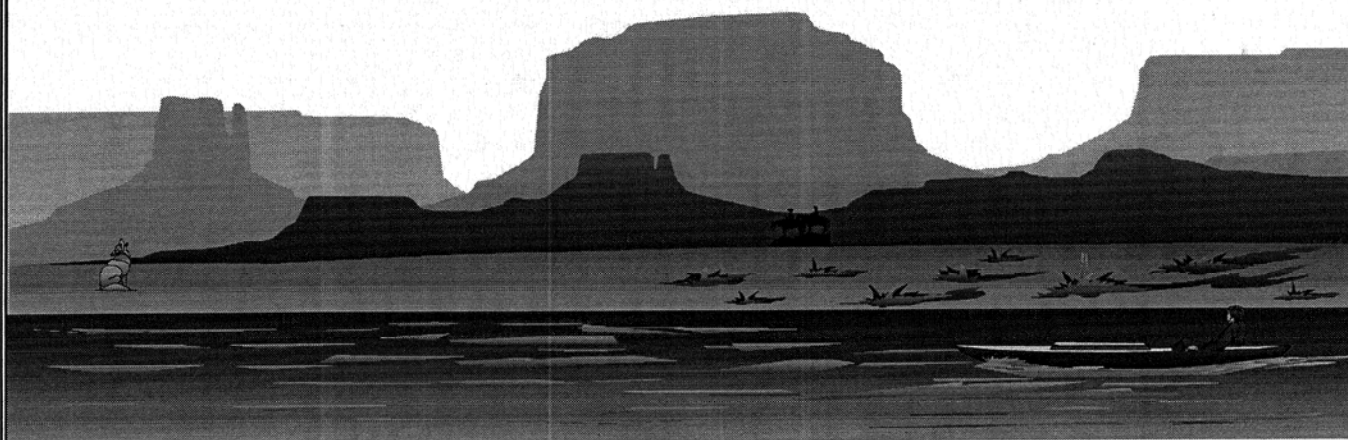


**UTAH RIVER STUDY RESULTS REPORT:
RECREATIONAL USE, VALUE, AND
EXPERIENCE OF BOATERS ON RIVERS
MANAGED BY THE BLM IN UTAH**

VOLUME V: ANALYSIS PAPERS



Institute of Outdoor Recreation and Tourism
Utah State University
Department of Forest Resources
Logan, Utah 84322-5215

Professional Report IORT-PR-2001-3v5

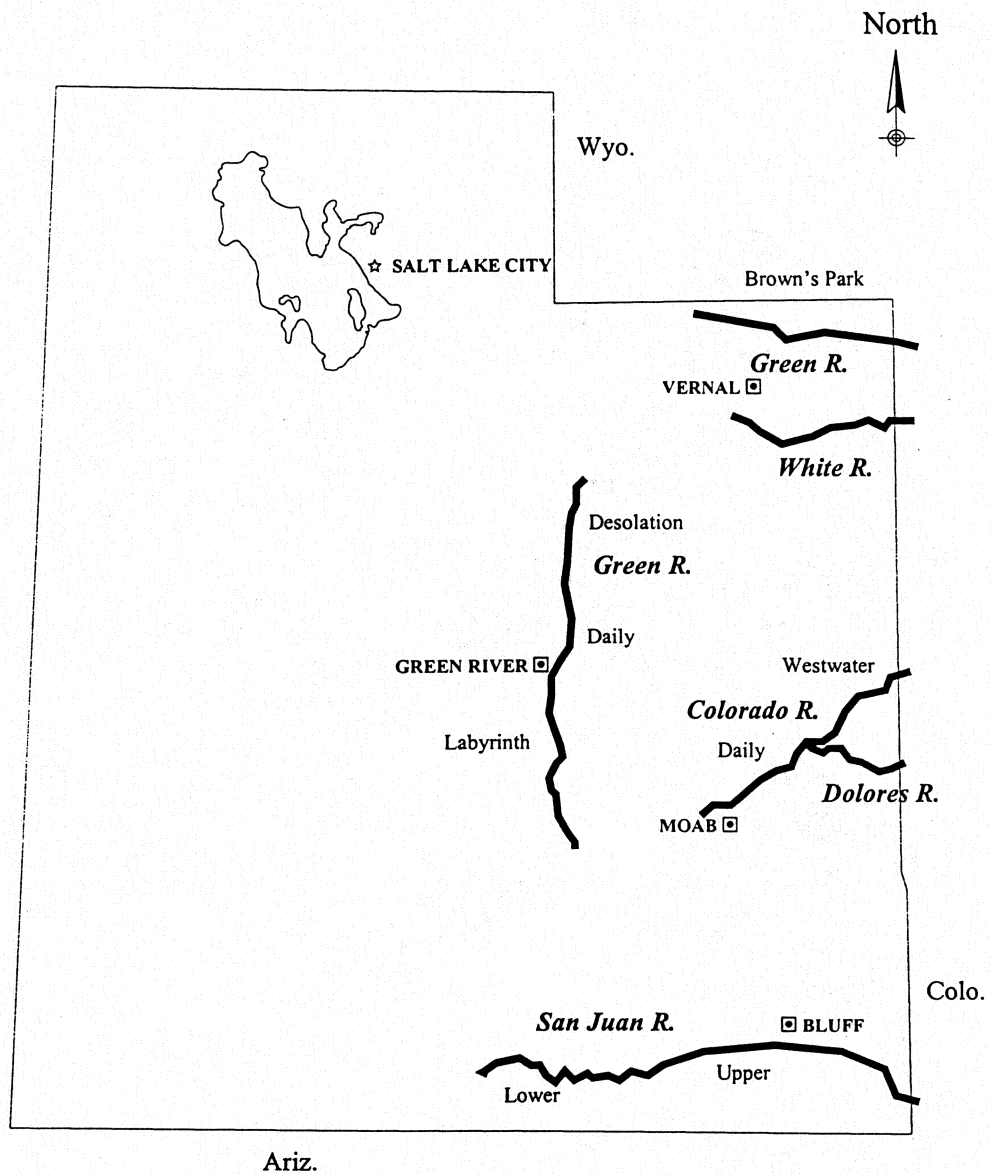


Figure 1. Major floatable Utah rivers administered by the Bureau of Land Management.

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prepared for:

Bureau of Land Management
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Northeast Segments Location Map:
Brown's Park, White, Desolation, and Green Daily.



Flaming Gorge
National Recreation Area

BROWNS PARK
Green River

Ashley
National Forest

191

Dinosaurs
National Monument

Vernal

Duchesne

40

Bonanza

White
River

Sand Wash

UTAH
COLORADO

Price

6

DESOLATION / GREY CANYON
River

Hill Creek Extension Uintah
and Ouray Indian Reservation

Green
River

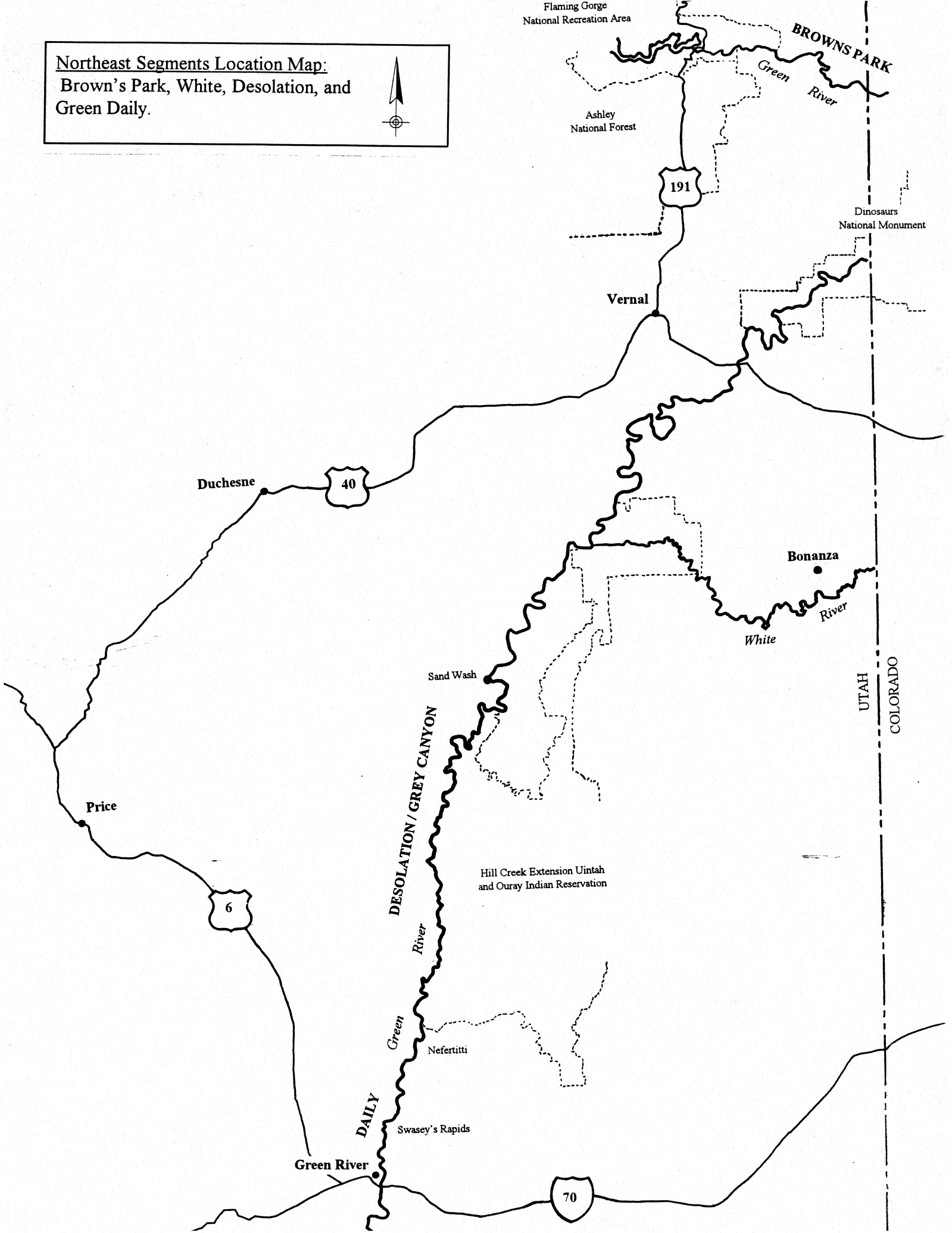
Nefertiti

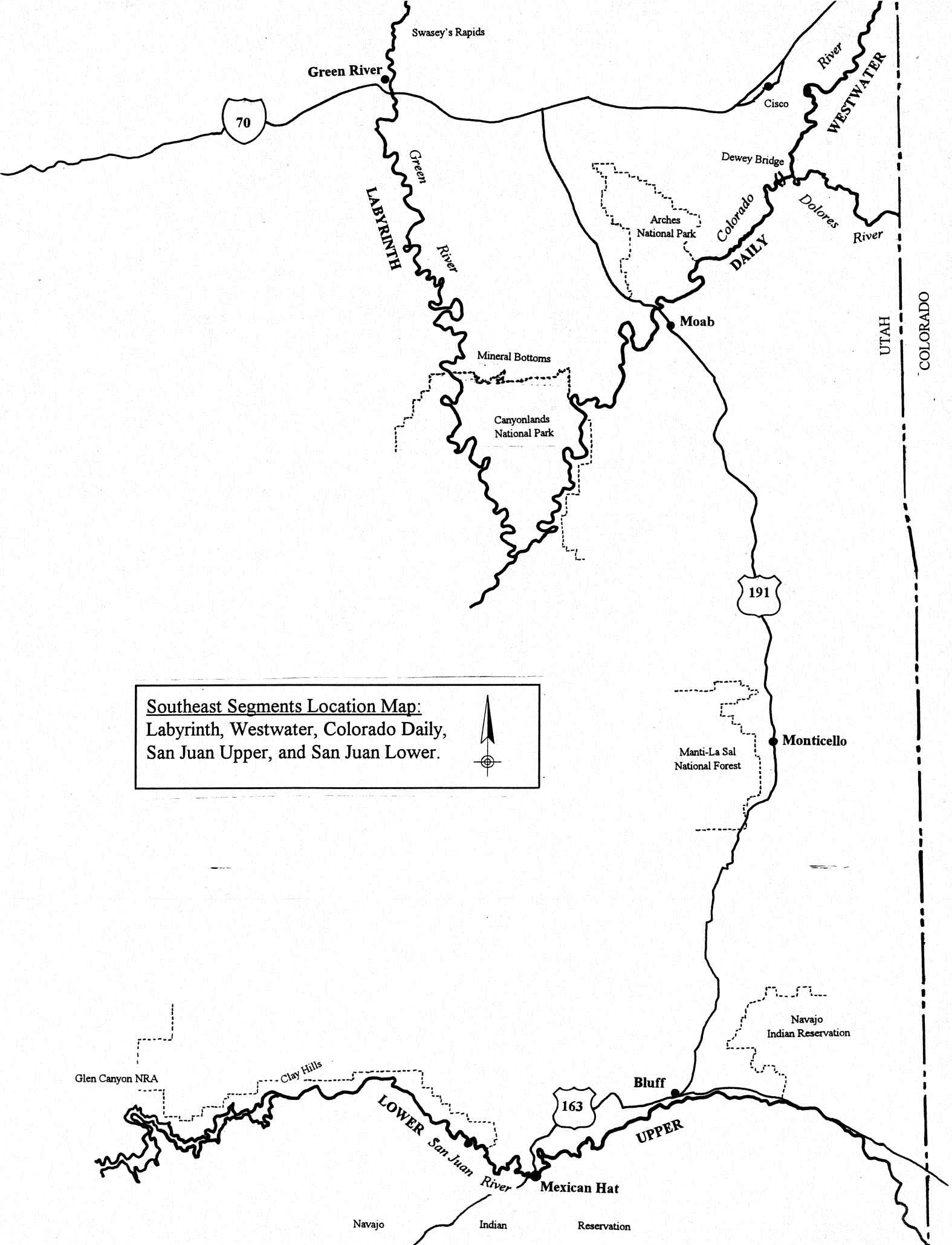
DAILY

Swasey's Rapids

Green River

70





Southeast Segments Location Map:
 Labyrinth, Westwater, Colorado Daily,
 San Juan Upper, and San Juan Lower.



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Regional Study of Whitewater Boaters in Utah: Implications for River Corridor Planning and Carrying Capacity

Some of the earliest studies of whitewater river boater attitudes and preferences were conducted by Richard Schreyer and his associates at Utah State University in the mid 1970s (Schreyer and Nielson 1978, Schreyer and Roggenbuck 1978). Two of the river segments they studied—the Desolation-Grey segment on the Green River and Westwater Canyon on the Colorado—are managed by the Bureau of Land Management (BLM). The BLM used the study results to prepare river corridor management plans. In 1999, a similar study of boaters was conducted on nine BLM managed whitewater river segments in Utah. This paper reports results of this study, and discusses the implications of regional visitor studies for developing river management objectives and using social carrying capacity in wildland planning.

Need for Regional Studies

Historically, social and biological data of land management agencies were collected within individual administrative units. In recent decades, research in ecology and conservation biology illustrate the need to collect data on an ecoregional rather than site-specific basis (Grumbine 1994). Since ecosystems are nested, however, there is no one type or scale of ecosystem that is relevant for all decisions. Rather, it is important to recognize that management actions are not geographically insular—one can only understand the ecosystem effects of decisions made at one scale by also considering the larger scale effects of those actions.

The need for regional scale planning is being slowly integrated into resource agency culture in the U.S. Planning legislation in the 1970s required the Forest Service, BLM, Park Service, and Fish and Wildlife Service to produce multi disciplinary plans at larger scales of

analysis compared to those produced earlier. In the 1980s, the agencies developed planning processes—such the Forest Service’s Limits of Acceptable Change (LAC) and the Park Service’s Visitor Experience and Resource Protection (VERP)—that required multi disciplinary indicators and standards to evaluate management objectives and actions. These were improvements over past planning models, but there were still problems related to disciplinary integration, analysis scale, and agency commitment (Nilsen and Tayler 1997).

With the emergence of ecosystem management in the 1990s, land management agencies have a new mandate to look beyond administrative units in planning efforts (Grumbine 1994, Gilmore 1997). While there is still debate over how, or even if, ecosystem management can be implemented, social and ecological scientists generally agree on the need to take a regional view of management policies and decisions and on setting spatially explicit management objectives.

An important value of regional level planning in river management is to provide for a diversity of recreation opportunities (Lime 1977, Bruns 1985, Schreyer 1985, Shelby *et al.* 1990). At the first River Recreation Management and Research symposium in Minneapolis, Lime (1977: 205) argued for greater emphasis on regional river studies “so recreation uses can be better planned and allocated to reflect the mix of experiences desired by the public.” He advocated a classification of rivers, based on physical, cultural, and perceptual attributes. Schreyer (1985: 12) echoed this sentiment when he argued that identifying river management objectives, addressing recreation impacts and conflicts, and providing a diversity of experience opportunities for a river segment depended on viewing the segment “as part of a larger system of recreational opportunities.” He also recommended developing a river classification system:

[I]f one were to look at the whole array of river recreation opportunities across a set of

rivers that are more or less in the same region, it might be possible to provide a full range of opportunities . . . one river could be seen as a source of opportunities for wilderness recreation, and others would provide more socially oriented experiences; another might be managed solely for thrill-seekers wanting to test themselves against rapids.

Regional river use studies are rare, but there is tentative support for Schreyer's proposed classification. In a reanalysis of National River Study data for seven river segments in Colorado, Bruns (1985) found that being with friends was an important motivation on four river segments, avoiding crowds was important on four segments, and "thrills and action" was important on all segments. On four whitewater rivers in Oregon, Shelby *et al.* (1990: 91) found that social interaction was more important on the Clackamas and Upper Klamath compared to the Rogue and Deschutes Rivers where "the ability to make overnight trips into roadless areas may tend to attract people who seek more solitude . . ." Running rapids was the highest or second-highest reason for running all four rivers. And in a study of several segments of the Salmon River watershed in the Frank Church-River of No Return Wilderness, Watson *et al.* (1998) found that private users on the Main and Middle Forks of the Salmon river differed significantly from tributary boaters regarding the importance of five of six trip outcome factors, including: "river challenge," "escape from civilization," and "companionship."

Carrying Capacity Debate

Social carrying capacity is another area of wildland planning that can benefit from taking a regional perspective. A debate is emerging today related to the use of social carrying capacity as a wildland planning tool. Use capacities are usually applied at the site or unit level and based on facility limitations or managers' or visitors' estimates of the number or type of contacts that visitors consider appropriate (Williams *et al.* 1992, Hof and Lime 1997, Borrie *et al.* 1998). The

Park Service is even required by law to identify park carrying capacities and, as a result of increasing visitation, the perceived need for setting these capacities is escalating (Mitchell 1995, Hof and Lime 1997). Many of these applications are in high use or high impact areas within parks and other protected areas; and while this seems intuitively obvious, it may be exactly the opposite of how recreational use capacities should be applied.

There is increasing criticism of the use of visitor capacity limits in both the ecological and social science literature. Ecologists point out that recreation use–impact curves tend to be curvilinear; i.e., the incremental impact of each additional visitor in low use areas tend to be high, but in moderate and high use areas, the incremental impact of each additional visitor is very low and eventually it becomes negligible (Hammit 1990, Hammit and Cole 1998). Thus, limiting use in one area may increase aggregate regional resource impacts if use is shifted from heavier to lighter used areas. And *reversing* existing impacts often requires major reductions, or even eliminating use. Most use capacities, however, recommend small decreases or even increases from existing use levels, resulting in little ecological gain without the application of other management tools (e.g., site hardening or visitor education). Dispersing visitors from high to low use areas makes the application of these tools less effective (Thorn *et al.* 1994). As a result, recreation ecologists are beginning to discuss the value of visitor “concentration” strategies, and suggest that use limitations are more appropriate in areas that receive relatively little use.

Social scientists are starting to arrive at similar conclusions, but for a different reasons. This is a complex methodological and conceptual debate (c.f., Shelby *et al.* 1989, Williams *et al.* 1992, Stewart and Cole 1997), and here we will focus simply on the tendency to apply use capacities in relatively high use areas, whether in front country or back country settings, and

problems related to that approach when viewed in a regional context.

Borrie *et al.* (1998) suggest that carrying capacities should only be applied for recreational experiences that are truly density-dependent and where the relationship between use levels and crowding is known and consistent. These conditions are relatively rare and probably occur primarily in low use areas. In a study of three wilderness areas in the Southeast, Williams *et al.* (1992) found that contact standards vary more within sites than across sites, so that relying on visitor judgements would result in similar areas across many different settings, under representing the actual diversity of experience preferences across many areas. A different type of critique of social carrying capacity is offered by Stewart and Cole (1997). They found that Grand Canyon visitors experience solitude in zones of the park, regardless of use or development levels. They concluded that management actions can encourage feelings of solitude in areas with any number of people, and it is professional bias to assume solitude can only be found in remote locations.

A common theme in this debate is that too much emphasis is placed on social carrying capacity and use limitations in wildland planning.

[T]he predominant focus on carrying capacity has unfortunately misdirected attention almost solely to controlling numbers of visitors, deflecting attention away from many more useful actions based on an understanding of relationships between visitation levels, impacts, area goals and local community expectations. . . Essentially, carrying capacity focuses attention on the question, "How many is too many?" when the question confronting protected areas managers is, "What are the appropriate or acceptable conditions for visitation and how do we achieve them?" (Borrie *et al.* 1998:134)

This problem is reflected in Park Service policies, which require the use of social carrying capacity in planning (Hof and Lime 1997), and use limiting actions are emphasized as the most "appropriate tools" for dealing with visitor impacts and conflicts (U.S.D.I., NPS 1988: 8-2). The new management plan for Grand Canyon National Park reflects this policy. Planners feel the

developed area of the South Rim is overused, and while the plan recommends using a shuttle system to help accommodate additional visitors, they are also planning to open up remote stretches of both rims by “constructing new paths, overlooks, and bikeways [and] encouraging tourists to use canyon trails that are now fairly quiet” (Brownridge 1995: 3). According to the park planner, the general idea is to limit use at South Rim, and do “a better job of spreading people around” to areas of “under-utilization.” While the shuttle can help reduce certain impacts at the South Rim even at higher use levels, implementing a use capacity will not, and may exacerbate impacts in other areas of the park. And since visitors in the Developed zone of the park are as likely as those in Primitive and Wild zones to feel they are experiencing solitude, there seems to be no behavioral basis for this approach, but rather an example of professional bias against heavy use areas (Stewart and Cole 1997).

On a regional basis, applying carrying capacity and use limitations in non density-dependent areas, may homogenize recreational experiences and exacerbate ecological *and* social impacts due to visitor displacement and the resulting *off-site* impacts (Thorn *et al.* 1994).

Schreyer (1985:11-12) voiced similar concerns regarding river management.

Managers responded [to increasing use] by focusing on ways to limit use to protect the resource, and “carrying capacity” became a trendy concept. They lumped recreationists into one category, river runners, and did not seek to understand the nature and extent of diversity of the demands. Calls for diversity of opportunity were dismissed, because the focus was primarily on single river segments. The outcome was often a weak rationale for limiting use on many rivers.

We contend that understanding the “diversity of demands” requires a regional perspective. The regional river boater data allow us to empirically test visitors’ perceptions of crowding in high use and low use areas. If crowding is a greater concern of boaters on low use segments, it indicates

that, at least from a recreation perspective, carrying capacity is less relevant in high use than in low use areas. Again, there are few empirical tests of this, but some preliminary evidence exists. In Bruns' (1985:84) study of whitewater segments in Colorado, he concluded that "on three of the most heavily-used river segments in the system . . . people felt rather neutral about the need to escape crowds. Users on the four remaining segments all felt that it was important to escape crowds." And preliminary results of a study of boaters in Canyonlands National Park found that place attachment and encounter norms were less of a concern for boaters on the exciting and popular Cataract Canyon segment of the Colorado River than the more remote but less dramatic and less popular segment through Stillwater Canyon on the Green River (Warzecha and Lime 2000). And, as noted above, Shelby *et al.* (1990) found differing expectations toward solitude and social interaction for boaters on four rivers in Oregon.

Purpose of Paper

The study of nine BLM managed river segments allows us to investigate the value of regional studies for setting river management objectives and to test the question related to the application of carrying capacity in high vs. low use wildland settings that provide similar opportunities. First, we hypothesize that river boaters on low use segments will be more likely to be sensitive to the number of people they see than boaters on high use segments. If this is supported, social and ecological research may be converging on a similar set of policy implications that differ radically from current practice: that is, when comparing similar opportunity settings, use limits make more sense in low use than in high use areas.

This paper can only begin to answer this complex and controversial policy question. Thus, a more general purpose of the paper is to investigate the value of region-wide analysis of visitor

expectations for helping to identify segment-by-segment management objectives for a system of river opportunities. In specific, we expect to find that different river segments will cater to three general types of visitor expectations: solitude, social experience, and thrill-seeking.

Study Rivers

Data were collected via intercept and mail surveys of boaters on the Colorado, Green, San Juan, and White rivers (Table 1). The intercept survey was conducted at 13 take outs and was designed to represent the nine BLM whitewater river segments that are located in Utah and have commercial river trips (Fig. 1). See Table 1 for summary statistics for each segment.

Beginning at the north end of the state, the *Brown's Park* segment of the Green River exits Flaming Gorge Dam and flows to the Brown's Park Bird Refuge near the Colorado border. It is a blue-ribbon trout fishery with many of the boaters using drift boats and other craft as fly fishing platforms. The top half of the segment (from Spillway to Little Hole) is managed by the Forest Service as part of the Flaming Gorge NRA. It is usually run in a single day. The *White River's* headwaters are in northern Colorado Rockies. While the Colorado portion contains whitewater opportunities, the Utah stretch, or Bonanza segment, is essentially flat-water and canoeists take about three days to run the river and take out before entering the Uintah-Ouray Indian Reservation.

Below the confluence with the White River, the Green River flows through *Desolation* and *Upper Grey Canyons* as the river cuts through one of the most remote areas of the state, the Tavaputs Plateau. A popular destination, rafters generally spend three or four days floating this segment, stopping along the way to take short hikes and visit archeological and historic sites. The Green River then flows through *Lower Grey Canyon* from Nefertiti Falls to Swasey's Rapids near

Green River, Utah. This segment typically takes four to six hours and, depending on flow rate, has seven or eight Class II to III rapids. Starting at Green River State Park, the Green flows through *Labyrinth Canyon*, a stretch that takes about four or five days to float. This stretch is also quite remote, as the river finds its way through the red rock canyon country of Southeastern Utah. Most boaters take out at Mineral Bottom, just before entering Stillwater Canyon at the northern boundary of Canyonlands National Park.

Westwater Canyon of the Colorado River offers the steepest gradients and most challenging rapids of the study segments. Most of the river runners take a full day to run this stretch, although quite a few enjoy turning this segment into an overnight stretch. The *Colorado Daily* segment takes about four hours, has minor rapids, and attracts many tourists visiting Moab, Utah. It is but one aspect of the "Moab Experience," which includes visiting many state and national parks, mountain biking on "slickrock" trails, redrock four-wheeling, and rock climbing.

The San Juan River in the southeastern corner of the state is bounded by the Navajo Indian Reservation to the south. At certain points, its flow has cut enormous meanders through thousands of feet of sandstone, creating spectacular geologic features such as the Goosenecks of the San Juan. Some boaters take just a few days and float just the *Upper San Juan* or the *Lower San Juan* segments, and others may take several weeks to run both segments. Both stretches offer many opportunities for hiking up side canyons with waterfalls, hanging gardens, and ancient cliff dwellings.

Survey Methods

For the intercept survey, research technicians were divided into three teams of two. Between May and September, 1999, they rotated among the nine river segments, contacting river

runners at the take outs and asking them to fill out a short, two-page survey. The intercept survey contained key questions that were most dependent on recall, such as the number of boaters and watercraft they saw during their trip, and crowding and conflict questions. The mail survey also contained these questions as well as experience expectation (42 items) questions. Question wording and response scales were designed to be comparable with those used by Schreyer and Nielson (1978) in the original river studies.

Of the 2,360 river runners contacted, 2248 completed the intercept survey for a 95% response rate. About 62% (1,394) also agreed to participate in the mail survey and provided their correct names and addresses. Surveys and two reminders were mailed to these boaters in the summer and fall of 1999. We received 804 responses for a 58% response rate to the mail survey, ranging from 43% for the Colorado Daily sample to 73% for the San Juan Lower sample. Unfortunately, the mail survey represents only about 36% of all the boaters contacted during the summer. The results especially under represent boaters on the more tourist-oriented Colorado Daily segment. Since all segments are independent samples, segment means are compared statistically using Tukey's HSD post hoc test.

Results

Table-2 shows the average number of visitor contacts with other boaters, and their attitudes toward crowding and trip satisfaction. Use levels vary significantly; the heaviest used segments are Brown's Park, Colorado Daily, Green Daily, and Westwater Canyon. In fact, boaters on the Colorado Daily saw six to nine times as many people as boaters on the Lower San Juan, Desolation, Labyrinth, and White River segments. These data are similar to the general use levels based on 1998 estimates (Table 1) except for Brown's Park where boaters saw a much

higher number of other boaters than segment estimates would predict. This is because over 90% of these boaters who put in at the dam take out at Little Hole on Forest Service land part way down the river without traveling the majority of the Brown's Park segment.

Despite the large differences in use levels, relatively few boaters on any segments said they saw too many people, and satisfaction is uniformly high on all segments (Table 2). As expected, boaters on the lower use segments (Lower San Juan, Desolation, Labyrinth) were more likely to say they saw too many people than boaters on the higher use segments. The only exception to this trend is Brown's Park, where respondents saw an average of 55 other boaters per trip and 34% said they saw too many people. Most of these contacts occurred near the dam, however, and using the full segment statistics, this segment also confirms the hypothesis.

Unlike the crowding and satisfaction results, there are many differences in boater expectations for the various segments. Due to the large number of segment comparisons, we just show the results for five expectation variables that provide the clearest test of the study hypotheses and input for developing management objectives: "experience solitude," "be with family and friends," "run rapids," "learn about human history and culture," and "catch a lot of fish." Table 3 and Figure 2 show the means for each segment, including a new segment called "San Juan Both," which includes those who floated the Upper *and* Lower San Juan. Table 3 is followed by a segment contrast matrix and graph for each variable. The contrast matrix shows statistically significant differences for all possible segment comparison pairs, with the direction of difference (+ or - sign) referring to the segment on the *left* side of the matrix. For example, in the Fig. 3 matrix, boaters on the Upper San Juan rated solitude significantly higher than boaters on the Colorado Daily, and Colorado Daily boaters rated solitude lower than all other segments

except Brown's Park and Green Daily. (The matrix for the variable "to be with family and friends" is not included because there was only one significant contrast.)

Solitude is an important expectation for boaters on most segments, but especially the Lower San Juan, White, Desolation, and Labyrinth segments, and less important for Brown's Park, Green Daily, and Colorado Daily boaters (Table 3, Fig. 3). Similar results were found for several related items: "feel secluded," "get away from it all," "get away from crowds," and "experience remote areas." Being with family and friends was also rated relatively important on most segments, and there is only one significant contrast: Brown's Park boaters tend to think being with family and friends is less important than boaters on Desolation (Table 3, Fig. 2).

There are many segment differences related to the expectation to run rapids (Table 3, Fig. 4). Westwater boaters were more likely than boaters on *any* other segment to expect to run rapids, followed by boaters on Desolation, the Colorado Daily, and the Green Daily. While Desolation and Westwater provide many opportunities to run rapids, this is not the case for either of the Daily segments. This indicates that a large number of inexperienced boaters and tourists who decide to go rafting on the Daily segments as part of larger trip, do not know what the river actually offers. The importance of running rapids is very low for Labyrinth boaters.

"Catch a lot of fish" is clearly the most important expectation on the Brown's Park segment (Table 3, Fig. 5). (Of all 42 expectation items, "being in a natural area" and "scenery" were the only expectations Brown's Park boaters rated higher than fishing.) "Learn about human history and culture" is very important on both segments of the San Juan River and on Desolation, especially compared to the Brown's Park, Westwater, and both Daily segments, where the expectation for learning is particularly low (Table 3, Fig. 6). The findings were similar for

learning about “nature,” but they were not quite as strong.

Discussion

The results support all study hypotheses, but with some important qualifiers. There is evidence for segment differences that are similar to Schreyer’s ideal typical river experiences, but the final determination of management objectives also requires looking at biophysical, cultural, and managerial characteristics of the rivers. And visitor expectations alone (solitude, social interaction, and thrill-seeking) should not be used to “define” river management objectives. Some experience expectations are distinctly different across segments, but these were related to the existing physical and biological attributes of the rivers (fishing, learning, and rapids). Solitude and social interaction are relatively important across all rivers, and differences in the importance of solitude also seem to be influenced by biophysical and managerial factors (e.g., remoteness).

The segments can be loosely categorized based on Schreyer’s typology as providing “solitude” (San Juan Lower, Desolation, Labyrinth, and possibly the Bonanza segment of the White River), “social interaction” (Colorado Daily, Green Daily, Brown’s Park, and Upper San Juan), and “thrill-seeking” (Westwater). But these descriptors can be misleading. For example, we need to add two important secondary expectations: fishing for Brown’s Park boaters and learning for Upper San Juan boaters. And social interaction was equally important on all segments. Thus, segment descriptors and objectives should reflect the combination of social, biophysical, and managerial factors used to categorize the river segments; e.g., “remote” or “backcountry” (rather than solitude), “access” or “frontcountry” (rather than social), and “rapids” or “wild” (rather than thrill-seeking).

This typology of management objectives would provide a diversity of experiences and

match the physical and social characteristics of the segments. The backcountry segments are the longest, most remote, and currently least used rivers; the front country segments are shorter, relatively accessible, and more; and Westwater has the most rapids. By viewing the rivers in a regional context, planners can also identify and prioritize key secondary management objectives and strategies. Thus, for example, Desolation can provide opportunities for running rapids but within the broad context of a solitude experience, while Westwater can provide social experiences along with the rapids experience. Both stretches of the San Juan can provide excellent opportunities for learning about human history, but on the Lower San Juan this should be secondary to providing a remote, solitude experience. In general, river management objectives must focus on relatively few experience expectations, and lower level objectives should enhance, or at least be compatible with higher level objectives.

The carrying capacity hypothesis was also supported: boaters were more likely to say they saw too many people on the lesser used segments where solitude is more likely to be expected. This sounds just as intuitively obvious as applying social carrying capacity in the most heavily used areas (as Park Service and most informal applications of the concept are used), but the planning and management implications of the two approaches are contradictory. Viewing this system of rivers as an example, problems of applying a use capacity on heavy use segments become clear: highly satisfying river experiences will be lost, the displacement of “surplus boaters” from high to low use segments may have greater aggregate social *and* ecological impacts, and the diversity of river opportunities would be reduced in the long run. For example, limiting use on the Colorado and Green River Daily segments would increase use on a currently rarely used, day trip segment of the Labyrinth. This would: 1) increase perceptions of crowding

on a solitude-oriented river, 2) not reduce crowding perceptions appreciably on the heavy use segments (the experience is non density-dependent), 3) disperse and increase ecological impacts along the Labyrinth segment at a far greater rate than the same (or many fewer) boaters would have on the Daily segments, and 4) increase the difficulty and expense of managing the more dispersed ecological and social impacts.

While visitor displacement is often used as the reason for use limitations, in this case, limitations could increase displacement on the Daily segments (direct influence of limitations) *and* Labyrinth (where solitude oriented boaters may leave to seek out other remote segments like Desolation or Bonanza as use levels increase). Conversely use limits will not reduce displacement on the Daily segments because the current boaters do not expect solitude or low use conditions. Thus, use limits on heavy use segments may cause a “use ripple effect” that could adversely influence several rivers in the region. Even if a relatively small number of boaters are actually displaced from the high to the low use rivers, the use-impact curves indicate that the aggregate impacts may still be higher and the impacts will be more difficult to manage.

The combination of the expectation and crowding results indicate that social carrying capacity and related indicators (e.g., use levels, number of contacts, crowding) are relevant on backcountry-rivers, but not frontcountry or wild rivers *at any use level*. Other social, managerial, and biophysical indicators are more important, and simply setting higher contact standards on the front country segments will simply postpone the adverse impacts described above.

The only apparent exception to the crowding findings is the Brown’s Park segment, which had a relatively high level of both boater contacts and crowding concerns. This especially seems to be an anomaly because solitude was relatively unimportant. The number of boaters who travel

the full segment, however, is quite low, which means using the full segment numbers in Table 1, the Brown's Park results also support the study hypothesis. Furthermore, most of the boater contacts take place near the dam at the beginning of the river trip, and many Brown's Park boaters are fishermen. These problems should be addressed with recreation conflict management, zoning, or educational strategies rather than use capacities.

Conclusions

The nine BLM managed whitewater river segments in Utah can be managed as a system to provide a diversity of river experiences. A regional analysis of river boaters helps identify important differences in boater expectations and perceptions of crowding. Developing river management objectives, however, also requires synthesizing social, biophysical, and managerial factors, as well as some judgement on the part of planners. The broader implications of the study are more controversial, however.

It appears that only the remote river segments are density-dependent experiences, and boater numbers, contacts, and crowding indicators and standards are only relevant for planning on those rivers. Using social carrying capacity as a planning approach on the high use, non density-dependent segments may exacerbate social and ecological impacts and unnecessarily limit the number and diversity of river running opportunities. This conclusion may be applicable to many resource and recreation systems, and it is contrary to many uses of carrying capacity and use limitations in resource agencies, including the planning policies of the National Park Service.

For park and wildland planning in general, the results illustrate how visitor expectations and crowding estimates can be used to provide a diversity of experiences, reduce physical impacts, and still accommodate increasing demand. Like the results of recreation ecology

research, these results also question the logic of using carrying capacity in site specific or relatively high visitation areas. Across similar types of opportunity settings, social carrying capacity seems more applicable to relatively low use areas. Besides rivers, this can also apply to other systems of recreational opportunities (e.g., trails, campgrounds, reservoirs, fishing, rock climbing), natural attractions (e.g., wildlife and geological areas like caves, arches, geysers, waterfalls), and cultural attractions (e.g., battlefields, cliff dwellings), both within and across administrative units. In fact, administrative units (e.g., wildernesses, wildlife refuges, and parks) may also be reviewed in a regional context. Recreational and other social systems are nested, just like ecological systems, and the key for planning is to look beyond the individual unit or site that may be the primary planning or management focus.

The results also provide empirical support for analysts who feel agencies rely too on social carrying capacity as a planning tool, or visitation numbers as an indicator of recreational quality. This does not reflect a lack of concern with solitude as an important experience outcome, but recognizes that visitor density is only one of many indicators of solitude, and that there may be a professional bias against high use areas. In a regional context, over use social carrying capacity may, paradoxically, dilute existing solitude experiences in a regional context. As a rule, planners should not expand or encourage use of lightly used areas (e.g., advertise or build new roads, trails, or facilities), and limit use in an area without evidence that: 1) experiences are density-dependent, 2) use of indirect visitor management methods have been attempted and found to be ineffective, and 3) use dispersal will not create greater off-site impacts (social, ecological, and managerial) than are currently occurring. It may be rare that quantitative data can be collected regarding off-site implications of decisions, but coarse-filter data and manager judgements Can be

documented. And in some cases, safety and legal issues (e.g., endangered species impacts) may necessitate use limitations in non density-dependent areas, but these will be rare, and even then, alternative tools and potential off-site effects (number 2 and 3 above) should be investigated before use limitations are implemented.

The most popular use areas within a region, such as the South Rim of the Grand Canyon, should not be viewed as “problems” but, in many cases, as opportunities for providing a large number people with very satisfying recreational experiences, while at the same time, protecting surrounding landscapes. This can only be done if we begin to treat heavy use areas as a management tool, and seriously investigate social and ecological dynamics and the effectiveness of indirect management strategies on a regional basis. Obviously, this is a complex policy issue, and much more research is needed.

Using recreation concentration areas as a *regional* ecosystem management tool allows managers to accommodate more visitors at the same time as controlling regional ecological impacts. This represents an ecosystem management approach to recreation planning. It also indicates that the dual mandate of the National Park Service, to encourage resource use *and* protection, is not a conflicting mandate in and of itself. Only when visitor use is restricted and visitors dispersed into areas of “under utilization” does the mandate become conflicting. Either we throw up our hands in defeat and admit the need to limit use at some arbitrary level for all wildland locations and attractions (a highly dubious social and political undertaking), or recognize that carrying capacity and use limitations should be rarely used, and that high use zones can assist land protection on an ecoregional basis.

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Table 1. Summary characteristics of study rivers.

Response	San Juan River		White R.	Green River				Colorado River	
	Upper	Lower		Brown's	Daily	Labyrinth	Desolation	Daily	Westwater
Number of boaters -- 1998 ¹	5,600	5,900	1,400	52,000 ²	11,000	8,000	6,000	59,000	14,000
Segment length (miles)	26	58	30	16	8	70	84	13	17
Rapid Classes	II-III	II-III	I-II	I-III	II-III	I	II-III	I-III	III-IV
Average trip length (days) ³	2	6	3	2	1	5	6	1	2

¹ Based on 1998 BLM estimate.

² Based on estimates in "The Recreation Use Capacity of the Green River Corridor Below Flaming Gorge Dam" prepared by Institute for Human Ecology for Flaming Gorge Ranger District, Ashley National Forest, USDA Forest Service, Dutch John, UT, Contract No. 53-8499-0-002, April 1991. The report stated that the USFS estimated 52,000 people floated the Green River from the Flaming Gorge Dam spillway to the Colorado Border and that 96% of those 52,000 pulled out before floating the Browns Park section.

³ Based on 1999 intercept survey.

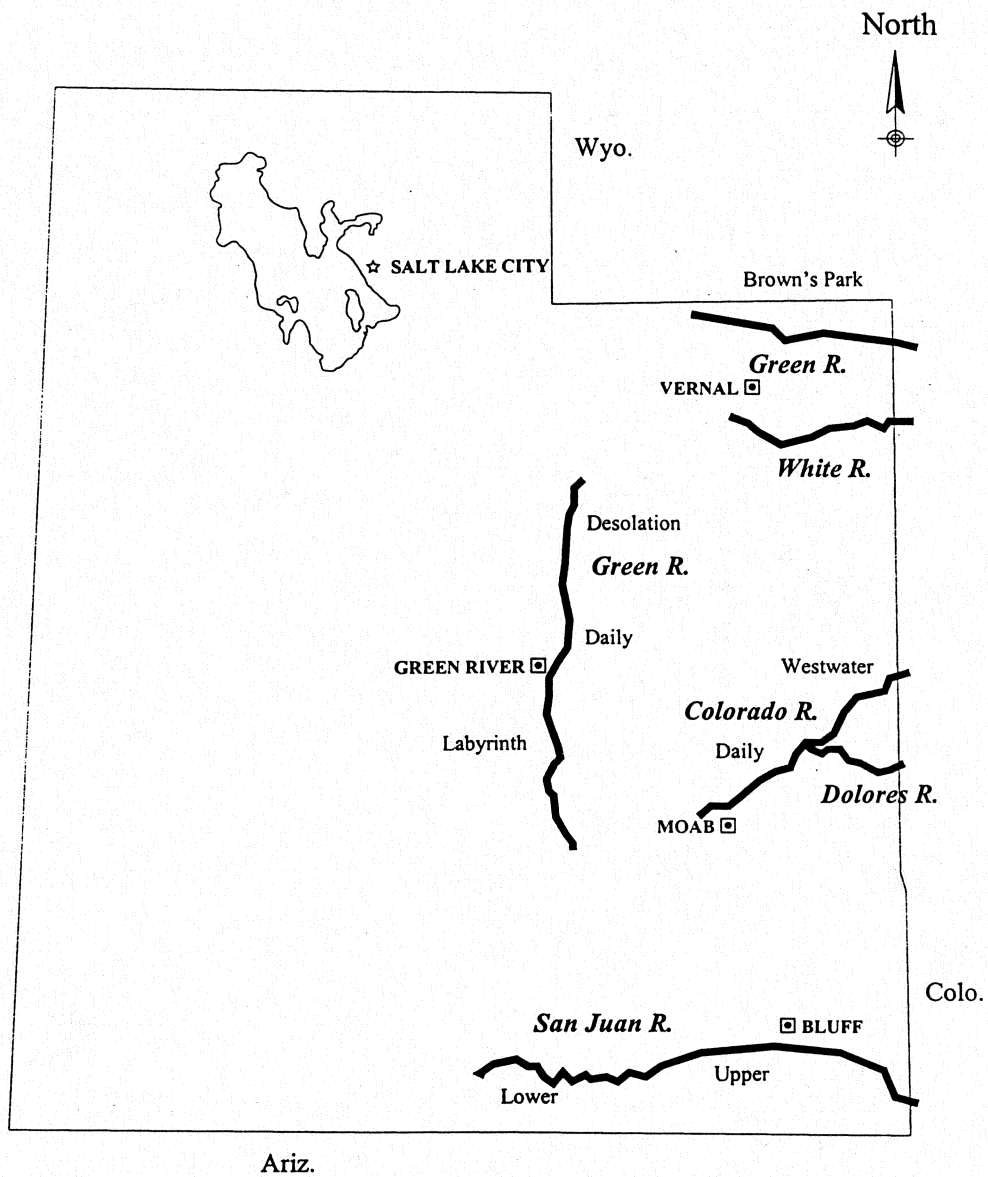


Figure 1. Major floatable Utah rivers administered by the Bureau of Land Management.

Table 2. Average number of people seen (other than your own group) and which best describes your feelings about the number of people you saw and general satisfaction level with trip.

Response	San Juan River		White R.		Green River				Colorado River	
	Upper	Lower			Brown's	Daily	Labyrinth	Desolation	Daily	Westwater
Sample size (n)	(126)	(176)	(47)		(144)	(155)	(149)	(257)	(638)	(556)
Average number seen/ trip ¹	29	43	25		80	35	27	47	62	33
Average number seen per day	15	7	9		55	27	6	9	58	23
Too many people	15%	34%	13%		34%	9%	19%	32%	17%	17%
About the right number	78%	63%	79%		56%	79%	75%	66%	78%	75%
Too few people	8%	2%	9%		10%	12%	6%	3%	5%	7%
Satisfaction mean ²	1.30	1.26	1.30		1.33	1.47	1.61	1.29	1.47	1.17
Percent satisfied with trip ³	97.6%	99.4%	95.7%		97.2%	96.1%	92.5%	98.4%	96.5%	99.5%

¹ River trips are various lengths and averages shown are not standardized to account for the different trip lengths.

² Mean score based on a five point scale where 1 = Very Satisfied, 2 = Satisfied, 3 = Neutral, 4 = Dissatisfied, and 5 = Very Dissatisfied.

³ Percent shown include those who indicated either "Very Satisfied" or "Satisfied" with their river running trip.

Table 3. Segment means and rankings for five expectation variables.¹

Expect to ...	San Juan River			White River (n=22)	Green River				Colorado River	
	Upper (n=41)	Lower (n=50)	Both (n=41)		Brown's (n=48)	Daily (n=50)	Labyrinth (n=55)	Desolation (n=118)	Daily (n=154)	Westwater (n=219)
Experience solitude	3.80 3	4.39 1	4.13 2	4.33 1	2.95 3	2.86 3	3.98 1	4.30 2	2.32 3	3.68 3
Be with family & friends	4.08 2	4.17 2	4.63 1	3.86 2	3.75 2	4.68 1	3.91 2	4.66 1	4.32 1	4.53 2
Run rapids	3.55 4	3.22 4	3.13 4	3.14 3	2.75 4	4.18 2	1.89 4	4.28 3	4.20 2	5.05 1
Learn about human history/culture	4.12 1	3.61 3	3.72 3	2.62 4	2.02 5	1.90 4	2.80 3	2.99 4	1.99 4	2.18 4
Catch a lot of fish	1.08 5	1.29 5	1.05 5	1.24 5	3.87 1	1.32 5	1.22 5	1.13 5	1.08 5	1.10 5

¹ Mean score based on a six point scale where 1 = Not at all Important, 2 = Slightly Important, 3 = Somewhat Important, 4 = Moderately Important, 5 = Very Important, and 6 = Extremely Important.

Figure 2. Comparison of expectation variables for each river segment.

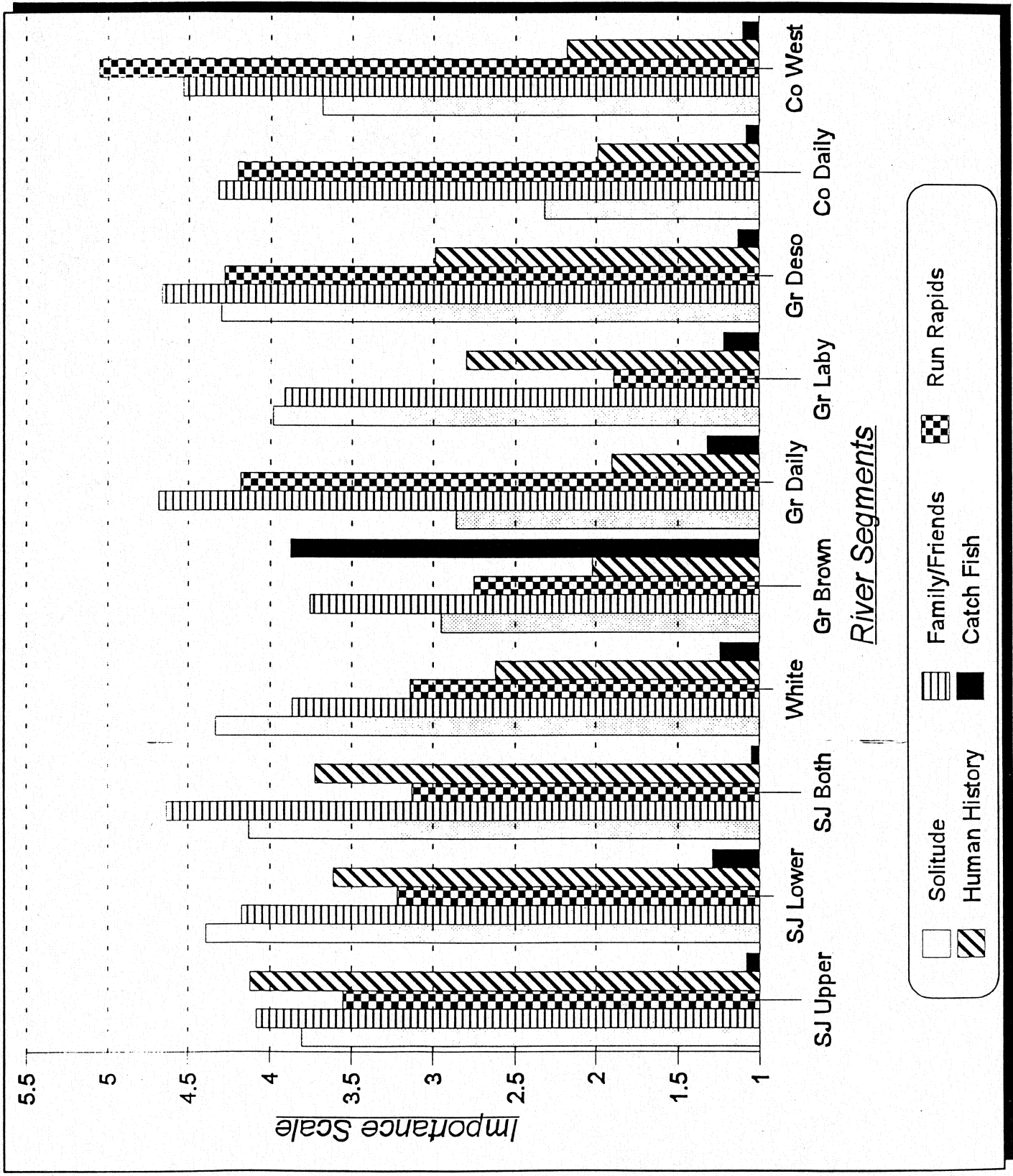


Figure 3. Expectation: Importance to experience solitude.

	SJ Lower	SJ Both	White	Gr Brown	Gr Daily	Gr Laby	Gr Deso	Co Daily	Co West
SJ Upper	-	-	-	+	+	-	-	+***	+
SJ Lower		+	+	+***	+***	+	+	+***	+
SJ Both			-	+*	+*	+	-	+***	-
White				+	+*	+	+	+***	+
Gr Brown					+	-	-***	+	-
Gr Daily						-*	-***	+	-
Gr Laby							-	+***	+
Gr Deso								+***	+*
Co Daily									-***

+ and - indicates a positive or negative difference between the segment mean score in the row and the column segment mean score (row mean minus column mean).

* $p \leq 0.05$, ** $p \leq 0.01$, and *** $p \leq 0.001$ calculated using Tukey's HSD post hoc multiple comparison.

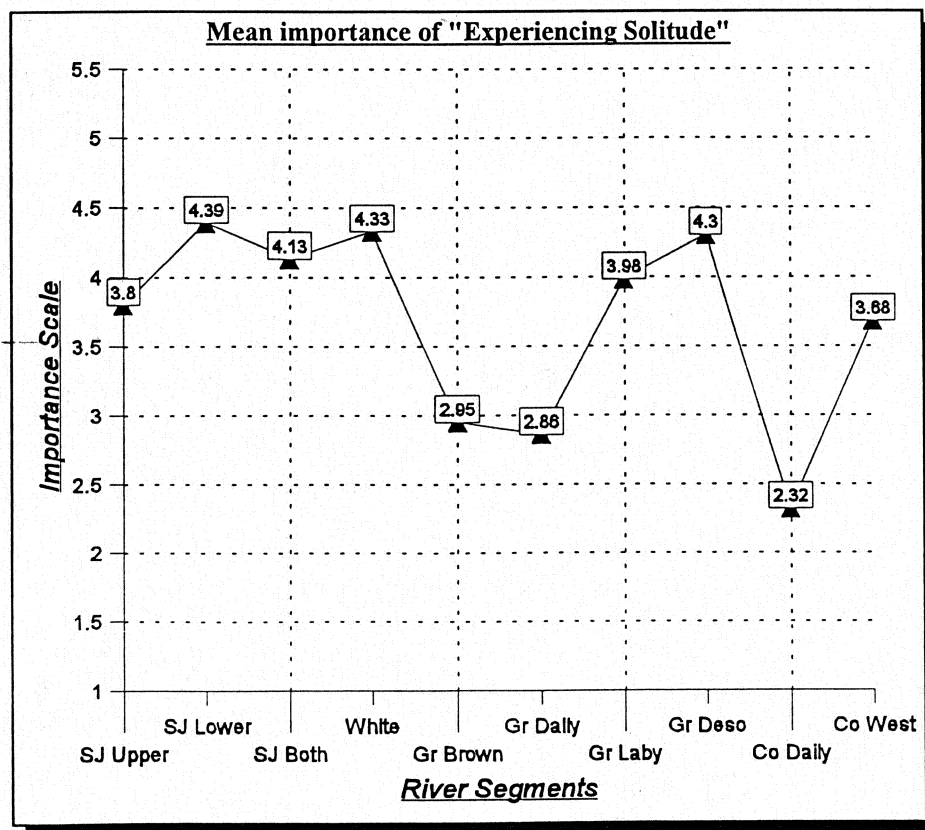


Figure 4. Expectation: Importance to run rapids.

	SJ Lower	SJ Both	White	Gr Brown	Gr Daily	Gr Laby	Gr Deso	Co Daily	Co West
SJ Upper	+	+	+	+	-	+***	-	-	-***
SJ Lower		+	+	+	-**	+***	-***	-***	-***
SJ Both			-	+	-**	+***	-***	-***	-***
White				+	-	+**	-**	-*	-***
Gr Brown					-***	+*	-***	-***	-***
Gr Daily						+***	-	-	-***
Gr Laby							-***	-***	-***
Gr Deso								+	-***
Co Daily									-***

+ and - indicates a positive or negative difference between the segment mean score in the row and the column segment mean score (row mean minus column mean).

* $p \leq 0.05$, ** $p \leq 0.01$, and *** $p \leq 0.001$ calculated using Tukey's HSD post hoc multiple comparison.

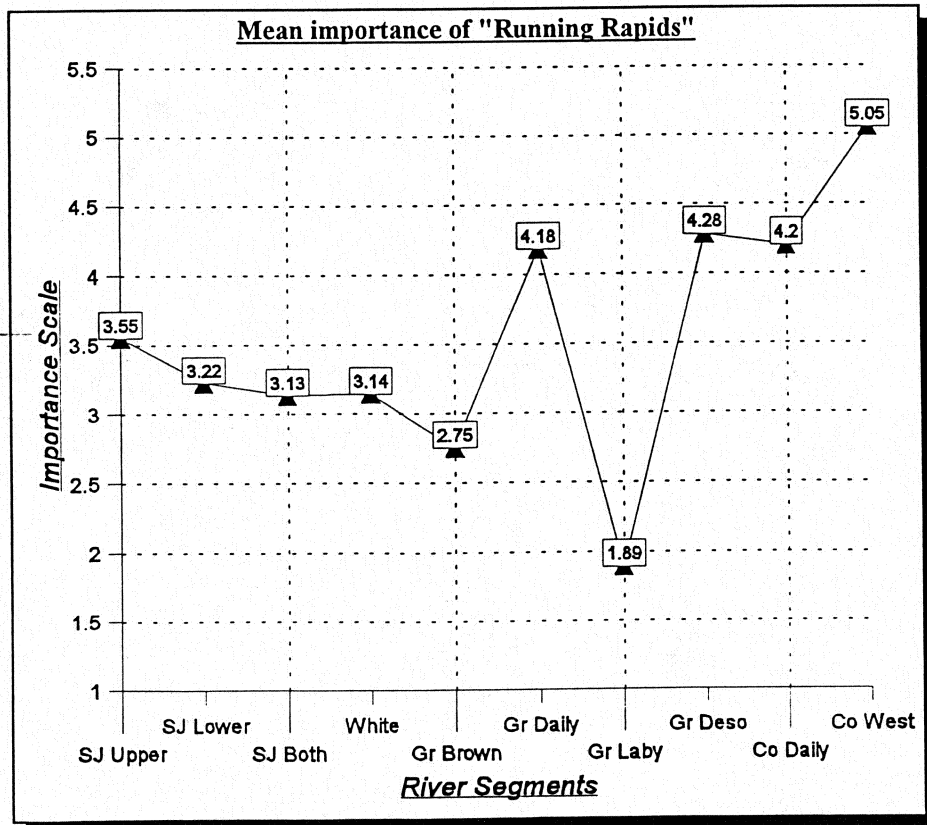


Figure 5. Expectation: Importance to catch a lot of fish.

	SJ Lower	SJ Both	White	Gr Brown	Gr Daily	Gr Laby	Gr Deso	Co Daily	Co West
SJ Upper	-	-	-	-***	-	-	-	-	-
SJ Lower		+	+	-***	-	+	+	+	+
SJ Both			-	-***	-	-	-	-	-
White				-***	-	+	+	+	+
Gr Brown					+***	+***	+***	+***	+***
Gr Daily						+	+	+	+
Gr Laby							+	+	+
Gr Deso								+	+
Co Daily									-

+ and - indicates a positive or negative difference between the segment mean score in the row and the column segment mean score (row mean minus column mean).

* $p \leq 0.05$, ** $p \leq 0.01$, and *** $p \leq 0.001$ calculated using Tukey's HSD post hoc multiple comparison.

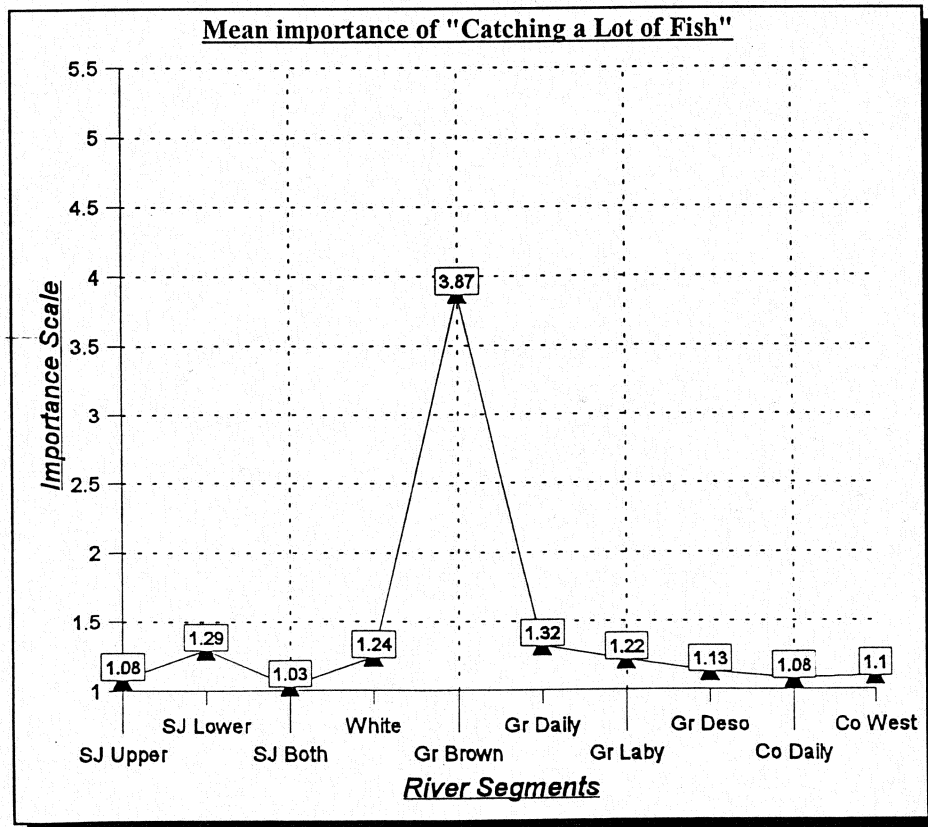
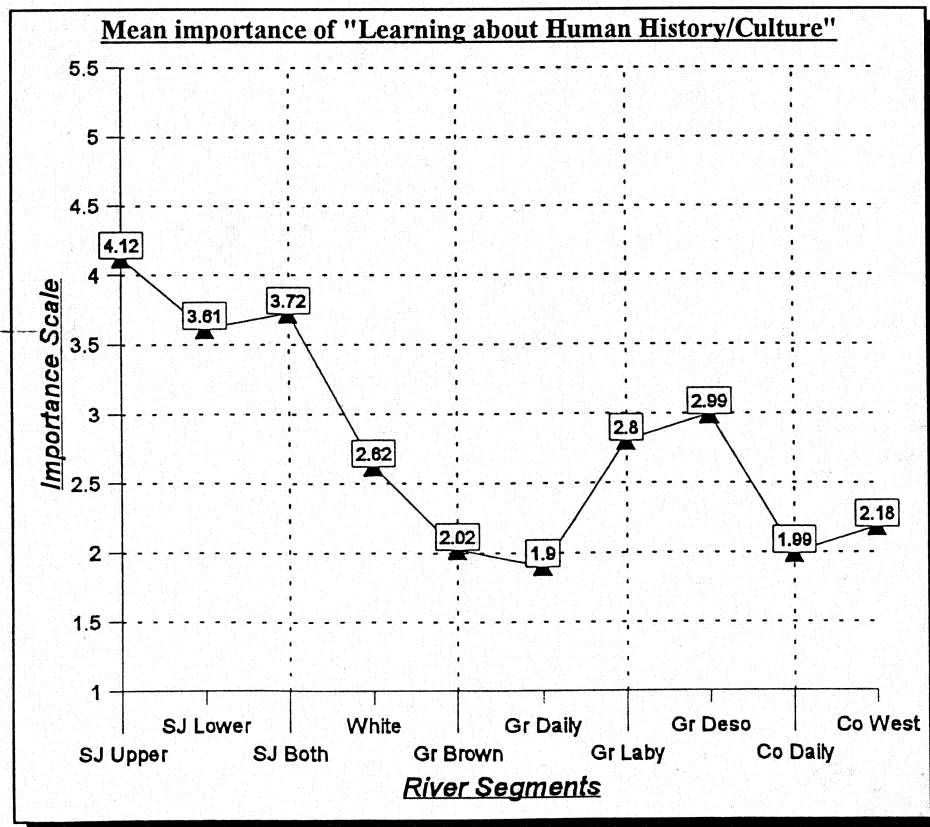


Figure 6. Expectation: Importance to learn about human history and culture.

	SJ Lower	SJ Both	White	Gr Brown	Gr Daily	Gr Laby	Gr Deso	Co Daily	Co West
SJ Upper	+	+	***	****	****	****	****	****	****
SJ Lower	-		+	****	****	+	+	****	****
SJ Both			+	****	****	+	+	****	****
White				+	+	-	-	+	+
Gr Brown					+	-	-**	+	-
Gr Daily						-	-***	-	-
Gr Laby							-	+	+
Gr Deso								****	****
Co Daily									-

+ and - indicates a positive or negative difference between the segment mean score in the row and the column segment mean score (row mean minus column mean).

* $p \leq 0.05$, ** $p \leq 0.01$, and *** $p \leq 0.001$ calculated using Tukey's HSD post hoc multiple comparison.



A Comparison of 1975 and 1999 River Runners on Two Utah Rivers: Desolation and Westwater River Segments

In 1975, a study of river runners' attitudes was conducted on two Bureau of Land Management (BLM) major river segments in Utah, Desolation Canyon of the Green River and the Colorado River's Westwater Canyon (Schreyer et. al. 1977, Schreyer and Nielson 1978). More than two decades later, a similar study was conducted on those segments in addition to seven other segments that flow through or are adjacent to lands administered by the BLM in Utah. The 1999 survey instrument design incorporated several questions from the earlier study with the intent to compare results over time. Those questions dealt with issues such as the ratio of commercial vs. private boaters, preferences for number of other parties seen, demographic characteristics of floaters, and river trip expectations. Even though there were methodological differences employed in the data collection, a comparison of the results will allow river recreation managers to assess changes in river runners and their attitudes over time. The comparison is also useful in policy analysis; a hindsight perspective can help answer questions such as "Were assumptions that were made to form earlier policy correct?" and "Are unacceptable social changes occurring as a result of existing policy?" and "Are fundamental changes to river management plans necessary to meet the needs of the current and future generations of floaters?" The following presents comparative results of the two studies in a effort to address those types of management policy considerations.

River Segment Descriptions

Boaters floating through Desolation and Gray Canyons (referred to as Desolation Canyon segment) of the Green River usually put-in at Sand Wash and takeout a few miles above Green River,

Utah. The river cuts through the 10,000 foot high Tavaputs Plateau forming the steep Desolation and Gray Canyons. The landscape can be characterized as uninhabited, remote, rugged, and devoid of vegetation outside the immediate riparian corridor. The length of the segment is more extensive than Westwater covering about 84 river miles. Floaters tend to spend about four days on the river although some may be on the river only two days while others could spend up to seven or more days floating this segment. The segment is generally considered to offer a leisurely float but does contain some Class II-III rapids. The BLM estimated that about 6,000 boaters floated this Desolation in 1998.

Trips through Westwater of the Colorado River can be run in a single day. Total time on the river is a little more than six hours to negotiate the 17 river miles, but many parties enjoy spending several days along the river, camping in the canyon. Most boaters put-in at the old townsite of Westwater and takeout at the ramp located next to the historic Cisco pumphouse site. There are some floaters who will enter the river above Westwater and there are also a few who will continue the trip past Cisco and end their trip above the town of Moab, Utah. The Colorado River finds its way through relatively steep gradients with Class III-IV rapids for the more experienced river runner. In 1998 the BLM estimated that 14,000 boaters ran the Westwater segment.

Commercial outfitters offer regular trips through both segments providing their customers with not only guiding services but also catering to other trip needs. Private individuals also run these segments but must obtain a use permit. Restrictions on both segments include: using portable toilets, use of fire pans (no fires on the beaches), and carrying out all trash and human waste. There are no restrictions on the use of outboard motors.

Study Methods

Schreyer's study was conducted between May and September, 1975 (Schreyer and Nielson 1978). Westwater and Desolation floaters were approached by researchers as they completed their float trip and asked to complete a questionnaire. Those who agreed were given a survey form and a stamped, addressed envelope and asked to complete it at home and return it by mail. There were a total of 60 sampling days on Westwater and 57 on Desolation. Sampling days were distributed as evenly as possible across the summer, and clustered in order to increase researcher efficiency. Every third person (high school age or older) coming off the river on a sample day was considered in the sample. During heavy use times, sample selection could be difficult, but researchers made every effort to be as systematic as possible. Researchers also recorded the names and addresses of participants, and a follow-up letter and questionnaire and reminder postcard were sent to nonrespondents at three week intervals.

In order to meet research objectives, data collection methods were different in 1999, but we attempted to make them as comparable as possible to the 1975 study. The sampling period was similar (10 May to 30 September) and sampling days were clustered and distributed across the summer. Since there were nine segments included in the 1999 study, it was only possible to sample for 39 days on Westwater and 38 on Desolation. There was a similar distribution of sampling by days of the week, although there was a slightly higher proportion of weekdays selected on Westwater (13 weekend day and 27 weekdays on Westwater and 15 and 26 respectively on Desolation. Instead of every third person, all floaters (15 or older) coming off the river on sampling days were approached and asked to participate in the study. There were more survey topics and questions in 1999, so recall dependent data

were collected with a short intercept survey and then a detailed mail survey was sent to those respondents who gave us their names and addresses. Where possible, question wording and scales were based on the 1975 survey, but some questions were expanded to include information not included in 1975.

The use of two surveys in 1999 resulted in a different response rate compared to 1975. The 1975 response rate was 70.3% for Westwater (462 of 657) and 76.9% for Desolation (524 of 681). In 1999, the response rates were higher for the intercept survey, but lower for the mail survey. For the intercept survey, the Westwater response was 97.9% (556 of 568) and 98.1% for Desolation (260 of 265). Of the intercept respondents, 362 (65.2%) agreed to complete the mail survey on Westwater, compared to 183 (70.4%) on Desolation. This resulted in a mail survey response of 62.4% for Westwater (n=214) and 66.5% for Desolation (n=119). The relatively low percent who agreed to participate in the mail survey in 1999 may result in less representative results than the 1975 survey, and these results must be viewed with caution.

Boater Characteristics

In 1975, about 40% of the boaters on both segments were females. Results of both 1999 surveys suggest the percentage of women increased to over 50% on Desolation but remained low (about one-third) on Westwater (Table 4).

What is more striking is the trend towards older people choosing to run the segments (Table 5). On the Desolation segment in 1975, 17.4% were under the age of 20 while 47.3% were between the ages of 20 and 30. In 1999, about 10% were under 20, and a similar number (9.9%) were between 20 and 30. In 1999, 40.7% were between 40 and 50 compared to 11.1% in 1975. Similar trends can also

be seen with the Westwater floaters. In 1975, 45.9% were between 20 and 30 which dropped to 12.5% in 1999. The percent of 40 to 50 year old boaters was about 14% in 1975 and increased to 40% in 1999.

This trend toward a greater percentage of older boaters is probably also a factor in the increased education level summarized in Table 6. In general, floaters in both years tended to have high levels of education. However in 1975, 55.2% of the Desolation floaters had completed a college degree or had done some graduate work. In 1999, that percentage increased to 72.3%. Similar results were found with the Westwater floaters with 54.8% having a college degree or better in 1975 compared to 69.8% in 1999.

There was also an increasing trend in the experience the floaters had running each segment (Table 7). At Desolation in 1975, about 82% indicated that they were first time users compared to 63.5% of the 1999 respondents. A more striking contrast emerges with the Westwater river runners. In 1975, more than three-quarters (76.3%) indicated that it was the first time they had run that segment compared to about half of the intercept respondents (49.6%) in 1999. The results shown in Table 4 may also underscore a sampling response phenomenon that could be characterized as a "salient vested interest." When comparing the results between the 1999 intercept and mail survey results, the percent of Desolation first time uses dropped over seven percentage points from 63.5% to 55.6%. That phenomenon is even more striking when comparing the 1999 Westwater results (49.6% and 28.3% respectively). In other words, when contacted on the river, about half of the Westwater river runners had run that segment previously, but 71.7% of the mail surveys (that takes more time and interest investments to complete) were from the experienced floaters. Those with a great deal of experience

(ten or more previous trips) accounted for almost two-fifths (39.0%) of the Westwater mail survey respondents. This suggests there may be a consistent response bias toward the more experienced in the 1975 results, the 1999 mail survey, and mail surveys of river runners in general.

Other People and Parties Seen on the River Trip

There appears to have been little change between 1975 and 1999 in the number of other people seen during river trips on both of the study segments. Although in comparing 1975 to 1999, there seems to be a small decrease in number seen on Desolation and a small increase on Westwater. In 1975 on Desolation, 7.7% indicated they saw ten or fewer other people, which increased to 13.7% in 1999 (Table 8). Similar findings but an opposite trend is reflected in the Westwater results with 29.1% indicating they saw 10 or fewer in 1975 compared to 12.2% in 1999. Those who saw 11-25 others increased from 29.3% in 1975 to 36.4% in 1999 which is similar to the next highest category (26-50) which increased from 31.3% in 1975 to 40.0% in 1999.

Other questions asked in both the 1975 and 1999 studies was what would be an acceptable number of other people (Table 9) and parties (Table 10) to see on those segments. It would appear that those floating Desolation are more sensitive to seeing other people (about one-quarter in both study years indicating that it makes no difference) than those at Westwater (almost one-third in both 1975 and 1999). One category that appears to have changed is those indicating that seeing no one was an acceptable number. None of the respondents at Desolation and Westwater in 1999 indicated that seeing zero people was desirable compared to 5.8% at Desolation and 3.7% at Westwater in 1975. Those who indicated 1-10 at Desolation remained constant at over 15% between the two study years but dropped from 10.1% to 2.7% between 1975 and 1999 for Westwater floaters (Table 9).

When asked about the acceptable number of other parties to see, similar trends emerge (Table 10). Results suggest that although the percent who indicated that it does not make a difference in the number of other parties seen are similar between the two study years, Desolation floaters are more sensitive (around four-fifths indicating that it does make a difference) than the Westwater floaters (about three-quarters saying it makes a difference). None of the 1999 respondents on both segments indicated that zero parties was acceptable compared to 5.9% of the 1975 Desolation boaters and 3.5% of the Westwater boaters. A similar but more contrasting finding are those who indicated that one other party seen was acceptable. In 1975, 22.6% of the Desolation boaters thought that one was acceptable and that percentage dropped to 10.6% in 1999. About 13% of the Westwater respondents thought that one other party was acceptable in 1975 compared to only 2.6% in 1999. The next four categories (two, three, four, and five to six parties) each show an increase from 1975 to 1999 at Desolation. Those running Westwater show a decrease from 1975 to 1999 for the categories two and three other parties but an increase for the next two categories (four and five to six parties) along with an increase for the remaining categories (e.g., an increase from 3.0% to 9.2% for 10-15 other parties).

When asked if the number of other boaters seen was too many or too few, a majority of boaters on both segments in both study thought that the number seen was about right (Table 11). However, boaters were less likely to say that the number seen was too many in 1975 than in 1999. On Desolation in 1975, 45.6% indicated that they had seen too many other people compared to 31.2% in the 1999 intercept results and 21.9% in the 1999 mail results. Similar results were found with the Westwater boaters where in 1975, 30.6% indicated too many other people seen, compared to 17.2% in the 1999 intercept results and 10.9% in the 1999 mail survey.

Expectations of Boaters

The 1975 survey instrument contained a series of questions asking floaters to rate their expectation of having certain types of experiences during their river trips. Based on previous studies (Roggenbuck 1975 and Driver 1976), Schreyer and Nielson (1978) took the results of those questions, ran a factor analysis, and reported on seven river trip expectation categories. These were identified and described as: “Stress Release/Solitude (the desire to get away from it all and find peace and quiet); Challenging Nature (the chance to feel that one takes on a challenge, and is able to overcome it); Affiliation (a desire to share the experience with others); Self-awareness (introspection, learning more about oneself through the experience); Learning about Nature; Experiencing Nature (being in and perceiving a natural environment without necessarily learning facts about it); and Action/Excitement” (Schreyer and Nielson 1978: 114).

The 1999 mail survey also contained a series of statements asking respondents to think back to when they were deciding to make their float trips and to rate these 42 reasons for taking their trip on a scale of one to six where 1 = not at all important, 2 = slightly important, 3 = somewhat important, 4 = moderately important, 5 = very important, and 6 = extremely important. Using factor analysis, these items were reduced to nine multi-item scales tapping: Solitude and Nature, Social Interaction with Family/Friends, Social Interaction with Peers, Novelty and Learning, Thrills and Rapids, Skill and Accomplishment, Exercise, Social Status/Image, and Good Fishing (Table 12). Each factor had an Eigen Value greater than one and the items loading on the nine factors explained nearly 65% of the items' variability. Table 12 also show the average factor scores for both segments.

When comparing the factor means on Table 12, the highest average scores were experiencing

Solitude and Nature followed by Social Interaction with Family/Friends, the only two with means above four (moderately important). These were followed by experiencing Thrills and Rapids (3.65), Novelty and Learning (3.25), Exercise (3.14), and Social Interaction with Peers (3.06) (a mean of three indicates somewhat important). Those factors with mean scores above two (slightly important) were Skill and Accomplishment (2.74) and Social Status/Image (2.59). By far the least important expectation with Good Fishing (1.10) with most respondents indicating that fishing was not at all important on these two segments. Because the 1975 survey did not include items designed to measure fishing expectations, the Good Fishing factor is excluded from the following comparison discussion.

It should be noted that the factor analysis and T-test results from the two studies cannot be directly comparable for several reasons. One reason is that although the 1999 questionnaire used items that matched the constructs measured in 1975, the wording was altered to reflect more recent trends in recreation research and similar studies. Also, the expectation scales used for the two studies contained slightly different scale descriptions, the 1999 study used 42 expectation items (compared to 28 in 1975), and, as discussed above, there were differences in data collection.

With those cautions in mind, the 1999 study results contrasted with the 1975 research findings (Schreyer and Nielson 1978) in several ways. The 1975 results indicate that the factor Action/Excited (roughly equivalent to the 1999 factor Thrills and Rapids) ranked highest in importance followed by Experience Nature and Stress Release/Solitude. In 1999, Solitude and Nature was rated highest followed by Social Interaction with Family/Friends and Thrills and Rapids. In other words, in 1975, the expectation of running exciting whitewater rapids was rated as the highest expectation but was the third highest in 1999.

Schreyer and Neilson (1978) used T-tests to compare the factor scales mean scores between boaters on the Desolation and Westwater segments as well as individuals in commercial vs. private groups and experienced vs. non-experienced boaters on each segment. Identical analysis was conducted on the 1999 data. Table 13 summarizes the results of the 1999 T-tests analysis.

In comparing the 1975 and 1999 mean score expectation factor differences between boaters on the two segments, the findings were similar but tended to differ in the degree of statistically significant differences. In both studies, mean scores for the expectation of finding thrilling whitewater rapids was higher for those on Westwater than those on Desolation ($p < .05$ in 1975 and $p < .001$ in 1999). The mean for expectation of finding solitude was higher on Desolation than on Westwater ($p < .01$ in 1975 and $p < .001$ in 1999). However, in 1975 the factor having to do with experiencing learning opportunities was not significantly different, but in 1999 boaters on Desolation had a significantly higher learning expectation ($p < .001$) than Westwater floaters (Table 13).

Analysis of the 1999 Desolation commercial vs. private boaters (Table 13) indicates that those in commercial groups were more likely to expect the experience to provide a challenge or contribute to their social status than those in private groups ($p < .01$). The 1975 results indicate similar results ($p < .001$) but also found that the commercial users were more likely to expect a learning experience than private users and that private users were more likely to both experience social affiliation and explore their personal self-awareness as a result of their trip than the commercial users ($p < .01$ and $p < .001$ respectively). The 1975 study indicated that there were no significant differences between the Desolation segment experienced and non-experienced floaters on any of the expectation factors. However, the 1999 results indicate that the Desolation non-experienced boaters had greater

expectations for Novelty and Learning ($p < .001$) and Social Status/Image ($p < .001$) than those who had previously floated Desolation.

In examining the 1975 Westwater experience expectation factors between commercial and private boaters, the boaters in private groups were more likely to expect to find solitude ($p < .001$), challenges ($p < .001$), affiliation with others with similar interest ($p < .05$), and find opportunities to explore their self-awareness ($p < .001$) than those in commercial groups. The 1999 results indicate similar results with the private boaters more likely to have social interaction with their peers ($p < .001$) and family/friends ($p < .01$), test their skills ($p < .001$), and get some exercise ($p < .01$). The commercial boaters were more likely to seek to improve their social status or image ($p < .01$). The 1975 study found that Westwater boaters who had run the river before were more likely to expect a solitude experience ($p < .001$), find challenges ($p < .01$), and have an opportunity for self-awareness ($p < .001$). In 1999, experienced Westwater floaters were also seeking a solitude experience ($p < .05$). However, they were also more likely to test their skills ($p < .001$), get exercise ($p < .05$), and be with others with similar interests ($p < .001$) than non-experienced floaters. The non-experienced Westwater boaters were more likely to seek Novelty and Learning ($p < .01$) and improve their social status or image ($p < .001$) (Table 13).

Summary

In comparing results from the 1975 and 1999 studies, several interesting contrasts and similarities emerge. On Desolation, there appears to have been an increase from 1975 to 1999 in the percentage of women boaters whereas at Westwater, the percentage of women river runners has remained fairly constant. There also appears to be a percentage shift in the ages of the users. On both

segments in 1975, the median ages fell between 25 and 29 years old and in 1999 the median ages for both segments were between 40 and 49. It appears that the aging of river runners on these segments may also be a reflection of a general population trend toward a maturation of the “baby boomer” generation, and as the U.S. population continues to mature, demand for river boating may decline.

The results from the education levels may also be a reflection of this aging trend. In 1975, the large percentage of younger rivers had probably not had the opportunity to complete their scholastic career. In 1999, nearly 13% more boaters on Desolation than in 1975 indicated they had completed at least an undergraduate college degree, and on Westwater it increased from 21.4% to 27.8%.

Another interesting change in boater characteristics is the familiarity or experience with floating the two segments. Nearly 82% of the Desolation boaters in 1975 indicated that they were first time floaters. In 1999, that percentage dropped more than 18 percentage points to 63.5%. The change on the Westwater segment was even more substantial. The percentage change fell nearly 27 percentage points from 76.3% in 1975 to 49.6% in 1999. It should also be noted that these results indicate that the inexperienced 1999 floaters who completed the intercept survey were less likely to fill out and return the more comprehensive mail survey. Thus, the results from the mail survey may be a reflection of the attitudes of floaters with more experience floating those segments rather than the more representative sample collected in 1975 and the 1999 intercept survey.

This sampling anomaly can be referred to as those with a “salient vested interest” being more inclined to complete a comprehensive opinion survey. In other words, if a respondent has intimate knowledge of the issues or feels that offering his opinions will directly benefit his own interests, then he will be more likely to take the time to complete a more detailed questionnaire. The casual, first-time

tourist who will more than likely not float the river segment again, may have less strongly held opinions about future management, and those policies are less likely to affect his general recreation activities.

The number of other people seen on the segments between 1975 and 1999 appears to have remained relatively stable, although on Desolation there appears to have been a slight increase in the percent of respondents who indicated they saw 10 or fewer between 1975 and 1999, and on Westwater the opposite trend occurred with a decrease in the percent who saw 10 or fewer and an increase of nearly 16% of those who saw 11 to 50 other floaters.

When asked if the number of other people to see while on the river, the percent who indicated that it made no difference was constant in 1975 and 1999 for both Desolation (about 25%) and Westwater (about 31%). The percent who indicated that small numbers of people to see (0 to 10) decreased from 1975 to 1999 for both segments. This finding is also reflected when asked what was the acceptable number of parties to see on river trip. Nearly 54% of the 1975 Desolation boaters thought that two or fewer parties were acceptable while about 43% felt the same in 1999. The same trend shows up on the Westwater segment with about 38% indicating that two or fewer parties were acceptable in 1975 compared to about 22% in 1999.

When asked their feelings about the number of other people seen, 45.6% the 1975 Desolation boaters felt that the number seen were too many which dropped to 31.2% in 1999 (responses to the 1999 intercept survey). A similar trend appears on Westwater where 30.6% said they saw too many people in 1975 and 17.2% in 1999. It should also be noted that in both years and on both segments, the majority indicated that the number seen was about the right number. It should also be noted that when the 1999 respondents were asked the same question on the mail survey, their responses were

somewhat mollified. A greater percentage said that the number seen was about right and a lower percentage said they had seen too many other people. This could be the result of some kind of “assuagement effect” where upon reflection over time (filling out a mail-back survey several months after running the river), people’s opinions would tend to be less severe than the immediate occurrence of the event (intercept survey as they came off the river).

A comparison of the river trip expectation analysis between the two studies revealed several interesting findings. Probably foremost is the shift in the highest ranked expectation. In 1975 on both rivers, the respondents’ highest expectation was to run a lot of thrilling rapids. In 1999, finding solitude and nature was rated first. This could be a result of a larger percentage of river runners in 1999 having run those segments before. On Desolation, the percent of first time river runners dropped from nearly 82% in 1975 to over 55% (mail survey) in 1999. A more dramatic drop occurred with the Westwater floaters from about 76% in 1975 to only around 28% in 1999. These combined results may indicate that the 1999 floaters, with more previous experience running those segments had a more realistic expectation of encountering fewer rapids and more flatwater than those in 1975. The more inexperienced 1975 floaters may have carried a mental image reinforced by popular media that these western river segments would offer the same type of experiences as running the Green River through Cataract Canyon or Colorado River through Grand Canyon. What they found instead was tranquil float with an opportunity to find solitude in a natural setting.

Conclusion

This comparison of two studies on the same river segments separated by 24 years revealed several longitudinal changes that is beneficial to river managers when considering policy changes. For

instance, the aging of the user group may require that infrastructural changes resulting in easier accessibility be warranted. It is also important to strongly consider retaining policies that tend to be functioning well over time. When examining the results from the question asking boaters feelings about the number of other people seen, a majority thought that it was acceptable in 1975 and that percent increased in 1999. To focus on the results that indicate the percent who saw too many has dropped and therefore, those findings can be construed as an indicator that the number of river running permits issued can be increased (push the bubble back) is doing disservice to the data.

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Table 4: Gender of floaters in 1975 and 1999.

	<i>Desolation</i>			<i>Westwater</i>		
	1975	1999		1975	1999	
		Intercept	Mail		Intercept	Mail
Male	57.2%	47.4%	42.0%	60.9%	62.8%	67.5%
Female	42.8%	52.6%	58.0%	39.2%	37.2%	32.5%

Table 5: Age distribution of 1975 and 1999 river runners.

	<i>Desolation</i>		<i>Westwater</i>	
	1975	1999	1975	1999
Under 20	17.4%	9.9%	8.5%	3.0%
20-24	17.0%	2.7%	19.5%	5.5%
25-29	20.3%	7.2%	26.4%	7.0%
30-39	25.3%	16.1%	23.7%	19.5%
40-49	11.1%	40.7%	13.9%	40.0%
50-59	6.9%	18.6%	6.4%	21.5%
60-64	0.8%	2.7%	1.0%	1.5%
65 and over	0.8%	4.5%	0.8%	2.5%

Table 6: Education levels of river runners in 1975 and 1999.

	<i>Desolation</i>		<i>Westwater</i>	
	1975	1999	1975	1999
Less than high school	10.1%	5.9%	3.7%	2.4%
High school graduate	13.3%	2.5%	15.9%	3.3%
Some college	21.4%	19.3%	25.1%	24.5%
College graduate	17.9%	30.3%	21.4%	27.8%
Graduate studies	37.3%	42.0%	33.4%	42.0%

Table 7: Number of times floated river segment in 1975 and 1999.

	<i>Desolation</i>			<i>Westwater</i>		
	1975	1999		1975	1999	
		Intercept	Mail		Intercept	Mail
First time	81.9%	63.5%	55.6%	76.3%	49.6%	28.3%
1	10.4%	-	12.0%	9.1%	-	4.6%
2	2.9%	-	7.7%	3.7%	-	5.9%
3	1.0%	-	4.3%	2.9%	-	6.3%
4	0.8%	-	5.1%	1.9%	-	3.4%
5-9	2.0%	-	8.6%	3.1%	-	12.7%
10-14	0.6%	-	2.6%	1.4%	-	7.9%
15-19	0.2%	-	.9%	0.6%	-	5.4%
20 or more	0.4%	-	3.6%	1.2%	-	25.7%

- The number of previous float trips was not asked on the intercept survey.

Table 8: Number of people seen on river trip in 1975 and 1999.

	<i>Desolation</i>		<i>Westwater</i>	
	1975	1999 ¹	1975	1999 ¹
0	2.0%	3.3%	8.8%	0.6%
1-5	1.8%	2.5%	6.6%	3.0%
6-10	3.9%	7.9%	13.7%	8.6%
11-25	23.1%	22.9%	29.3%	36.4%
26-50	43.1%	37.0%	31.3%	40.0%
51-100	21.6%	22.9%	9.3%	10.9%
101-200	3.3%	4.1%	0.7%	0.6%
over 200	1.2%	0.0%	0.4%	0.2%

¹Question was asked only on the mail survey.

Table 9: Acceptable number of people to see on river trip in 1975 and 1999.

	<i>Desolation</i>		<i>Westwater</i>	
	1975	1999 ¹	1975	1999 ¹
0	5.8%	0.0%	3.7%	0.0%
1-5	5.1%	3.0%	1.6%	0.0%
6-10	10.7%	13.2%	8.5%	2.7%
11-25	24.6%	29.5%	22.9%	24.2%
26-50	20.9%	20.4%	22.1%	20.5%
51-100	6.3%	6.0%	7.7%	11.5%
101-200	0.7%	1.0%	0.5%	6.2%
over 200	0.5%	0.0%	1.3%	2.1%
Makes no difference	25.3%	26.5%	31.6%	32.6%

¹Question was asked only on the mail survey.

Table 10: Acceptable number of parties to see on river trip in 1975 and 1999.

	<i>Desolation</i>		<i>Westwater</i>	
	1975	1999 ¹	1975	1999 ¹
0	5.9%	0.0%	3.5%	0.0%
1	22.6%	10.6%	13.1%	2.6%
2	25.4%	32.7%	21.5%	19.5%
3	11.3%	17.3%	16.4%	11.3%
4	6.4%	13.5%	7.1%	10.3%
5-6	3.6%	6.8%	8.6%	15.3%
7-9	1.6%	1.0%	0.8%	2.5%
10-15	2.6%	0.0%	3.0%	9.2%
over 15	0.6%	0.0%	0.8%	2.0%
Makes no difference	20.0%	18.3%	25.3%	27.2%

¹Question was asked only on the mail survey.

Table 11: Feelings about number of people seen on river trip in 1975 and 1999.

	<i>Desolation</i>			<i>Westwater</i>		
	1975	1999		1975	1999	
		Intercept	Mail		Intercept	Mail
Far too many	16.8%	5.1%	2.6%	9.4%	2.2%	1.0%
Somewhat too many	28.8%	26.1%	19.3%	21.2%	15.0%	9.9%
About the right number	55.7%	66.5%	76.3%	62.5%	75.1%	83.3%
Somewhat too few	2.8%	1.6%	1.8%	6.0%	5.3%	5.4%
Far too few	1.0%	0.8%	0.0%	1.0%	2.4%	0.5%

Table 12: Results of factor analysis for river trip expectation on Desolation and Westwater.

Expectation Categories and Item Names	Rotated Factor Loading ¹	Item Mean ²	Category Scale n Size ³	Category Scale Mean ⁴
SOLITUDE AND NATURE			312	4.35
Be in a natural area	.647	5.19		
See spectacular scenery	.503	5.21		
Feel secluded	.740	4.05		
Get away from it all	.720	4.52		
Enjoy quiet and tranquility	.817	4.55		
Get away from crowds	.824	4.40		
Experience remote areas	.704	4.36		
Think about personal values	.541	2.85		
Experience solitude	.843	3.90		
SOCIAL INTERACTION WITH FAMILY/FRIENDS			324	4.06
Others wanted to go	.773	3.55		
Be with family/friends	.724	4.58		
SOCIAL INTERACTION WITH PEERS			324	3.06
Be with others w/similar interests	.535	3.98		
Meet other people	.542	2.13		
NOVELTY AND LEARNING			319	3.25
See unfamiliar landscapes	.820	3.60		
Have unplanned experiences	.531	3.76		
See new/different areas	.750	3.00		
Learn human history/culture	.584	2.45		
Visit historic/archeological sites	.624	2.87		
Hike up side canyons	.501	3.20		
See wildlife	.461	3.49		
Learn about nature	.533	2.97		

¹Factor analysis based on Principal Components Analysis and Varimax Rotation with Kaiser Normalization (fifteen iterations).

²Items rated on a scale of 1=Not at all Important, 2=Slightly Important, 3=Somewhat Important

4=Moderately Important, 5=Very Important, and 6=Extremely Important.

³Final scale n size based on number of respondents who answered all items in the scale.

⁴Scales for each expectation category were created by taking an average score for all items include in that category. Scores range from 1 to 6 with 1=Not at all Important to 6=Extremely Important.

Table 12: Results of factor analysis for river trip expectation on Desolation and Westwater (cont.).

Expectation Categories and Item Names	Rotated Factor Loading ¹	Item Mean ²	Category Scale n Size ³	Category Scale Mean ⁴
THRILLS AND RAPIDS			318	3.65
Run river in high water	.598	2.46		
Thought conditions would be good	.493	3.97		
Run rapids	.705	4.77		
Have lots of thrills	.557	3.43		
SKILL AND ACCOMPLISHMENT			320	2.74
Run familiar river segment	.617	2.18		
Improve boat skills	.617	3.06		
Use outdoor skills	.467	3.19		
Feeling in control of boat	.618	2.92		
Close to home	.500	2.35		
EXERCISE			322	3.14
Get a good workout	.815	2.83		
Exercise	.784	3.45		
SOCIAL STATUS / IMAGE			316	2.59
Show others you can do it	.758	1.75		
Tell others about it	.742	1.92		
Part of organized trip	.449	2.55		
Impressive thing to do	.759	2.17		
For a challenge	.637	3.54		
Sense of personal accomplishment	.566	3.13		
Do something new and different	.565	3.00		
GOOD FISHING			324	1.10
Catch lots of fish	.849	1.10		
Catch large fish	.830	1.08		
Practice fishing skills	.812	1.12		

¹Factor analysis based on Principal Components Analysis and Varimax Rotation with Kaiser Normalization (fifteen iterations).

²Items rated on a scale of 1=Not at all Important, 2=Slightly Important, 3=Somewhat Important, 4=Moderately Important, 5=Very Important, and 6=Extremely Important.

³Final scale n size based on number of respondents who answered all items in the scale.

⁴Scales for each expectation category were created by taking an average score for all items include in that category. Scores range from 1 to 6 with 1=Not at all Important to 6=Extremely Important.

Table 13: 1999 river runners t-test comparisons between different groups.

		EXPECTATION CATEGORIES MEAN SCORES AND SIGNIFICANCE DIFFERENCES								
		Solitude and Nature	Social Interaction Family and Friends	Social Interaction Peers	Novelty and Learning	Thrills and Rapids	Skill and Accomp	Exercise	Social Status / Image	Good Fishing
<u>DESOLATION</u>		4.67 ***	4.04 n.s.	3.05 n.s.	3.71 ***	3.36 ***	2.50 ***	2.99 n.s.	2.72 n.s.	1.11 n.s.
	<u>WESTWATER</u>	4.18	4.07	3.06	2.99	3.81	2.87	3.22	2.51	1.09
<u>DESOLATION</u>	Commercial	4.57 n.s.	3.77 n.s.	2.72 n.s.	3.89 n.s.	3.32 n.s.	2.36 n.s.	3.31 n.s.	3.33 **	1.10 n.s.
	Private	4.73	4.15	3.15	3.65	3.37	2.54	2.89	2.51	1.11
	Experienced Non-experienced	4.73 n.s. 4.62	3.96 n.s. 4.13	2.83 n.s. 3.21	3.33 *** 3.99	3.25 n.s. 3.44	2.60 n.s. 2.45	2.82 n.s. 3.16	2.18 *** 3.15	1.10 n.s. 1.13
<u>WESTWATER</u>	Commercial	3.91 n.s.	3.34 **	2.38 ***	3.44 **	3.85 n.s.	1.68 ***	2.58 **	2.97 **	1.09 n.s.
	Private	4.23	4.22	3.20	2.88	3.79	3.12	3.34	2.42	1.08
	Experienced Non-experienced	4.32 * 3.88	4.18 n.s. 3.86	3.25 *** 2.65	2.81 ** 3.36	3.75 n.s. 3.93	3.21 *** 2.08	3.38 * 2.81	2.30 *** 3.02	1.12 ** 1.01

n.s. = no significant difference

* p<.05

**p<.01

***p<.001