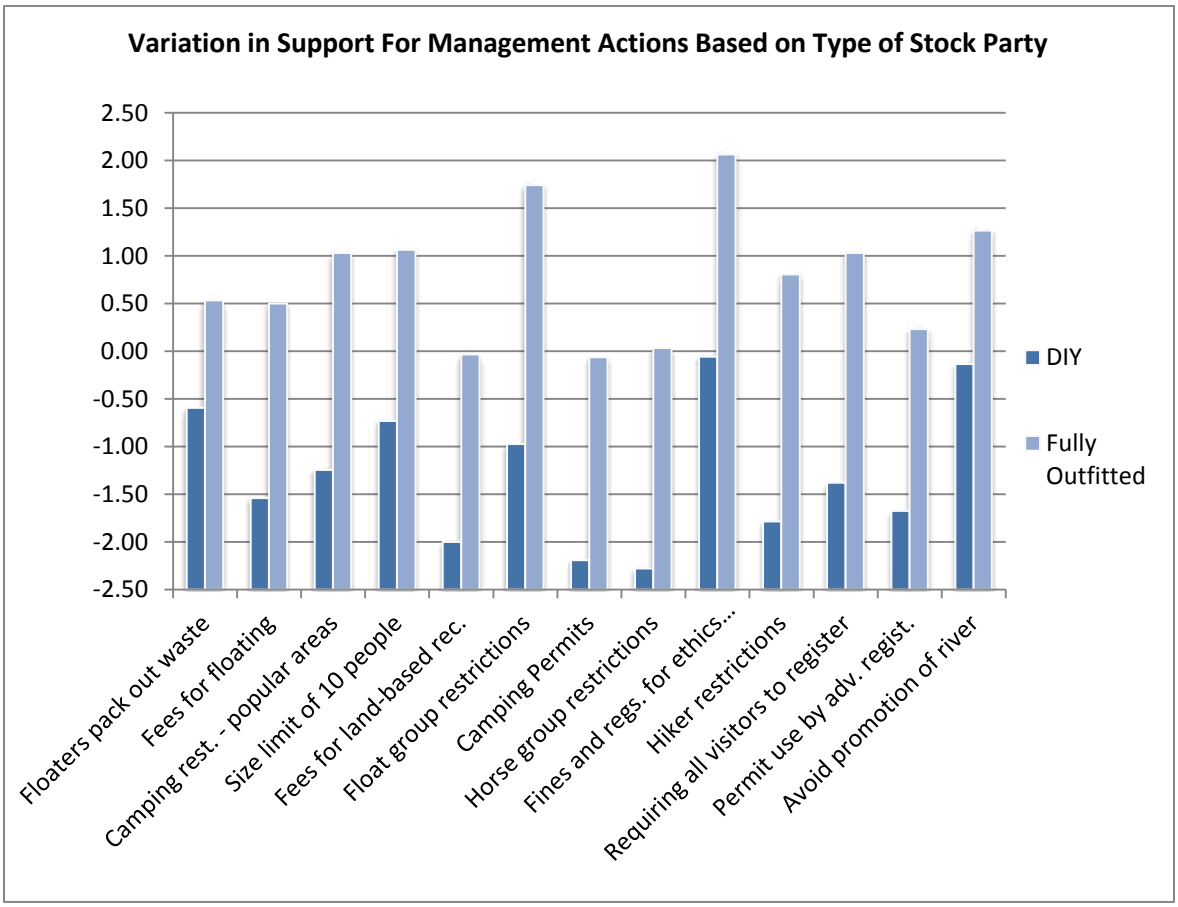

Figure 4.30 – Variation in Support for Management Action Based on Type of Stock Party

Variation in Support for Management Actions Among Stock Users

	DIY			Fully Outfitted			
Management Action	N	Mean	St. Dev.	N	Mean	St. Dev.	Sig.
Floaters pack out waste	37	-0.59	1.95	30	0.53	2.22	0.031
Fees for floating	37	-1.54	1.95	30	0.50	1.89	<0.001
Camping rest. - popular areas	37	-1.24	1.77	31	1.03	1.64	<0.001
Size limit of 10 people	37	-0.73	2.29	31	1.06	1.93	0.001
Fees for land-based rec.	37	-2.00	1.55	30	-0.03	1.87	<0.001
Float group restrictions	36	-0.97	2.04	31	1.74	1.37	<0.001
Camping Permits	37	-2.19	1.61	31	-0.06	1.82	<0.001
Horse group restrictions	36	-2.28	1.28	30	0.03	2.01	<0.001
Fines and regs. for ethics violations	36	-0.06	2.37	31	2.06	1.39	<0.001
Hiker restrictions	37	-1.78	1.75	31	0.81	2.01	<0.001
Requiring all visitors to register	37	-1.38	1.89	31	1.03	1.99	<0.001
Permit use by adv. regist.	37	-1.68	1.75	30	0.23	1.87	<0.001
Avoid promotion of river	37	-0.14	2.21	30	1.27	1.82	0.007

Table 4.16 – Variation in Support for Management Actions – DIY vs. Fully Outfitted Stock Groups

Appendix B – Survey Instrument

Upper South Fork of the Flathead River

Visitor Survey 2011

As part of a graduate research project we would like some information about your visit so as to better understand what you experienced and what you value about this section of the Flathead Wild & Scenic River System. **The information you provide will help fulfill the thesis requirements for a Master's student in Recreation Management at the University of Montana. It may also be used at a later time by the Flathead National Forest to better manage the river for your enjoyment and to retain the Wilderness and Wild & Scenic River values as they prepare a Comprehensive River Management Plan.** This survey will not be associated with your name or address in order to maintain the confidentiality of your responses.

The University of Montana

Survey Number: _____

For the purposes of this study the Upper South Fork is defined as the section of river between the confluence of Young's and Danaher Creeks downstream to the Wilderness boundary near Meadow Cr. Gorge.

(1) What is the **zip code** for your primary residence? _____

(2) What is your **gender**? ❑ Male or ❑ Female

(3) What is your **age**? ❑18-29 ❑ 30-39 ❑ 40-49 ❑ 50-59 ❑ 60-69 ❑ 70+

(4) When and where did you start and when and where will you end your trip to the Bob Marshall Wilderness?
Beginning date:_____(mm/dd)
starting from (trailhead):_____
Ending date: _____(mm/dd)
Leaving from (trailhead):_____

(5) How many people are in your group on this trip? _____

(6) About what percentage of this trip to the Bob Marshall Wilderness will be spent in the Upper South Fork river corridor?

❑ 0-20% ❑ 20-40% ❑ 40-60% ❑ 60-80% ❑ 80-100%

(7) What are the most important characteristics or qualities of the upper South Fork that influenced your decision to recreate here?

_____

(8) How did your group access the river (check **only one**)?

❑ Outfitter (they packed us to the river and dropped us off)
❑ Outfitter (they guided my whole trip)
❑ Personal pack and/or riding stock
❑ Self-supported hiking/backpacking
❑ Other _____

(9) What **activities** are you participating in when in the upper South Fork river corridor? (check **all** that apply and **circle** the most important**)**

❑ Wildlife viewing
❑ Fishing
❑ Floating the river
❑ Viewing scenery
❑ Hunting
❑ Swimming
❑ Camping
❑ Backpacking
❑ Horseback riding
❑ Photography
❑ Other _____

(10) If you floated the river, what is the main type of watercraft you personally used? If you did **not** float, **skip** to question **12.**

- ❑ Large, multi-person raft
- ❑ Hard-bodied canoe or kayak
- ❑ Inflatable canoe, kayak, or ducky
- ❑ Inflatable, personal raft with a floor (ex.©Alpacka)
- ❑ Personal pontoon watercraft
- ❑ Other_____

(11) A. Where did you start your float (put-in)? _____

B. Will you end (take-out) your float at Mid-Creek? ❑ Yes or ❑ No.
If **No**, where?_____

(12) A. How many days are you into your trip? _____

B. How many nights will you camp by the river in total? _____

(13) Compared to other campsites you have stayed at, how are the conditions (i.e. litter, human waste, damage to vegetation, number of other groups nearby) at this site?

❑ Better ❑ About the same ❑ Worse ❑ I haven't camped anywhere else

(14) What were the **primary** reasons for visiting the Flathead when you did? (check **all** that apply)

- ❑ Trying to avoid the crowds
- ❑ Hunting Season
- ❑ Better chance of good fishing
- ❑ Better chance of good weather
- ❑ Available vacation days
- ❑ Other _____

(15) A. How many times do you visit wilderness areas per year? _____

B. How many times have you been to the Bob Marshall Wilderness in your lifetime? _____

C. How many other wildernesses have you visited in your lifetime? _____

This following section asks you about the values you place on the Upper South Fork of the Flathead River.
Please place a check or an X in the box that represents how important each statement is to you (1= Strongly Disagree, 8 = Strongly Agree).

I believe the upper South Fork of the Flathead is particularly important as:

	Strongly Agree → **Strongly Disagree**							
	8	**7**	**6**	**5**	**4**	**3**	**2**	**1**
A place to renew my sense of personal wellbeing								
A protector of fish and wildlife habitat								
A display of natural curiosities								
A symbol of America's identity								
A free-flowing river								
A tourist destination								
A social place								
A place to develop my skills and abilities								
A sacred place								
A place that is accessible only by trail								
A place to be free from society and its regulation								
A place for scientific research and monitoring								
A place for wildness								
A place for education about nature								
A place where the imprint of man's work is substantially unnoticeable								
An unpolluted watershed								

I believe the upper South Fork of the Flathead is particularly important as:

	Strongly Agree → Strongly Disagree							
	8	7	6	5	4	3	2	1
A historic resource								
A protector of threatened and endangered species								
An economic resource								
A place for the use and enjoyment of the people								
A wildlife sanctuary								
A vestige of primitive America								
A place for outstanding opportunities for solitude								
A place without most types of commercial development								

	Strongly Agree → Strongly Disagree							
	8	7	6	5	4	3	2	1
A family or individual tradition								
A preserve of natural resources for future use								
A place for recreational activities								
A place for all living things to exist								
A place everyone should see at least once								
A place for primitive recreation								
A place of scenic beauty								

The following section asks you to rate how each of the following *hypothetical situations* would affect the quality of your river experience. Please answer in terms of what you think an ideal Wilderness and Wild river experience *should be*. Please rate these items on a scale of +3 (would add a lot to your experience) to -3 (would detract a lot from your experience. A score of 0 would represent that the situation would have no impact on your experience. Please place a check or an X in the box that most accurately describes how the situation would affect your experience.

	Would add to → experience → Would detract from						
	+3	**+2**	**+1**	**0**	**-1**	**-2**	**-3**
Encountering **no float** groups while hiking, riding, or floating each day							
Encountering **1-2 float** groups while hiking, riding, or floating each day							
Encountering **3-5 float** groups while hiking, riding, or floating each day							
Encountering **more than 5 float** groups while hiking, riding, or floating each day							

	+3	**+2**	**+1**	**0**	**-1**	**-2**	**-3**
Encountering **no land-based** groups while hiking, riding, or floating each day							
Encountering **1-2 land-based** groups while hiking, riding, or floating each day							
Encountering **3-5 land-based** groups while hiking, riding, or floating each day							
Encountering **more than 5 land-based** groups while hiking, riding, or floating each day							

	+3	**+2**	**+1**	**0**	**-1**	**-2**	**-3**
Encountering **outfitted/commercial** groups in general							
Encountering **stock (horse)** groups in general							
Encountering **backpacking** groups in general							
Encountering **large** groups (10 or more people) in general							

	Would add to →						Would detract from
	+3	**+2**	**+1**	**0**	**-1**	**-2**	**-3**
Having swimming holes, lunch spots, or other scenic or special river locations to yourself or your group alone							
Sharing swimming holes, lunch spots, or other scenic or special river locations with **one** other group							
Sharing swimming holes, lunch spots, or other scenic or special river locations with **many** other groups							

	+3	**+2**	**+1**	**0**	**-1**	**-2**	**-3**
Not being disturbed by others while fishing each day							
People walk or float through your fishing spot **once or twice** per day							
People walk or float through your fishing spot **many** times per day							

	Would add to →						Would detract from
	+3	**+2**	**+1**	**0**	**-1**	**-2**	**-3**
Camping **far** from other groups each night							
Camping within sight or sound of **one** other group each night							
Camping within sight or sound of **many** groups each night							

	+3	**+2**	**+1**	**0**	**-1**	**-2**	**-3**
Seeing **no** litter							
Seeing **a few** pieces of litter per day							
Seeing **many** pieces of litter in many places per day							

	+3	**+2**	**+1**	**0**	**-1**	**-2**	**-3**
Camping in campsites that are undisturbed/pristine							
Camping in campsites with evidence of previous use (barren ground, trails, etc)							
Camping in campsites with significant previous use (exposed tree roots, tree scars, large area of barren ground, many trails)							

	Would add to → experience → Would detract from						
	+3	**+2**	**+1**	**0**	**-1**	**-2**	**-3**
Encountering **no** groups with poor wilderness ethics (overly loud, improper use of river such as for food disposal, tree scaring in campsites, litter, etc.)							
Encountering **one** group with poor wilderness ethics each day							
Encountering **many** groups with poor wilderness ethics each day							

	+3	**+2**	**+1**	**0**	**-1**	**-2**	**-3**
Not seeing any improperly disposed of human waste							
Seeing **a few** instances of improperly disposed of human waste each day							
Seeing **many** instances of improperly disposed of human waste each day							

	Would add to → experience → Would detract from						
	+3	**+2**	**+1**	**0**	**-1**	**-2**	**-3**
Easily finding an unoccupied campsite							
Having to travel up to **¼ mile** further than planned down the river or trail in order to find an unoccupied campsite							
Having to travel **more than a mile** further than planned down the river or trail in order to find an unoccupied campsite							

	+3	**+2**	**+1**	**0**	**-1**	**-2**	**-3**
Not being contacted by a researcher and asked to fill out a questionnaire while in your camp or on the river							
Being contacted by a researcher and asked to complete a 25-minute questionnaire while in your camp or on the river							

The following section asks you to evaluate the conditions you are experiencing on <u>this trip while recreating in the South Fork river corridor</u>. On a scale from +3 (added a lot to) to -3 (detracted a lot from) please rate the impact that the conditions in the following areas have had on your experience to this point.

	Added to experience → Detracted from						
	+3	**+2**	**+1**	**0**	**-1**	**-2**	**-3**
Encounter levels with **float groups** while hiking, riding, or floating have…							
Encounter levels with **land-based groups** while hiking, riding or floating have…							
Level of adherence to wilderness ethics of groups encountered has…							
Encounter levels with other groups at swimming holes, lunch spots, scenic spots, or special river locations has…							
Encounter levels while fishing have…(<u>leave blank if not fishing</u>)							

Please feel free to comment on any specific experiences (good or bad) you had in regards to encounters with other parties.

_____

_____

	Added to experience → Detracted from						
	+3	**+2**	**+1**	**0**	**-1**	**-2**	**-3**
Number of groups camped within sight or sound has…							
Ability to find an unoccupied campsite has…							
Conditions of campsites that you used have…							
Level of improperly disposed of human waste has…							
Level of litter has…							
Contact with researcher and participation with research has…							

Please feel free to comment on any specific experiences you had in regards to the conditions mentioned above.

_____

The following section asks you about your willingness to support potential management actions. To the best of our knowledge, <u>none</u> of these management actions have been proposed on this section of river. These are just actions that have been looked at in the past as options when social and resource impacts from recreation have been determined to be unacceptable. Please state your level of support on a scale from +3 (strongly agree) to -3 (strongly disagree).

Based on the conditions I have experienced in the Upper South Fork, I would be willing to support:

	Strongly Agree → Strongly Disagree						
	+3	**+2**	**+1**	**0**	**-1**	**-2**	**-3**
Requirements for floaters to pack out human waste							
Fees charged for floating the river							
Camping restrictions at popular areas							
A group size limit of 10 people							
Fees charged for land-based river recreation							
Restrictions on the number of float groups on the river							
Issuing trip permits so visitors could only camp each night in the area assigned to them							
Restrictions on the number of horse groups camped by the river							
Regulations and fines for wilderness ethics violations such as dumping food in the river or scarring live trees in campsites							
Restrictions on the number of hiking groups camped by the river							
Requiring all visitors to register when entering							
Permitting river use based on advanced registration							
Avoiding promotion of the river by the Forest Service							

Please feel free to share any other comments you have in regards to your trip on the Upper South Fork.

_____

_____

_____

_____

_____

_____

End of Survey: Thank You!

Works Cited

Ajzen, I. and M. Fishbein. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice Hall.

Borrie, W.T., Roggenbuck, J.W. and Hull, R.B. (1998). The problem of verbal reports in recreation research : Review, recommendations and new directions. *Tourism Analysis*, 2: 175-183.

Borrie, W.T., and Birzell, R.M. (2001). Approaches to Measuring Quality of the Wilderness Experience. In W.A. Freimund and D.N. Cole, comps. *Visitor Use Density and Wilderness Experience: Proceedings*. Ogden, Utah: USDA Forest Service, Rocky Mountain Research Station. RMRS-P-20: 29-38.

Borrie, W.T., Friemund, W.A., Davenport, M., and Manning, R. (2001). Crossing Methodological Boundaries: Assessing Visitor Motivations and Support for Management Actions at Yellowstone National Park Using Quantitative and Qualitative Research Approaches. *The George Wright Forum*, 18(3): 73-83.

Borrie, W.T., Friemund, W.A., Davenport, M.A. (2002). Winter Visitors to Yellowstone National Park: Their Value Orientations and Support for Management Actions. *Human Ecology Review,* 9(2): 41-48.

Borrie, W.T., and McCool, S.F. (2007). Describing Change in Visitors and Visits to the "Bob". *International Journal of Wilderness*, 13(3): 28-33.

Bright, A. D., Manfredo, M. J., & Fulton, D. C. (2000). Segmenting the public: an application of value orientations to wildlife planning in Colorado. *Wildlife Society Bulletin*, 28(1): 218-226.

Castren, H., Wilderness Forester, Flathead National Forest. (2/15/2011). Personal Communication.

Cauley, L. (2004). *Integrating social equity into the measurement of human values in outdoor recreation.* Unpublished master's thesis, University of Montana, Missoula, MT.

Chase, K.J., Hay, L.E., and Markstrom, S.L. (2012). Watershed Scale Response to Climate Change – South Fork Flathead River Basin, Montana. Retrieved from pubs.usgs.gov.

Cole, D.N. (2004). Wilderness Experiences: What should we be managing for? *International Journal of Wilderness*, 10(3): 25-27**.**

Cole, D. N. (2007). Managing recreation in wilderness: special areas and specialized research. In: L. Kruger, R. Mazza and K. Lawrence, eds. *Proceedings: national workshop on recreation research and management*. Gen. Tech. Rep. PNW-GTR-698. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 115-121.

Cole, D. N., & Hall, T. E. (2009). Perceived Effects of Setting Attributes on Visitor Experiences in Wilderness: Variation with Situational Context and Visitor Characteristics. *Environmental Management*, 44(1): 24-36.

Cole, D.N., McCool, S.F. (1997). The Limits of Acceptable Change Process: Modifications and Clarifications. In McCool, S.F. and Cole, D.N., comps. (1997). *Proceedings-Limits of Acceptable Change and related planning processes: progress and future directions.* Gen Tech. Rep. INT-GTR-371. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Cole, D.N. and Stewart, W.P. (2002). Variability of User-Based Evaluative Standards for Backcountry Encounters. *Leisure Sciences,* 24: 313-324.

Driver, B., Nash, R., and Haas, G. (1987). Wilderness Benefits: A state of the knowledge review. *Proceedings-National Wildlife Research Conference: Issues, State-of-Knowledge, Future Conditions*. U.S. Forest Service General Technical Report. INT-220, 294-314.

Fulton, D. C., Manfredo, M. J., and J. Lipscomb. (1996). Wildlife value orientations: A conceptual and measurement approach. *Human Dimensions of Wildlife* 1: 24- 47.

George, D., & Mallery, P. (2003). SPSS for Windows step by step: A simple guide and reference. 11.0 update (4th ed.). Boston: Allyn & Bacon.

Glaspell, B., Watson, A., Kneeshaw, K., and Pendergrast, D. (2003). Selecting Indicators and Understanding Their Role in Wilderness Experience Stewardship at Gates of the Artic National Park and Preserve. *The George Wright Forum,* 20(3): 59-70.

Gliem, J.A., and Gliem, R.R. (2003). Calculating, Interpreting, And Reporting Cronbach's Alpha Reliability Coefficient For Likert-Type Scales. *Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education.* (2003 Conference) Columbus, Ohio: Ohio State University.

Graefe, A., Kuss, F., and Vaske, J. (1990). *Visitor Impact Management: The Planning Framework.* Washington, D.C.: National Parks and Conservation Association.

Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E., and Tatham, R.L. (2006). Multivariate Data Analysis: Sixth Edition. Upper Saddle River, NJ: Prentice Hall. 899 pp.

Heberlein, T.A., and Vaske, J.J. (1977). *Crowding and visitor conflict on the Bois Brule river.* (Report WISC WRC 77-04). University of Wisconsin: Water Resources Center.

Hendee, J.C. and Dawson, C.P. (2002). *Wilderness Management: Stewardship and Protection of Resources and Values.* Golden, CO: Fulcrum Publishing. pp. 640

Henneberger, J. (1996). Transformations in the concept of the park. *Trumpeter,* 13: 127-133.

Heywood, J.L. (1993). Behavioral Conventions in Higher-Density, Day Use Wildland/Urban Recreation Settings: A Preliminary Case Study. *Journal of Leisure Research,* 25(1): 39-52.

Hollenhorst, S., Olson, D. and Fortney, R. (1992). Use of importance-performance analysis to evaluate state park cabins: the case of the West Virginia State Park System, *Journal of Park and Recreation Administration*, 10(1): 1–11.

Hollenhorst, S. and Gardner, L. (1994). The Indicator Performance Estimate Approach to Determining Acceptable Wilderness Conditions. *Environmental Management*, 18(6): 901–906.

Hollenhort, S., Frank III, E., and Watson, A. (1994). The Capacity to be Alone: Wilderness Solitude and Growth of the Self. In Hendee, J.C., Martin, eds. (1994). *International Wilderness Allocation, Management, and Research*. Ft. Collins, CO: International Wilderness Leadership (Wild) Foundation: 234-239.

Homer, P. M., and L. R. Kahle. (1988). A structural equation test of the value-attitude-behavior hierarchy. *Journal of Personality and Social Psychology.* 54: 638–646.

Jolliffe, I.T. (2002). *Factor Analysis (2nd Edition)*. New York: Springer. 487 pp.

Kaiser, H.F. (1960). The Application of Electronic Computers to Factor Analysis. *Educational Psychology Measurement*. 20: 141-151

Kyle, G., Graefe, A., Manning, R., and Bacon, J. (2004). Effects of place attachment on users' perceptions of social and environmental conditions in a natural setting. *Journal of Environmental Psychology*, 24(2): 213-225.

Leung, Y. and Marion, J.L. (2000). Recreation impacts and management in wilderness: A state-of-knowledge review. In D.N. Cole, S. McCool, W.T. Borrie and J. O'Loughlin (eds). *Wilderness Science in a Time of Change: Vol. 5. Wilderness Ecosystems, Threats, and Management*. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station: pp. 23–48.

Lucas, R.C. (1980). Use Patterns and Visitor Characteristics, Attitudes and Preferences in Nine Wilderness and Other Roadless Areas. Research Paper INT-253. Ogden, UT: *U.S. Department of Agriculture, Forest Service, Intermountain Research Station*

Lucas, R.C. (1985). Visitor Characteristics, Attitudes, and Use Patterns in the Bob Marshall Wilderness Complex, 1970-1982. Research Paper INT-345. Ogden, UT: *U.S. Department of Agriculture, Forest Service, Intermountain Research Station*

Manfredo, M.J., Driver, B.L., and Brown, P.J. (1983). A Test of Concepts Inherent in Experience Based Setting Management for Outdoor Recreation Areas. *Journal of Leisure Research*, 15(3): 263-283.

Manning, R. E. (1999). Studies in Outdoor Recreation: Search and Research for Satisfaction, (2nd ed.). Corvallis: Oregon State University Press. 374 pp.

Manning, R. E. (2003). What to do about crowding and solitude in parks and wilderness? A reply to Stewart and Cole. *Journal of Leisure Research, 35*(1): 107-118.

Manning, R.E. (2007). *Parks and Carrying Capacity: Commons Without Tragedy*. Washington, DC: Island Press. 313 pp.

Manning, R. E. (2010). Studies in Outdoor Recreation: Search and Research for Satisfaction, (3rd ed.). Corvallis: Oregon State University Press. 468 pp.

Manning, R., Lawson, S., and Valliere, W. (2009). Multiple Manifestations of Crowding in Outdoor Recreation: A Study of the Relative Importance of Crowding-related Indicators Using Indifference Curves. *Leisure/Loisir*, 33(2): 637-658.

Manning, R., Lime, D., Freimund, W., and Pitt, D. (1996). Crowding norms at frontcountry sites: A visual approach to setting standards of quality. *Leisure Sciences,* 18: 39-59.

Martilla, J.A. and James, J.C. (1977). Importance-performance analysis. *Journal of Marketing*, 41, 77–79.

McCool, S.F., Krumpe,R., Lucas, R., McLaughlin, W., Shomaker, J., and Wright, J. (1983). Review of the Flathead Wild and Scenic River Addendum Management Plan. *USDA-Forest Service*. pp. 13.

McLaughlin, W.J., Krumpe, E.E., Paradice, W.E., Salvi, W.C., and Weesner, M.W. (1982). The Flathead River Study Preliminary Report 2. *University of Idaho*: Moscow, Idaho.

Mengak, K., Dottavio, F. and O'Leary, J. (1986). Use of importance-performance analysis to evaluate a visitor center, *Journal of Interpretation*, 11(2): 1–13.

Merigliano, L. (1990). Indicators to monitor the wilderness recreation experience. In: Lime, D. W., ed. *Managing America's enduring wilderness resource*. Minneapolis, MN: University of Minnesota; 1990: pp. 156-162.

Nash, R.F. (2001). *Wilderness and the American Mind, (*4th Edition). New Haven: Yale University Press. 413 pp.

Patterson, M.E. and Hammit, W.E. (1990). Backcountry Encounter Norms, Actual Reported Encounters, and Their Relationship to Wilderness Solitude. *Journal of Leisure Research*, 22(3): 259-275.

Roggenbuck, J.W. and Lucas, R.C. (1987). Wilderness use and users: A state-of-knowledge review. *Proceedings of National Wilderness Research Conference: Issues, State-of-Knowledge, Future Directions.* USDA Forest Service General Technical Report. INT-220: 204-245.

Roggenbuck, J.W., Williams, D.R., Bange, S.P., and Dean, D.J. (1991). River Float Trip Encounter Norms: Questioning the Use of the Social Norms Concept. *Journal of Leisure Research*, 23(2): 133-153.

Roggenbuck, J.W., Williams, D.R., and Watson, A.E. (1993). Defining Acceptable Conditions In Wilderness. *Environmental Management, 17*(2): 187-197.

Shafer, C.S., and Hammitt,W.E. (1995). Congruency Among Experience Dimensions, Condition Indicators, and Coping Behaviors in Wilderness. *Leisure Sciences,* 17: 263-279.

Stankey, G.H. (1973). Visitor perceptions of Wilderness Recreation Carrying Capacity. *USDA Forest Service*, Research Paper INT-142

Stankey, G.H., McCool, S.F., and Stokes, G.L. (1984). Limits of acceptable change: A new framework for managing the Bob Marshall Wilderness Complex. *Western Wildlands.* 10(3): 33-37.

Stankey, G.H., Cole, D.N., Lucas, R.C., Petersen, M.E., Frissell, S.S. (1985). The limits of acceptable change (LAC) system for wilderness planning. Gen. Tech. Rep. INT-176. Ogden, UT: *USDA Forest Service,* Intermountain Forest and Range Experiment Station. pp. 37.

Streep, A. (2010). Water Travel Hall of Fame 2010. *Outside Magazine*. July. Retrieved from: http://outsideonline.com/

Tanner, Randy J., Wayne Freimund, William T. Borrie, and R. Neil Moisey. 2008. A meta-study of the values of visitors to four protected areas in the western United States. Leisure Sciences. 30, 1-14.

Tarrant, M.A., Cordell, H., and Kibler, T. (1997). Measuring perceived crowding for high-density river recreation: The effects of situational conditions and personal factors. *Leisure Sciences,* 19: 97-112.

Tarrant, M.A., & English, D.K. (1996). A crowding-based model of social carrying capacity: Applications for whitewater boating use. *Journal of Leisure Research*, 28(3): 155-168.

Tarrant, M.A. and Smith, E.K. (2002). The use of a modified importance-performance framework to examine visitor satisfaction with attributes of outdoor recreation settings, *Managing Leisure*, 7(2): 69-82

Teel, T. and M. Manfredo. (2010). Understanding the diversity of public interests in wildlife conservation. *Conservation Biology*. 24(1): 128-139

USDA Forest Service (USFS). 1984. Flathead Wild and Scenic River Recreation Management Direction. *United States Department of Agriculture*, Flathead National Forest.

USDA Forest Service (USFS). (2010) Flathead Wild and Scenic River Resource Assessment. *United States Department of Agriculture*, Flathead National Forest.

US Geological Society (USGS). (2012). Stream flow data: South Fork Flathead River near Twin Creek (Gauging Station 12359800). *USGS*. Retrieved online at nwis.waterdata.usgs.gov.

Vaske, J.J., and Donnelly, M.P. (1999). A Value-Attitude-Behavior Model Predicting Wildland Preservation Voting Intentions. *Society and Natural Resources,* 12: 523-537.

Vaske, J.J., and Donnelly, M.P. (2002). Generalizing the Encounter-Norm-Crowding Relationship. *Leisure Sciences*, 24: 255-269.

Vaske, J.J., Donnelly, M.P., Williams, D.R., and Jonker, S. (2001). Demographic Influences on Environmental Value Orientations and Normative Beliefs About National Forest Management. *Society and Natural Resources,* 14: 761-776.

Vaske, J.J. and Shelby, L.B. (2008). Crowding as a Descriptive Indicator and an Evaluative Standard: Results from 30 years of research. *Leisure Sciences.* 30: 111-126.

Watson, A.E., Cole, D.N. (1992). LAC indicators: an evaluation of progress and list of proposed indicators. In: Merigliano L, (ed) Ideas for Limits of Acceptable Change process, Book II; Selected papers on wilderness management planning efforts and the LAC process. Washington, DC: USDAFS, Recreation, Cultural Resources and Wilderness Management Staff p. 109.

Watson, A.E., and Niccolucci, M. (1992). Defining past experience dimensions for wilderness recreation. *Leisure Science,* 14: 89-103.

Watson, A.E., Roggenbuck, J.W. (1998). Selecting human experience indicators for wilderness: different approaches provide different results. In: Kulhavy DL, Legg MH, (eds) Wilderness & natural areas in eastern North America: research, management and planning. Nacogdoches, TX: Stephen F. Austin State University, Arthur Temple College of Forestry, Center for Applied Studies: 264–269.

Watson, A., Glaspell, B., Christensen, N., Lachapelle, P., Sahanatien, V., and Gertsch, F. (2007). Giving Voice to Wildlands Visitors: Selecting Indicators to Protect and Sustain Experiences in the Eastern Arctic of Nunavut. *Environmental Management*, 40: 880-888.

West, P. (1982). Effects of user behavior on the perceptions of crowding in backcountry forest recreation. *Forest Science*, 28: 95-105.

White, D.D., Hall, T.E., and Farrell,T.A. (2001). Influence of Ecological Impacts and Other Campsite Characteristics on Wilderness Visitors' Campsite Choices. *Journal of Park and Recreation Administration.* 19(2): 82-97.

White, D.W., Virden, R.J., and Carena, J.R. (2008). Effects of Place Identity, Place Dependence, and Experience-Use History on Perceptions of Recreation Impacts in a Natural Setting. *Environmental Management*. 42: 647-657.

Whittaker, D., Vaske, J., and M. Manfredo. (2006). Specificity and the Cognitive Hierarchy: Value Orientations and the Acceptability of Urban Wildlife Management Actions. Society & Natural Resources, 19(6): 515-530.