

U.S. Department of the Interior  
Bureau of Land Management

BLM Alaska Open File Report 108  
BLM/AK/ST-06/024+8351+050  
June 2006

QH  
105  
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No. 108

## Delta National Wild and Scenic River 2005 Recreation User Survey

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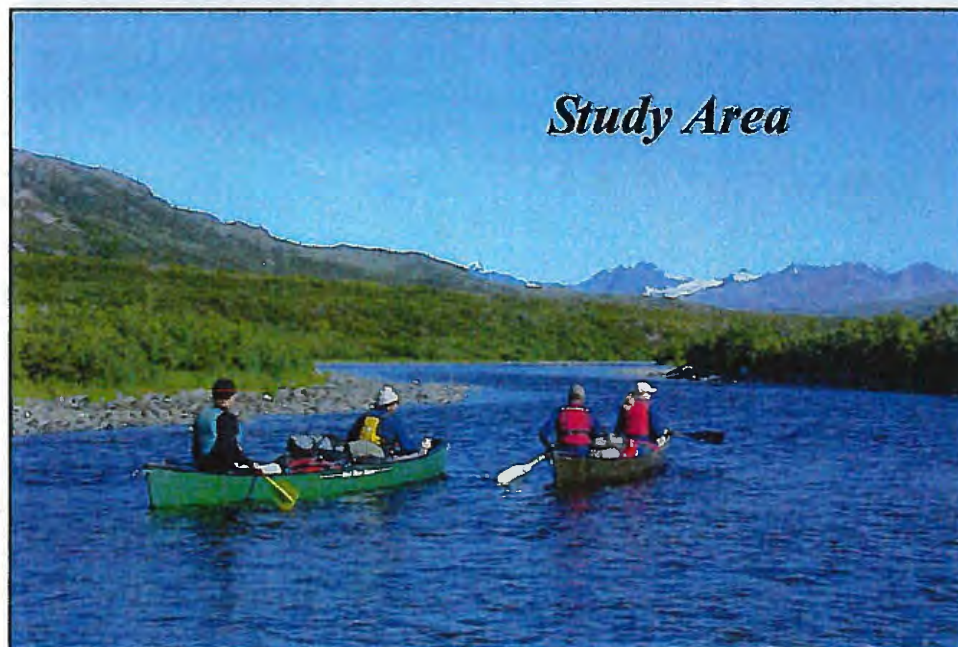


# Delta National Wild and Scenic River 2005 Recreation User Survey



## *Photo Gallery & Summary*

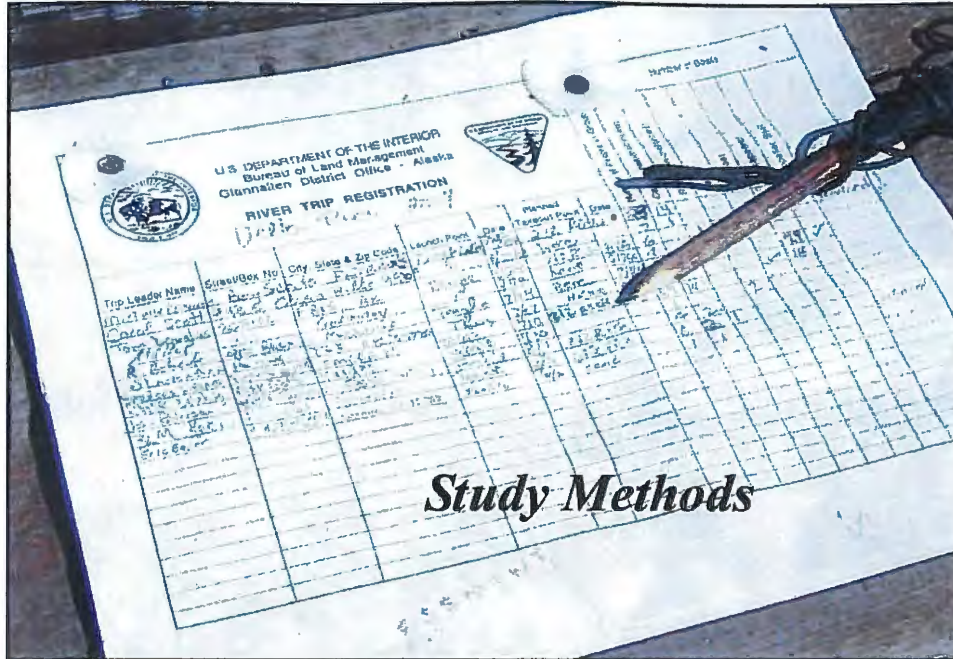
*Lower Tangle Lakes.* This photo gallery illustrates major findings from a 2005 recreation user study on Alaska's Tangle Lakes and Delta River, a 62-mile corridor that is part of the National Wild and Scenic River System. Offering high quality boating, fishing, hunting, and camping opportunities that attract substantial recreation use, BLM expects to revise a 1983 river management plan in the near future. This survey is one input for planners to consider.



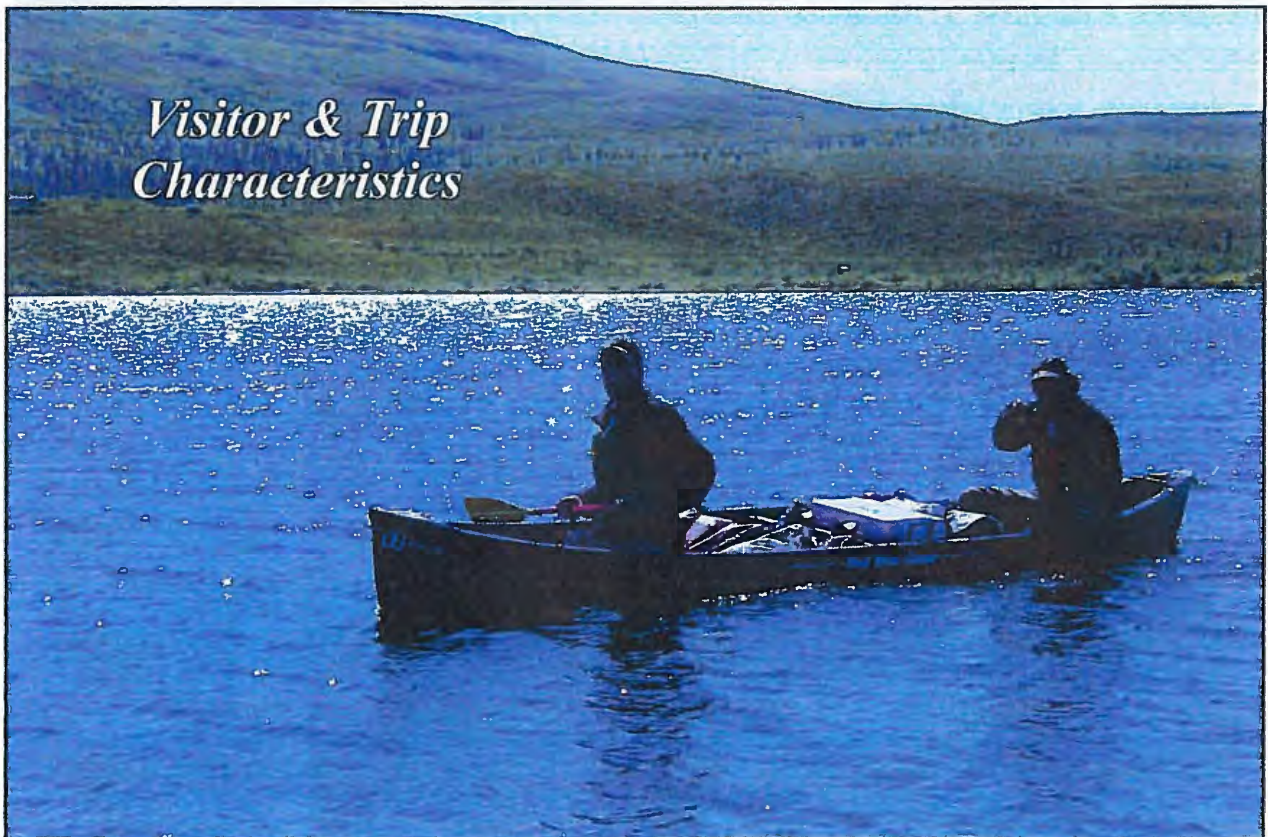
## *Study Area*

*Upper Delta River.* The study area includes five lake/river segments: Upper Tangle Lakes, Lower Tangle Lakes, Upper Delta, Lower Delta, and the Black Rapids segment. Report sections summarize recreation facilities, recreation features (e.g., topography, scenery, fish, wildlife), setting character by segment, and historical use levels.





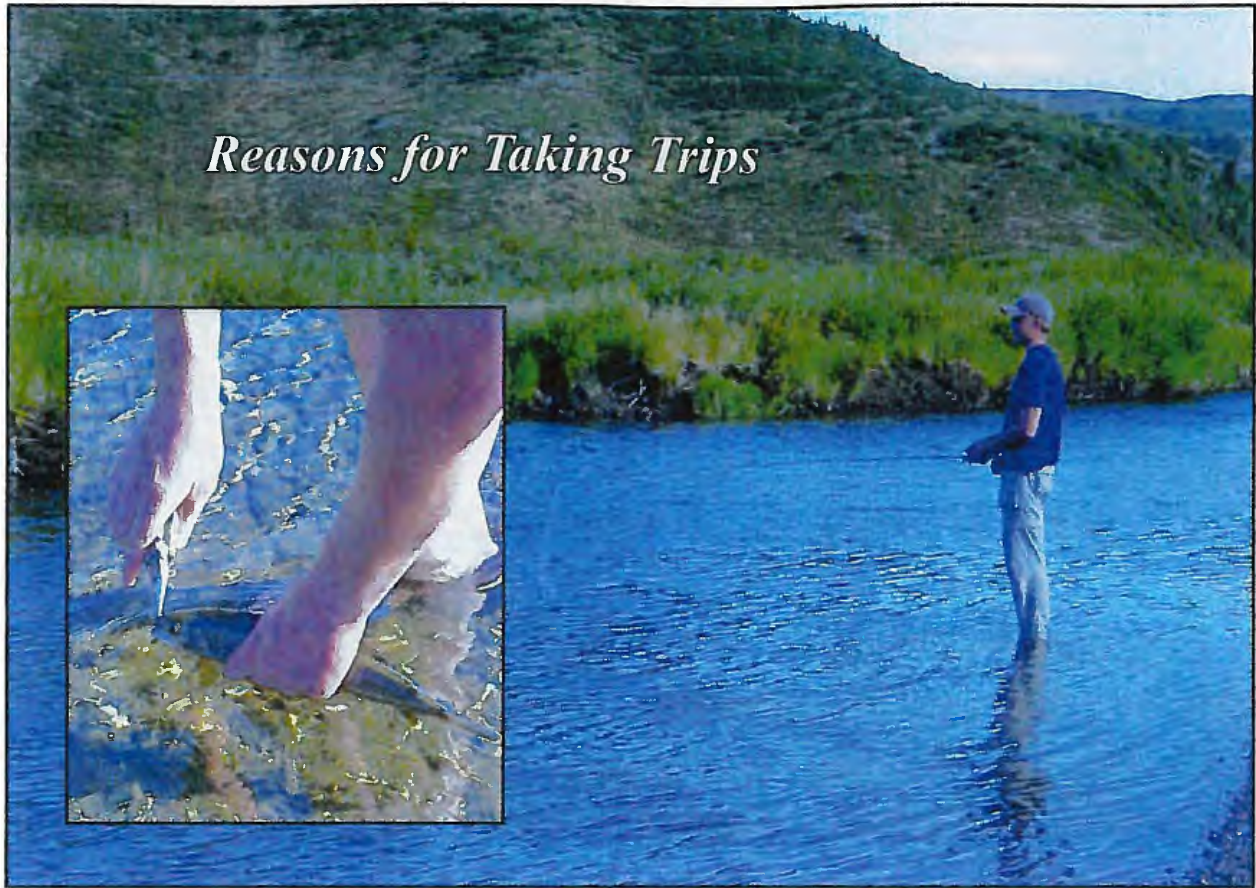
*Registration form.* The survey targeted recent Delta users identified from 1) voluntary registration boxes at boat launches, and 2) a networking sample reached via paddling clubs, a motorized access organization, outfitters, and known local users. In all, 358 people were mailed surveys and 345 returned them (68% response rate). The sample included 152 non-motorized users, 73 motorized users, and 116 ATV users.



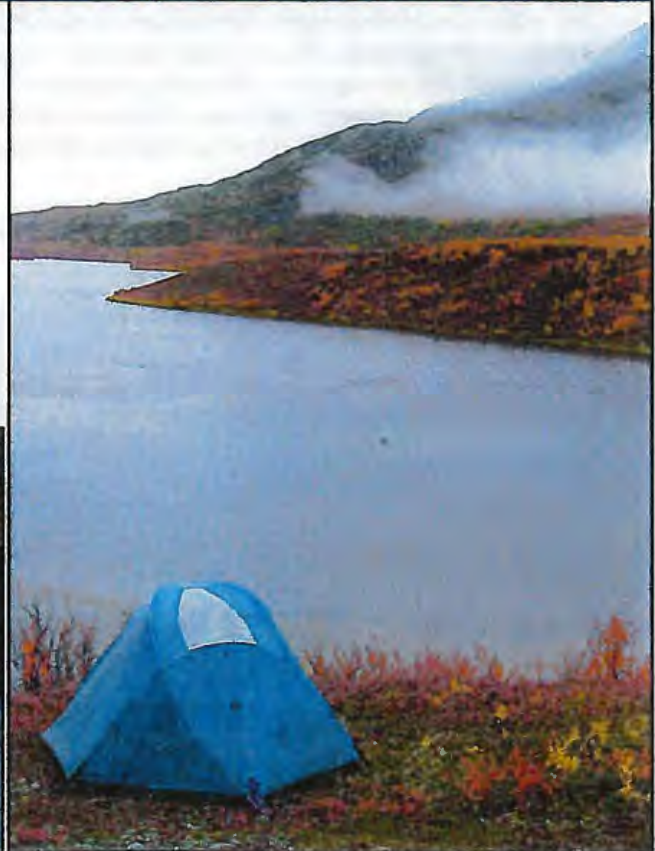
*Lower Tangle Lakes.* Sampled Delta users take many types of trips, but lake-based trips were more common than lake-to-river “through trips,” while Lower River powerboat, Black Rapids, and ATV trips were even less common. Median number of previous trips was 2 to 4. Most respondents were males in their 40s and 50s. Median trip length was 3 to 4 days. Most groups included 2 to 6 people. Majorities of all trips fish, but hunting was more common on Lower River powerboat and ATV trips. None of the “through trip” boaters reported hunting.



## *Reasons for Taking Trips*



*Clockwise from top: Lower Delta grayling fishing; Lower Tangle camp; whitewater in Delta Gorge.* Users rated different reasons for taking trips, and results suggest recreation experiences are multi-faceted. The least important attribute is “meeting other users,” so minimizing interaction is a reasonable management goal. Non-motorized users were more interested in several attributes commonly associated with “wilderness recreation” (e.g., solitude, scenery, being in a natural place) than motorized users. Fishing and hunting were more important for motorized users.

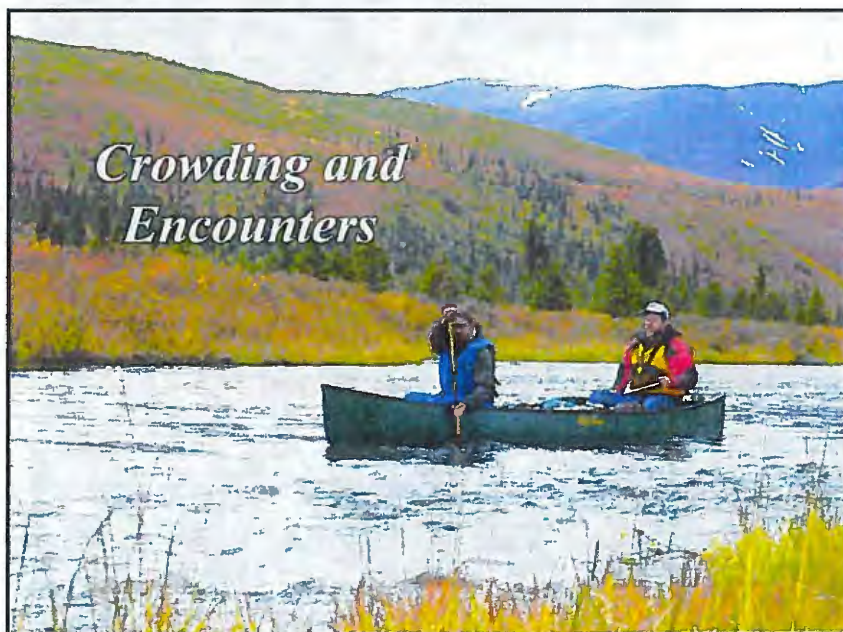






## *Opportunity Settings and Impact Priorities*

*Camp on Lower Delta River.* Few respondents thought any segment should provide a higher density setting, but there were differences between motorized and non-motorized users. Non-motorized users are more sensitive to high densities, development levels, and motorized use, preferring less of each. Most users reported 8 of 16 impacts as “high priorities” for management. Signs of use impacts (litter, human waste) were the highest priorities, and camp competition, camp sharing, and camp encounters were more important than river encounters. Motorized boat encounters, ATV encounters, and ATV trail impacts were higher priorities for non-motorized users.



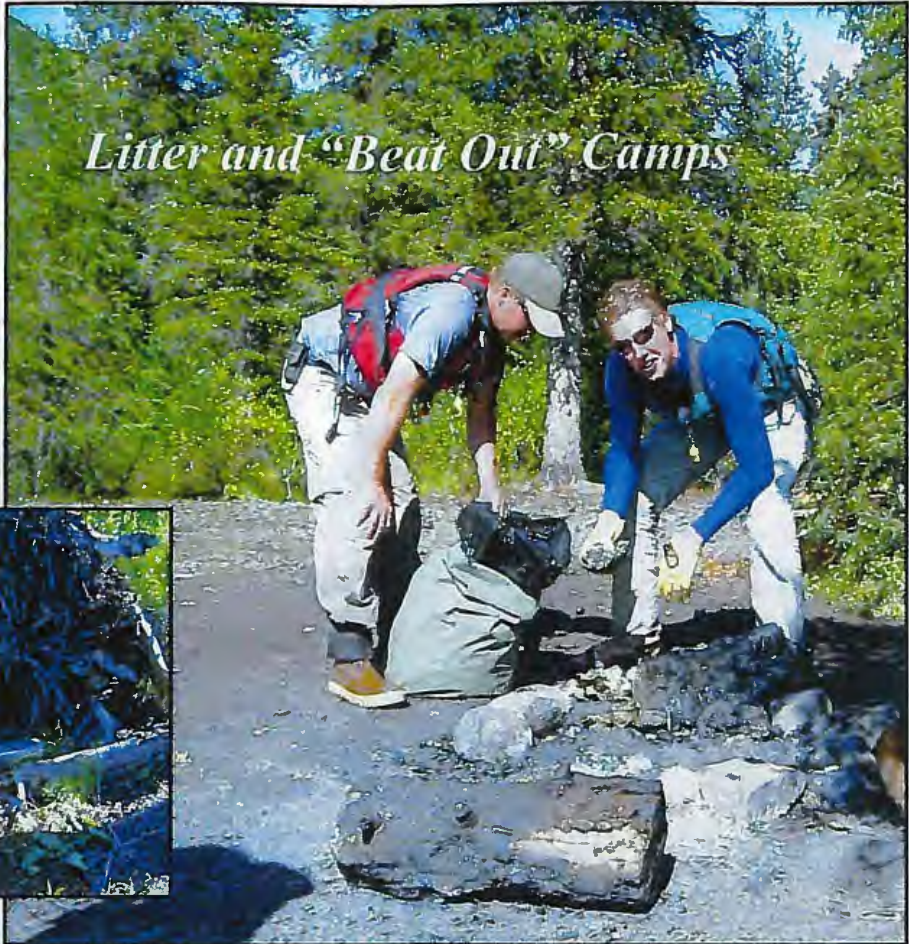
## *Crowding and Encounters*

*Lower Delta River.* Perceived crowding scores suggest that no segment is “over capacity” and crowding scores were well below those from studies on the Gulkana and several Susitna Basin rivers. Analysis of crowding ratings revealed no upward trend in recent years.

Reported encounters with other groups were generally higher than preferences, but were lower than tolerances. Average encounter tolerances (usually less than 4) are similar to those from many other studies of backcountry areas.



*BLM recreation crew cleaning a camp; cached equipment found near a camp.* Based on reported impact and tolerance levels, litter and “beat-out” camps are not substantial problems in the corridor at this time. BLM crew trips that clean camps 3-4 times per year help explain this finding. However, human waste impacts were reported slightly more often than user tolerances.



## *Litter and “Beat Out” Camps*

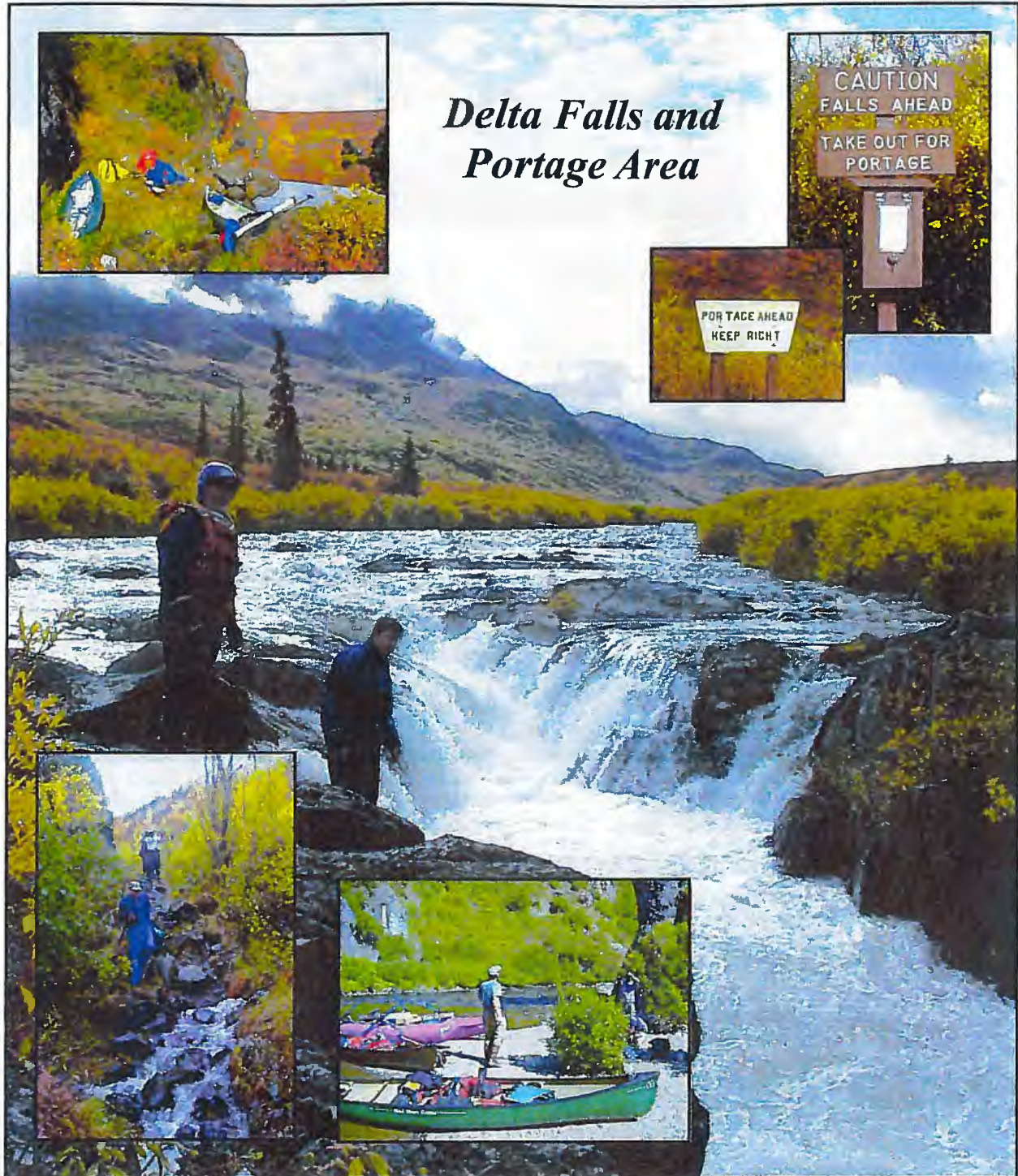


## *Patrols, Education, and Facilities*



*Lower Tangle Lakes boat launch and information kiosk.* Most users support existing patrol levels and increased education efforts; there was slightly lower support for increased patrols. Most users support creation of pit toilets or steps to prevent erosion at high use camps, but they are more divided over specific improvements at the Delta River portage (see next page) and Mile 212 launch improvements.





## *Delta Falls and Portage Area*

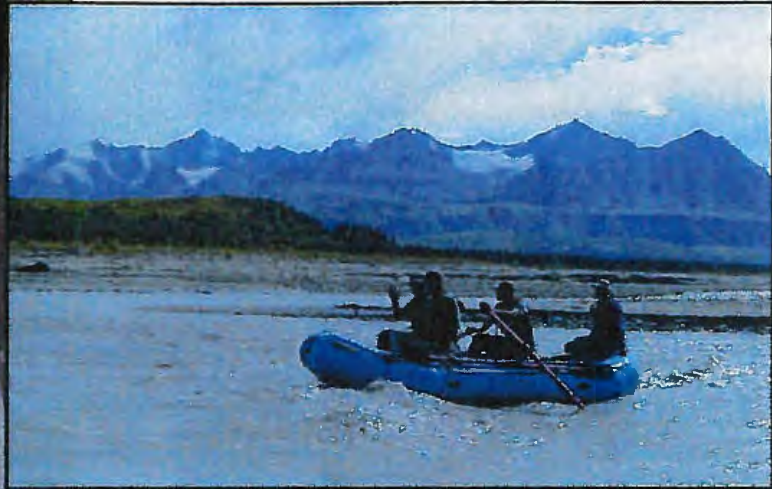
*Main photo: Upper Delta River Falls; a 2nd larger falls is just downstream, followed by a short Class III-IV gorge. Clockwise insets from top right: Portage signs; beach at end of portage trail at low water; 2nd half of portage trail; Beaver pond along portage route. Most Delta River “through trip” users support the current balance of facilities at the portage, which include warning signs, a pit toilet, and a portage trail maintained with mostly on-site rock. There was less support for substantial portage trail improvements, perhaps out of concern that they might attract higher use. The trail, which has two parts divided by a short beaver pond, can be muddy or under water after rain events. There was some support for closing and rehabilitating some side trails to scenic vistas in the area, but opposition toward limiting camping (the number of sites has expanded in recent years).*



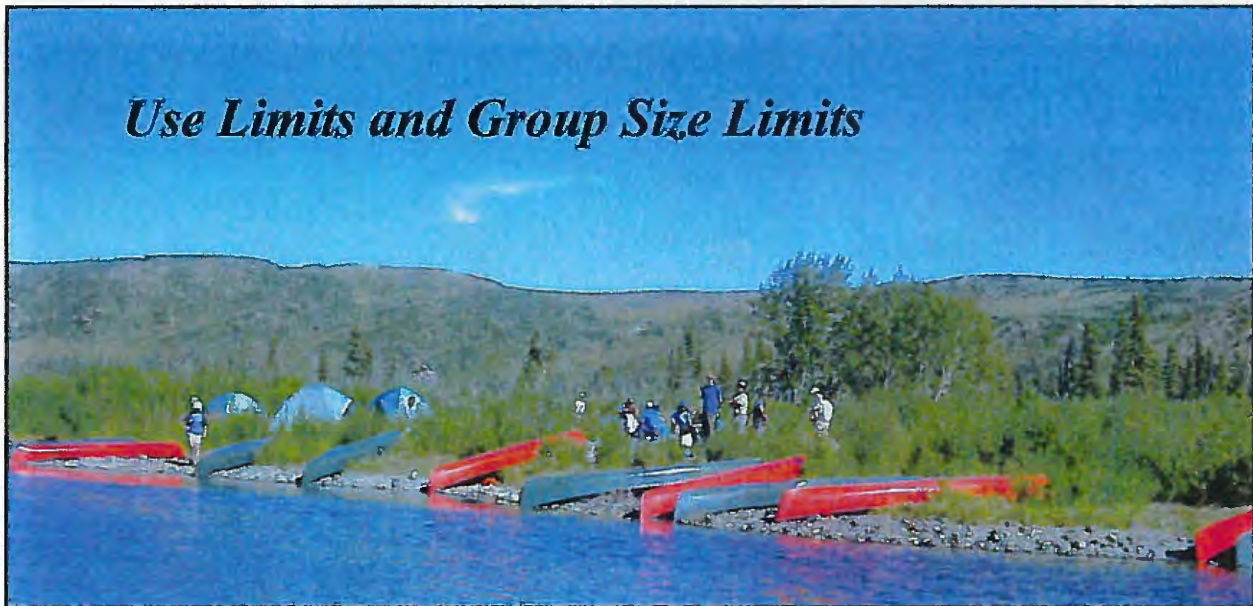
## User Fees



*Left; Registration station at a boat launch. Below: Black Rapids segment. Most users are willing to pay user fees, although there were differences between groups. A majority of non-motorized and small engine motorized boaters were willing to pay fees, but there was less support among other power boaters and ATV users. Among those willing to pay, average amounts were \$3 to \$5 per person per day or \$10 to \$20 per group per trip.*



## Use Limits and Group Size Limits

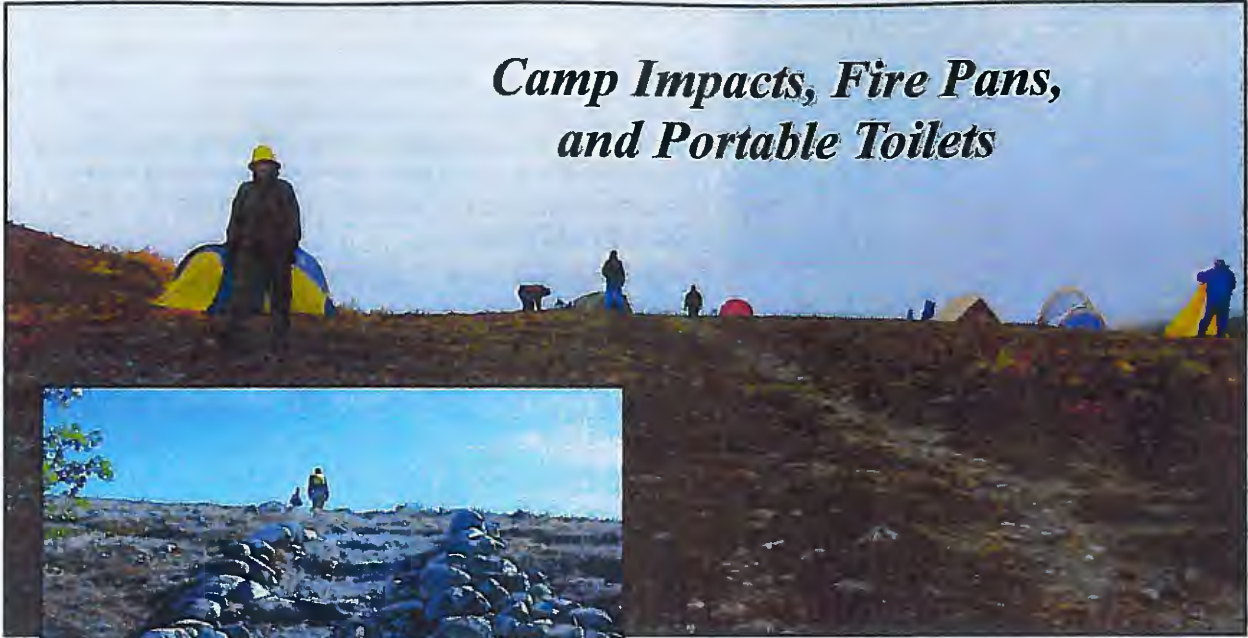


*Large Boy Scout group camped on Lower Delta. About two-thirds of non-motorized users philosophically support (or might support) use limits, while only one-third of motorized users said the same. However, there is little enthusiasm for most specific use limit options among any group. The exception was commercial use limits.*

A majority of non-motorized users support group size limits, while only about a quarter of the motorized users support them. Among those who support group size limits, nearly three quarters support limits of 12 or less and 91% support limits of 16 or less. Some recent scout trips have approached 30 people; most group size limits on other rivers are between 12 and 25.



## *Camp Impacts, Fire Pans, and Portable Toilets*

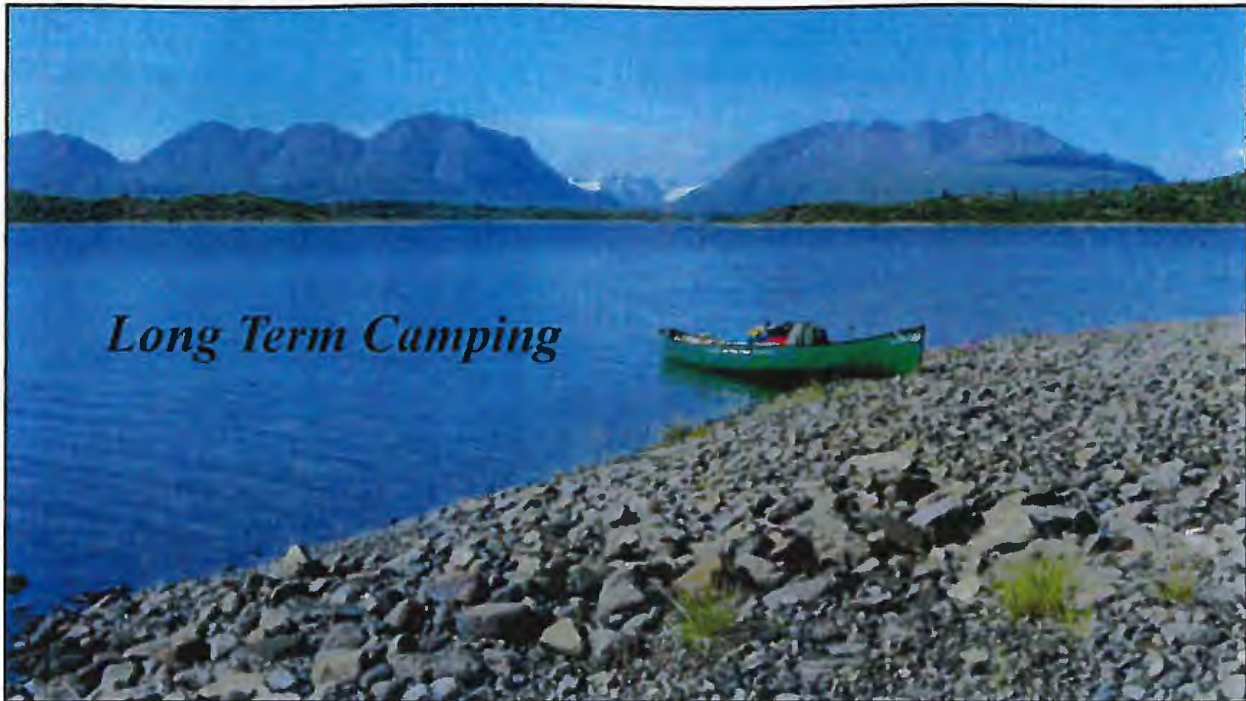


*Camp on Lower Tangle Lakes.* Trail erosion to some popular camping areas has become more pronounced over time; one solution is to build steps or otherwise harden trails to concentrate use, but this also may make the site appear less primitive.

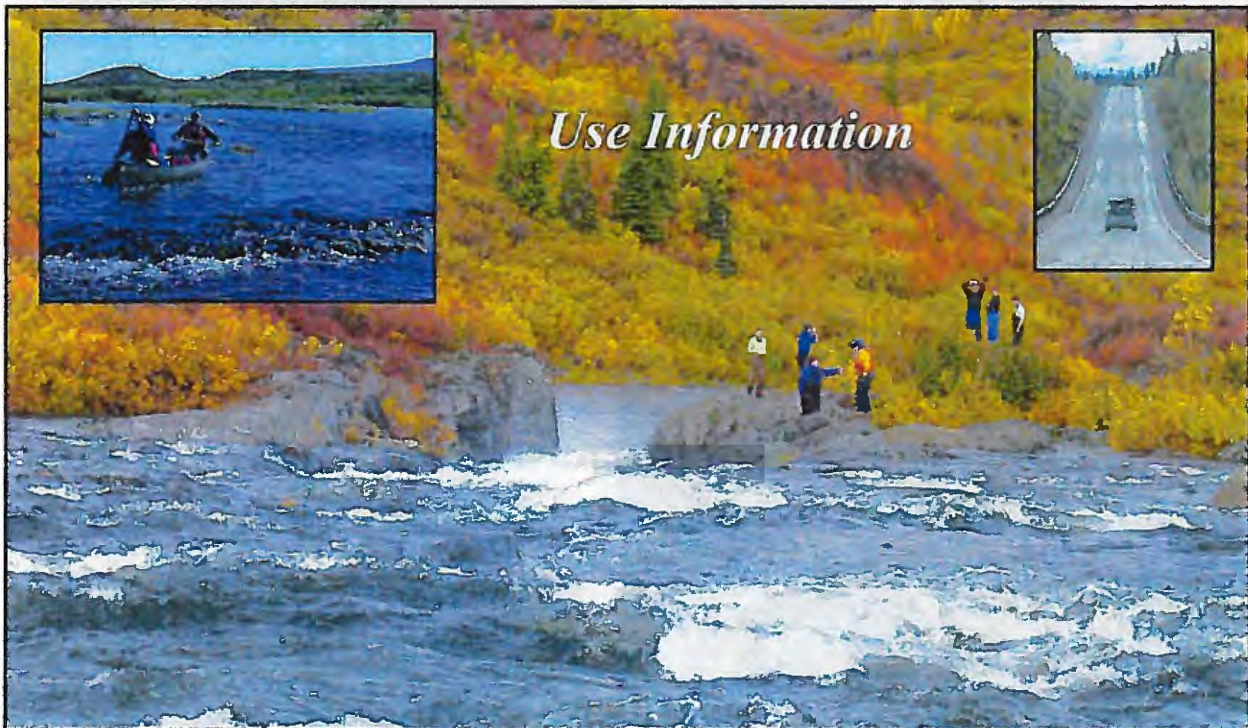


*Left to right: PETT portable toilet and shelter; fire ring at a Delta camp; fire ring and cut tree at another site.* There was majority opposition to requiring portable toilets (carry out human waste regulations) and fire pans. These regulations are common on many Lower 48 rivers and require a change in equipment and norms, but they also substantially solve human waste and fire ring scar impacts.





*Upper Tangle Lakes.* A minor problem on the Upper Tangles and Lower Delta concerns long term camping. Patrol crews have noted that a few users establish camps for several weeks each hunting season and this may exacerbate camp competition. However, survey data do not show support for camp occupation limits.



*Main photo: Upper Delta Falls. Inset left: Lower Tangles. Inset right: Richardson Highway.* A report appendix summarizes use data based on periodic overflights. Data show use is relatively low, with most segments having no use on 20 to 60% of the open water season. On average, there are 10 to 15 boats on the entire system at one time, with most of that use non-motorized. Long distances to population centers, shallow reaches between lakes, and portages help explain the low use levels for a resource with otherwise outstanding recreation attributes.





## *Motorized Boating Issues*

*Above: Jet boat passes a popular camp on the Lower Delta River. There is ample evidence of a motorized/non-motorized use conflict in the Delta River corridor. Most non-motorized users supported a variety of restriction options while most motorized users opposed them. Non-motorized users also rated 11 possible reasons for restricting motorized use "important," while motorized users only rated four reasons "important." While results document a conflict, they also show substantial numbers of non-motorized users accept some motorized use (even as they prefer more non-motorized segments).*



*Above: Shallow reach in Lower Tangle Lakes. Shallow depths make large powerboat use on some lakes problematic and BLM recommends engines less than 15 horsepower, but this recommendation is not widely followed. Use data suggests that 70% of the boats on the lakes and 85% on the river are non-motorized.*

*Below: PWC (jet ski) on Round Tangle Lake in 2003. Although these boats are rare, there was majority support for a PWC ban in the corridor among all users, and more support than opposition for an airboat ban on the Lower Delta even among motorized users.*





## ATV and Mining Access Issues



BLM ATV with a GPS unit used to locate existing trails in the corridor. Most non-ATV users don't know that ATV trails exist in the corridor and less than a third reported encounters with ATV users on their trips, confirming that ATV use in the area is currently low.

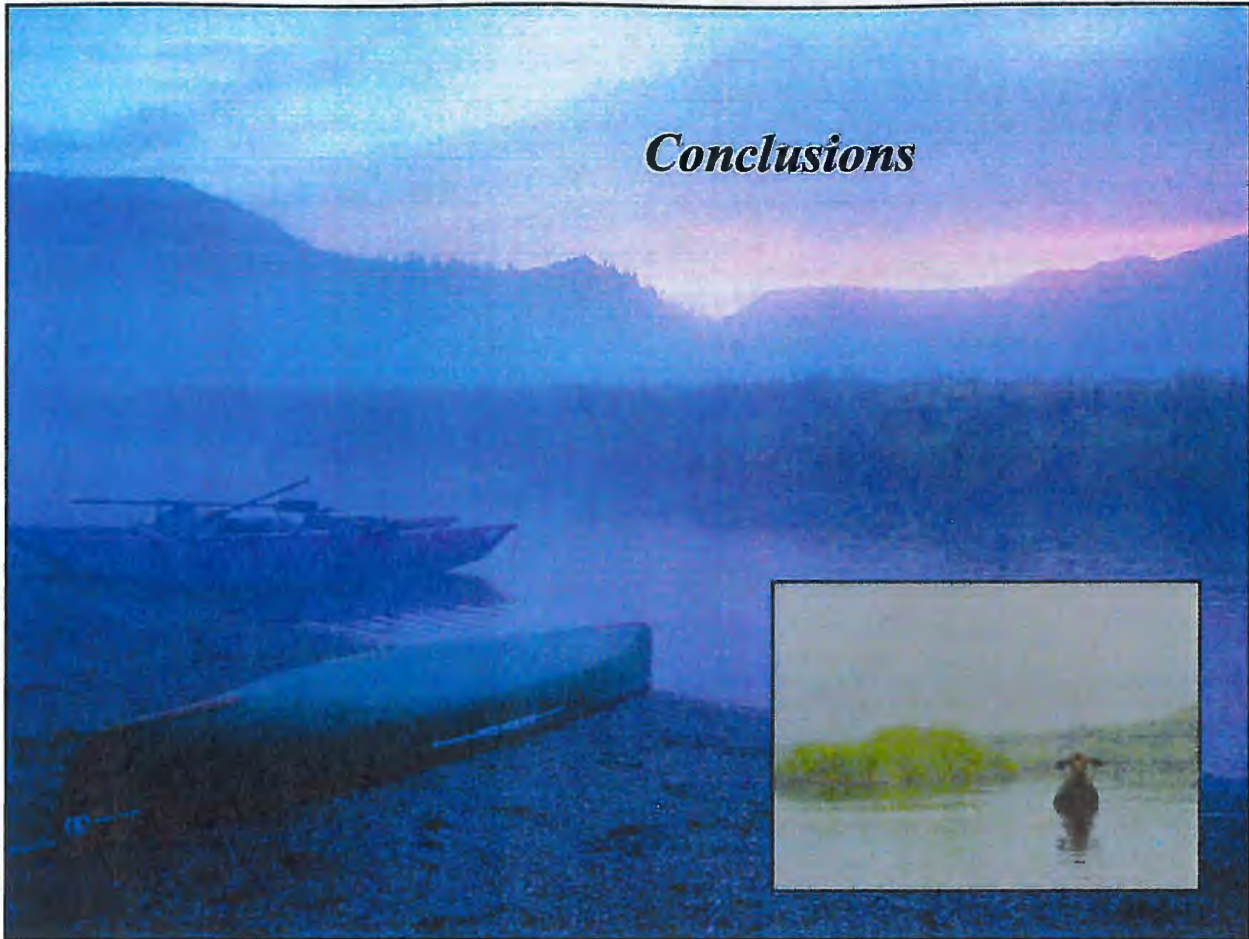


Above: Photos of "low," "medium," and "high" ATV impact levels provided in the survey. Acceptability ratings of these photos suggest that personal ATV use affects evaluations of physical resource conditions, but also illustrates when disparate groups might be able to agree about what constitutes "damage" on the ground. Responses to attitudinal questions about ATVs showed opposing views about existing trails, the relative importance of biological and experiential impacts from ATV use, and support for improvements of existing trails.

Right: Mining access route on the glacial/braided part of the Lower Delta below Eureka Creek. Only 13% of all respondents had seen mining equipment in the corridor, but 26% had seen this mining access route (which is most prominent at the location in this photo). Motorized users were more likely to report "mining" encounters, probably because they spend more time in upland areas (or use the trails for access themselves). Results also show differences between motorized and non-motorized users; the latter are much more supportive of restrictions on mining access.







## *Conclusions*

A final section in the report integrates key findings from the survey data and makes recommendations for managers to consider in future planning. General recommendations focus on 1) applying a planning framework that explicitly defines the types of opportunities to be provided, articulates standards for high quality, and links management actions to these standards.; 2) managing for high quality regardless of the type of opportunity; 3) planning for a diversity of opportunities on different segments and during different seasons; and 4) monitoring impacts. Specific recommendations are made for specific segments and issues, as well as continued collaborative planning efforts between BLM and the state.



*Thanks to BLM and River Management Society 2005 trip participants for several photos in this gallery.*



## Executive Summary

**Introduction.** The 62-mile long Delta National and Wild Scenic River includes lakes and river segments accessible from the Denali and Richardson Highways, and offers high quality boating, fishing, hunting, and camping opportunities. Congressional designation in 1980 required BLM to complete and implement a management plan to protect the river's values. A revision to the existing (1983) plan is expected in the next couple of years; this survey can provide important information for that effort. The study purpose was to describe Delta River users, their trips, and their opinions about management options.

**Report organization.** The report was designed as a reference document, with findings organized by topics and with numerous sub-headings. The following executive summary and an expanded table of contents were also designed to help readers navigate the document.

**Study Area.** The report summarizes key characteristics of recreation uses on five lake / river segments (Upper Tangle Lakes, Lower Tangle Lakes, Upper Delta River, Lower Delta River, and Black Rapids). It also reviews the area's climate (interior Alaska); topography and scenic values (alpine tundra and Alaska Range peaks); whitewater (Class I to IV); fish (primarily lake trout and grayling) and wildlife (multiple species, including bear, moose, and caribou). A final section summarizes recreation facilities (roads, lodges, campgrounds, boat launches, portages, and trails); the setting character of different reaches (primitive to developed); historic use of the region; and estimates of recent use levels.

**Methods.** Survey format and content were developed from several sources and based on established research protocols; they were also reviewed by BLM, DNR, and ADF&G staff. The survey targeted "recent" Delta users, based on two sources: 1) a *registration sample* from launch registration boxes from 2000-2004, and 2) a *"networking" sample* that reached individuals in paddle clubs, a motorized access organization, outfitting companies, and local users. The survey was conducted from February through May 2005. Potential respondents were sent a pre-study postcard, an initial mailing, a reminder postcard, and two reminder letters. In all, 358 individuals were mailed surveys and 245 returned them for a response rate of 68%. The final sample included 107 lake users, 88 lake-to-river "through-trip" users, and 10 lower river power boaters; the remainder took multiple types of trips. Alternative sub-groups developed from the sample included 152 non-motorized users, 73 motorized boaters, and 116 ATV users.

**Visitor characteristics.** Sampled Delta users take several different types of trips, but lake-based trips were more common than Delta River "through trips," and Lower River powerboat, Black Rapids, and ATV trips were even less common. Most respondents reported taking several trips over the past decade, and the median number for different groups ranged from 2 to 4. The majority of respondents were male, and most ranged from 43 to 58 years old. Most recent trips occurred during mid-summer for "through trips" and in late summer or early fall (hunting season) for other trips. Most people take trips to the area for 2 to 6 days; median length was 3 to 4 days. Most respondents reported group sizes between 2 and 6 people. Majorities of all groups fish, but fishing was slightly more common on lake trips. Hunting was more common on Lower River powerboat trips and ATV-based trips; about half of the lake-based users (but none of the "through trip" users) reported hunting.

**Reasons for taking trips.** Users rated reasons for taking trips important, and results indicate that recreation experiences in the corridor are multi-faceted. The least important attribute was "meeting other river users," which suggests that minimal interaction between users is a

reasonable management goal. The top rated reasons for non-motorized users are oriented toward “non-consumptive” backcountry recreation. In contrast, motorized users rated fishing and hunting (“consumptive recreation”) much higher.

**General evaluations.** Ratings for overall environmental conditions and experience quality were high, but recent trips were rated slightly lower than first trips (for those who have taken more than one). About one-third of users reported this decline, particularly those interested in non-consumptive and wilderness-like trips (more often non-motorized and “through trip” users). Questions also evaluated fishing on different segments. Results indicate that the highest catch-rates are associated with grayling on the river segments (particularly the lower Delta at 4 to 10 fish per hour), and that fishing evaluations follow from catch-rates.

**Current and preferred opportunity settings.** Relatively few respondents thought any segment provided or should provide a higher density “undeveloped recreation” setting, but there were differences between motorized and non-motorized users. In general, non-motorized users are more sensitive to high use densities, development, or motorized use, and they would prefer less of each. About half of the motorized users recognize that the Upper Delta and portage area offer non-motorized opportunities at present, but slightly fewer prefer that setting (apparently opposing motorized restrictions).

**Crowding.** Perceived crowding scores suggest no segment is “over capacity,” and crowding was well below nearby rivers such as the Gulkana and several Susitna Basin rivers. The Upper and Lower Delta River segments have particularly low crowding ratings, suggesting they offer relatively unique low density opportunities; the highest crowding ratings are on the Lower Tangle Lakes in August. Analysis of crowding ratings by years revealed no upward trend in recent years.

**Impact priorities.** Most users identified 8 of 16 impacts as high priority issues. Signs of use impacts (litter and human waste) were rated the highest; a clean environment appears to be a starting point for high quality experiences. Camp competition, camp sharing, and camp encounters (camping within sight or sound) were relatively higher priorities than “beat out” camps, suggesting that users are more concerned about camp privacy than camp conditions. ATV trails and ATV encounters are high priorities for just over half of all users, but there were several differences between motorized and non-motorized users.

**Encounters.** Reported encounters with other groups were generally higher than preferences but lower than tolerances. Encounter tolerances for the river segments (generally less than 4 per day) were similar to those found in many other studies of backcountry settings. On group size issues, most users have not encountered groups larger than 10, and only 4% saw trips larger than 20. Most users were intolerant of groups larger than 12.

**Other impacts.** Litter, camp encounter, camp competition, fishing competition, and “beat-out camps” do not appear to be substantial problems in the corridor at this time. The only other impact where reported levels were higher than tolerances (on average) was for human waste, and this difference was small. In all other cases, average impacts were similar to, or less than, tolerances.

**Planning to avoid crowding.** About half of all users adjust their plans to address potential crowding. Users who plan to avoid high use employ several strategies; the most common include going to a low use segment, going mid-week, or going off-season.

**Reported changes in quality.** Nearly 70% of the sample had taken multiple trips over the years, and most indicated that the Delta / Tangles have stayed the same or improved. However, 44% of non-motorized and 45% of river users reported some decline (although most reported only a "slight" decline). It is difficult to assess whether a perceived decline is related to actual changes or a general perception that "things are not like they used to be." Among those who reported a small decline, most report that they adjust their expectations in response to a "product shift," but take fewer trips in response to a perceived large decline.

**Facilities, education, regulations, and patrols.** Most users support existing patrol levels and increased educational efforts, with slightly lower (but still majority) support for increased enforcement and increased river clean-ups. Most users also support camp improvements such as toilets and steps to control erosion, and there is more support than opposition for Mile 212 launch improvements. Most river users do not support substantial portage area improvements, although improving the main trail with local materials appears acceptable. There was majority opposition toward mandatory fire pans and human waste carry-out systems.

**User fees.** Most users appear willing to pay user fees, although there were interesting differences between groups. A majority of non-motorized boaters and powerboaters that use small engines were willing to pay fees, but there was less support among other power boaters and ATV users. Among those willing to pay, mean amounts for different groups were \$3 to \$5 per person per day; \$20 to \$40 per person per year; and \$10 to \$20 per group per trip.

**Use limits.** About two-thirds of non-motorized users philosophically support or might support use limits, while only about one-third of the motorized users said the same. However, there was little enthusiasm for specific use limit options among any group. The exception was commercial limits among non-motorized users, which showed majority support (and there was more support than opposition from motorized users too). About a third of all respondents supported group size limits; among these, nearly three-quarters specified limits of 12 or less.

**Motorized boating issues.** There is ample evidence of a motorized/non-motorized use conflict in the Delta Corridor: Most non-motorized boaters supported restrictions, and most motorized boaters opposed them. The exception was prohibiting personal watercraft on the lakes and airboats on the river, both of which showed more support than opposition even among motorized users. Results document the existence of a conflict, but they also indicate that many non-motorized users accept some motorized use on the lakes, although they prefer some segments or lakes to be non-motorized. In contrast, a majority of motorized users do not want any restrictions on motorized use. Many motorized boaters express interest in minimizing the noise or safety issues associated with some types of motorized use (e.g., PWCs and airboats), while retaining access for their own craft.

Most motorized users rated only four reasons for motorized restrictions (discourteous behavior, safety, noise, and biophysical impacts) as important. Most non-motorized users reported that all 11 reasons in a list were important, including several related to experience quality and some that may be "values-based." The conflict is "asymmetrical;" non-motorized users are concerned about several aspects of motorized use, while motorized users are much less likely to consider those concerns to be important or related to their use.

**ATV use issues.** Most non-ATV users don't know that ATV trails exist in the corridor and less than a third have had actual encounters with ATV users, suggesting that current Delta ATV use is relatively low. Ratings of the acceptability of ATV impacts in three photos suggest that personal ATV use affects evaluations of physical resource conditions. These ratings also illustrate when

disparate groups might be able to agree about what constitutes “damage” on the ground, which could lead to improvements supported across groups. Responses to a series of attitudinal questions about ATVs also show opposing views about existing trails, the relative importance of biological and experiential impacts from ATV use, and support for improvements of existing trails.

**Mining.** Only 13% of all respondents had seen mining equipment in the corridor, but 26% had seen the mining access route that crosses and follows the river for a short distance. Motorized users were more likely to report these “mining” encounters, probably because they spend more time in upland areas on ATVs (and some may actually use the mining trails for access). Results also show differences between motorized and non-motorized users toward mining issues, with the latter generally supporting restrictions while the former show more opposition than support. Support for restrictions may related to social values positions toward mining in primitive areas than concern about actual mining encounters or impacts.

**Conclusions.** A final section in the report integrates key findings from the survey data and makes recommendations for managers to consider in future planning. The recommendations are based on researcher knowledge and experience; they do not necessarily represent the views of BLM or the State of Alaska. General recommendations focus on 1) applying a planning framework that explicitly defines the types of opportunities to be provided, articulates standards that define high quality, and links proposed management actions to those standards; 2) managing for high quality regardless of the type of opportunity; 3) planning for a diversity of opportunities on different segments and during different seasons, and 4) monitoring impacts. Specific recommendations are made for specific segments and issues, as well as continued collaborative efforts between BLM and the State.

**Appendices.** An appendix includes overflight use data that helped establish context for the survey results, as well as a copy of the survey instrument. They also include verbatim comments from survey respondents, organized by topic area.

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# 1. Introduction

The Delta National and Wild Scenic River consists of several lakes and river segments in the upper watershed of the Delta River in the Alaska Range west of Paxson. The 62-mile long corridor includes the Upper Tangle Lakes and Tangle River, the Lower Tangle Lakes, and the Delta River from the outlet of the lakes to the toe of Black Rapids glacier.

Accessible from the Denali and Richardson Highways, the Tangle Lakes and Delta River are important recreation resources for southcentral and interior Alaskans, offering high quality boating, fishing, hunting, and camping opportunities. In 1980 through the Alaska National Interest Lands Conservation Act (ANILCA), Congress recognized this importance by designating the Tangle Lakes and Upper Delta as part of the National Wild and Scenic River System for its "outstandingly remarkable scenic, fish, wildlife, and recreation values." The designation required the Bureau of Land Management (the lead federal agency) to complete a management plan to protect the river's values, a task completed in 1983.

The 1983 plan addressed a full range of management issues, including visitor impacts and carrying capacity, motorized boating use, ATV use, and mining. The plan reported that 1983 use levels were not creating unacceptable impacts, but recommended future planning to determine "the amount and type of use that the Delta...can perpetually sustain without impairing the scenic and primitive character or causing unacceptable change to the experience of the user" (BLM, 1983).

The plan also defined allowable uses, recommending a ban of motorized use on the river's "Wild" segment, but allowing winter snowmachine use, "existing use of motorized boats" for "upstream access," ATV use on existing trails, and mining access to valid existing claims if no other reasonable access was available. In addition, the plan recommended limiting motorized use on lakes to 15 horsepower because "larger sized motors are not necessary on the relatively small Tangle Lakes" and "larger motors produce more noise and large wakes...which reduce the enjoyment of this area for other visitors."

BLM has implemented management programs in accordance with the plan since the early 1980s: (1) initiating monitoring, clean-up, and law enforcement efforts to address visitor impact issues; (2) managing commercial recreation use; (3) providing small-scale improvements (e.g. steps, fire ring consolidation at camps and portages) to minimize impacts; and (4) managing mining access across the corridor. These programs appear to have been generally successful, and Delta use and impact levels do not appear to have increased as much as on the nearby Gulkana River over the past two and a half decades. However, state population and visitation have probably caused some increases in use that may be affecting conditions or experiences. In addition, ATV use in the area has increased, and motorized boats with more than the currently recommended 15 horsepower limit are common on the Tangle Lakes.

Taken together, concerns about these issues suggest the need to review the current situation and assess future management responses. BLM is currently completing a general planning effort for the Glennallen resource area (the East Alaska Resource Management Plan), and the preferred alternative includes a recommendation to conduct a "step-down" revision of the Delta River Management Plan. This survey of recreation users is one input into that more specific planning effort. The information is expected to be integrated with other biological and physical information, legal and administrative guidelines, and extensive public involvement.

## **Study Purpose and Objectives**

The purpose of this study was to describe Delta River users, their trips, and their opinions about the river and management options. Specific objectives for the boater survey were to:

- Describe river user characteristics (demographics, residency, experience on the Delta, etc.)
- Describe trip characteristics (length, party size, craft, etc.)
- Describe reasons for taking trips and preferred opportunity types.
- Describe user perceptions of facilities and support for improvements or new development.
- Describe and evaluate current impact levels.
- Describe extent of potential conflicts between users and likely reasons for conflict.
- Describe support for management actions to address impacts or conflicts.
- Explore potential displacement and product shift among veteran users.
- Describe acceptability of ATV impacts and attitudes toward ATV management issues.
- Compare findings with those from other Alaskan river studies when possible.

## **How to Use This Report**

This report is designed as a reference document. As with an encyclopedia, few readers are likely to read it from start to finish, but when they want information on a particular topic, it should be easy to find. To help readers focus on specific areas of interest, we have organized the document into several parts. Within those sections, issues are organized by numerous headings. An expanded table of contents also helps readers navigate the document.

This report begins with a discussion of survey methods, and then provides survey findings and conclusions. The results begin with sections on visitor characteristics, perceptions of overall resource health and experience quality, reported and preferred experiences, crowding, impacts and standards, and responses to impact problems. These are followed by sections addressing opinions toward alternative management strategies, including development, education, regulation, use limits, and user fees. Finally, the report provides some overall conclusions and recommendations for future planning, research, and monitoring. Appendices to this report include an analysis of overflight use data and the survey instrument.

## 2. Study Area

The study area includes the Upper Tangle Lakes and Tangle River, the Lower Tangle Lakes, and the Delta River from the outlet of the Tangle Lakes to Black Rapids Glacier. As shown in Map 1, the river has been divided into segments that were developed from use patterns and recreation trip features. The segments and important characteristics of each are summarized in Table 1.

Table 1. Delta River /Tangle Lakes Segments.

Segment	Miles	Types of Recreation Use	Comments
Upper Tangle Lakes	15	Boaters use canoes and small powerboats on the first lake from the Delta Wayside on the Denali Highway; on lakes beyond the first portage, canoes are more common. Day use is probably more common than overnight use except during subsistence hunting season. ATV routes approach corridor boundaries, but there are no known ATV trails.	Designated "Scenic," this segment includes a canoe loop with two short portages; a third longer portage provides access to Dickey Lake and Middle Fork Gulkana. The segment has open tundra in hilly terrain with some views of the Alaska Range. Approximately 25 campsites identified.
Lower Tangle Lakes	9	Boaters use multiple craft, with more use by canoes and small powerboats than rafts. Access is from a boat ramp at Tangle Lakes Campground on the Denali Highway. No known ATV trails.	Designated "Scenic," this segment has larger lakes in an alpine tundra setting with views of the Alaska Range. Provides access to the Delta River. Approximately 18 campsites.
Upper Delta River and falls / portage	2	Boaters use canoes, kayaks, and rafts to run the upper river (which drains the Lower Tangles) then portage around the falls and gorge to the lower river. Motorized boat use if rare. No known ATV trails.	Designated "Wild," a shallow channel tends to preclude most motorized use. It has steeper canyon topography with some views of the Alaska Range. Includes roughly 0.25 mile portage around two falls and a short gorge. Approximately 5 campsites.
Lower Delta River	18	Downstream boaters use canoes, kayaks, and rafts. Motorized users use jetboats (and possibly some propeller-driven boats) by traveling upstream from Mile 212 access. An ATV trail from the pipeline crosses the corridor about river mile 36. An informal ATV/mining route formerly followed the river downstream to Mile 212; it does not continue upstream of Rainey Creek.	Designated "Wild," this segment has a ½ mile Class II whitewater reach, a meandering 10 mile clearwater reach, and then becomes glacial at the confluence of Eureka Creek for the remaining 7 miles. Approximately 14 camps on the clearwater part of this segment; others could be used on braided bars below Eureka Creek.
Black Rapids Segment	18	This has multiple accesses from the Richardson Highway, and may be occasionally used by whitewater craft or for access across the river. No known ATV trails.	Designated "Recreational" segment along the Richardson Highway, with pipeline and highway development often visible. Spectacular glacial and alpine scenery; Black Rapids offers a mile of Class III-IV whitewater.



## **Climate**

The Delta region has the continental climate of interior Alaska, with long severe winters and short mild summers. Winter ice breakup on the lakes is typically in late May or early June and freeze-up occurs in October. Summer temperatures commonly range from 40 to 70 degrees, but are occasionally warmer. Winter temperatures commonly range from minus 30 to freezing; snowfall averages over 100 inches per year.

## **Topography, Scenic Values**

The Delta and Tangle Lakes have exceptional alpine tundra scenery. Several peaks of the eastern Alaska Range (about 6,000 to 9,000 feet elevation) are visible from the corridor, and the Black Rapids segment cuts through the range, with several glaciers visible on mountain flanks.

Aside from longer views of the Alaska Range, the river features rolling tundra hills near the Upper Tangle Lakes, larger foothills and peaks (about 5,000 feet elevation) along the Lower Tangle Lakes, and several geologic features such as slides, moraines, eskers, and kettles. Some forested riparian areas and emerging foothills occur along the Lower Delta River, and after the confluence with Eureka Creek, the river "braids out" though a U-shaped glacial valley that bisects the Alaska Range.

## **Gradient and Whitewater**

The Tangle Lakes are at 2,800 feet elevation and the river drops about 650 feet in 50 miles with an average gradient of 13 feet per mile. The steepest part of the river occurs in the short gorge created by the Denali Fault, which has two falls about 8 and 15 feet high. Boaters usually portage the falls and a short Class III/IV section of the gorge, using a two-part trail that incorporates a long pond in an old channel. The portage rejoins the river near the end of the gorge, with about a half-mile of Class II rapids.

The Black Rapids Segment also has some whitewater, particularly during mid-summer high flows. Generally created by channel constrictions, these rapids have long Class II+ wave trains. There is about a mile of larger boulders, steeper gradients, and narrower constrictions at the moraine below the toe of Black Rapids Glacier; these create larger holes and wave trains that are Class III-IV at medium to high flows.

## **Fish and Wildlife**

There is an abundance of wildlife in the Delta area. Hunted animals include moose, caribou, black bear, and brown bear. Trapped animals include wolves, marten, wolverines, otters, minks, foxes, lynx, and beaver. The most commonly seen mammals are beaver, moose, bears, and caribou. Bird species include swans, ducks, geese, terns, gulls, and a variety of songbirds; over 110 species have been identified, with most being summer residents only. The Tangle Lakes have good lake trout and grayling fisheries, as well as some whitefish and burbot. The clear water sections of the Delta River have an exceptional grayling fishery.

## Setting Character and Facilities

The Delta is a largely “wilderness-like” setting with few developments except where the corridor crosses or is adjacent to the Denali and Richardson Highways. The Denali Highway crosses the corridor for about a mile between the Upper and Lower Tangle Lakes, where there are two small lodges in addition to a BLM campground and two boat ramps with access to the Upper and Lower Tangle Lakes. The entire 18 miles of Black Rapids Segment adjacent to the Richardson Highway is slightly more developed, and river users have intermittent views of the highway, the pipeline, a pipeline pump station, and an army training center.

Aside from the launch areas (Delta Wayside and Tangle Lakes Campground), BLM maintains one remote pit toilet (at the Delta River portage) in the corridor, and has built a few improvements at portage trails or popular camps to reduce impacts from erosion. There are about 62 identified camps in the corridor – most informally developed by users – but several are clustered within sight or sound of each other.

There is a short hiking trail from the Denali Highway along part of the first lake in the Upper Tangles. The primary ATV trail in the corridor (Top of the World Trail) crosses the river about River Mile 26 and is a user-defined route (no major trail building has occurred in the corridor). ATV users also ride on a mining access route from Mile 212 up Rainey Creek in the braided part of the river.

## Historic Use and Development

Native Alaskans have used the Delta River area for several thousand years; evidence of this use is protected by the Tangle Lakes Archaeological District. The first recorded non-native visits to the area were by USGS surveyors led by Walter Mendenhall in 1898, who reported a well-used trail in the vicinity.

Construction of the Denali Highway brought the first substantial recreation use to the area in 1952, leading to the development of two private lodges and the Tangle Lakes campground. Use increased substantially in the mid-70s in response to nearby pipeline construction. Recent use appears related to statewide and Copper Valley populations, although out-of-state visitation may also play a role.

## Recreation Use Levels

There are several recreation opportunities in the Delta River corridor. The most common use appears to be lake trips (often associated with the Tangle Lakes Campground or the two nearby lodges), although river “through trips” from the Denali Highway to Mile 212 on the Richardson Highway are also popular. Some powerboat users access the Lower Delta River from Mile 212, and some ATV users travel across the corridor from the Top of the World Trail. Recreational use of the Black Rapids segment is thought to be relatively rare (not counting road-based recreational travel along the Richardson Highway).

Recreation use on the Delta is not easy to estimate because of multiple access sites and its remote location. Although developed campground use can be estimated from fee information (a host encourages compliance), there are no formal registration requirements to use boat launches, trails, or other areas in the corridor. For backcountry use, BLM makes estimates based on voluntary



registrations by users at boat launches and the Delta River portage (summarized below). Additional information about use estimation and trends is given in Appendix A.

**Upper Tangle Lakes.** BLM estimates that about 6,000 to 10,000 people stop or camp at the Delta National Wild and Scenic Wayside each year, but only about 2,500 to 3,000 take trips on or along the lakes (e.g., hiking, boating, canoeing, shore-based fishing, berry-picking). Among boaters, BLM estimates that two-thirds use non-motorized and one-third use motorized craft, proportions that are roughly consistent with overflight use data (See Appendix A). During subsistence hunting season, BLM estimates that 2 to 5 hunting camps are established on the lakes on any given day.

**Lower Tangle Lakes.** BLM estimates that approximately 10,000 to 12,000 people camp at the Tangle Lakes campground each year, but only about 3,000 to 4,000 recreate on or along the Lower Tangle Lakes (e.g., hiking, boating, canoeing, shore-based fishing, berry-picking). Among boaters, BLM estimates that two-thirds use motorized and one-third use non-motorized craft (the converse of the Upper Tangles), although an analysis of overflight data suggest lower motorized use. BLM estimates 3 to 5 powerboats and 1 to 3 float groups use the lakes on a typical summer day; more detailed information about use is available in Appendix A.

**Through trips and Lower Delta boating use.** BLM estimates that approximately 700 to 900 people take trips from the Lower Tangle Lakes through to the Delta River and the Richardson Highway each year or use powerboats on the Lower Delta. Using group size information from this report, there are probably less than 150 trips per year of this type, or less than 2 starts per day over the course of the roughly 100-day summer/fall recreation season. Overflight data suggests these estimates may overstate actual use (see Appendix A).

**ATV use in the Lower Delta River.** BLM estimates about 250 ATV users per year take trips on the Top of the World Trail and perhaps another 50 use the mining access road up Rainey Creek. These are professional judgments by staff based on trail impact levels and encounters during patrol trips; overflight data suggests this may be a slightly high estimate. There is no consistent ATV use in other parts of the corridor (not counting use along the highways or in other developed areas), although an overflight of the corridor to count use recorded 2 ATVs in the Upper Tangle Lakes area in August 2001.

**Other uses.** BLM estimates that about 500 users engage in other dispersed recreation in the corridor during the summer or fall season.

In many ways, these broad estimates of annual use are less useful than "people at one time" (PAOT) estimates. Appendix A contains more detailed analysis of overflight information that helps characterize seasonal AOT use levels since 2000. These data show no clear long term use trends, but they help characterize use through the year (it is generally higher on the Lower Tangles and Upper River in July and August; and higher on the Lower River and Upper Tangles in August and early September). Non-motorized boats account for more than 65% of boats on lake segments; 80% or more on the river upstream of Eureka Creek; but only 29% on the lower river below Eureka Creek.

### 3. Methods

*This section briefly reviews the methods employed to conduct the survey. It reviews important theoretical issues that helped guide survey development, and then details the sampling frame, administration, and final sample sizes.*

#### **Theoretical Background and Survey Development**

Survey format and content were developed from several sources and generally based on accepted recreation research protocols. The core concepts come from well-established research and planning frameworks (e.g., CCAP [Shelby & Heberlein, 1986], VIM [Graefe, Kuss, & Vaske, 1990], VERP [National Park Service, 1997], LAC [Stankey, Cole, Lucas, Petersen, & Frissell, 1985]). All of these frameworks require information about how recreation users affect each other and the environment, and the management factors related to these effects (Kuss, Graefe, & Vaske, 1990).

These frameworks also recognize two separate components (Shelby & Heberlein, 1986). The *descriptive component* describes relationships between the amount of use and the impacts associated with this use (i.e., how the system works). The *evaluative component* involves assessing the acceptability of various impacts, and requires value judgments about the different impacts that arise from recreational use and the management strategies that should be employed to address them.

Confusion between these two components is a common problem in recreation planning, and this confusion can be illustrated by the misused term, “resource damage.” Damage refers to both a change (an objective impact) and a value judgment that the impact is not acceptable. Most people would agree that use should be limited when *unacceptable* resource damage occurs, but there must be agreement about what constitutes “unacceptable.” All human use has some impact. Whether the impact is “damage” depends on management objectives, standards, expert judgments, and broader public values for the setting in question. The same logic applies to social impact issues. For example, the number of people in an area is often less important than how individuals evaluate visitor densities.

Most recreation capacity conflicts revolve not around resource questions, but rather around questions of values (Vaske, Donnelly, Wittmann, & Laidlaw, 1995; Vaske & Donnelly, 1999a). In many situations, managers spend time and energy collecting information about the physical environment when the problem is unlikely to be resolved by biological or physical impact data. Abandoning terms like resource damage may not be necessary, but it is important to break the concept into two parts – the impact component (environmental or experiential change) and the evaluative component (the acceptability of the change).

Current visitor impact or carrying capacity frameworks have addressed this challenge by focusing on indicators and standards. Indicators define the type of impact that is to be evaluated, and standards specify the level of impact that is tolerable (the maximum) or most desirable (the optimum). Standards are yardsticks for determining how much impact is too much impact. To be effective, standards must go beyond such generalities as “protect the resource” or “provide a high quality recreation experience.” Management objectives need to define the type of experience to be provided and specify measurable standards for ecological and social impacts.

Many items in the survey relate directly to impacts and standards that could be adopted during planning for the Delta River and Tangle Lakes. Examples include measures of perceived crowding, river and camp encounters, litter and human waste impact frequency, and competition for camps. In most cases, these items have been developed from previous research on rivers in Alaska and the Lower 48, they have been tested for reliability and validity, and they allow comparisons across rivers.

Additional items in this survey focused on the acceptability of management actions that might be used to address any impact problems or conflicts. Many of these items have also been tested in previous research using standard Likert-type attitudinal formats.

In all cases, specific items for the Delta survey were modified to fit the resource setting. The survey also benefited from thoughtful reviews of the survey by resource managers or planners for the BLM and the State of Alaska (DNR and ADF&G).

## Sampling Protocol

Information was developed through a mail survey of "recent" Delta River users, including people who take trips on the Upper and Lower Tangle Lakes and subsistence users. The Delta River and Tangle Lakes have relatively low recreation use, so it was challenging (and inefficient) to develop an on-site sample over a single season. The sample was therefore developed from two sources: 1) a *registration sample* from launch area registration boxes from 2000 through 2004 and 2) a *"networking" sample* of users developed from contacts or notices on list servers, message boards, on in newspapers that reached individuals in paddle clubs, a motorized access organization, outfitting companies, and local users from the Copper River Valley and Delta Junction.

Both of these samples have strengths and weaknesses. The *registration sample* probably suffers from substantial non-compliance; an informal study conducted by BLM staff on the Delta and Gulkana in 2003 suggests that less than 15% of groups register at boat launches. In addition, the people who register did not always provide complete or accurate contact information. Finally, the people who registered may be more likely to be "trip leaders" than a random sample of users. On the positive side, registration information covers five years, so there were opportunities to compare information across seasons and balance idiosyncrasies from any particular season (e.g., if a wild fire or poor weather caused use to be atypically low).

The *networking sample* is likely to over-sample experienced users who are well known in Alaskan paddling or local communities and under-sample users from out-of-state or those who take trips without telling many other people. However, these experienced Delta users are likely to be good observers of conditions, and the sample allows researchers to explore potential "displacement," (former users who no longer boat the river due to crowding or other factors), "product shift," (users who have redefined the type of experience they expect), or perceptions of change over the history of their Delta River use. These issues are more difficult to address effectively from a single season sample.

In addition, the networking sample is likely to include important leaders in motorized boating, non-motorized boating, ATV, and local communities who may become "stakeholders" in planning processes. Including them in the sample provides a systematic way to assess and address their concerns. For the same reason, we also sent surveys to 12 individuals who asked to participate after they had heard about the study (9 returned them). In all cases, we kept track of

the way that each participant was included in the sample frame so we could compare results among identifiable groups (see discussion below).

## Survey Administration and Response Rates

The mailed surveys were sent from the BLM Glennallen Field Office. A pre-study postcard announcement was sent to the sample in mid-February 2005, and the initial mailing with the survey occurred the week of February 21, 2005. Reminder postcards were sent to the sample one week later, and a reminder letter was sent to people who had not returned the surveys by the end of March. A final reminder letter with a replacement survey was sent in the end of April, and the survey was “closed” at the end of May. The coding protocols and database were developed by CRC; data were coded by BLM staff in Glennallen. The river data were coded by June; analysis and report writing began afterward.

In all, 358 individuals received surveys and 245 returned them, a response rate of 68%. A summary of the sampling frame and response rates for sample frame groups is given in Table 2. This overall response rate is typical for surveys of this type (a similar study among Gulkana River boaters had a 64% response rate).

**Table 2. Sample frame and response rates by major sample sources.**

Sample source	# in Sample Frame <sup>1</sup>	# Returned	Response Rate
2000 launch registers	24	14	58%
2001 launch registers	43	24	56%
2002 launch registers	27	21	77%
2003 launch registers	38	22	58%
2004 launch registers	39	30	77%
1997-2003 BLM survey respondents <sup>2</sup>	33	28	85%
<b>All launch register users</b>	<b>204</b>	<b>139</b>	<b>68%</b>
Local area networking	15	14	93%
Motor access user networking	73	40	55%
Non-motorized boater networking	46	38	83%
East Alaska RMP comment providers	4	2	50%
Commercial guides/lodges	4	3	75%
<b>All networking users</b>	<b>142</b>	<b>97</b>	<b>68%</b>
<b>Requested surveys</b>	<b>12</b>	<b>9</b>	<b>75%</b>
<b>All respondents</b>	<b>358</b>	<b>245</b>	<b>68%</b>

<sup>1</sup> Number after wrong addresses removed.

<sup>2</sup> BLM offered a self-administered on-site survey at the launches in these years.

## Sub-group Sample Sizes

The diversity of ways that individuals could enter the sample frame means the study did not represent a random sample of Delta River /Tangle Lakes users. Instead, the study tried to represent groups of known user types or stakeholders, and developed sufficient sub-group samples for those major groups (e.g., motorized boaters, non-motorized boaters, & ATV users; lake users & river users). The sampling strategy created several stratified sub-samples for these various groups, and the goal was to have representative samples within those strata.

Table 3 summarizes sample sizes for important sub-groups. Disaggregated analysis of these groups helped characterize differences. When different groups show diverse results, the study does not combine them to represent “all users,” and we strongly recommend against assessing preferences of a theoretical “average Delta River user” in these cases. For readers interested in the relative use levels from different groups on this river, Appendix A provides some information on these topics. Readers should also note that some groups overlap (i.e., sub-groups were created by segments used, as well as by type of use); more details about sub-group comparisons are provided when results are presented.

**Table 3. Sample sizes for different user groups.**

Sub-group	Number	% of sample	Comments
Hiker	1	< 1	
Upper Tangle Lakes only	31	13	Total lake-only sub-sample = 107 or 44%
Upper and Lower Lakes / no river	59	24	
Lower Tangle Lakes only	16	7	
Lower Tangles & Delta River	27	11	
Multiple lake and river segments (but no ATV use)	61	25	Total “through trip” sub-sample = 88 or 36%
Lower river powerboaters	10	4	Total lower river and ATV sub-group = 50 or 20%
ATV-only users	20	8	
Multiple segments and ATV users	20	8	
<b>Total for segment sub-groups</b>	<b>245</b>	<b>100</b>	
Non-motorized boaters/hiker	152	62	Total non-motorized users = 62%
Small HP boaters	33	14	Total motorized boat users = 73 or 31%; Total medium & large HP motorized users = 40 or 17%.
Medium HP boaters	30	13	
Large HP boaters	10	4	
ATV-only users	20	8	
<b>Total for boat type sub-groups</b>	<b>245</b>	<b>100</b>	
Top of the World ATV use	36	15	Total ATV users = 116 or 47%; Total Delta ATV users = 61 or 25%.
Other Delta/Tangles ATV use	25	10	
ATV use (but not in Delta)	55	22	
Non-ATV user (anywhere)	129	53	
<b>Total for ATV use sub-groups</b>	<b>245</b>	<b>100</b>	

## 4. Visitor Characteristics

*This chapter reviews visitor characteristics for various groups, including trip experience, use of powerboats and ATVs, descriptions of most recent trips, and reasons for taking Delta / Tangle Lakes trips. The data are generally useful for understanding the group sub-samples.*

### Trip Experience

Respondents were asked to report the number of trips that they had taken in the past ten years. Table 4 summarizes the percent of the sample reporting each type of trip, and the number of trips for those who report taking any.

Results indicate that many respondents take several types of trips, but lake-based trips were more common (about two thirds of the sample report them) than Delta River "through trips" (about one-third of the sample have taken them), and Lower River powerboat, Black Rapids, and ATV trips were even less common (9 to 15 %). These data do not indicate the frequency of trips among all Tangle Lakes / Delta River users because this is not a random sample of users. However, results indicate that many users take a variety of trips in the corridor.

Among those who report taking any trips, most respondents reported several trips over the last ten years, with median responses about 2 to 4, depending on the trip type. The relatively higher numbers of trips for Lower Delta powerboat trips indicates that the few who take this trip do so regularly (annually, in most cases). In contrast, the standard Delta River "through trip" has generally been taken less frequently (e.g., every two or three years), perhaps because it is a more involved trip because of shuttle logistics and the portage.

**Table 4. Experience taking different trip types in past ten years.**

Trip Type	% reporting trip type	Of those reporting any trips...		
		Average #	Median #	Typical range <sup>1</sup>
Upper Tangle Lakes	68	6.1	3.0	1 to 8
Lower Tangle Lakes	65	8.1	3.0	1 to 6
Delta River ("through trips")	38	3.3	2.0	1 to 4
Lower Delta powerboat trips	9	14.6	7.0	2 to 30
Black Rapids	9	10.5	2.0	1 to 3
ATV trips	15	11.1	3.8	1 to 8

1. Defined by the 25<sup>th</sup> and 75<sup>th</sup> quartile responses.

### Year of First Trip

Respondents were asked to report the year of their first trip. The earliest reported trip was 1950, but three-quarters of the sample had taken their first trip after 1985 and before 1998. The median year of first trip was 1995. As with trip type experience results, data indicate respondents have considerable experience on the river and lakes.

### Powerboat Use

Respondents who use powerboats to access the Tangle Lakes or Delta River were asked to describe boat type, length, and horsepower. Of those who reported any powerboat use, 33% use



jetboats, 31% use propeller-driven boats, 23% use kickers on rafts or canoes, 3% use air boats, and 10% use other types of powerboats.

On the Lower Delta, jetboat use is most common (83%) although 17% use propeller-driven boats. Boats typically ranged from 14 to 22 feet long, with a median length of 18 feet. Horsepower ranged from 20 to 350, with a median of 115.

On the Upper Tangles, 39% use kickers on canoes or rafts, but 32% use propeller-driven powerboats and 14% use jetboats. On the Lower Tangles, 27% were kickers on canoes or rafts, 45% were propeller-drive powerboats, 27% were jetboats, and the rest were classified as "other." Most lake powerboats were less than 18 feet long (median length was 15 feet) and 57% were under 15 horsepower (the current recommended BLM limit). However, other boats had as much as 115 horsepower.

## ATV Use

Twenty-five percent of the sample reported using ATVs in the Delta River or Tangle Lakes corridor. Of those, 60% use the Top of the World Trail and the remaining 40% use ATVs in other areas. As discussed above, it is unclear where these "general" Delta ATV users travel (there are no other known ATV trails in the corridor), but many respondents may be referring to ATV use off the Denali Highway in the vicinity of the river or lakes. Among those who report ATV use, over 90% reported using 4-wheelers and less than 10% used tracked vehicles; only one used an Argo.

## General Boating and ATV Experience

Respondents were asked how long they had been using non-motorized craft, powerboats, or riding ATVs. Results are summarized in Table 5; they indicate that most respondents had experience with non-motorized boating, but only about half used motorboats or ATVs. Among those with experience, however, the number of years was generally high. The fewer years of experience with ATV riding probably reflects the more recent development of that activity (reliable mass-production 4-wheelers did not emerge until the late 1980s).

Table 5. Years of general experience boating and ATV riding.

	% Reporting Any	Average	Median	Typical Range <sup>1</sup>
Non-motorized boating	91	26.3	27	18 to 35
Motorized boating	53	19.9	20	3 to 35
ATV riding	47	13.4	10	1 to 22

1. Defined by the 25<sup>th</sup> and 75<sup>th</sup> quartile responses.

## Socio-demographics

The majority of respondents were male (64%), and most ranged from 43 to 58 years old with a median of 50. The vast majority (97%) were Alaskan residents. These statistics are not necessarily representative of Delta River users in general because the purposive sampling frame probably over-sampled local and Alaskan users (people from outside the state generally entered the sample through the launch registration sample rather than the networking sample).

## Profile of Respondents' "Most Recent" Trips

Respondents were asked to describe characteristics of their most recent trip, including the year and month, type of transport, segments visited, number of days, number of people, and whether they fished or hunted.

### Year and Month

The median year of respondents' most recent trip was 2003 for lake and "through trip" users, and 2004 for Lower Delta powerboaters and Top of the World ATV users, suggesting that the latter two groups generally take trips annually, while lake and "through trip" users may not go every year.

The percent of recent trips taken in each month for different trip types is given in Figure 1. Lake users tend to go in June, July and August; Delta "through trip" boaters tend to go earlier in the summer (particularly in July), and Lower Delta power boaters and ATV users are more likely to go in the latter part of the summer (probably associated with hunting trips). These data are consistent with overflight use data (see Appendix A).

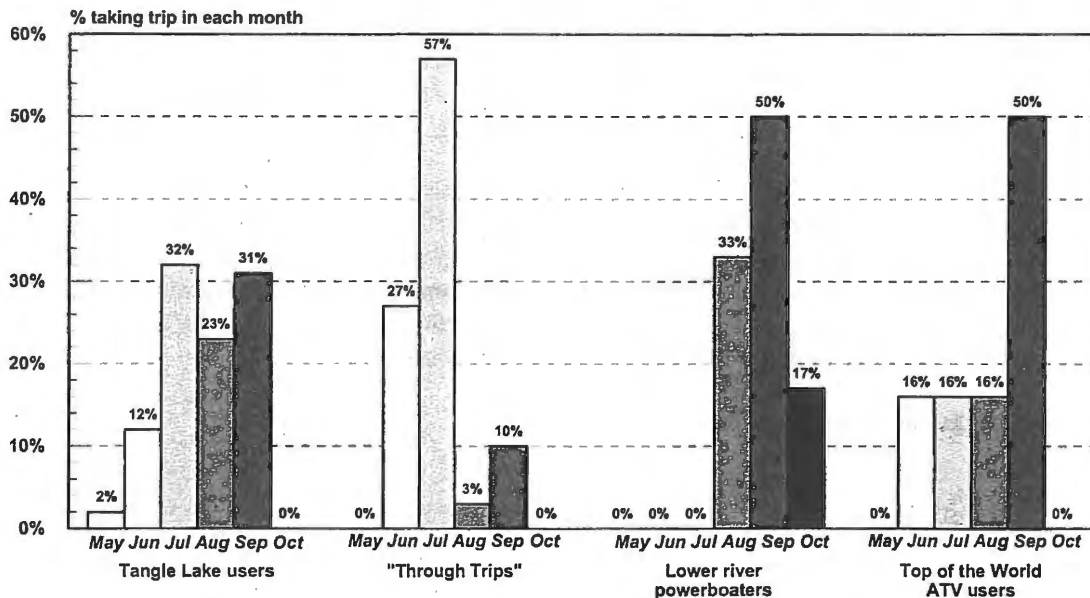


Figure 1. Reported month of "most recent trip" for different trip types.

### Type of Transport

Respondents reported diverse transport types on their most recent trips, and several trips used more than one type (totals can therefore exceed 100%).

On recent trips to the *Upper Tangle Lakes*, most (71%) used canoes, although 3% used rafts, 21% used powerboats and 7% used ATVs. Given that portages are required to travel beyond the "first lake," it is likely that few powerboats use the second lake (Upper Tangle Lake) and fewer still use the third lake (Mud Lake). The ATV results are curious, because there are no

designated ATV trails or evidence of ATV use in the Upper Tangles. ATV respondents may be reporting use on trails just outside the corridor such as the Swede Lake/Middle Fork Gulkana trail.

Among respondents who reported using both the *Upper and Lower Tangle Lakes* on their recent trips, 59% used canoes, 5% used rafts, 32% used powerboats, and 29% used ATVs. Powerboat use on the Lower Tangles is common, but there are no designated ATV trails or obvious off-trail ATV use in the Lower Tangles. Respondents who reported ATV use on the Lower Tangles may be referring to use on the Landmark Gap Trail (which is outside the corridor).

Among respondents who reported only using the *Lower Tangle Lakes*, 52% used canoes, 12% used rafts, 32% used powerboats, and 16% use ATVs.

Among respondents taking "*through trips*" on the *Delta River*, 90% report using canoes and 23% report using rafts (the overlap is accounted for by mixed trips). None reported using powerboats or ATVs.

*Lower Delta power boaters* by definition used some kind of powerboat, but an additional 17% reported using ATVs. Some users may bring ATVs on jetboats on this segment of the river, or they may meet other users who bring ATVs. Among *Top of the World ATV users*, 33% report also using powerboats on their trips, further documenting this potential overlap among uses.

Actual use information (see Appendix A) suggests about 84% of non-motorized boats (on all segments) were canoes and only 14% were rafts, which is generally consistent with survey data. Similarly, overflight use information suggests that the proportion of non-motorized boats ranges from 67 to 81% on the lake segments, 83 to 97% on the river segments above Eureka Creek, but only 29% on the Lower River below Eureka Creek.

### **Trip Length**

Most people take trips to the area for 2 to 6 days. The median trip length for lake and "through trip" users is 3 days, although it was slightly higher (4 days) for respondents who reported using both the Upper and Lower Tangle Lakes. Lower Delta River powerboat users take longer trips, with a median length of 6 days, while Top of the World ATV users take shorter trips, with a median of 2.5 days.

### **Group Size**

Most respondents reported group sizes between 2 and 6 people (16 was the highest). The median group size for Tangle Lakes and ATV trips was 3.0, while it was slightly higher (4.0) for "through trips" and slightly lower (2.5) for Lower Delta powerboat trips.

### **Fishing Participation**

Majorities of all trips fish, but it is slightly more common on lake trips, "through trips," and ATV trips. It was most common on Upper and Lower Tangles (85%), the Lower Tangles (72%), or on "through trips" (71%). About 67% of ATV users reported fishing on recent trips compared to 50% of Lower Delta powerboat users.

## Hunting Participation

All Lower Delta powerboaters reported hunting for either moose or caribou on their recent trips, as did two-thirds of ATV (with an additional 33% hunting for other species). In contrast, over one-quarter of Tangle Lakes users hunt for caribou on recent trips, but less than 20% hunt moose or other species. None of the “through trip” users reported hunting for any species.

## Reasons for Taking Trips

Users were asked to rate the importance of 12 different reasons for taking trips in the corridor. Comparisons of mean scores for different sub-groups suggest the largest differences were between motorized users (motorized boaters and ATV users) and those who never use motors on Delta / Tangle Lakes trips; those comparisons are highlighted in Figure 2. Findings include:

- Users in both groups rate several attributes important, indicating that recreation experiences in the corridor are multi-faceted.
- The only attribute relatively less important for both groups was “meeting other river users,” while “solitude” was rated much higher. Few users appear interested in “social recreation” found at other lake or reservoir settings (particularly those with beaches), so minimizing interaction and competition between users is probably an appropriate management goal. Both groups, however, rated “being with friends and family” very important, indicating that they are interested in intra-group socializing.
- Non-motorized users rated most reasons slightly more important than motorized users, and their top seven reasons are generally associated with “non-consumptive” backcountry recreation in primitive or wilderness-like settings (e.g., being in a natural place, scenery, wildlife, camping, and solitude).
- In contrast, motorized users rated consumptive activities such as fishing, small game hunting, and large game hunting higher than non-motorized users (although they also rated several backcountry attributes highly).
- Whitewater boating was rated much higher for non-motorized users, many of whom take the “through trip” that includes whitewater and a portage that prevents most motorized use.

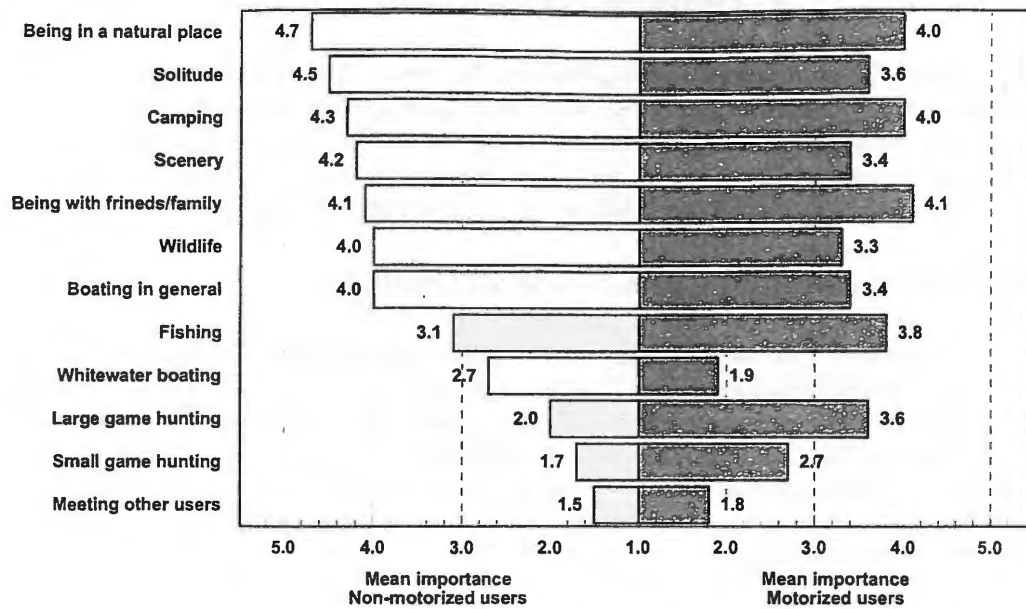


Figure 2. Mean importance ratings for reasons for taking trips among non-motorized and motorized respondents.

Comparisons between other sub-groups suggested other interesting findings, as summarized below (only statistically significant and important differences highlighted).

- Lake users rated fishing and hunting higher than river or multiple segment users (3.6 vs. 2.9 for fishing; 2.7 vs. 1.7 for big game hunting). This is partially explained by a higher proportion of motorized use on the lakes, but could also reflect other differences between lake and river users.
- For users who rated fishing and hunting less important, “being in a natural place” and “solitude” were rated 4.8 and 4.7 respectively, suggesting that these users may be particularly interested in “wilderness-like” experiences. In contrast, respondents who report engaging in big game hunting and fishing rated those activity reasons higher (4.7 and 4.6, respectively) than solitude (3.7) and “being in a natural place” (4.0).
- For obvious reasons, lake users rated whitewater less important than did river users (2.0 vs. 3.2). However, even for river users, whitewater was not rated important compared to other backcountry experience attributes such as “being in a natural place,” “scenery,” and “wildlife. There is not much whitewater on the Delta and it does not appear to be a major focus of trips for any group.
- Lower river powerboaters were slightly less interested in fishing than ATV users (3.3 vs. 3.7) or people who participated in both powerboating and ATV use.

## 5. General Evaluations

*This section examines fishing information and perceived fishing quality, perceived environmental conditions, and overall trip quality. These overall measures are usually less useful for establishing specific standards or making management decisions, but they can help characterize user perceptions of the river and its management. The chapter also compares reported and preferred types of experiences available on different segments of the river/lakes.*

### Fishing Information and Perceived Fishing Quality

Respondents were asked to report whether they fish on their trips, the number of hours they fish, and to specify target species, typical number of fish caught per hour, and overall quality of fishing on a scale of 1 to 5 (1=poor and 5=excellent) for each segment. Results indicate that about 69% fish, with similar proportions for motorized and non-motorized users. Of those who fish, the average length of time fishing was 3.7 hours per day (median 3.0; typical range of 2 to 5 hours), with slightly fewer hours (2.9 per day) reported by non-motorized users (possibly because they have to spend more time traveling).

The proportion of anglers who fish for different species for each segment is given in Table 6. Results indicate that grayling is the primary sport fishery, but many lake users also fish for lake trout, or both species. Relatively few fish for whitefish or burbot.

Table 6. Percent of respondents who fish for different species by segment (among those who fish).

Segment	Grayling	Lake Trout	Other (Whitefish, burbot)	Multiple species
Upper Tangles	62	13	3	22
Lower Tangles	52	17	3	28
Upper Delta	91	2	0	7
Lower Delta	94	0	0	6

The number of fish caught and mean evaluations of fishing quality for different segment/species combinations are summarized in Table 7. Results indicate that the highest catch-rates are associated with grayling on the river segments (particularly the lower river), and evaluations of quality generally follow from reported catch rates.

Table 7. Mean numbers of fish caught per hour and overall fishing quality for different species and segment combinations (among those who fish).

Species / Segment	Number of fish caught per hour			Average evaluation <sup>2</sup>
	Average	Median	Typical range <sup>1</sup>	
Lake trout / Upper Tangles	1.1	1	0 to 3	2.1
Lake trout / Lower Tangles	1.2	1	0 to 3	2.4
Grayling / Upper Tangles	4.7	3	2 to 6	3.1
Grayling / Lower Tangles	4.5	3	1 to 5	3.1
Grayling / Upper Delta	5.3	5	2 to 6	3.7
Grayling / Lower Delta	7.8	6	4 to 10	4.0

1. 25% and 75% responses.

2. On 5-point scale with 1=poor and 5=excellent.



Overall fishing quality ratings can be broadly compared to similar evaluations from the Gulkana and three Togiak Refuge rivers in Western Alaska (the Kanektok, Goodnews, and Togiak Rivers). In general, ratings for grayling fishing on the Delta (although not on the lakes) were similar to ratings for salmon and trout fishing on the more remote and “world class” Togiak rivers (3.8 to 4.0), and they were higher than ratings for the Gulkana (where both trout and salmon evaluations were under 3.4). However, ratings for grayling and lake trout on the Tangle Lakes were lower than those on the Gulkana.

## Perceived Environmental Conditions

Users were asked to rate the overall environmental condition of the Delta River / Tangle Lakes on a 1 to 10 scale (with 1=poor and 10 = excellent) on their first trip and most recent trip. Table 8 summarizes average responses and paired comparisons of means for those who gave both evaluations. Results indicate that users consider the river environment “healthy,” but on average they rated recent trips slightly lower than first trips. (Note: Results reflect perceived environmental conditions, not actual environmental conditions.)

Most (60%) rated conditions the same, but additional analysis shows that 35% reported lower scores for their recent trips compared to their first trips. Those most likely to report a decline were “through trip” users (43% of that group), while only 31% of lake users and 28% of lower river motorized users reported the same. Similarly, about 38% of the non-motorized users reported a decline compared to 29% of motorized users. In general, users focused on non-consumptive recreation and wilderness-like trips appear slightly more likely to report changes in environmental conditions.

A similar overall evaluation question was asked about “most recent trips” on the nearby Gulkana River and three Togiak Refuge rivers in western Alaska. Ratings for the Delta were similar to the Gulkana (7.4 to 8.2, depending upon the group), a surprise because the Gulkana certainly has higher use and impact levels. The Togiak Refuge rivers elicited higher ratings (8.7 to 9.1), but those rivers are not on a road system, feature week-long trips, and generally have lower use and impact levels than either the Gulkana or Delta. It is possible that the question format, which asked about first trips and recent trips, had some effect on evaluations (on other surveys, these evaluations were only asked for recent trips).

Table 8. Overall evaluations of environmental conditions on first and most recent trips.

	Average for first trip	Average for most recent trip	t value for mean comparison	p
All respondents	8.4	7.5	7.3	<.001
Non-motorized users	8.4	7.4	6.3	<.001
Motorized users	8.5	7.7	3.9	<.001

## Overall Trip Quality Evaluations (Satisfaction)

The “satisfaction” concept appears prominently in many social science fields, and recreation is no exception. Dating back to pioneering recreation researchers (Wagar, Lucas, Heberlein, Stankey, and Lime), “user satisfaction” was broadly considered a goal of recreation management (Kuss, et al., 1990; Manning, 1999), and the general idea is still commonly used by many managers, researchers, stakeholders, politicians, and the public in recreation management contexts.

This general evaluative dimension has been measured in a variety of ways, from economic “willingness to pay” formats to multiple item scales to single item scales. The distinctions between these variables and their advantages and disadvantages, are beyond the scope of this report. However, the simplicity and intuitive reasonableness of a simple Likert-type satisfaction scale has led to its inclusion in many recreation surveys. Sometimes the scale has included the word satisfaction in the item (e.g., a 6-point single-item scale ranging from “poor” to “perfect” as developed by Heberlein & Vaske, 1977 and used in several subsequent studies), while in other cases visitors have been asked to rate something like “overall trip quality” on a scale from “poor” to “excellent” (as was done in the present study). Item wording is important, but the response scales are arguably similar and appear to be measuring the same underlying general dimension: an overall evaluation of visitor trips.

Unfortunately, these general measures have limited utility (Shelby and Heberlein, 1986). It is possible to detect small differences in satisfaction among users with different characteristics or link satisfaction with some setting variables such as crowding, impacts, weather (Shelby and Neilson, 1976; Cole and Stewart, 2002, Vaske et al., 2002). However, most studies indicate that these broad indicators vary little among recreation users across resources or setting characteristics. In general, people tend to rate their recreation trips highly and the lack of variation in those evaluations makes the concept problematic. It has rarely been correlated with use density or crowding measures, and appears to suffer from a consistent finding in social psychology studies: general measures are usually poor predictors of more specific evaluations (Ajzen and Fishbein, 1980; Fiske and Taylor, 1991; Eagly and Chaiken, 1993).

Having noted these limitations, a general measure of satisfaction is usually requested by managing agencies and was included in the present study for completeness. Table 9 shows overall quality of experience ratings for all respondents, non-motorized and motorized users, and users that fish and hunt vs. those who do neither.

Results indicate that users generally rate experiences highly, and there are few differences between groups. On average however, users rated early trips higher than recent trips, indicating at least some perceived decline over the years.

Additional analysis showed that about 32% of respondents reported lower scores for recent trips than first trips, and there were a few notable differences between sub-groups. However, Delta “through trip” boaters or those who took multiple-segment trips were slightly more likely to report a decline (38% of the sub-group), compared to 30% of lake users and 28% of lower river motorized users. There were no statistically significant differences in the proportion of non-motorized and motorized users reporting the decline between first and most recent trips (32 vs. 31%).

As with overall environmental conditions, trip quality evaluations were asked on surveys for the nearby Gulkana River and the three Togiak National Wildlife Refuge rivers in Western Alaska. Results show the Delta was similar to the Gulkana (7.6 to 8.2, depending upon the group), while Togiak experiences were rated higher (8.7 to 9.1).



Table 9. Overall evaluations of trip experiences on first and most recent trips.

	Average for first trip	Average for most recent trip	t value for mean comparison	p
All respondents	8.8	7.9	7.0	<.001
Users that fish/hunt	9.0	8.0	6.3	<.001
Users that don't fish/hunt	8.6	7.4	3.2	.002
Non-motorized users	8.9	7.9	5.4	<.001
Motorized users	8.8	7.8	4.4	<.001

## Reported and Preferred Types of Experience Settings

Respondents were asked to compare the type of experience available on different segments of the river or lakes with the type of experience they think should be provided on those segments. The specific survey question appeared as below:

People seek different kinds of recreation experiences in different settings. Listed below are five "experience settings" available on different segments of the Tangle Lakes / Delta River. Please choose the letter that best describes...

- the setting you **experienced** during your **most recent trip** (for each segment you visited)
  - the setting you **prefer to experience** on those segments
- A. **Primitive Setting:** Where one expects to find solitude, very few traces of previous use, no motorized use or ATV trails, and no development.
  - B. **Primitive Motorized Setting:** Similar to primitive setting, but motorized use may occur and ATV trails may occasionally be visible.
  - C. **Semi-Primitive Setting:** Where one expects to meet few other groups, but solitude is still possible, particularly at camps. There is little or no motorized use or ATV trails, occasional evidence of previous use, and a few developments such as trails or outhouses.
  - D. **Semi-Primitive Motorized Setting:** Similar to a semi-primitive setting, but motorized use may occur and ATV trails may occasionally be visible.
  - E. **Undeveloped Recreation Setting:** Where one expects to meet other groups, and solitude is difficult to find. There is motorized use, ATV trails are visible at several locations, evidence of previous use at many sites, and some developments such as trails and outhouses.

Figures 3 through 8 show percentages of non-motorized and motorized users that experienced different settings on different segments on their most recent trip, as well as the setting they would prefer. Results illustrate contrasting perceptions and preferences for different types of opportunities, and they help suggest areas where there may be problems with overuse or use conflicts (when a more primitive or lower use experience is desired than the one people are getting).

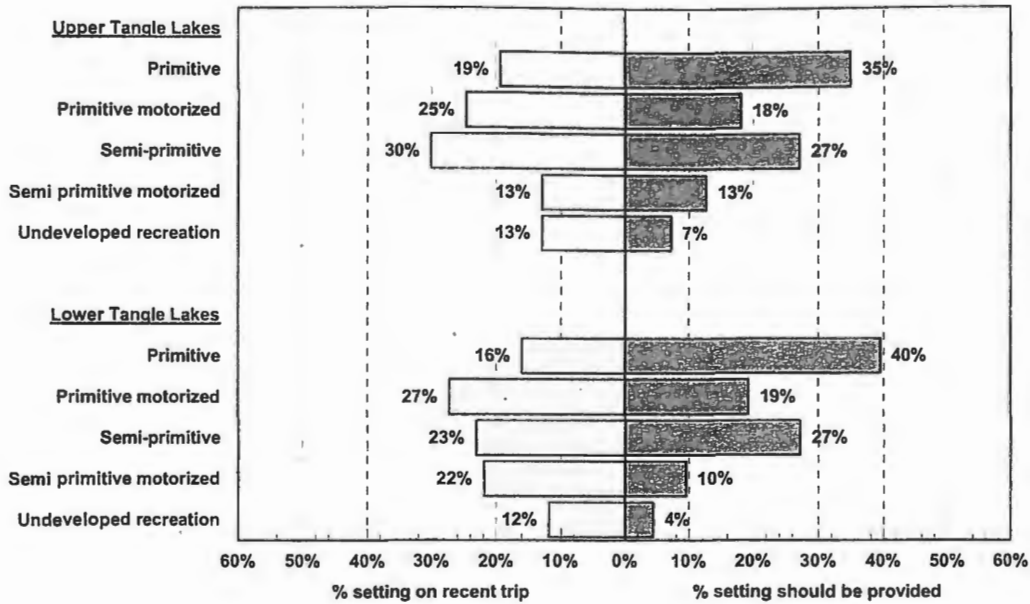


Figure 3. Percent of non-motorized users reporting and preferring different settings on the Tangle Lakes segments.

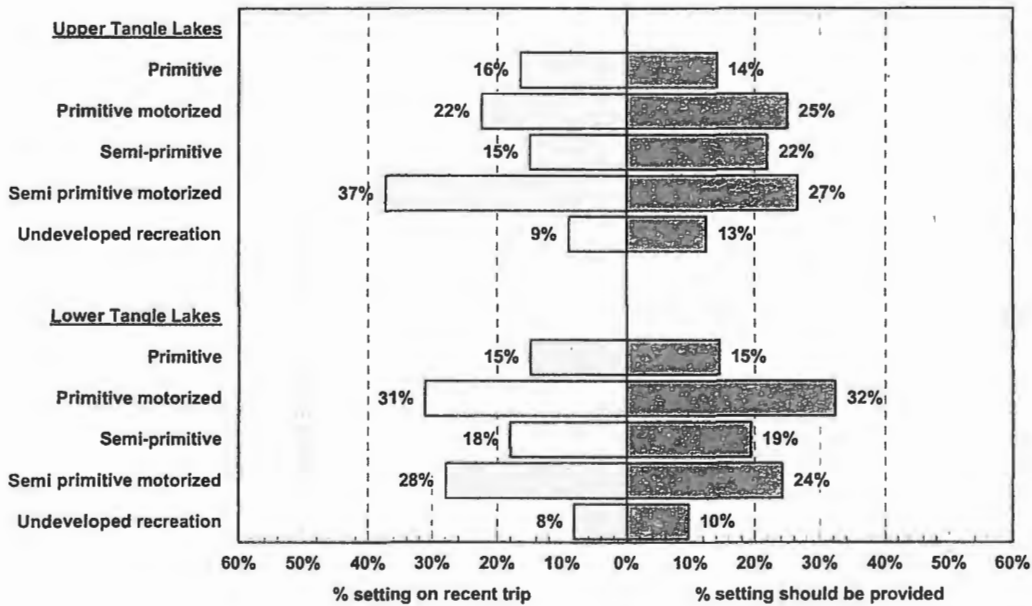


Figure 4. Percent of motorized users reporting and preferring different settings on the Tangle Lakes segments.

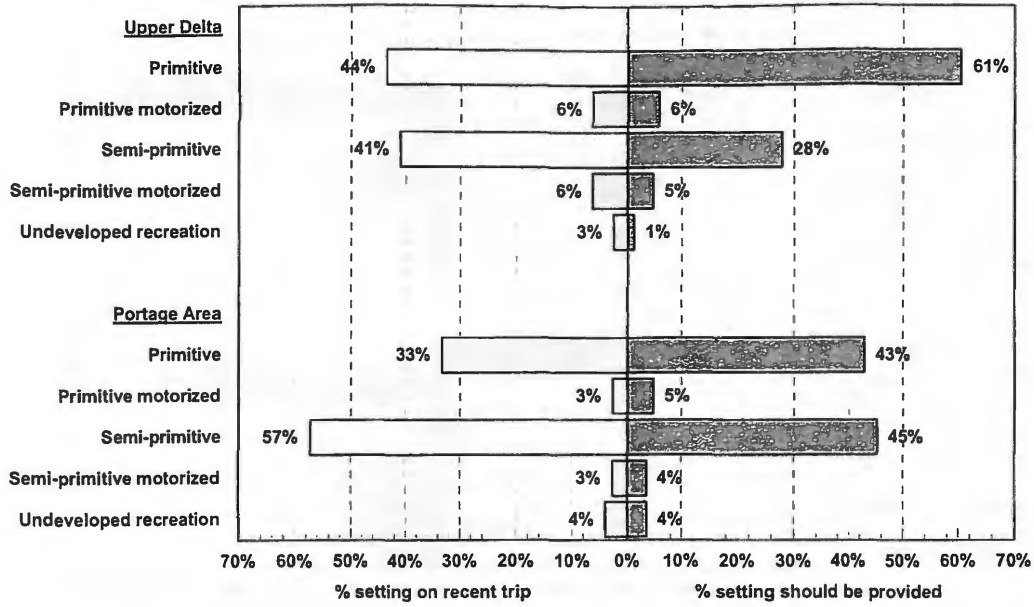


Figure 5. Percent of non-motorized users reporting and preferring different settings on the Upper Delta River segments.

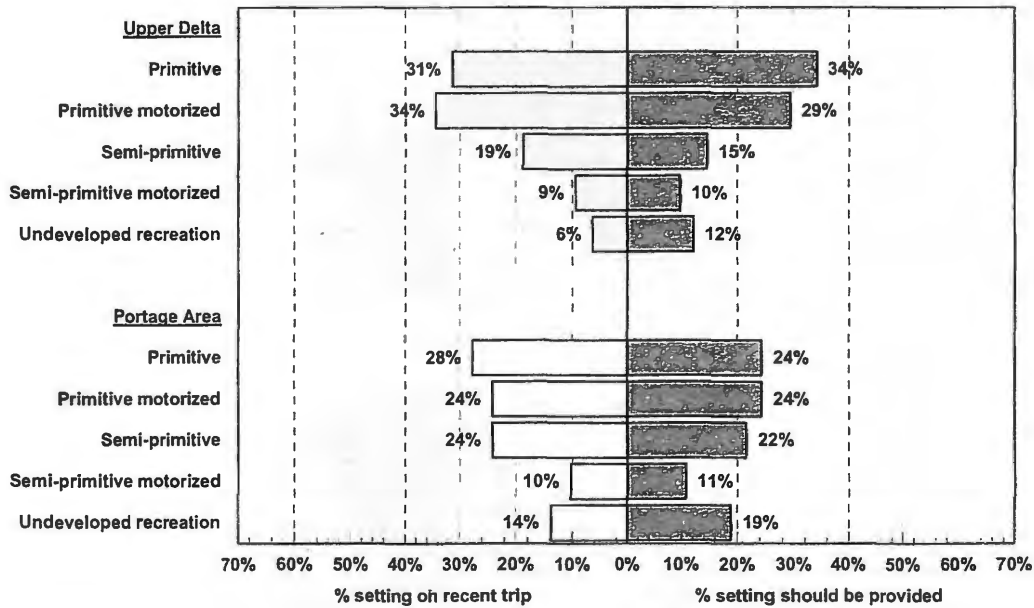


Figure 6. Percent of motorized users reporting and preferring different settings on the Upper Delta River segments.



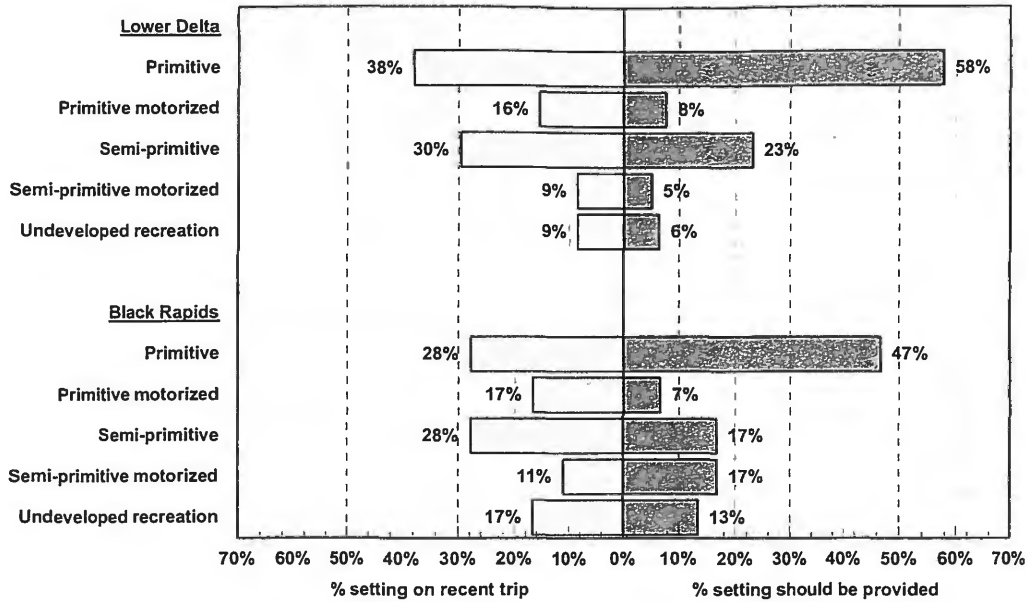


Figure 7. Percent of non-motorized users reporting and preferring different settings on the Lower Delta River segments.

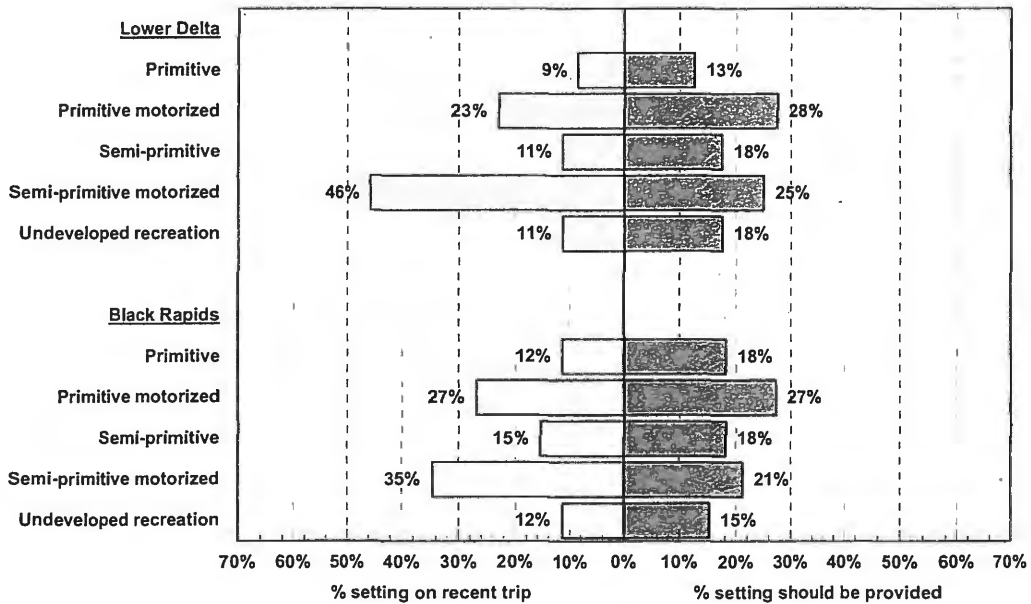


Figure 8. Percent of motorized users reporting and preferring different settings on the Lower Delta River segments.

Considering all of these results about settings, highlights include:

- Users generally recognize there may be different opportunities provided on different segments, and these differences are desirable.
- In general, there appears to be a continuum of opportunities from the primitive/non-motorized end of the spectrum to the semi-primitive motorized end. However, relatively fewer respondents thought any segment provided or should provide a higher density “undeveloped recreation” setting.
- Users generally thought the Upper Delta provides and should provide more primitive opportunities than the Tangle Lakes or the Lower Delta.
- In general, differences between reported and preferred experiences are greater for non-motorized users, suggesting they are more sensitive to higher use densities, development, or motorized use and would prefer less of each.
- Non-motorized users recognize that the Delta River portage area provides and should provide slightly less primitive conditions than the Upper Delta (but they still strongly prefer one of the two non-motorized settings).
- About half of the motorized users recognize that the Upper Delta and portage offer non-motorized opportunities at present, but slightly fewer prefer that situation (presumably opposing any non-motorized restrictions in the corridor).
- Motorized users prefer slightly more primitive settings than they reported, but they do not generally support non-motorized versions of more primitive settings.

## 6. Crowding, Impacts, and Tolerances

*This section examines more specific measures of experience quality and impacts. It includes data about perceived crowding, impact priorities, and comparisons of reported and tolerated impact levels. Results from this chapter are the central inputs into the Limits of Acceptable Change or Visitor Impact Management planning frameworks.*

### Perceived Crowding

Most theorists recognize a difference between density (or reported contacts) and crowding, but even scientists sometimes use the word “crowding” inappropriately when referring to high-density (Shelby et al., 1989). Density is a descriptive term that refers to the number of people per unit area. It is measured by counting the number of people and measuring the space they occupy, and it can be determined objectively. Crowding, on the other hand, is a negative evaluation of density; it involves a value judgment that the specified number is too many. The term *perceived crowding* is often used to emphasize the subjective or evaluative nature of the concept.

Perceived crowding combines descriptive information (the density or encounter level experienced by the individual) with evaluative information (the individual's negative evaluation of that density or encounter level). When people evaluate an area as crowded, they have at least implicitly compared the condition they experienced (impacts) with their perception of what is acceptable (standards). If they conclude that the area is crowded, it would appear that the existing conditions exceeded their definition of a standard (one criterion for an area being over capacity).

Researchers have developed a relatively simple measure of perceived crowding (Heberlein & Vaske, 1977). The question asks people to indicate how crowded the area was at the time of their visit. Responses are given on the scale below:

1	2	3	4	5	6	7	8	9
Not at all		Slightly			Moderately		Extremely	
Crowded		Crowded			Crowded		Crowded	

The advantage of this approach is that it is simple and easy to apply. Two of the nine scale points on the crowding scale label the situation as uncrowded, while the remaining seven points label it as crowded to some degree.

The scale can be analyzed in different ways. When describing a “wilderness experience” where the goal is to provide an opportunity for low-density solitude-oriented recreation, the scale has traditionally been collapsed into a dichotomous variable (not crowded versus any degree of crowding; the formula that was used here). This provides a conceptually meaningful break point between those who labeled the situation as not at all crowded (scale points 1 and 2, a positive evaluation), and those who labeled the situation as slightly, moderately, or extremely crowded (scale points 3 through 9, a negative evaluation).

Since 1975, this single item indicator has been used in over 200 studies conducted across the United States (e.g., Alaska, Arizona, California, Colorado, Delaware, Maryland, Michigan, Minnesota, Nevada, New Hampshire, Oregon, Pennsylvania, West Virginia, Wisconsin), Canada (British Columbia, Alberta), New Zealand, Australia, and Korea resulting in crowding ratings for over 500 different settings/activities. The activities included hiking, backpacking, wildlife viewing, wildlife photography, hunting of many types, fishing of many types, rafting, canoeing, tubing, motor boating, rock climbing, sailing, and driving for pleasure. The areas studied



represented considerable diversity, with some showing extremely high density and use impact problems, others illustrating low densities and no problems, and still others actively utilizing management strategies to control densities and use impacts.

A meta-analysis of 35 studies (Shelby, et al., 1989) identified five “rule of thumb” categories of crowding when the scale was collapsed in the manner described in Table 8. A substantially larger meta-analysis by the same authors (to be submitted for publication this year) supports use of this simple analytic technique. Settings where fewer than 35% of the visitors perceived the area as crowded appear to provide relatively unique low-density experiences, and managers should be concerned about preserving the conditions that maintain these relatively rare opportunities. Areas where perceived crowding is between 50-65% should be carefully scrutinized because they are probably approaching capacity. When more than 65% of visitors feel crowded, there is usually a capacity problem. When more than 80% of visitors feel crowded, the focus usually shifts to managing for high-density experiences.

Table 10. Carrying capacity judgments based on levels of perceived crowding.

% Feeling Crowded	Capacity Judgment	Comment
0-35%	Very low crowding	Crowding usually limited by management or situational factors (remote location, difficult access).
35-50%	Low normal	Problem situation does not exist at this time.
50-65%	High normal	Should be studied if increased use is expected, allowing management to anticipate problems.
65-80%	Over capacity	Studies & management necessary to preserve experiences.
80-100%	Greatly over capacity	Manage for high-density recreation.

Source: Shelby, Vaske, & Heberlein (1989).

Perceived crowding scores for a sample of rivers are given in Table 11, along with overall perceived crowding scores from segments on the Delta (shown in bold). Table 12 provides more detail about crowding scores for different segments and groups, and Figure 9 shows crowding scores for different segments by month. Results indicate several general findings:

- For all respondents taken together (Table 11), no segment is “over capacity,” and only the Lower Tangle Lakes are in the “high normal” category. In general, both the Delta and Tangle Lakes are generally un-crowded resources, and crowding scores are well below those of nearby rivers such as the Gulkana and several Susitna Basin rivers.
- The Upper and Lower Delta River segments have particularly low crowding ratings, suggesting they offer relatively unique low density opportunities.
- Analysis by segments and sub-groups (Table 12) suggest a few situations with slightly higher crowding scores, with Lower Tangle Lake boaters having the highest percentages reporting some degree of crowding. Of any segment, the Lower Tangles is probably the most likely to develop social capacity problems.
- Table 12 also shows that a majority of Lower Delta River powerboaters report some degree of crowding, but results are from a very small sample size (9). Similarly, the Black Rapids results are from small sub-group samples and probably do not indicate a “real” capacity problem (anecdotal information suggests that use is far lower on this segment than any other).

**Table 11. Percent feeling some degree of crowding on selected resources (entries collected from Vaske, Whittaker, Shelby).**

% Feeling Crowded	Resource	Population/Comments
<b>Greatly over capacity:</b> Should be managed for high densities; might be described as sacrifice area		
100	Deschutes River, Or	Boaters on weekends
100	Kenai River, Ak	Upper river bank anglers on high use days
97	Deschutes River, Or	Lower river boaters on weekends
94	Colorado River, Az	Anglers at Thanksgiving
92	Kenai River, Ak	Lower river powerboaters on high use days
89	Little Susitna River, Ak	All users
88	Deschutes River, Or	Boaters on weekdays
86	Kenai River, Ak	Upper river driftboaters on high use days
84	Gulkana River, Ak	All users - Richardson Highway Bridge
<b>Over capacity:</b> Studies and management likely needed to preserve quality		
80	Kanektok River, Ak	Guides
78	Kenai River, Ak	Middle River powerboaters on high use days
78	Lake Creek, Ak	All users
75	Waimakariri and Rakia Rivers, NZ	Salmon anglers
73	Boundary Waters, Mn	Canoers/boaters
72	Grand Canyon, Az	Rafters
70	Klamath River, Ca	Anglers
69	Kanektok River, Ak	Unguided floaters
65	Gulkana River, Ak	All users - Sourdough Launch Area
<b>High Normal:</b> Should be studied if use increases expected; managers might anticipate problems		
65	Kenai River, Ak	Lower river bank anglers on low use days
64	Talachulitna River, Ak	All users
63	Gulkana River, Ak	All users - Lower Main Stem
62	Kenai River, Ak	Middle river bank anglers
60	Gulkana River, Ak	All users - Sourdough Segment
59	Kanektok River, Ak	All users
55	Kenai River, Ak	Middle River driftboaters on low use days
54	Delta River, AK	Lower Tangle Lakes
54	Brule River, Wi	Anglers
53	Grand Canyon, Az	Rafters in winter
53	Snake River in Hells Canyon, Or/Id	Rafters
53	Goodnews River, Ak	Guided users
53	Kanektok River, Ak	Guided users
52	Brule River, Wi	Canoers
52	Goodnews River, Ak	Non-floaters
51	Gulkana River, Ak	All users - Upper Main Stem
51	Kroto Creek (Deshka), Ak	All users
51	Upper Youghiogeny, Pa	Kayakers
<b>Low Normal:</b> Unlikely to be a problem; may offer unique low density experiences		
49	Goodnews River, Ak	North Fork users
48	Delta River, Ak	Upper Tangle Lakes
46	Kenai River, Ak	Middle river powerboaters on low use days
45	Rakaia River, NZ	Anglers upstream
44	Delta River, Ak	All respondents - overall
43	Goodnews River, Ak	All users
43	Brule River, Wi	Tubers
42	Togiak River, Ak	King salmon season
41	Kenai River, Ak	Lower river powerboaters during catch/release
40	Poudre River, Co	Anglers
38	Klamath River, Ca	Floaters
38	Poudre River, Co	Kayakers
37	Brule River, Wi	Canoers during low use
36	Goodnews River, Ak	Middle Fork users
<b>No Crowding:</b> no problem; may offer unique low-density experiences		
35	Upper Youghiogeny, Pa	Rafters
34	Delta River, Ak	Black Rapids segment
33	Gulkana River, Ak	All users - Middle Fork
33	Togiak River, Ak	All users
27	Delta River, Ak	Lower River
26	Illinois River, Or	Rafters
25	Delta River, Ak	Upper Delta and Portage Area
25	Savage River, Md	Anglers
14-19	Gwali Haanas, BC	Touring kayakers at various areas
1-9	Athabasca-Sunwapta Rivers, Al	Whitewater rafters at various areas

Table 12. Percent feeling some degree of crowding on different segments for different groups.

Sub-group	Upper Tangles	Lower Tangles	Upper Delta	Portage	Lower Delta	Black Rapids	Overall
Upper Tangles only	46	--	--	--	--	--	50
Upper & Lower Tangles users	56	56	--	--	--	--	53
Lower Tangles only	--	71	--	--	--	--	71
"Through trip" river users	--	41	19	23	15	--	25
Multi-segment boaters (no ATVs)	56	65	33	27	28	44	43
Lower River power boaters	--	--	--	--	86	--	88
ATV only users	31	27	22	20	0	--	29
Multiple segment + ATV users	25	22	0	0	15	--	21
Non-motorized boaters	50	57	27	25	22	50	40
Small HP powerboaters (<15 hp)	52	50	0	0	0	0	60
Medium HP power boaters (16-85)	61	63	35	--	50	17	50
Large powerboats (>85 hp)	20	27	22	--	27	50	39

Bold cells -- denotes segment not used by sufficient users in the sub-group to calculate a useful estimate.

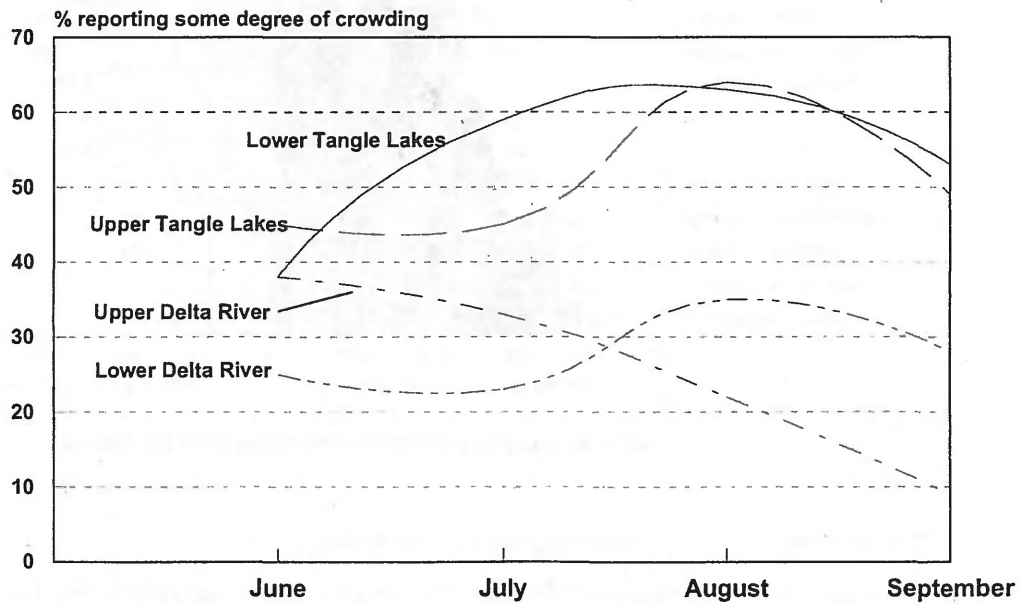


Figure 9. Perceived crowding for different segments by month.



- Analysis of crowding ratings by years revealed no pattern of higher scores in more recent years. However, there were some patterns among crowding ratings for various segments by month (Figure 9). In general, lake segments are higher during the subsistence hunting seasons in August and September, although the Lower Tangles also sees relatively high ratings in July. River segments remain low through the entire recreation season, but Lower Delta ratings are slightly higher in hunting season. Results are consistent with anecdotal information about how hunters use the lakes and lower river by setting up long term camps and traveling via powerboats in search of game, which might lead to slightly higher crowding scores.

## Impact Priorities

Users were asked to rate the priority of various impacts (on a 1 to 5 scale) that “deserve more management attention on the Tangle Lakes and Delta River” Table 13 ranks impacts by mean scores and shows the percentage of respondents rating impacts as high vs. low priorities. The figure combines all respondents because sub-group differences were generally small; additional discussion of group differences is given below.

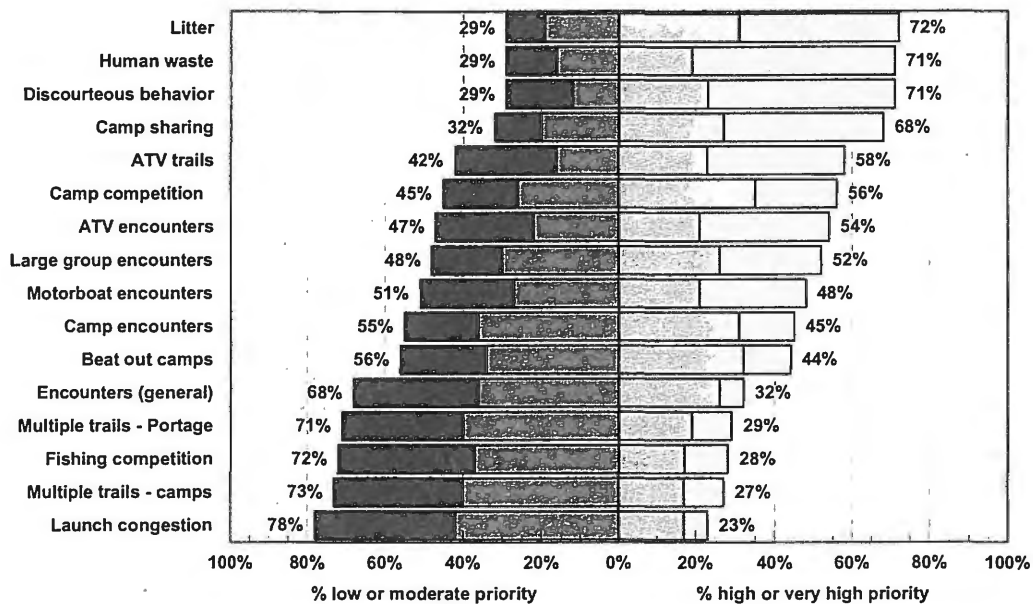


Figure 10. Respondents' priorities among different impacts.

Overall impact priority results suggest several findings:

- About half of the impacts were reported a high or very high priority by a majority of users, so users may be interested in management attention addressing these issues. However, a handful of impacts were rated high priorities by less than a third of respondents. Low priority ratings could mean either a) the impact itself is unimportant, or b) the impact level on the Delta is low and therefore doesn't need attention.
- Signs of use impacts (litter and human waste) were rated the highest priorities; a clean environment appears to be a starting point for high quality experiences.

- Discourteous behavior was also rated high, and while it is unclear how different users might define “discourteous,” comments from some users appear concerned about “out of norm” behaviors such as being drunk (see comments Appendix C).
- Camp competition, camp sharing, and camp encounters (camping within sight or sound) were relatively higher priorities than “beat out” camps, suggesting that users are more concerned about getting a camp to themselves than conditions at those camps.
- ATV trails and ATV encounters are high priorities for just over half of all users, but there were differences between motorized and non-motorized groups for these impacts (see below).
- Encounters with motorboats are rated a higher priority than encounters with floating users. This foreshadows the motorized use issue developed more fully in other sections of the report.
- Fishing is a primary activity in the corridor, but fishing competition was not a very high priority for many users. The ubiquity of good fishing areas on the Delta may diminish the importance of this impact compared to similar ratings from salmon rivers (where it is usually rated a higher priority).

Comparisons between motorized and non-motorized users on impact priorities suggest significant differences for six impacts (Table 13, ordered by the largest differences). In every case, more non-motorized users reported the impact as a higher priority, and for two impact types (motorboat encounters and ATV encounters), the differences are striking. These results are consistent with motorized/non-motorized use conflict results examined in other sections of the report. They are also consistent with non-motorized users being more “sensitive” to impact issues, which is consistent with their greater interest in attributes such as “being in a natural place” or “solitude.”

Respondents could also respond to the question by reporting that an impact “is not an issue on the Delta River / Tangle Lakes.” In general, fewer than 20% chose this response for any impact, with the two exceptions being fishing competition (22%), ATV trail conditions (27%), and launch congestion (28%).

**Table 13. Percent reporting an impact is “high” or “very high” priority for non-motorized and motorized users (when there were differences between group means).**

Impact	Non-motorized users	Motorized users	t value for mean comparison	p
Motor boat encounters	61	22	6.2	<.001
ATV encounters	63	34	4.1	<.001
Human waste	76	61	3.7	<.001
ATV trail conditions	62	48	2.8	.005
“Beat out” camps	49	34	2.5	.014
Encounters with large groups	57	42	2.3	.020

## Impacts and Impact Tolerances

### Encounters

“Encounters” – the number of other contacts with other *groups* per day – has been a focus of backcountry recreation researchers for 30 years. The consistent finding has been that backcountry users prefer contact with less than about 4 to 5 other parties per day in order to have a high quality “wilderness,” “primitive,” or “backcountry” experience (Vaske et al., 1986). As one moves into less primitive or frontcountry settings, however, findings show more variation (Shelby et al., 1996).

Users on the Delta were asked to report encounter levels for various segments, as well as their preferences and tolerances for encounter levels. Table 14 summarizes statistics for each segment, providing the mean, median, typical range (the 25% and 75% responses), the percentage unwilling to report a preference or tolerance, and the cumulative percentage reporting certain thresholds or less. The median response represents “50% of the sample reported this number or less,” and is probably a better measure of central tendency than means because of the potential influence of outliers. Responses are given for all users because differences between motorized/non-motorized groups were small.

Table 14. Statistics regarding reported, preferred, and tolerable encounters.

Segment	Mean	Median	Typical range <sup>1</sup>	% “don’t care”	Cumulative percentage			
					0	3 or less	6 or less	10 or less
<b>Reported encounters</b>								
Upper Tangles	5.0	3.0	2 to 5	--	10	54	81	91
Lower Tangles	6.1	3.0	2 to 8	--	12	53	73	84
Upper Delta	2.7	1.0	0 to 3	--	33	84	92	95
Lower Delta	2.9	1.0	0 to 3	--	31	78	90	97
<b>Preferred encounters</b>								
Upper Tangles	3.3	2.0	0 to 4	19	36	71	94	98
Lower Tangles	3.8	2.0	0 to 4	24	35	71	88	94
Upper Delta	2.9	1.0	0 to 3	16	48	84	96	99
Lower Delta	2.9	1.0	0 to 3	17	47	84	97	99
<b>Tolerable encounters</b>								
Upper Tangles	10.0	6.0	4 to 10	17	2	22	51	80
Lower Tangles	10.7	6.0	4 to 10	26	1	25	56	78
Upper Delta	6.3	4.0	2 to 10	22	3	43	72	91
Lower Delta	5.6	3.5	2 to 6	22	6	50	76	94

1. 25% and 75% responses.



Encounter results suggest several conclusions:

- For the lake segments, reported encounters were higher than preferences ( $p < .05$ ). For the river segments, they were higher but not statistically different.
- For all segments, reported encounters were significantly lower than tolerances ( $p < .01$ ).
- Taken together, people generally have more encounters than they prefer, but not more than they can tolerate.
- Encounter tolerances for the river segments (less than 4, using medians) are similar to those found in many other studies of backcountry settings (Vaske et al, 1986), but preferences are even lower. On the lake segments, slightly higher tolerances suggest that at least some users perceive them to be higher-density backcountry settings.
- Data suggest that few users are interested in substantially higher encounter levels than occur now.
- Differences between lake and river segments are not substantial, but they make sense. Rivers have more "closed" viewsheds, so encounters occur only when trips are in close proximity (or pass each other). In addition, river users travel in the one direction, while lake users go out and back, increasing the likelihood of encounters.

We analyzed respondents who reported more than 6 encounters per day. Over half were on trips in July (the highest use month on the Lower Tangles and through-trips), and there were differences by segment (55% were from Lower Tangle Lake users, 35% from the Upper Tangles, and only 19% each from the two main river segments. In general, results suggest that the lowest encounter levels occur on river rather than lake segments, which is consistent with overflight data showing lower use there (see Appendix A).

### **Campsite Impacts**

Overnight users were also asked to report impact and tolerance levels for several campsite impacts (see example question on next page). Table 15 summarizes statistics for each impact, providing the mean, median, typical range (the 25% and 75% responses), the percentage unwilling to report a tolerance, and the cumulative percentage reporting certain thresholds or less. The median response represents the number that 50% of the sample reported and is probably a better measure of central tendency than means because of the potential influence of outliers. Responses are given for all users because differences between motorized/non-motorized groups were small.

**Campsite impact question:**

We are interested in other impacts you experienced on **your most recent trip**, as well as your tolerance for those impacts. For the following questions, please...

- estimate the **amount you experienced** on your most recent trip.
- estimate the **amount you will tolerate** before your trip is compromised.

If an impact does not matter to you, place an X in the "tolerance" column.

NOTE: This question asks about percentages. Please round estimates to the nearest ten percent (0%, 10%....90%, 100%).

Impact	Percent you experienced on your most recent trip	Percent you will tolerate before your trip is compromised
Percent of sites with substantial litter (more than a handful)		
Percent of sites with visible human waste or toilet paper		
Percent of nights you camped within sight or sound of others		
Percent of nights you had to share a camp with another group		
Percent of times you passed up campsites because they were occupied		
Percent of campsites that were "beat out" (had unacceptable levels of fire ring scars, bare ground, or cut trees)		

**Table 15. Statistics regarding reported and tolerable camp impacts.**

Impacts	Mean	Median	Typical range	% "don't care"	Percentage reporting...		
					0	≤10%	≤25%
<b>Reported impacts (percent of sites you observed impact)</b>							
Litter	14	0	0 to 10	--	53	79	84
Human waste	18	10	0 to 20	--	46	73	78
Nights in sight/sound	30	0	0 to 50	--	52	58	63
Nights sharing	5	0	0	--	90	91	94
Camp competition	19	0	0 to 30	--	52	67	75
"Beat out" camps	16	0	0 to 20	--	55	73	81
<b>Tolerable impacts (percent of sites you will tolerate each impact)</b>							
Litter	14	10	0 to 20	3	38	73	86
Human waste	11	0	0 to 10	2	53	81	89
Nights in sight/sound	31	20	0 to 50	6	30	47	57
Nights sharing	11	0	0 to 10	6	66	78	88
Camp competition	28	20	0 to 50	6	27	46	56
"Beat out" camps	20	10	0 to 30	5	31	53	72

Figure 11 shows the percent of overnight respondents reporting tolerances for three important camp impacts. It graphically illustrates level of agreement about potential “standards” for these impacts.

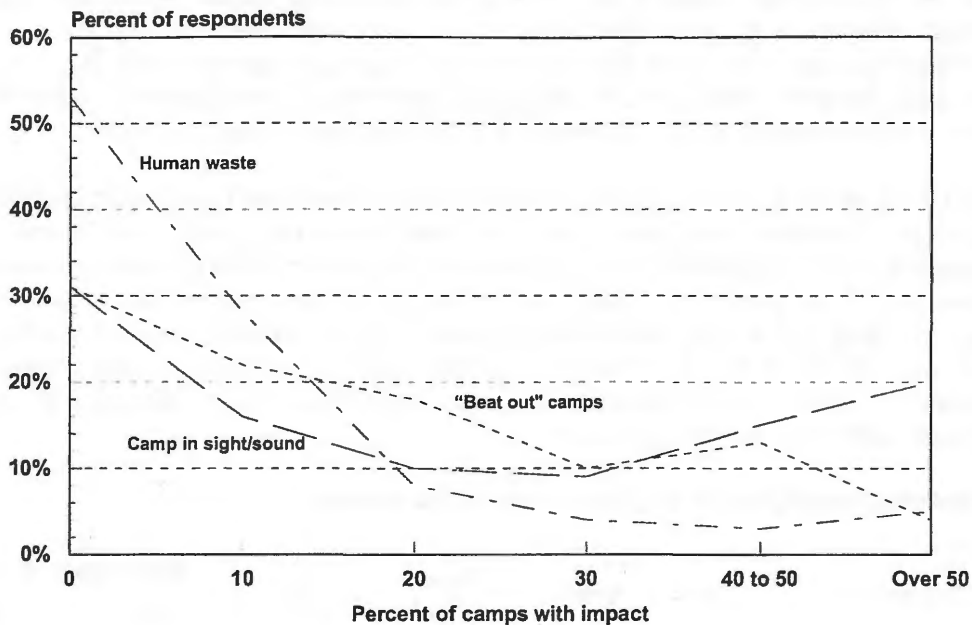


Figure 11. Percent of respondents reporting tolerances for three important camp impacts.

Taken together, campsite impact findings indicate several conclusions:

- The only impact where reported levels were higher than reported tolerances (on average) was for human waste, and this difference was small. In all other cases, average impacts were similar to, or less than, tolerances. Results indicate these impacts are not substantial problems at this time.
- Delta River / Tangle Lake camp impact tolerances appear to be similar to those for the Gulkana. However, Delta users reported slightly lower impact levels, so fewer “impact problems” exist.
- These findings have implications for BLM crew efforts, which currently occur roughly three times a year on the Delta and four times on the Gulkana. Because there is substantially higher use (and presumably higher impacts) on the Gulkana, crews may have a harder time “staying ahead” of litter or similar impacts on that river even with the extra trip.
- The human waste results reflect “no tolerance” standards for those types of impacts, a persistent result in several previous studies. A clean environment is a starting point for high quality recreation (Whittaker & Shelby, 1988). Users will apparently accept some litter and waste impacts at a small percentage of sites, but they expect those problems to be addressed by other users or management if they become more pervasive.



## Reported Group Size Encounters and Tolerances

Respondents were asked to report the largest group they had encountered on trips to the Tangle Lakes and Delta River, and to identify the largest group they would tolerate before their trip was compromised. Results are given in Table 16 for all users, and show that most have not encountered groups larger than about 9 or 10, and only 4% saw groups larger than 20. For tolerances, large majorities would tolerate groups no larger than 12, and almost all users (98%) indicate a tolerance for less than 20. However, 16% “did not care” about this impact.

Differences between segments or between non-motorized and motorized users were generally small, although 27% of small powerboat users “don’t care” about this impact. Additional analysis profiled the 60 respondents (24% of the sample) who were willing to tolerate encounters with groups over 12 or reported they “don’t care.” Only two of these respondents actually took recent trips with large groups (and none were larger than 16), but they were more likely to be motorized boaters (37% of the sub-group) than non-motorized boaters or ATV users (20% of each sub-group). There were no important differences between lake users, “through trip” river users, or lower river users for these questions.

**Table 16. Statistics regarding largest reported and tolerable group sizes.**

Segment	Mean	Median	Typical range <sup>1</sup>	% “don’t care”	Percentage reporting...	
					≤12	≤20
Reported largest group sizes	7.8	5	4 to 9	--	82	96
Largest tolerable group sizes	8.1	7	4 to 10	16%	86	98

## 7. Coping with Impacts and Perceived Change

### Avoiding High Use

Respondents were asked whether they planned trips to avoid high use and related impacts (Figure 12). Results suggest that about half of all users adjust their plans to address potential crowding, with small differences between lake and river users. There were some differences between motorized and non-motorized users; about two-thirds of the motorized users (and 70% of those who use ATVs in the corridor) planned trips to avoid crowding compared to only 43% among non-motorized users. A possible explanation is that motorized users are focused on hunting activities during a defined season, and the tradition of establishing a good base camp means many groups plan trips to “beat the crowds” by going mid-week or during the shoulder season.

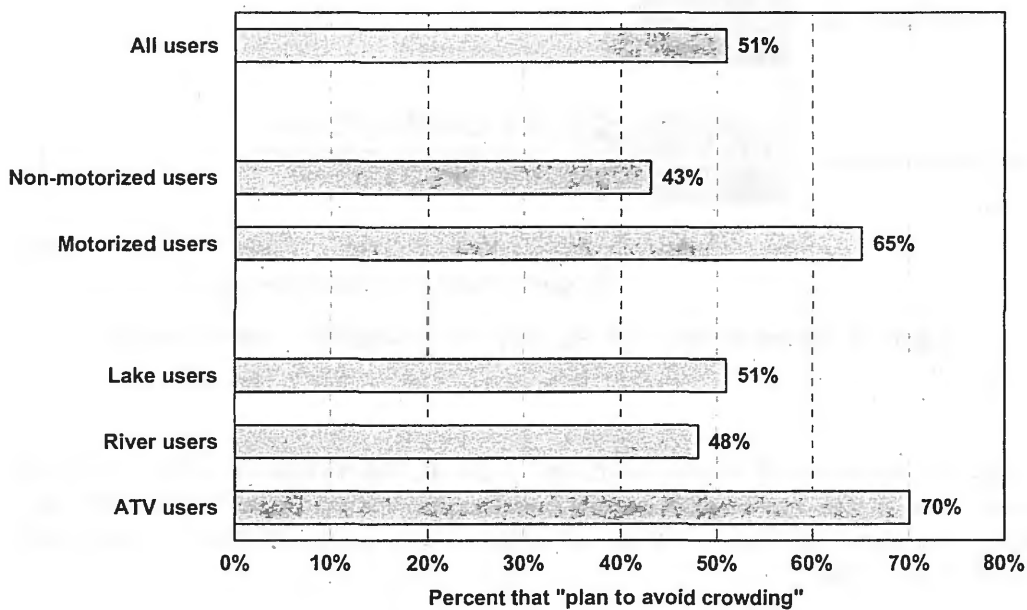


Figure 12. Percent of sub-groups that plan trips to avoid crowding.

Users who plan to avoid high use may employ several strategies, as shown in Figure 13. More than a third of all groups consider taking their trips mid-week, and a similar proportion of non-motorized users, river users, or lake users consider taking trips during the “low season.” However, motorized users as a group and ATV users in particular were less likely to go off-season, probably because many are focused on hunting, and regulations define that season.

Over half of lake users were also likely to report using lower use segments or areas to avoid crowding, presumably by going farther from the launches, while only about a fifth of river users said the same. “Through trip” river users have to travel through lake and river segments, which precludes use of this coping strategy (although they can spend more of their time on the river rather than higher use lake segments).

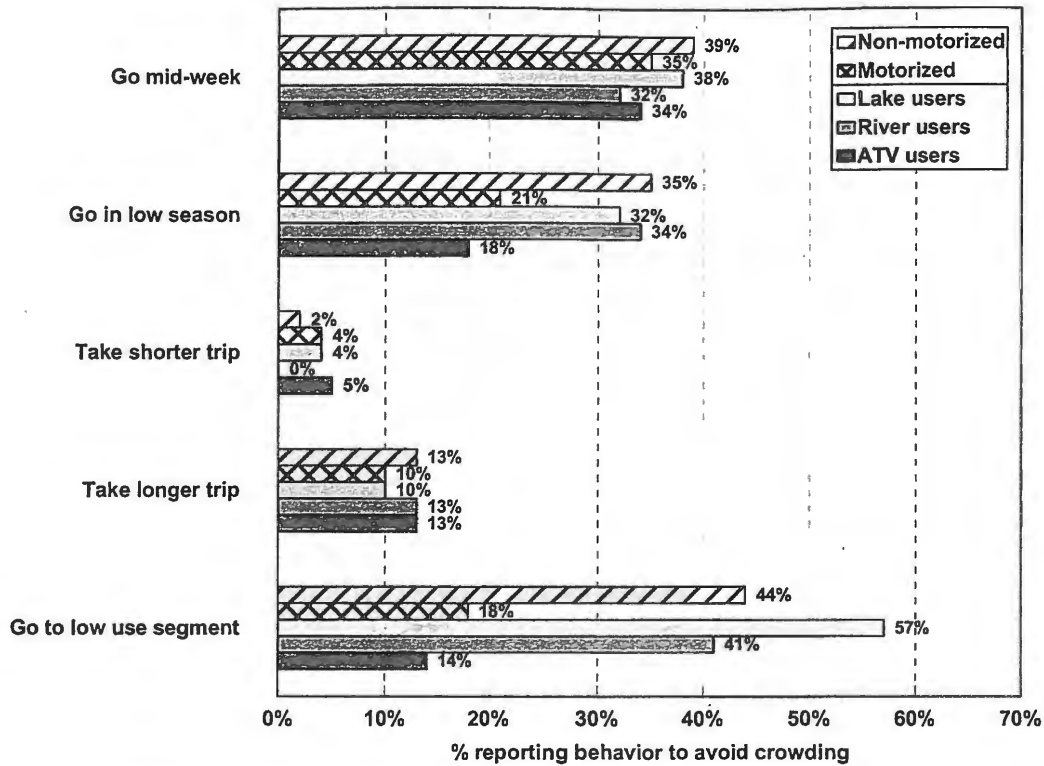


Figure 13. Percent of sub-groups reporting various behaviors to avoid crowding

ATV users are also less likely to go to a different segment, and are constrained by trail locations. Powerboats have similar limitations in getting past the first lake on Upper Tangles, traveling past the shallow necks between lakes on the Lower Tangles, or on to the shallower or rapid reaches of either reach of the Delta.

Relatively fewer respondents from any group reported taking shorter or longer trips to avoid crowding (this is not surprising given the distance of the Delta from major population centers). Because the corridor is relatively well-defined and linear, a longer trip generally does not translate into improved ability to avoid other users. The exception might be some of the smaller lakes in the Upper Tangles, accessible generally by small non-motorized craft like canoes.



## Perceived Change in Trip Quality

About 70% of all respondents had taken more than one trip on the Delta River or Tangle Lakes. This group answered questions about 1) whether trip quality has improved, stayed the same, or declined over time, and 2) if it has declined, whether that led them to change their expectations, take fewer trips, or stop taking trips. Results for different groups are represented in Figure 14.

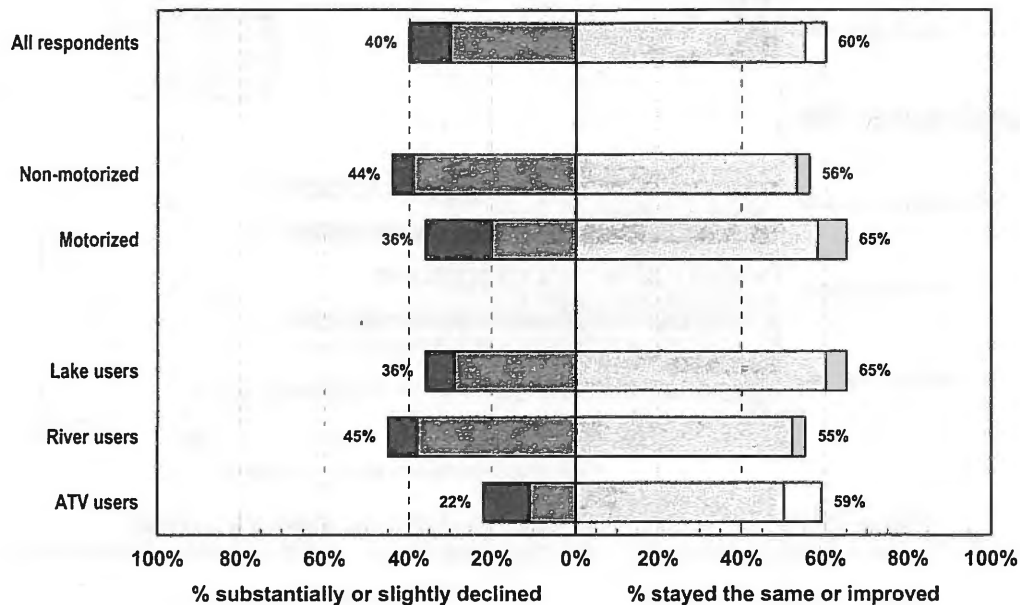


Figure 14. Percent reporting that trip quality has improved or declined.

Majorities of all groups indicated that the Delta / Tangles had stayed the same or improved, with slightly higher percentages for motorized and lake users. However, 44% of non-motorized and 45% of river users reported some decline (although most reported a slight decline).

It is difficult to assess whether a perceived decline is related to actual changes in conditions or a general human response that “things aren’t like they used to be.” If memories of negative conditions fade sooner than memories of positive ones, it may be difficult for any recent trip to compare to previous ones. Nonetheless, impacts may have increased in recent years, and these data may reflect some of those changes.

## Responses to a Decline in Trip Quality: Product Shift and Displacement

For users who indicated a decline in trip quality, the survey asked whether they responded to the decline by changing expectations (a cognitive shift in the “product” they were seeking) or by adjusting their behavior by 1) taking fewer trips or 2) stopping trips to the area altogether (indicating displacement). Results for different sub-groups are given in Figure 15.

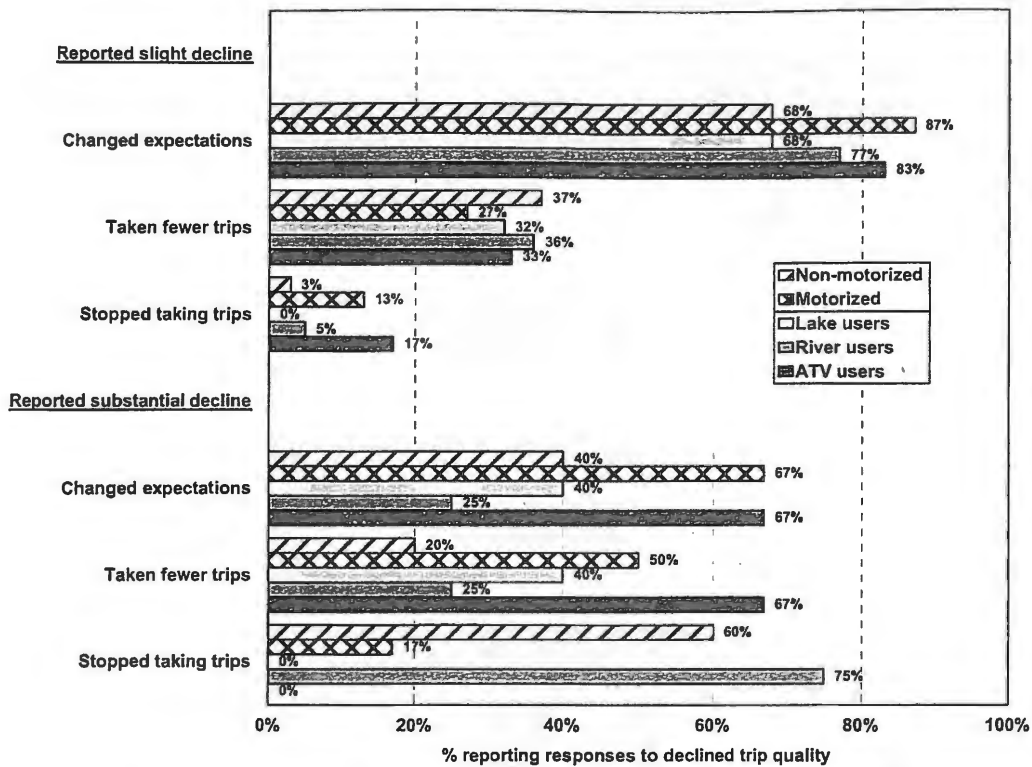


Figure 15. Percent reporting responses to a perceived decline in trip quality.

Note: Percentages do not necessarily sum to 100 within groups (respondents could choose more than one response).

For those reporting a slight decline, most users in all groups (68 to 87%) responded by changing their expectations, with slightly higher percentages among motorized users and ATV users. However, about one-third (27 to 37%) reported taking fewer trips. Relatively few (0 to 17%) stopped taking trips, but apparently even small declines can cause sensitive users to search for alternative opportunities at least some of the time.

For those reporting a substantial decline, response patterns were somewhat different. All groups were less likely (25 to 67%) to change expectations, and more likely to take fewer trips (20 to 67%) or stop taking trips (9 to 75%). The shift to fewer trips was most pronounced among motorized and lake users, and stopping trips was most pronounced among non-motorized and river users. Although sub-samples who reported substantial declines were small, the contrast in responses deserves additional research. One hypothesis is that sensitive non-motorized river users are more likely to “give up” on a resource with crowding or impact problems, while sensitive motorized users more easily redefine the setting.

## 8. General Management Strategies

This chapter describes support for and opposition to a series of possible management actions that could be used to address crowding or other impact issues on the Delta and Tangle Lakes. The sections are organized by types of alternatives, including development, education, regulation, fees, and use limits; subsequent chapters cover use conflict issues such as motorized boating, ATV use, and mining access.

The list of management actions in the survey was developed by managers and researchers based on information from scoping meetings for the East Alaska Plan, or from a review of common management regimes used on other rivers in Alaska and the West. No decisions about any of these actions have been advanced by the BLM; the research was designed simply to assess user group opinions toward them.

Results are presented in a series of graphs showing percent support and opposition by different user groups, as well as by float and powerboat guides. The survey asked users to respond to each alternative on a five-point scale from strong support to strongly oppose (with a neutral midpoint); for simplicity we have collapsed the “strongly” and “slightly” categories on each side. The percent that chose “neutral” responses can be calculated as  $100 - (\text{support} + \text{opposition})$ .

### River Clean-up Programs, Education, and Law Enforcement

Respondents were asked about two clean-up actions, increased “leave no trace” educational efforts, and increased law enforcement. Figure 16 shows results for all respondents (differences among sub-groups were small and are discussed below); specific items are listed below:

- Continue river clean-up programs (2 to 3 patrol trips per year)
- Increase river clean-up trips (4 to 5 patrol trips per year)
- Increase information about “leave no trace” practices
- Increase enforcement of existing laws and regulations

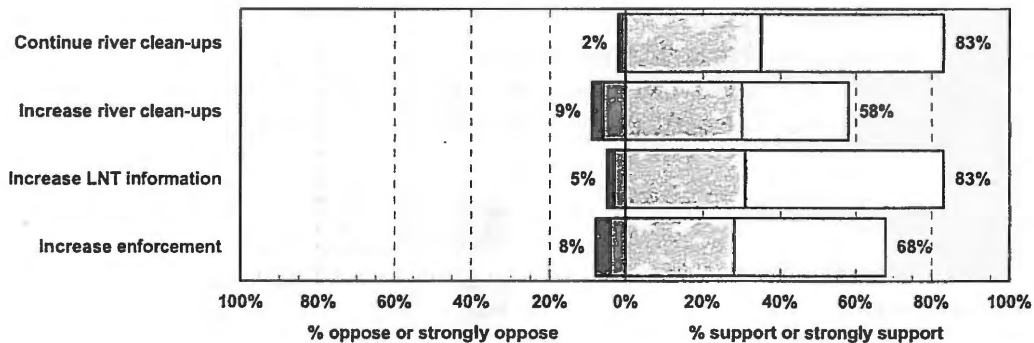


Figure 16. Opinion toward clean-up, education, and law enforcement strategies.

Results show the greatest support (83%) for existing patrol levels and increased educational efforts, with slightly lower (but still majority) support for increased enforcement and increased river clean-ups. Results are consistent with findings from other rivers, where these actions are commonly supported. The slightly lower support for increased clean-up patrols probably reflects general satisfaction with current patrol levels and is consistent with the impact-tolerance information reported earlier. Both results are consistent with the idea that the river is in relatively

“good shape” with regard to litter, so there may not be compelling reasons to increase clean-up efforts.

Differences between groups were small although ATV users and motorized boaters/ATV users were slightly less likely to support all these options (although there was still more support than opposition). The largest difference was for law enforcement, where only 44% of ATV users supported the action.

Support for education strategies deserves additional comment. Education efforts employ a “cognitive fix” approach and represent systematic persuasion efforts by managers to modify behavior that may be causing unacceptable biophysical or social impacts. As a way to address human-caused impact problems, managers and the public sometimes view these types of programs as a panacea (Roggenbuck, 1992), which they are not. Compared to regulatory approaches, however, education is preferred by many managers because it is less intrusive.

Education actions in river settings focus on minimum impact practices (e.g., no trace camping, human waste disposal), resource competition ethics (e.g., codes of behavior in “combat fishing” settings), and angling ethics (e.g., catch and release of non-anadromous species). Attempts to establish norms for these behaviors are evident in agency literature, information boards, and in the popular media (e.g., Outside, Backpacker, Field and Stream). However, while most users are probably aware of these education efforts, their influence on behavior is less clear. Persuasion research suggests that messages change both attitudes and behavior over the long term can be complex and challenging to develop, and that many users’ practices are learned from peers and relatives rather than agency communications (Manfredo, 1992).

## Facility Improvements

### General Improvements

Respondents were asked about three general facility improvements as listed below. Figure 17 shows results for all respondents (differences among sub-groups were small and are discussed below); specific items are listed below:

- Develop new outhouses at 2 to 4 high use campsites
- Create steps (with rocks or logs) to and from camps with erosion problems
- Improve access to Mile 212 on the Richardson Highway (road grading)

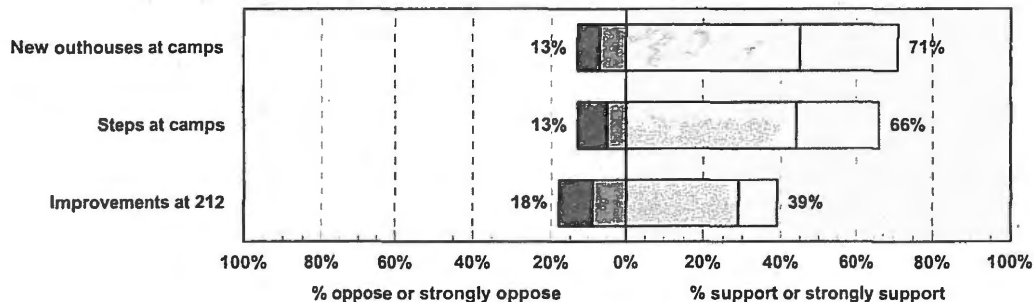


Figure 17. Opinion toward facility improvements and regulation actions.

Results show majority support (66 to 71%) for camp improvements such as toilets and steps, with more support than opposition (but not majority support) for Mile 212 improvements. In general,



Delta users support modest development if they are designed to address an impact problem, even if these slightly diminish “purist” wilderness values (e.g., the Wilderness Act generally prohibits permanent structures).

Differences between groups were generally small, although ATV users were less likely to support these actions than boaters (e.g., support for pit toilets at camps among ATV users was about 50%; support for steps at camps was about 42%). Of course, steps may be less important for users who generally don’t access camps from the river or lakes. Surprisingly, lower river power boaters were also less supportive of Mile 212 improvements (this is their primary access point); only 30% of this small group supported improvements. It is possible that these users are concerned that improvements would attract additional use; it also suggests most are satisfied with current facilities (an informal ramp and open gravel parking areas).

### Delta River Portage Improvements

Respondents that use the Delta River portage area were asked about eight actions that might be used there (see specific items below). Figure 18 shows results.

- Improve main portage trail with wood boardwalks and/or steps
- Improve main portage trail with “local” materials (mostly rock)
- Leave the main portage trail “as is” to avoid attracting more use
- Improve trails to the falls and “vista overlook” in the portage area
- Close or rehabilitate some side trails in the portage area
- Limit camping to designated areas at the downstream end of portage
- Remove outhouse to provide a more primitive setting
- Remove “warning–falls ahead” sign to provide a more primitive setting

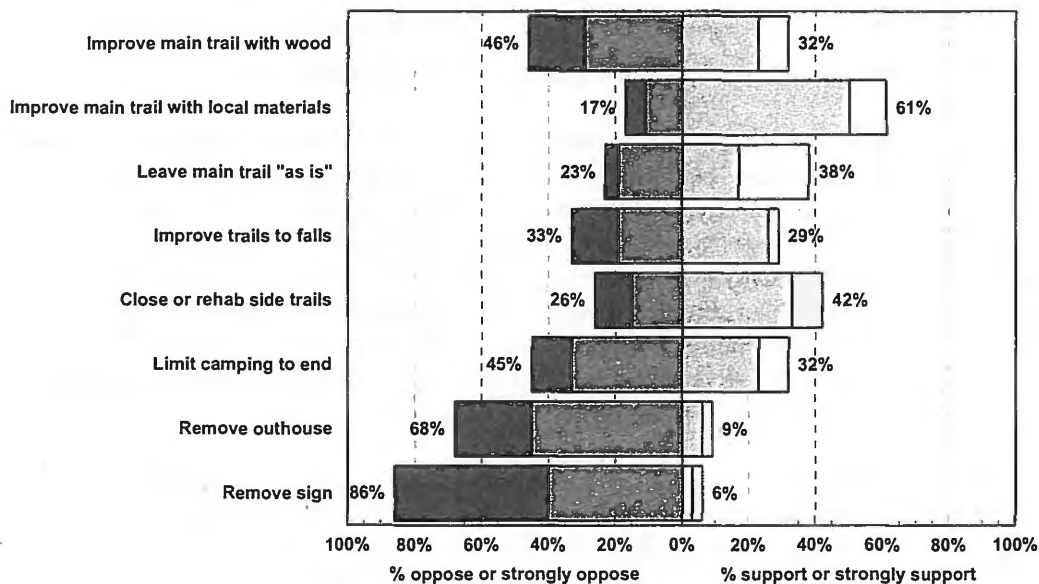


Figure 18. Opinion toward Delta River portage improvement actions.

Results indicate that most river users do not support substantial portage area improvements, although there was majority support for improving the main trail with local materials, and there was more support than opposition for rehabilitating some side trails in the area.

Majority opposition toward removing the portage warning sign and the outhouse further suggest that few users feel these substantially detract from the primitive nature of the corridor. Interestingly, there was nearly majority opposition to improving the portage trail with wood boardwalks (while a majority still wanted the trail improved), and divided opinion over improving the trail to the falls or the overlook. This suggests many users may still be sensitive about “too much” improvement in the area. Taken together, results generally support the current development balance at the portage.

## Fire Pan and Carry-Out Waste Regulations

Respondents were asked about two campsite regulations that are common on multi-day rivers in the Lower 48 (see specific items below). Figure 19 shows results for all overnight users (there were no statistically significant differences between groups).

- Prohibit open fires on the ground. Require fire pans or stoves.
- Require portable toilets (users would have to carry out their solid waste)

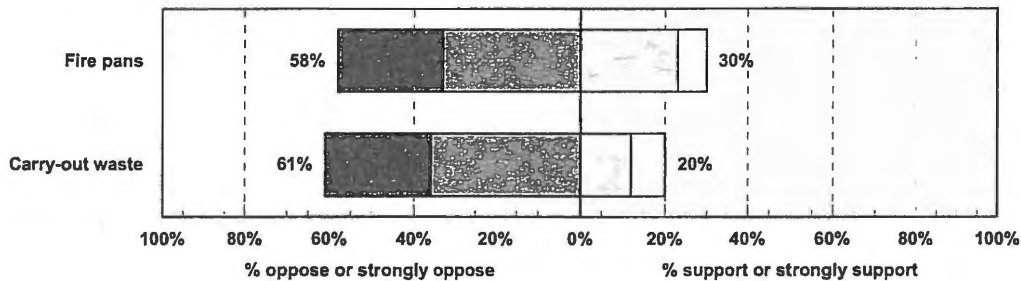


Figure 19. Opinion toward two campsite impact regulations.

Results show majority opposition to either strategy, with less than a third supporting fire pans and only a fifth supporting waste carry-out systems. Waste carry-out results are similar to those for Gulkana boaters (although a majority of Gulkana guides were supportive). This regulation, in place on many rivers in the Lower 48, requires a significant change in equipment and norms, but has become well-accepted in many areas and has virtually eliminated human waste impacts. These data, however, suggest that some Delta users are not prepared to support this type of change, even though they notice human waste impacts more often than they would like (the only impact for which this was true). Even among the 41 respondents who reported human waste at more than 20% of campsites, only 37% supported this strategy.

Opposition toward a regulation requiring fire pans was similarly strong. This type of regulation (which is also in place on many Lower 48 rivers where ash waste is an aesthetic issue and fire danger is a concern) also requires an equipment and behavior norm change. Delta users do not appear ready for such measures (similar to Gulkana users). Note: BLM patrols currently dismantle all but one fire ring per site (and keep them to reasonable sizes), which may limit concern about this impact for many users.

## User Fees

User fees are increasingly being used to help offset the costs of managing recreation areas in an era of fiscal austerity. Various federal agencies have day use, camping, and boat launching fees at facilities across the state, although most are not levied for backcountry use. However, on some rivers in the Lower 48 (e.g., Oregon's Deschutes, Idaho's Middle Fork and Main Salmon rivers), daily fees have been in place for many years and are widely accepted.

On the Delta, fees are currently only assessed for camping at developed campgrounds, but the survey asked if users would be willing to pay general use fees to help manage the river, as follows:

BLM facility maintenance and river patrols are currently funded by the general public through federal taxes. Do you support having users pay a fee if it were used to help support Delta River management or facility improvements?

1. No → SKIP TO NEXT PAGE
2. Yes

If you are willing to pay a fee, how much should it be? (*Write a dollar amount for each; if you don't think a type of fee is appropriate, place an X in the blank.*)

I am willing to pay....

- \_\_\_\_\_ dollar(s) per person per day
- \_\_\_\_\_ dollar(s) per person per season
- \_\_\_\_\_ dollar(s) per group per trip

Results indicate a majority (58%) of all users with an opinion (10% did not answer the question) would be willing to pay a fee, although there were interesting differences between groups. A majority of non-motorized boaters (61%) and powerboaters that use small engines (65%) were willing to pay fees, while proportions were much lower among other powerboaters (42%) and ATV users (33%). Results for non-motorized users were similar to Upper River Gulkana users. Among those willing to pay, mean amounts for different groups were between \$3 to \$5 per person per day (median: \$5); \$20 to \$40 per person per year (median: \$25); and \$10 to \$20 per group per trip (median: \$15).

When considering fees, planners should recognize the variable acceptability across groups, and the potential for fee collection to introduce a larger "management footprint" on trips. In addition to these direct effects on users, fee programs may also impact future management choices in subtle ways. If user fees lead to lower legislative appropriations for management, for example, agency revenue streams could become dependent upon higher use levels and lead some managers to favor developing higher density opportunities. Agencies might also become more interested in developed opportunities that typically feature higher fees and revenues. Taken together, fee programs run the risk of "commercializing" recreation experiences, with both direct and indirect (and perhaps unintended) consequences. User fee programs can be an important source of management revenue, but fees may be more appropriate for some situations than others, and probably deserve consideration beyond the issue of whether people are willing to pay them. Additional information about fees (their history, advantages, disadvantages, and public support for them) is available in an annotated bibliography on the topic (Puttkamer, 2001).

## Use Limits

Another class of regulatory actions adopts a use limit or “carrying capacity” approach. The fundamental idea that higher use levels equate with higher impact levels persists in the recreation management field and among the public, even though data suggests links between use and impacts can be relatively complicated (Shelby & Heberlein, 1986; Kuss et al., 1990). Several visitor impact planning frameworks (e.g., C-CAP, LAC, VIM, and VERP) are essentially efforts to cope with this complexity instead of focusing on use limits as a single “magic” solution (Washburne, 1982; Shelby and Heberlein, 1986; Graefe et al., 1990). Nonetheless, use limits remain a powerful management strategy for dealing with some impacts, especially in geographically-concentrated areas such as river corridors.

In general, use limit alternatives appear to have greater efficacy when addressing social impacts such as encounter levels or competition for sites and facilities. In contrast, many biophysical impacts appear less directly related to use levels because initial or relatively low levels of use may create proportionately larger impacts (Hammitt & Cole 1987; Kuss et al., 1990). For example, the first few groups to pioneer a campsite appear to have the greatest impacts on vegetation loss; subsequent groups then camp in the same areas and typically cause marginal additional impact (Cole, 1987). Some wildlife disturbance impacts may also fit this pattern, because many animals adjust or habituate to human uses over time (Knight & Cole, 1995; Whittaker & Knight, 1998).

In river settings like the Delta, use limits are a potentially effective tool because some social impacts are likely to be related to numbers of users, and limits on use might prevent some “impact problems” from becoming unacceptable. The trade-off with use limits, however, is loss of access and a heavier managerial footprint. Several questions in the survey asked users to assess this trade-off and respond to the philosophy of use limits for the Delta. The idea was to find out if the “cure” (use limits) is more acceptable than the “disease” (higher use and impact levels).

### Respondents' Philosophy toward Use Limits

One question focused on respondents' general “philosophy” toward use limits on the river or lakes, with response options ranging from “yes, limits are needed now” to “no, I'll always want unlimited access.” Specific question wording is given below; results for non-motorized and motorized users are given in Figure 20.

Would you be willing to compete for a limited number of permits to take overnight trips on the Tangle Lakes and Delta River (if it meant that there would be fewer other users)? *(Circle one number)*

1. Yes, some limits on use are needed now.
2. Maybe, but it depends on how many permits would be available each day.
3. Maybe, but it depends on how the permit system works.
4. Maybe, but it depends on how many permits would be available and how the permit system works.
5. No, I'll always want unlimited access to the river / lakes, even if use and impact increase.
6. It doesn't matter to me.



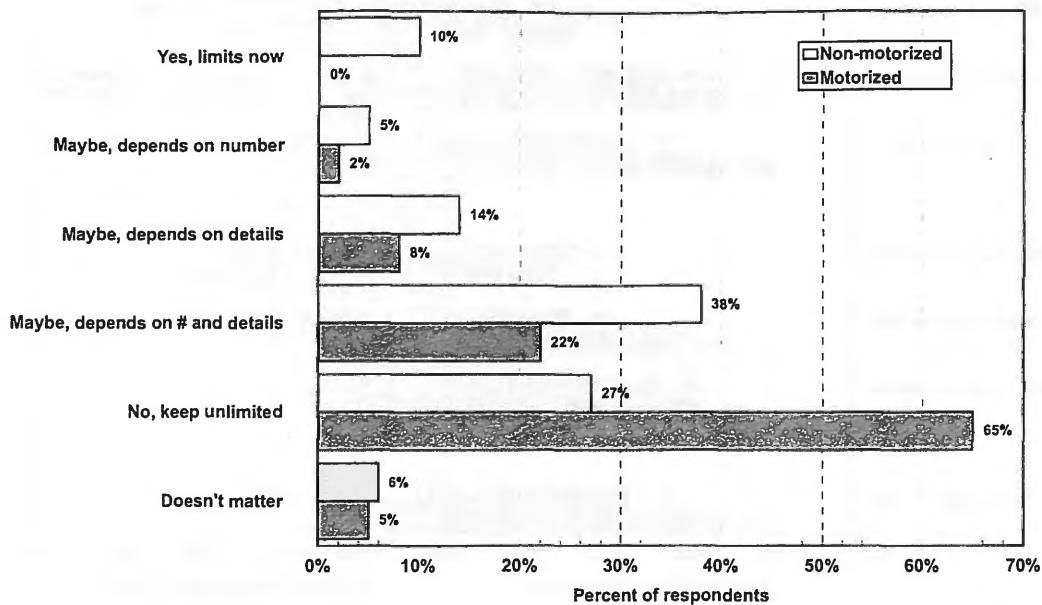


Figure 20. "Philosophy" toward use limits among non-motorized and motorized users.

Results show striking differences between motorized and non-motorized users. Nearly two-thirds of motorized users were philosophically opposed to use limits even if use or impacts were to increase, and no motorized user thought limits need to be established now. In contrast, while only 10% of non-motorized users thought limits were needed now, 57% chose the "maybe" responses. Taken together, about two-thirds of the non-motorized users support or might support limits, while only about one-third of the motorized users said the same.

### Opinion toward Use Limit Options

A "full-on" permit system is not the only use limit option. Users were also asked to react to six specific use limit options as given below; they were also asked about support for developing more camps as a way to handle increasing use during peak periods (possibly minimizing the need for use limits). Figure 21 shows results for non-motorized and motorized users, the groups with the greatest differences.

- Limit the number of guided trips
- Limit the number of private or non-guided trips
- Limit the number of all trips
- Develop more campsites to handle peak use
- Require all overnight groups to register (on a free website) so people can adjust their plans to avoid crowding
- Set up a reservation system for campsites
- Limit the length of stay at heavy use campsites to one night

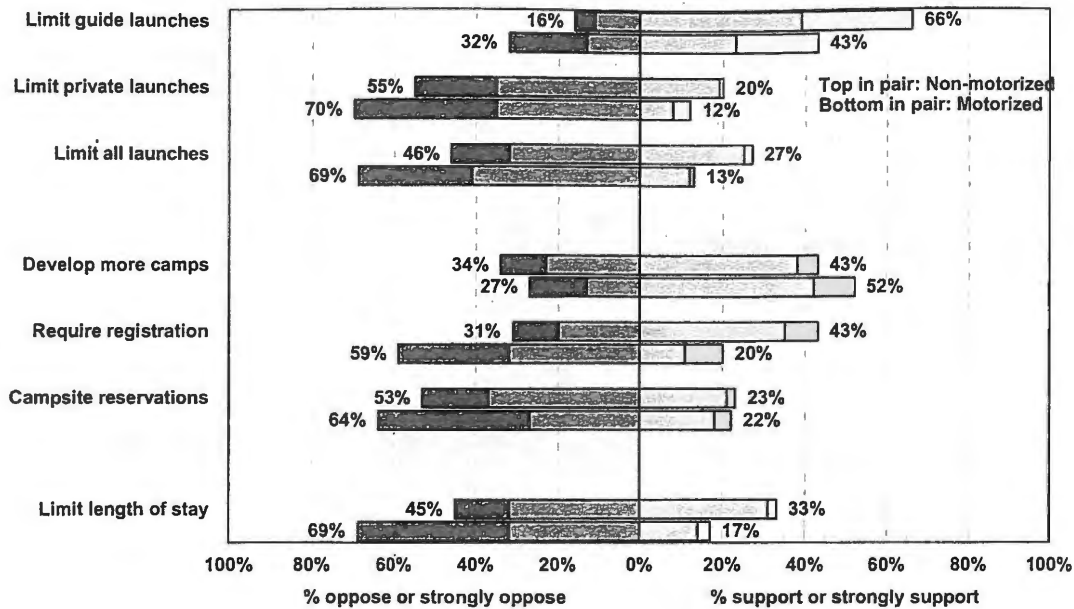


Figure 21. Opinion toward specific use limit options for non-motorized and motorized users.

Overall, results suggest little enthusiasm in either group for most use limit options. But they also illustrate consistent differences between non-motorized and motorized users (differences were statistically significant for 5 of the 7 items). In general, more motorized users are opposed to these options than non-motorized users.

There was majority (66%) support among non-motorized users for limiting commercial use, and there was more support than opposition among motorized users as well. This result is consistent with findings from several other rivers in Alaska. It is worth noting that the Delta currently has low levels of commercial use (probably less than a dozen trips per year on the river or lakes), so this may reflect general attitudes toward commercial use rather than a real guide/private conflict that has been evident on rivers such as the Kenai (Whittaker and Shelby, 1993) and Situk (Watson, Christensen, & Whittaker, 2004).

If use limits are contemplated, managers should recognize that use limits have trade-offs and may create unintentional consequences. They undeniably involve greater regimentation, as well as administrative costs (Brunson et al., 1992). There are also several considerations in how use limits should be implemented, including how to allocate use among different groups (e.g., commercial vs. non-commercial users, lake vs. river users, motorized vs. non-motorized users) and which rationing method to use (e.g., reservations, lotteries, first-come/first-served, merit systems, or pricing). Existing information in the research literature about users' attitudes toward these choices and the trade-offs they present could prove useful if planners want to further explore use limit options (Shelby & Danley, 1980; Shelby et al., 1982; Shelby, Whittaker & Danley, 1989; EDAW, 1995).

Final note on use limits: The Wild and Scenic Rivers Act requires carrying capacities to be specified for river segments in the system (WSRA, title 16, chapter 28, 1274), even though many managers have interpreted this as simply a requirement to develop a visitor impact management program (that may or may not involve use limits). A recent federal appellate court ruling

addressing this issue on Yosemite's Merced River (9<sup>th</sup> Circuit Federal Court of Appeals, Oct. 2003) implies that capacities include real standards or a numerical use level. NPS is in the process of revising Merced plan, so it is premature to assess whether this ruling mandates revisions to the 300+ river plans across the nation that do not have explicit capacities. Some researchers have advocated that all new plans or plan revisions include numeric capacities (Haas, 2004), and given the court ruling, this advice seems prudent.

## Group Size Limits

Group size limits are a final type of use regulation common in many backcountry settings. Respondents were asked if they support or oppose limiting the size of groups, and a follow-up question asked what it should be. The follow-up question preamble included information about maximum group sizes observed by BLM rangers on the Delta, and typical group size limits on other rivers (see below):

Groups on the Tangle Lakes and Delta River are usually small, but some have had as many as 29 people. Typical group size limits on other rivers are between 12 and 25. If you support a group size limit, what do you think it should be? *(Fill in the blank or check the box).*

- I support a limit of \_\_\_\_\_ people per group, or...  
 I don't support group size limits.

For the simple support-opposition question, a majority (57%) of non-motorized users supported group size limits, with 24% opposed. Among motorized users, only 27% supported limits, with 47% opposed.

For the follow-up question, 29% of all respondents reiterated their opposition to group size limits. Among those who supported them, specified limits were between 10 and 15 people (the average was 11.9). Nearly three quarters (74%) specified limits of 12 or less, 91% specified 16 or less, and 97% specified 24 or less. Overall, most respondents support some controls, with relatively small group size limits compared to other rivers (and much lower than the largest groups recently observed in recent years by BLM on the Delta).

## 9. Motorized Boating

*Motorized/non-motorized conflicts are among the most common and contentious issues in many river settings, and the existing management plan for the Delta River recommends powerboat horsepower limits on the Tangle Lakes (< 15 hp). Respondents were asked whether they support or oppose several motorized boating restrictions on different segments, and follow-up questions had them rate the importance of reasons for restricting motors.*

*As with other management strategies addressed in the survey, actions were developed by managers and researchers based on information from scoping meetings for the East Alaska Plan, or from a review of common management regimes used on other rivers in Alaska and the West. No decisions about any of these actions have been advanced by the BLM; the research was designed simply to assess user group opinion toward them.*

### Opinion toward Motorized Boating Restriction Options

#### Restrictions on the Tangle Lakes

Respondents were asked about five different boating restriction options on the Tangle Lakes (see below). Figure 22 shows support and opposition for these options among motorized (top bar in each pair) and non-motorized users (bottom bar in each pair).

#### *Upper Tangle Lakes:*

- Prohibit all motorized use

#### *Lower Tangle Lakes:*

- Prohibit motors larger than 15 horsepower “downstream” of Round Tangle Lake (the first lake)
- Prohibit motorized use downstream of Long Tangle Lake (shallow area about 6 miles from the put-in)
- Prohibit PWCs (jet skis)
- Prohibit all motorized use



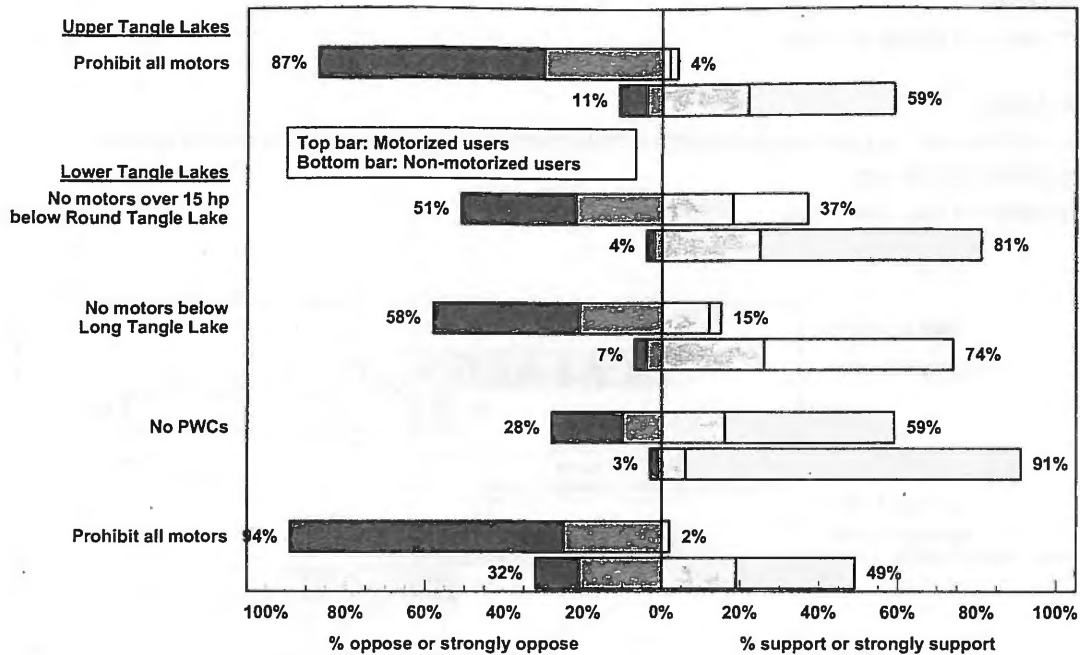


Figure 22. Opinion toward Tangle Lakes boating restriction options.

In general, results follow a classic user conflict pattern: most non-motorized users supported restrictions and most motorized users opposed them. The exception was for prohibiting personal watercraft, which was supported by a majority of motorized users.

Results indicate the existence of a conflict, but they also show that a substantial number of non-motorized users tolerate motorized use on the lakes (even though they may prefer some segments or lakes to be non-motorized). Motorized users were generally united in opposing total prohibitions, but non-motorized users were also less supportive of those bans, particularly on the Lower Tangles (only 49% support a total ban and 32% oppose it).

Some motorized users believe that larger motorboats may not be necessary on some lakes, or that not all lakes may be appropriate for motorized use. A small proportion (15%) of motorized users support a motorized ban below the shallow reach downstream of Long Tangle Lake, while 37% support a 15 horsepower restriction below Round Tangle Lake (many already use small motors, as discussed below). Taken together, however, a majority of motorized users clearly value access to the area, and do not want any motorized restrictions.

The support for a PWC (jet ski) ban among both groups, however, provides one point of agreement. Although motorized support (59% vs. 91%) for this restriction is weaker, it appears that neither group is interested in having the Tangle Lakes provide the kind of “sport-boating” or “social recreation” commonly associated with PWCs (e.g., higher densities of users who travel at high speed, jump wakes, or perform other maneuvers).

### Restrictions on the Delta River Segments

Respondents were asked about four different boating restriction options on the Delta River segments (see below). Figure 23 shows support and opposition for these options among motorized (top bar in each pair) and non-motorized (bottom bar in each pair) users:

**Upper Delta:**

- Prohibit all motorized use

**Lower Delta:**

- Prohibit motorized use except during subsistence hunting season (after mid-August).
- Prohibit airboat use.
- Prohibit all motorized use.

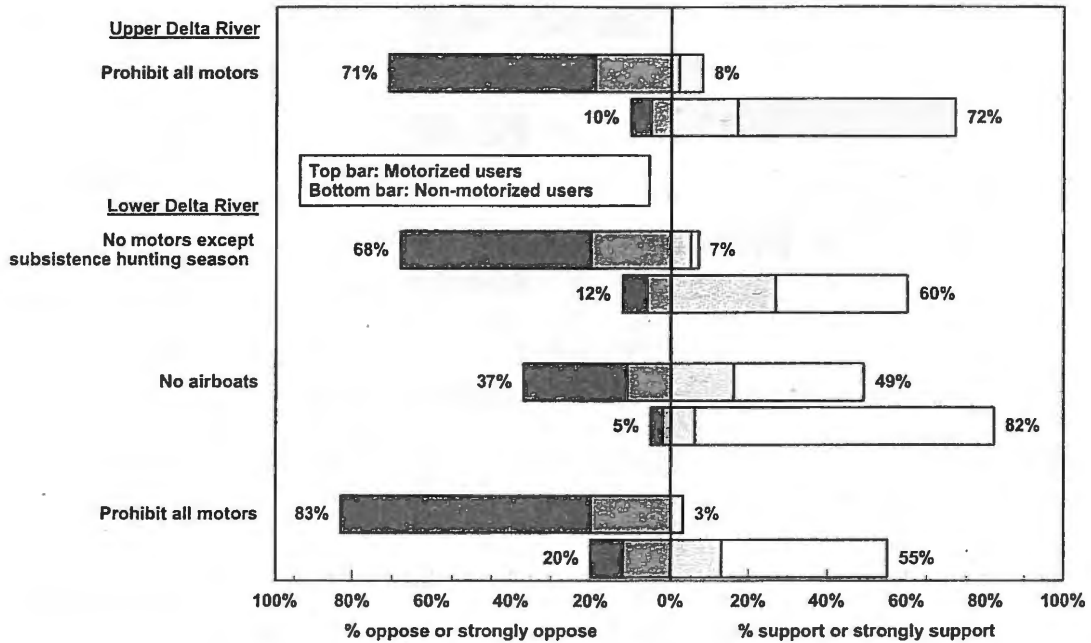


Figure 23. Opinion toward Delta River boating restriction options.

Results are similar to those for the lakes, with large majorities of non-motorized boaters generally supporting motorized restrictions and large majorities of motorized boaters generally opposing them. The notable exception was for banning airboats, which had more support (49%) than opposition (37%) even among motorized users.

As with the lake findings, results fail to suggest any “elegant” zoning solutions that would be supported by both groups. Both a temporal zoning option (no motorized use outside of the hunting season) and a spatial zoning option (no motorized use on the Upper Delta) were strongly opposed by most motorized users.

**Differences between Sub-groups**

Follow-up analysis for three restriction options examined differences by type of craft as shown in Figure 24. “Small motor” users were respondents who currently use engines of 15 horsepower or less (includes kickers on canoes or rafts); “medium motor” users have 16 to 85 horsepower engines; and “large motor” users have engines over 85 horsepower.

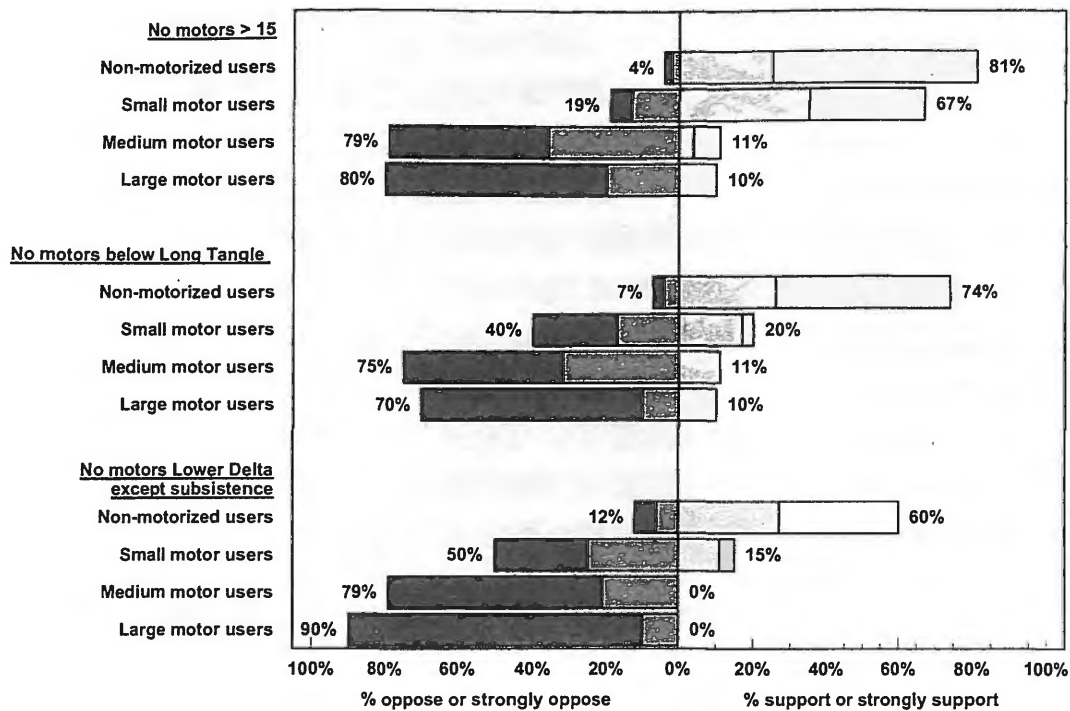


Figure 24. Opinion toward boating restriction options by non-motorized and motor-size sub-groups.

Results show that motorized users with small engines are more like non-motorized users in regard to the 15 horsepower restriction, but more like other motorized users for other options (which would restrict their access).

### Rating Reasons for Restricting Motorized Boating

Respondents were also asked to rate the importance of 11 reasons for motorized restriction options. The reasons were developed from public comments or findings from other river studies; the idea was to assess their relative importance for different groups to help understand the underlying issues in the conflict. Response choices ranged on a four point scale from “not important” to “extremely important” and “restrictions would not address this.” Figures 25 and 26 show the ranked reasons; there were statistically significant differences between motorized and non-motorized users for all 11 reasons.

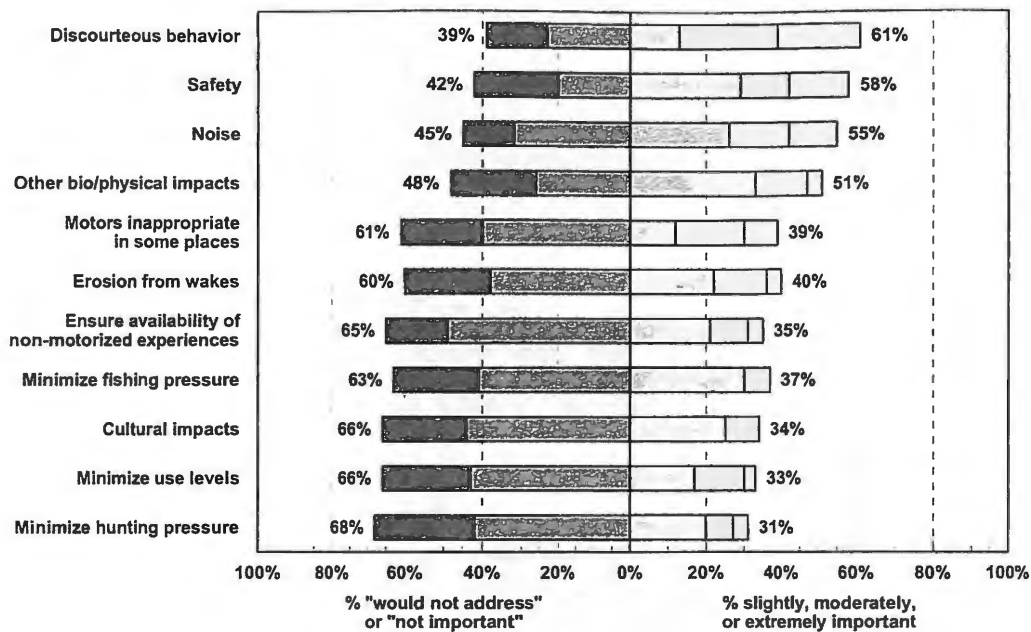


Figure 25. Ranked most important reasons for restricting motorized boating use among motorized users.

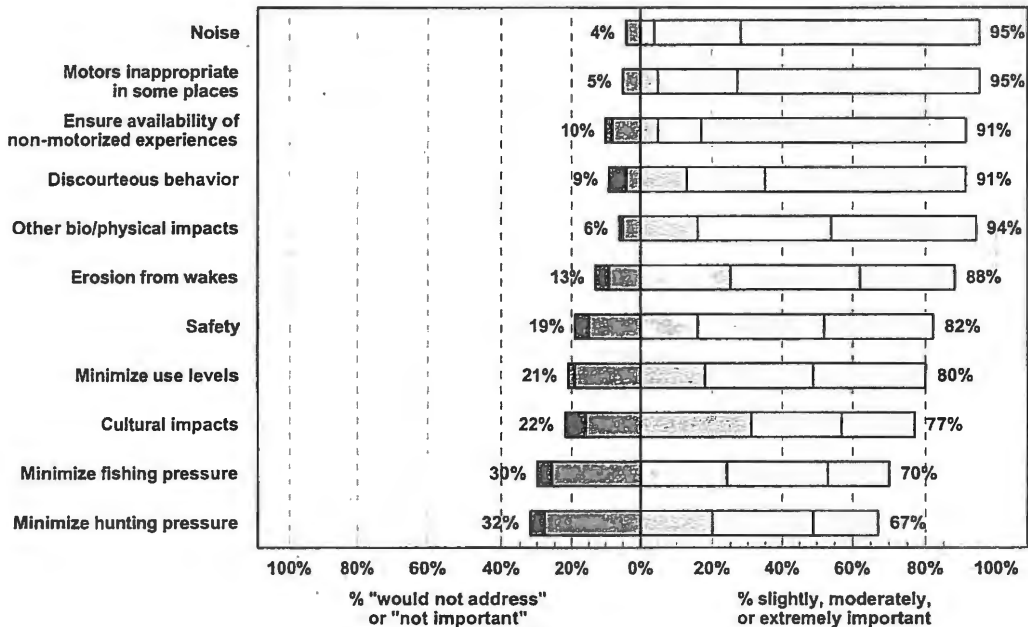


Figure 26. Ranked most important reasons for restricting motorized boating use among non-motorized users.



Differences between the two groups were striking. There were only four reasons important to a majority of motorized users (discourteous behavior, safety, noise, and biophysical impacts), while majorities of non-motorized users reported that all 11 were important. This highlights the sensitivity of non-motorized users toward several aspects of motorized use, while motorized users are much less likely to consider those potential concerns to be important.

Regarding the relative ranking of specific reasons, motorized users rated discourteous behavior at the top of their list, which may reflect issues associated with PWC or airboat use, the only powerboat restrictions that many of them supported. Safety and potential biophysical impacts were also rated highly for motorized users.

Non-motorized users, in contrast, rated noise, the notion that motors are inappropriate in some places, and ensuring the availability of non-motorized experiences as their most important reasons. Of these, only noise was considered important for a majority of motorized users. This highlights the fundamental difference between the two groups – non-motorized users may purposely seek out places or times with no motorized use, while most motorized boaters do not see that as important (or at least do not consider it a reason to deny access to motorized use).

Regarding other issues, a substantial minority of motorized boaters (about 40 to 50%) recognize that there may be erosion or other biophysical impacts from motorized use. Although even higher proportions of non-motorized users are concerned about these impacts, they were ranked lower than social or experiential reasons. Historically, managers have utilized biophysical resource impacts to justify most motorized use restrictions, but these data suggest that some users recognize the equal or higher importance of social issues.

Finally, there were some similarities between groups' overall rankings. Both groups report that motor restrictions are less likely to minimize use levels, fishing pressure, or hunting pressure, and that neither considers these restrictions to be an effective way to limit use. Similarly, both groups placed cultural impacts from motorized use well down the list.

## 10. ATV Use and Mining Access

*ATV use and mining access were the final set of issues addressed in the survey. Questions focused on whether users had encountered ATVs, ATV trails, mining equipment, or mining access impacts, as well as opinions toward management options addressing those impacts. As with other management strategies addressed in the survey, potential actions were developed by managers and researchers based on information from scoping meetings for the East Alaska Plan, or from a review of common management options used on other rivers in Alaska and the West. No decisions about any of these actions have been advanced by the BLM; the research was designed simply to assess opinions toward them*

### ATV Use Issues

The current management plan for the Delta River allows ATV use in the corridor on existing trails. However, BLM is also responsible for managing ATV use to minimize impacts on outstanding recreation, scenic, or ecological values. Respondents were asked about ATV use and trails in the corridor, the acceptability of trail conditions, and opinions about ATVs and management options that might be used to minimize impacts.

In most cases, results were analyzed for four groups:

- Top of the World ATV users: People who reported trips on the Top of the World Trail that crosses the Lower Delta (this is the primary ATV trail in the corridor, with access to the Yost Trail on the far side of the corridor, although some ATV users may also travel on the Rainey Creek mining access route).
- Other Delta/Tangle ATV users: People who reported ATV use in the corridor but did not report Top of the World Trail use (they may believe other trails off the Denali Highway are in the Delta Corridor or may actually take cross country trips in other parts of the corridor).
- General ATV users: People who report having ATV experience but not in the Delta corridor.
- Non-ATV users: People with no ATV experience anywhere.

### Presence of ATV Trails and ATV Encounters

Respondents were asked whether they had seen or used ATV trails in the corridor. Among non-ATV users, 64% had not seen an ATV trail (many were lake users), while 59% of the general ATV users reported the same. However, all of the Top of the World and Other Delta ATV users saw or used trails (by definition). Among non-ATV users and general ATV users, only 29% actually encountered ATV use during their trips, while 64% of the Top of the World ATV users encountered other ATV groups and 46% of Other Delta ATV users reported the same. Taken together, results suggest most non-ATV users don't even know ATV trails exist and less than a third actually have had encounters with ATVs. It confirms that ATV use in the corridor is relatively low.

Survey information about locations of trails and encounters is somewhat less conclusive. Among general and non-ATV users, similar percentages (15 to 19%) reported seeing ATV trails at the south end of the Upper Tangles, near or along the Lower Tangles, and along the Lower Delta River (Top of the World Trail). Among Top of the World ATV users, 31% reported seeing or using trails in the Upper Tangles, with 33% reporting trail use in the Lower Tangles, and all of them report using the trail that crosses the Lower River. Among other Delta ATV users, 44% said they saw or used trails in the Upper Tangles, and 28% saw or used trails along the Lower Tangles.

The only location with documented ATV use in the corridor is along a short stretch of the Lower Delta (Top of the World/Yost Trail). Reconciling this fact with wider reported ATV use and trails in the rest of the corridor is difficult. Some respondents may actually use trails in those other areas. However, it is also possible that some ATV users mistakenly believe that certain nearby trails (e.g., Gulkana Middle Fork Trail/Swede Lake Trail, Landmark Gap Trail) are in the corridor. We believe that ATV users were probably accurate in describing their use of the Top of the World Trail or overall use of ATVs in the corridor because those questions came at the front of the survey; these are the questions we used to create the four different ATV sub-groups.

### Evaluating ATV Trail Impacts

Respondents were asked to rate the acceptability of three photos with varying degrees of ATV impact. Photos were taken in or near the corridor (the Top of the World Trail). Impacts (amount of bare ground or erosion) in the photos were not quantified; instead, they were designed to create three ordinal levels of impact (low, medium, and high) so we could compare perceptions of various groups. Mean acceptability ratings for the four groups are given in Figure 27.

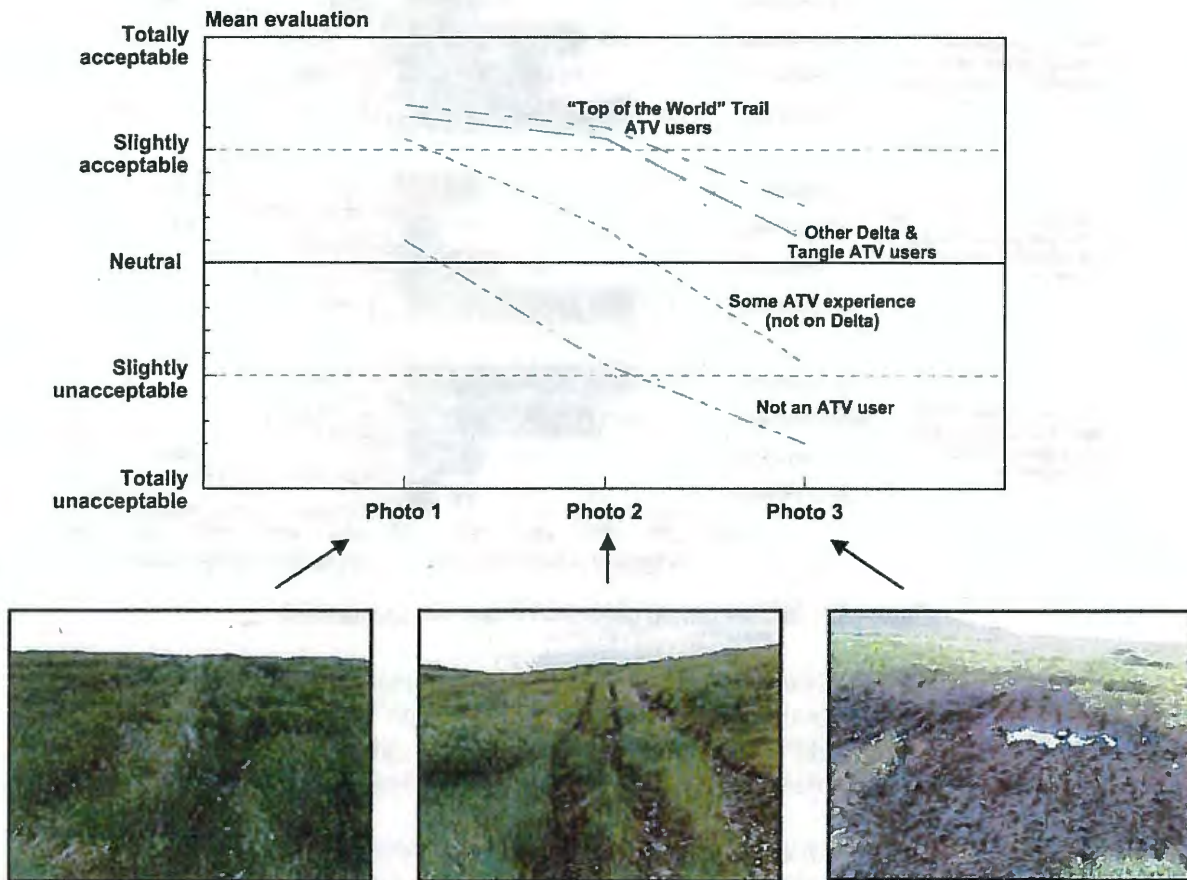


Figure 27. Average acceptability of ATV-caused impacts shown in photos for different groups.

Results show interesting differences between the groups, with current ATV users in the corridor (Top of the World and Other Delta ATV users) rating low and medium impact photos acceptable, while the highest impact picture approaches unacceptable levels. In contrast, non-ATV users rate only the lowest impact photo acceptable. General ATV users were in between: the low impact

photo was acceptable, the high impact photo was unacceptable, and they were divided over the medium impact photo.

Results suggest that user group affiliations affect evaluations of physical resource conditions, but also illustrate when disparate groups might be able to agree. With both the lowest and highest impact photos, a consensus among many users from different groups may eventually emerge about what constitutes damage on the ground, which could lead to improvements supported across multiple groups.

### Attitudes related to ATV Issues

Respondents were also asked to agree or disagree with a series of statements about ATV use, impacts, and management strategies to address them. Results (Figures 28-31) have been organized by the four groups.

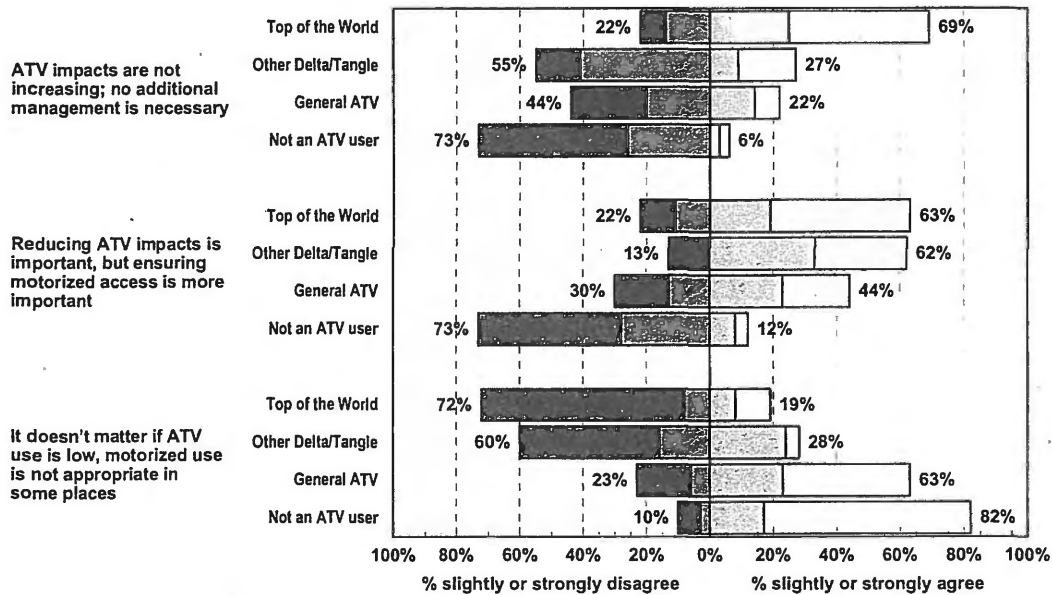


Figure 28. Attitudes toward general ATV use and management.

Three items addressed *general attitudes about ATV use and management* in the corridor (Figure 28). There is a common pattern throughout these questions: pro-ATV use opinions are more widely held by Top of the World ATV users and Other Delta / Tangle ATV users, while users with (non-Delta) ATV experience and non-ATV users held more anti-ATV opinions.

Some specific results are also illuminating. For example, Top of the World ATV users were the only group where a majority agree that no additional ATV management is necessary in the corridor. However, they were joined by Other Delta ATV users in believing that access is more important than reducing impacts.

Most current ATV users in the corridor strongly disagree that ATV use is a kind of “social values conflict” (the notion that actual encounters are the problem, and “some places simply should not have any motorized use”). In contrast, 8 of 10 of the non-ATV users agree with this idea. In general, this supports the notion that the conflict does have a values-basis for non-ATV users.



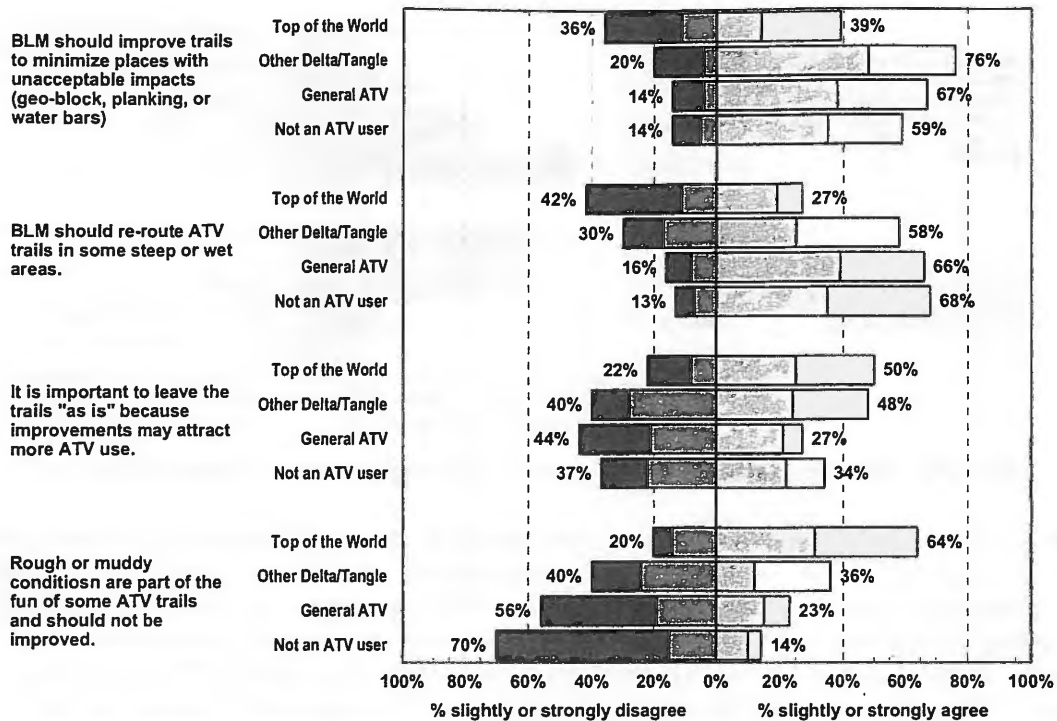


Figure 29. Attitudes toward ATV trail improvements.

Four items addressed opinions toward *ATV trail improvements* (Figure 29), with majorities of most groups supporting at least some improvements, and more support than opposition even for Top of the World users (the group with a majority saying additional management is unnecessary). There were similar results for re-routing trails in steep or wet areas, but here Top of the World users were distinct from other groups. This may reflect concern that a re-routed trail would not provide them access to the areas they use. It also may reflect physical characteristics of the trail, which is steep on both sides of the river. A re-routed trail would probably have to switchback several times or traverse the ridges for longer distances.

Comments in East Alaska Plan public meetings suggested some local users fear improvements could attract more use, and that keeping trails “as is” – potentially rough and muddy – will prevent this from happening. Data from these questions suggest that about half of current users (Top of the World and Other Delta ATV users) feel this way, and a quarter to a third of general ATV users and non-ATV users also agree.

A majority of Top of the World ATV users agree that rough and muddy conditions are part of the fun of the activity; no other group had more agree than disagree with this statement. It suggests that this trail may be attracting some users who enjoy the “sport” component of ATV use rather than solely using ATVs for hunting or fishing access. Understanding the proportions of, and differences between, “sport-oriented” and “access-oriented” ATV users is an area in need of additional research.

As long as ATV-caused erosion does not put sediment in the river or cause other biological impacts, ATV use is not a problem.

Even if they don't cause many biological impacts, ATVs detract from the primitive setting of the corridor.

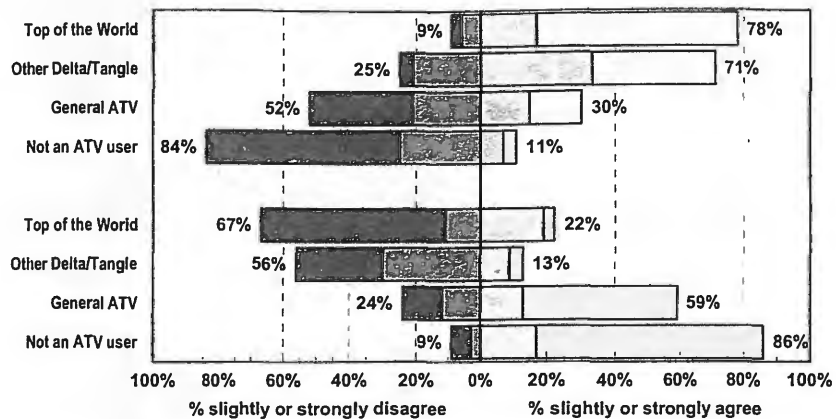


Figure 30. Attitudes about the relative importance of biological and social impacts of ATV use.

Two questions addressed *relative concern over biological and social impacts of ATV use* (Figure 30). The split between in-corridor ATV users and those who use ATVs elsewhere or not at all was particularly large. In general, most in-corridor ATV users appear to believe that potential biological impacts are the primary concern; if those are low, they do not appear to have much concern about whether ATV use changes the primitive nature of the setting. In contrast, most general ATV users and non-ATV users appear concerned about experiential impacts as well as biological ones.

Existing ATV trails are not a problem, but its important not to let new trails develop in the corridor.

As long as impacts only occur on existing trails, ATV use in the corridor is not a problem.

It is okay to cross the corrior to provide access to other areas, but trails along the river should be minimized.

Existing trails are not a problem, as long as the number of people useing them does not increase substantially.

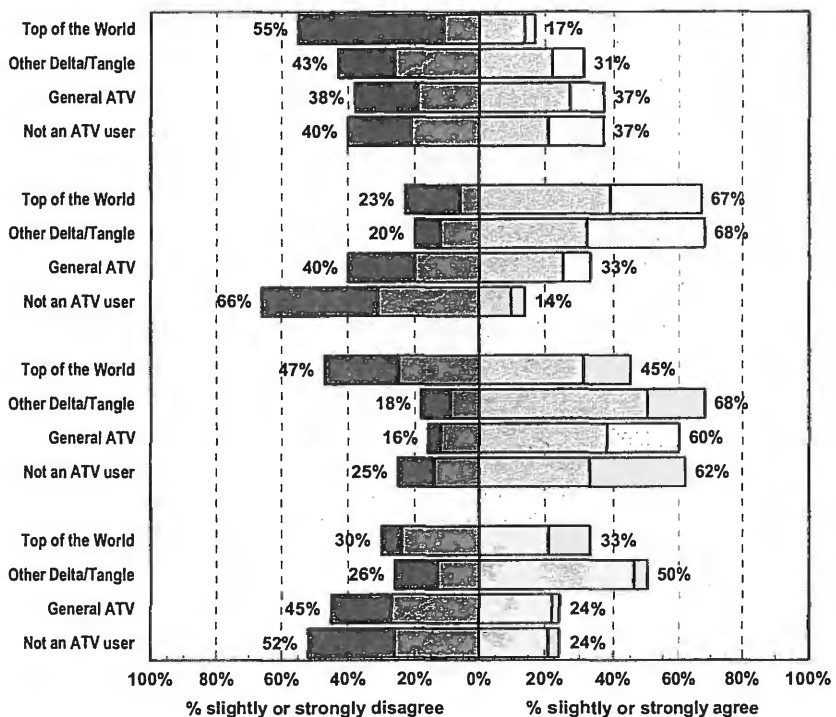


Figure 31. Attitudes toward existing and potential ATV use and impacts.

The last set of ATV attitude questions addressed *potential differences between existing trails or impacts and potential new trails or impacts* (Figure 31). In general, groups appeared more divided about these issues. For example, two-thirds of in-corridor ATV users didn't think impacts on existing trails were a problem, while a similar proportion of the non-ATV users disagreed.

Interestingly, all groups except Top of the World ATV users showed substantial agreement that trails across the corridor might be acceptable, but routes along the river should be minimized. It is notable that the Top of the World Trail parallels the river for about a mile, so it makes sense that current users of that trail would disagree with this concept.

## **Access to Mining Claims**

An access route to valid, existing mining claims crosses and follows the glacial water segment of the Lower Delta River between Rainey Creek and Mile 212. Current mining laws and regulations allow "reasonable access" to valid claims, but mining access may be restricted by season or limited to designated routes to minimize impacts.

Respondents were asked if they had personally seen mining equipment or vehicles in the mining access corridor, and whether they had seen the access route or impacts from it. Only 13% of all respondents had seen mining equipment, but 26% had seen the access route or other impacts. Motorized users were more likely to report these encounters (18% encountered mining equipment and 28% saw access routes or impacts), probably because many spend more time in upland areas on ATVs (and some may actually use the mining trails).

Respondents were also asked if they supported or opposed three potential strategies for managing mining access. Specific wording for the alternatives is given below; results for motorized and non-motorized users are given in Figure 32.

- Limit mining access to a designated road that is routed away from the river and sensitive terrain.
- Prohibit mining access across the corridor from June to September.
- Prohibit mining access across the corridor for new claims if other reasonable access exists.

Non-motorized users generally support restrictions on mining access, while motorized users generally show more opposition than support. The largest differences in the two groups were for designating and re-routing mining access away from the river and prohibiting access if alternatives exist.

Prohibiting summer access only (the time of year when nearly all boating use occurs) was supported by fewer non-motorized users (not even a majority) while a majority of motorized users were opposed. For non-motorized users, concern over surface disturbance impacts from mining access (outside the corridor) rather than encounters with mining equipment itself may be more important, so allowing winter access fails to solve the problem. This suggests that support for mining restrictions may have more to do with social values positions toward mining in primitive areas than concern about actual contact with mining equipment or impacts. It is unlikely that any lake users would encounter these mining impacts, and river users probably spend less time in the glacial water segment of the river than the clearwater segments (which have better fishing and camps).

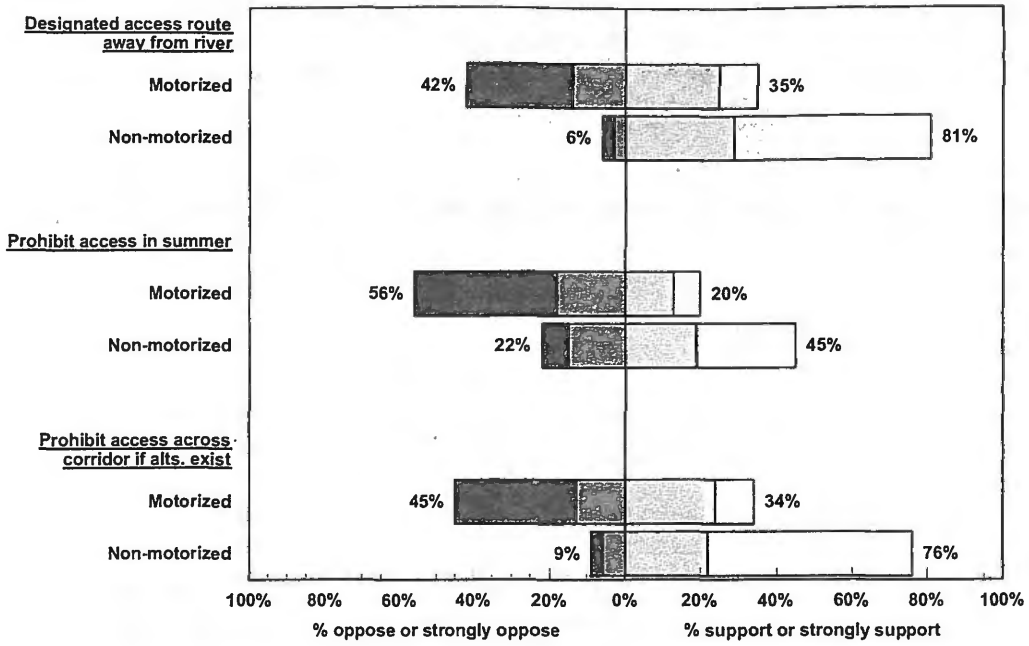


Figure 32. Opinion toward mining management strategies among motorized and non-motorized users.



## **11. Implications and Recommendations**

Data from the 2005 Delta River User Survey provide extensive information about recreation opportunities, impacts and standards, user conflicts, and opinions about management actions that might be used to address these issues. Taken together, these have implications for future planning, management, and monitoring. The recommendations discussed below are based on researchers' experience with studies and management plans on other rivers; they do not necessarily represent the views of BLM or the State of Alaska. They are provided for consideration during future planning.

### **Manage for a Diversity of Recreation Opportunities**

Data from this survey suggests there are diverse recreation opportunities available in the Delta corridor. Different segments and types of use provide opportunities for different trips at different times of the year, and users recognize and take advantage of those differences. Different use densities, types of users, and levels of impacts are associated with each of these opportunities, and users have developed tolerance levels that fit with those impact levels. Managing agencies should recognize this diversity through proactive management, which means identifying (1) opportunities to be provided; (2) defining "high quality" opportunities by articulating appropriate indicators and standards; and (3) choosing appropriate management actions to keep impacts at or below those standards.

A planning effort utilizing the Limits of Acceptable Change process or a similar framework may be the most effective way to achieve this, but less formal collaborative planning that steps-down from the forthcoming East Alaska Plan or revises the existing 1983 River Management Plan may also suffice. The important goal is to "manage by design" rather than "manage by default."

### **Manage for High Quality**

The management goals described in the Wild and Scenic Rivers Act include the protection of biophysical resources and "outstandingly remarkable" recreation experiences. The Tangle Lakes and Delta River provide a diversity of motorized and non-motorized opportunities, some of which may be compromised by impact levels that exceed standards or conflict with other opportunities. Data in this report help define differences in impacts and user standards for different segments and types of use. Managers need to take that information and collaborate with stakeholder groups to define which opportunities they are trying to provide by location and time. Then monitoring activities will show the public and managers when conditions are changing, and when actions need to be taken to prevent unacceptable change.

### **Key Issues and Potential Management Initiatives**

Given the data from the survey, we think it makes sense to identify important issues on the various lake and river segments and suggest management initiatives that are likely to be effective and publicly acceptable for addressing them. Continued collaboration with stakeholders is important when considering these options, but the survey suggests several useful starting points for future planning discussions. The legislative guidelines for a National Wild River offers general direction for management, but we think a focus on the following specific issues will be necessary to specify how current management fits with the broader directives of the Wild and Scenic Rivers Act. This discussion focuses first on types of recreation and potential use limits for

each segment, then addresses use conflicts, mining, and human waste regulations for the entire system.

### Upper Tangle Lakes

The Upper Tangle Lakes appear to offer low density boating, canoeing, and hunting opportunities that may be slightly more primitive than those on the Lower Tangle Lakes (particularly Round Tangle Lake). Current users tolerate current levels of use and impacts, and would probably support standards that maintain semi-primitive conditions on the first lake, and more primitive conditions on lakes past the first portage.

Regulations prescribing use limits (permit system) do not appear necessary to address current on-lake encounter or crowding issues, and even peak use appears to maintain encounters and other social impacts at or below commonly-cited "wilderness" standards. A permit system to limit use is also widely opposed by most lake users.

Even so, defining a "working capacity" (the level of use that is likely to begin creating impacts that exceed standards) makes sense; it also appears to be required by a recent federal court ruling about capacities on Wild and Scenic Rivers. As that capacity is approached, the agency, stakeholders, and the public will have time to review a range of ways to address problems.

If such a capacity is to be developed, we recommend that it be focused on overnight use, and it should probably be based on camp competition/camp sharing standards, among the higher priority impacts. There is relative consensus among all groups that sharing camps is undesirable, and that users should not have to pass up camps (because they are occupied) more than about 20% of the time.

There are approximately 25 camps on the Upper Tangles (but only about 10 on the first lake, with several in sight and sound of each other). We estimate that more than about *three overnight groups on the first lake, and five on all of the Upper Tangles per night* might start to exceed standards (although monitoring may be necessary to hone these estimates). Current peak use levels probably do not exceed this working capacity, and the average is probably closer to two or three. This produces virtually no camp sharing and limited camp competition (probably most evident during hunting season on the first lake because fewer motorized users travel beyond the first portage).

A related impact focuses on long term camping. Patrol crews have noted that a few users establish long term camps on the Upper Tangles for several weeks each year, and this exacerbates camp competition (or at least tie up the best camps for a single group). Although survey data do not show support for camp occupation limits (particularly among motorized users), limiting the length of stay at these sites could prove effective. A common regulation on unclassified state lands limits camping to 14 days, and this is one potential model. It is also possible to design a camp occupancy regulation that allows long-term camping at some lower demand sites (with a permit) while precluding it at higher demand camps (so those have more turnover through the hunting season). Discussions with key stakeholders and the State are important if these options are pursued.

Recreation patrol crews also note that a few popular camps tend to be "beat out" by the end of each year, and a few groups also leave behind considerable trash (old visquine, 2x4 furniture, large fire rings with half-burnt trash, etc.). Some attention to these sites may be necessary over time (and might include rehabilitation of satellite sites or user trails), but clean-up trips just after

the hunting season are probably the most cost effective way of addressing the problem. Given current levels of use, monitoring and clean-up efforts at current levels will be needed to meet other resource standards. Some increased education efforts directed at proper human waste disposal may help with that impact, but we are pessimistic that education alone will solve this problem (see discussion below).

### **Lower Tangle Lakes**

The Lower Tangle Lakes offer slightly higher density boating, canoeing, and hunting opportunities than the Upper Tangles, and Round Tangle Lake in particular attracts greater day use (and motorized use) than other segments in the corridor. However, current users tolerate existing levels of use and impacts, and would probably support standards that maintain semi-primitive conditions on Round Tangle Lake, with more primitive conditions "downstream."

As with the Upper Tangles, regulations prescribing use limits do not appear necessary at this time, and peak use levels in recent years maintain encounters or other social impacts at or below commonly-cited "wilderness" standards. Lower Tangle users (particularly motorized users) also appear less sensitive to some impacts. However, if a "working capacity" is to be developed, the camp competition/camp sharing standards discussed for the Upper Tangles provide a useful basis for that capacity.

There are approximately 18 camps on the Lower Tangles (with none on Round Tangle Lake, not including Tangle Lakes Campground), but 16 are clustered in a short three mile reach at the start of Lower Tangle Lake. Based on a review of the geography of these camps, we estimate that more than about *six overnight groups on the Lower Tangles per day* would begin to change the type of experience that is currently offered (although continued monitoring is probably necessary to hone this estimate). Currently, peak use levels probably do not exceed this capacity even on the highest use weekends, and the average is probably closer to two or three. In addition, the Lower Tangle Lakes do not appear to have as much long term camping as the Upper Tangles, making campsite occupancy limits less necessary.

Most of the camps on the Lower Tangles are in good shape, although at least one popular site toward the end of the segment sees regular use by "through trip" users and has erosion issues on the informal trails from the water to the main camp area. These have been partially addressed by patrol crew or scout group erosion control efforts, but more might be done to redirect surface water from some trails and to rehabilitate other (redundant) trails. While steps and water bars might make the site appear less primitive, existing eroded trails arguably detract as much. Some increased education efforts directed at proper human waste disposal may also help address that impact (see discussion below).

### **Upper Delta and Portage Area**

The Upper Delta and portage area are mostly used by "through trip" boaters, and these segments offer the lowest density opportunities in the corridor. Through trip users, however, are generally more sensitive to impacts and appear more willing to accept management actions (including regulations and use limits) that could be used to meet standards. They generally appear interested in primitive conditions on the upper river and semi-primitive conditions at the portage (the trails, warning sign, and outhouse are acceptable).

As with the lake segments, regulations prescribing use limits do not appear necessary at this time, and even peak use levels in recent years probably maintain encounters and other social impacts at

or below commonly-cited “wilderness” standards. However, if a “working capacity” is to be developed, camp competition/camp sharing standards for the entire “through trip” probably provide the most reasonable basis for a capacity.

There are approximately five camps in the Upper Delta and portage area, but many “through trip” users camp on the Lower Tangles their first night and the Lower Delta their second, so the number of camps in Upper Delta may not be important. If one assumes that about half of the Lower Tangle Lake overnight capacity sites (three of the six) are used by “through trip” groups the Upper Delta probably provides capacity for two more trips (one on the Upper Delta and one at the portage). Taken together, we estimate that launching more than *five “through trips” per day* would begin to unacceptably change the type of experience offered. Currently, peak use levels probably approach this level only on the 4<sup>th</sup> of July weekend, but the average is probably closer to two or three on other summer weekends and lower on weekdays.

Most camps in this segment are in good shape, but the two camps at the portage have some shortcomings (lack of flat terrain, encroaching vegetation). The camp at the start of the portage is very small and is probably only used when the “lower camp” (at the end of the portage) is occupied. The lower camp works fine when water levels are low and a gravel beach is available, but at higher flows campers use satellite tent sites strung out down the river in the riparian vegetation. In recent years, the number and size of satellite sites has increased as campers have cut alder trees and trampled the understory.

In order to prevent additional impact but still provide camping opportunities in this area, BLM could “formalize” up to five tent sites, close and rehabilitate the others, and then limit group sizes to preclude expansion. There was strong support among “through trip” boaters for group size limits of 12 or less, and the only large groups in recent years appear to be scout trips. Permits for these large groups could include stipulations that prohibit use of the lower portage site (or requires them to use only the formally identified tent areas).

Users showed strong support for keeping the falls/portage warning signs and the pit toilet, so no changes to those developments seem warranted. Users were also interested in some portage trail improvements, but using local rather than lumbered materials. Our sense is that current users prefer the primitive feel of the rocky portages, and they may worry about use increasing if the portage were made too “easy.” However, during wet periods, long segments of the trail can be muddy or under water, and some of that sediment-laden water makes its way into the river on the lower end (it all drains into an intermittent creek that runs from the beaver pond). Additional water bars, steps, and perhaps judicious boardwalk using local materials would probably be supported, and is unlikely to attract additional use.

Several informal or user trails in the portage area lead to views of the two falls, the gorge, or the Alaska Range. Some of these are overgrown by alder, while others have occasional erosion problems. Formalization of a few trails to these places might prevent expansion of redundant trails and improve resource impact issues. Occasional brushing is the main requirement to cue users about where to go.

### **Lower Delta**

The Lower Delta is used by “through trip” boaters, power boaters who travel upstream from Mile 212 on the Richardson Highway, and ATV users on the Top of the World Trail. Use levels in mid-summer are similar to those on the Upper Delta and reflect mostly “through trip” use. After subsistence hunting season opens in mid-August, powerboat and ATV use increase as “through



trip" use decreases. This creates *de facto* seasons with different types of users; "through trip" users appear to be more sensitive to crowding, motorized use, and other social impacts than hunting-oriented users, and it probably makes sense to recognize and manage for those differences and opportunities. The first half of the season could emphasize opportunities for solitude and (possibly) require non-motorized use, while the second half of the season would offer less primitive conditions.

As with other segments, regulations prescribing use limits do not appear necessary at this time, and even peak use levels in recent years probably maintain encounters and other social impacts at or below commonly-cited "wilderness" standards. However, if a "working capacity" is to be developed, camp competition/camp sharing standards for the lower river provide a most reasonable basis for that capacity.

There are approximately 14 camps on the Lower Delta, but many are in sight or sound of each other. We estimate that more than about *five overnight groups on the reach per night* would start to exceed competition/camp sharing standards and change the type of experiences that are currently offered. However, continued monitoring as use levels rise may be necessary to hone these estimates. Currently, even peak use levels probably do not exceed these estimates, and the average is probably closer to two or three. This produces virtually no camp sharing and limited camp competition.

Most of the camps on the Lower Delta are in good shape, although a few popular forested camps see regular use during the summer season and are sometimes used as long-term hunting camps later in the year. These tend to have greater erosion problems between the river and the camp, and some groups also cache equipment for future use (e.g., visquine, camp furniture, pots). It is legal to cache equipment (but not food) on BLM land for up to 12 months (43 CFR 8365.1-2) as the owner includes identification information with the cache, but it may make sense to revisit this issue in a recreation corridor like the Delta. There is no question that discovering an equipment cache at a campsite detracts from its otherwise primitive nature.

The erosion impacts at these camps are probably best addressed by judiciously-placed steps (using local materials) and closures of redundant bankside trails. The removal of caches that are inappropriately located or without identification becomes a responsibility of the recreation crews that travel the corridor about three times per year.

It is unclear whether Lower Delta camps are used for longer than a week or two during hunting season, and the survey shows opposition toward camp occupation limits (particularly among motorized users). However, a common regulation on general unclassified state lands limits camping to 14 days at a site, and a similar regulation in the corridor would ensure that prime sites were not controlled by a single group for the entire season. As with the Upper Tangles, it is also possible to design a camp occupancy regulation that allows long-term camping at some lower demand sites (with a permit) while precluding it at higher demand camps (so those have more turnover through the hunting season). This would also allow BLM to monitor the long-term camping sites and perhaps ensure that users do a better job of cleaning up before they leave. Discussions with key stakeholders and the State are important if these options are pursued.

The Lower Delta is the one segment with potential conflicts between boaters and ATV users, but these are localized at present, and ATV use remains very low (particularly during the main part of the summer when more non-motorized users are present). Additional discussion of ATV issues is given below.

## **Black Rapids**

This segment has very low use, and fieldwork conducted in August 2004 suggests there are few if any tangible impacts from that use. Although the highway, the pipeline/pump station, and a military exercise compound are in view along much of this segment, it also has spectacular alpine and glacial scenery, nice beaches for picnicking and camping away from the road, and more than a mile of Class III/IV rapids. If it weren't far from population centers, more people would certainly boat it.

As with other segments, regulations prescribing use limits are not necessary at this time. However, if a "working capacity" is to be developed as required by the Wild and Scenic Rivers Act, daily river encounter standards would probably provide the most reasonable basis (because the segment is unlikely to attract much overnight use). Based on our experience from other day use rivers, even ten launches per day is unlikely to result in more than about five encounters per day given the length, continuous swift flow, and braided nature of the segment.

## **Motorized/Non-motorized Boating Conflicts**

Survey data document motorized/non-motorized boat conflicts in the corridor. Some non-motorized boaters are particularly sensitive to these conflicts, but many appear to accept motorized use on some segments (particularly the lakes). A majority of powerboat users, in contrast, are opposed to any segment-wide prohibitions for general motorized boat use, even though a majority of all users support PWC and airboat restrictions.

Results do not suggest any "elegant" zoning solutions that would be supported by both groups (the usual way that managers address use conflicts of this nature). Both temporal zoning options (no motorized use outside of the hunting season) and spatial zoning options (no motorized use on the Upper Delta) were strongly opposed by most motorized users. The pattern of responses is consistent with positions based on "principles" rather than attention to the *de facto* geography and existing use of the area. For example, the Upper Delta is rarely used by power boaters because it is too shallow, and the Lower River is not commonly used by motorboats before hunting season, so restrictions in these specific locations and times would affect few current motorized users. Additional information about these use patterns is given in Appendix A.

Results have implications for the current BLM motorized use recommendations (which limit boats on the lakes to less than 15 horsepower and restrict motorized use on the river except during traditional subsistence activities). Most use in the corridor is non-motorized and that group is generally supports restrictions, so one could argue that it makes sense to carve out some times and places where motorized use would be limited or prohibited (formalizing existing recommendations or developing new restrictions). On the other hand, motorized use appears well established (particularly on the lakes and the lower river), and because motor use is currently low, few other users see them. The conflict is likely to escalate only if motorized use increases substantially.

If planners pursue more formal motorized use regulations, they should expect some controversy, and supportable decisions will require explicit information about the impacts of motorized use on safety, biophysical resources, and/or experiences. Of these issues, we suspect that social/experiential impacts are at the heart of the conflict, and the data collected in this study should prove helpful. However, extensive work with the relevant stakeholders (e.g., floaters, "quiet rights" advocates, powerboaters, boating groups, and state agencies) will also be necessary to "manage" the conflict (we don't suspect any solution will resolve it).

If a compromise exists for the lakes, we suspect it will involve short non-motorized use periods for some of the lakes (those farther from the launches, with shallows or portages delineating them) in mid-summer, but with fewer or no restrictions in the subsistence season. For the Lower Delta, compromise options might look at limiting the number of motorized groups (or all groups), or restricting motors to the hunting season. This could limit number of motorized encounters, while still allowing some motorized use (particularly in the late summer and fall when motor use is higher and non-motorized use is low).

Regarding other types of motorized restrictions, there is probably support for a PWC (jet ski) ban, even among many motorized users. PWC use on the lakes is currently rare (during 37 overflights from 2000 to 2004, PWCs were observed just once on the Upper Tangles, in August 2001). In addition, the lakes are not great candidates for "sport boating" compared to many others in Southcentral or interior Alaska because they are remote from population centers (Anchorage and Fairbanks), cold, and shallow. Support for this type of ban is also consistent with providing a more primitive or semi-primitive experience that is focused on access to hunting, fishing, and backcountry recreation (rather than higher density or socially-oriented boating activities).

An alternative to an outright ban on PWCs is to target restrictions on speed of travel and sport boat maneuvers instead of specific types of boats. This would allow use by PWCs or variants of that craft (e.g., a "Mokai," which is a quiet, low speed motorized kayak that uses a small jet pump), but would prevent the kind of use that causes conflicts for others.

Another motorized restriction that is likely to be supported by most users is an airboat and hovercraft prohibition, particularly on the Lower Delta. Both craft types are rare on the Delta, and they are distinguished from other motorized craft by their noise levels and potential safety issues (they typically can't turn as sharply as other craft). Survey results suggest that many motorized boaters are interested in minimizing the noise or safety issues associated with some types of motorized use, while retaining access for their craft.

Regarding lake horsepower limits, many boaters ignore the current recommended 15 horsepower limit, even though non-motorized users and people who use small motors generally support horsepower limits. Lake depths and portages partly regulate horsepower already (only the first lake on the Upper Tangles and Round Tangle Lake on the Lower Tangles are suited to large powerboat use), so users who want to avoid larger craft can simply travel a little farther. In spite of this, there is a consistency in advocating smaller craft in an area where the management goal is to provide low density primitive and semi-primitive opportunities. Two decades after the horsepower limit was recommended, it appears that 15 horsepower may be too low given widespread use of slightly larger engines. A limit about 25 or 35 horsepower, or which requires the use of quieter four-stroke engines, may make more sense.

### **ATV Issues**

The survey also documents at least some conflicts between non-motorized boaters and ATV users, even though most boaters do not encounter ATV users or notice the one prominent ATV trail in the corridor (on the Lower Delta). However, many non-motorized users are concerned about even the potential for these types of impacts, and they generally support efforts to minimize or eliminate ATV trails.

The heart of this conflict appears focused on perceived environmental and trail impacts, so maintaining designated ATV trails to certain non-degradation standards is a reasonable

management goal. The 1983 management plan recommends that ATVs remain on existing trails and opposes expanding trails in the river corridor, so this actually does not require a change in current management. However, enforcement programs and a marked trail may be needed to implement this decision. In addition, there may be specific parts of the Top of the World Trail where trail work or re-routing may help minimize existing impacts. Because the trail crosses the river, routing the trail to the most benign crossing location is probably the highest priority; minimizing noticeable erosion on the steeper portions of the trail on either ridge is also important.

The differing responses to ATV impacts in the survey indicate that users are not of "one mind" about how much impact is too much on an ATV trail. Additional research is probably necessary to develop consensus about when impacts are unacceptable, and can be combined with monitoring to "trigger" appropriate trail improvements, re-routes, seasonal closures, or outright closures. ATV impacts are an increasing concern in backcountry Alaska because the level of use has increased in the past decade. Information from the current survey represents a "pilot study" on how different groups perceive ATV impacts and management options, but more research will be needed to further clarify different groups' positions and the opportunities for consensus management programs to address the problems.

### **Mining Issues**

Current mining impacts are relatively minor and are limited to an access route from Mile 212 upstream to Rainey Creek. While this route is occasionally visible from the river, and can be easily followed if one walks along the bank, it is in the glacial segment where most users spend little time. As the survey documents, most users were unaware of the access route and had no encounters with mining equipment. As long as mining use of the route stays at current levels, major changes in mining access stipulations are probably not needed.

Having noted this, there is obvious sensitivity to mining impacts among some groups (particularly non-motorized users), who support more restrictive access regulations. Limiting access during the prime non-motorized season (June through mid-August) is one obvious solution, and trying to screen or minimize the aesthetic impacts of the route is another.

We think concern about the existing mining access route is largely associated with a social values conflict about mining impacts that may occur outside the corridor. There has been increased mining exploration in the region, and opposition to mining development appears to be coalescing in response. Delta River recreation experiences could be affected by new exploration that increases helicopter traffic, mining equipment on the access route, or expansion of the access route. However, with intensive management, most of these impacts could be directed away from the corridor during the recreation season. There may be environmental reasons to minimize or prohibit large scale mine development in primitive areas adjacent to the Delta corridor, but as long as most mining activities occur outside the basin, specific effects on Delta users are likely to be small.

### **Human Waste Disposal Regulations**

A final issue relates to a perennial problem in river corridors, the appropriate disposal of human waste. As discussed in the report, this is one impact which apparently occurs at greater levels than users will tolerate. If recreation crews did not clean popular camps three times per year, this impact would probably be a major problem.



On many rivers in the Lower 48, managers have required users to carry out their human waste (using portable toilet systems designed for the purpose), virtually eliminating the impact on many multi-day rivers. Recent innovations such as the PETT toilet (which uses plastic bags and chemicals that allow waste to be directly deposited in the garbage and eliminates the need to clean portable toilets) make these systems even easier to use.

These systems only came into widespread use on Lower 48 rivers after regulations required them; education alone does not appear to substantially increase their use. It is not our intention to take an advocacy position on these kinds of regulations, but they clearly solve a difficult impact problem, and have been highly effective in other settings. Many current Delta users are opposed to them, but this was also true on Lower 48 rivers before regulations required them. Once regulations were adopted, and users acquired the systems and learned how to use them, they became widely accepted (and are often used voluntarily in areas where they are not required). We think this would happen among Delta (and Gulkana) users, particularly if rental systems and clean-out facilities were available. If BLM took the lead on this issue, the experience of several Lower 48 rivers could prove helpful. The regulations could also be phased in or added to commercial use permits first, as a way to improve diffusion of this innovation.

## **Planning and Monitoring Needs**

All of the recommendations above assume that managing agencies (BLM, DNR, and ADF&G) would engage in a collaborative planning effort when they decide to revise the current river management plan. While BLM could probably implement some regulations unilaterally (e.g., commercial use limits or regulations), these data suggest there is sufficient contention among user groups (particularly regarding conflict issues) to warrant broad-based involvement in any larger decision-making. Several visitor impact frameworks prescribe ways to include stakeholders in the process, and NEPA requires public input as final actions are contemplated. The survey provides one important source of information about public opinion, but other sources and mechanisms for capturing that sentiment should also be built into the process. As that process is defined, formal roles for cooperating agencies make sense.

We also recommend continued monitoring to ensure that planners and stakeholders have factual information to consider when making management decisions. The Delta has extensive use, resource impact, and social impact data available, including information from this report. Additional analysis of this data set is also possible as planners and stakeholders focus on key issues. Over time, however, use levels, user behaviors, and subsequent impacts may shift; agencies need to track them into the future. We recommend continuation of the current monitoring program (with a particular focus on photographic documentation of camp and ATV impacts).

## **Summary and a Disclaimer**

The current study provides a snapshot of user opinions from recent Delta River and Tangle Lakes users. It also supports the need to continually monitor key impacts, and institutionalize periodic discussions with stakeholders and other land managing agencies. Recreation areas and users change over time, and good management pays attention to those changes.

Visitor management on the Delta has been essentially static since Wild River designation in 1980. While BLM has an active patrol/clean-up program and improved access points, major initiatives

to address social or biophysical impacts have not been taken. This is a sign that users have generally treated the river and each other's experiences with respect.

However, use may be slightly higher in recent years than when the river was designated in 1980, and some use patterns have and will probably continue to change. There is also potential for future use increases; the population of the state continues to grow, and out-of-state tourist visitation appears to be growing even faster. Increased use is likely to cause additional impacts, often in an incremental way that may be difficult to notice from one year to the next. Good management requires attention to these changes, and agreement about how much change is acceptable before actions should be taken. The data in this report can be inserted into planning efforts to help define high quality recreation on the Delta, ensuring that impacts do not degrade the river's resources or experiences.

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## **Appendix A**

### **Selected Use Level Information**

This appendix summarizes use information for the Delta River and Tangle Lakes. Not intended as a complete analysis of all available use information, the goal is to describe how use varies over seasons or years on different segments, and to compare the relative amounts of different types of users. Methods and results are discussed as figures are shown.

#### **Overflight Information, 2000-2004**

BLM operates an overflight program to estimate use on the Gulkana and Delta rivers. The resulting "at-one-time" information is accurate enough to gauge use trends for different segments through the seasons and over several years. The agency flew the Delta River corridor on 37 occasions from 2000 through 2004, spacing flights relatively evenly through the use season from June through early September. Observers counted the number of ATVs and boats of various types (motorboats, driftboats, canoes, kayaks, rafts, PWCs) for each segment (Upper Tangles, Round Tangle Lake, Other Lower Tangles, Upper Delta, Lower Delta above Eureka Creek, Lower Delta below Eureka Creek, and on the Black Rapids segment). The technique provides an accurate count of boats and ATVs (especially in the relatively open tundra of the Delta), but it does not attempt to count groups or the numbers of people. For the purposes of this report, we assume each overflight count represents the total number of boats or ATVs for that day.

#### **Observations by Year, 2000 to 2004**

The average number of boats across all overflights shows no obvious pattern from 2000 to 2004. Individual years averaged between 10.9 (2001) and 15.0 (2000 and 2002) boats per day, with one outlier year at 27.5 boats per day (2004). As discussed with RMIS use estimates (see below), the 2004 result appears to be a function of a few large Boy Scout trips (14+ canoes per group), which apparently were observed on three overflights in 2004.

#### **Observations by Segment, All Years 2000 to 2004**

Exploring overflight data in greater detail, we calculated the percent of days that each segment had any use, any non-motorized use, and any motorized use. Results are given in Table 17; they show relative levels of use by segment (and whether that use is more likely to be motorized or non-motorized).

Data suggest two important conclusions. First, use levels are relatively low. On the lake segments, 19 to 35% of the days had no boating use, and on the main river segments this was true for 45 to 65% of the days (97% on Black Rapids).

Second, the highest use levels are on the lake segments (particularly Round Tangle Lake), with boats observed on 65 to 80% of the days when overflights occurred. In contrast, use was observed on 35% to 54% of the days on the main river segments (and only 3% on the Black Rapids segment). This is consistent with the number of respondents reporting lake vs. river use in the user survey, as well as with RMIS use estimates.

**Table 17. Percent of days with boating use.**

	Upper Tangle	Round Tangle	Other Lower Tangles	Upper Delta	Lower Delta (above Eureka)	Lower Delta (below Eureka)	Black Rapids
% of days with no boating use	35	19	24	65	46	59	97
% of days with any boating	65	81	76	35	54	41	3
% of days with non-motor boats	62	76	68	35	45	11	3
% of days with motor boat use	40	62	38	3	19	32	0

For the days when any use was observed on a segment, we calculated the average number of motorized and non-motorized boats. Results are given in Table 18; they show that when there is use, it generally involves small numbers of boats.

**Table 18. Average number of boats (on days when any were observed).**

	Upper Tangles	Round Tangle	Other Lower Tangles	Upper Delta	Lower Delta (above Eureka)	Lower Delta (below Eureka)	Black Rapids
Non-motorized boats	3.8	3.6	4.3	4.5	1.7	2.0	1.0
Motorized boats	1.9	2.1	1.9	2.0	3.4	1.7	--

Note: Do not multiply these averages by the number of days per season to estimate total use; there were many days with no boating use of each type (see Table 17).

On the lakes, the average is 3-4 non-motorized craft and 1-2 motorized boats. On the river segments, the average is 2-5 non-motorized boats (with that higher number influenced by large boy scout groups in 2004) and 1-3 motorized boats. These use estimates are roughly consistent with encounter data in the survey, which suggested encounter rates of 2 to 4 groups per day. (Note: Encounters occur among groups. Overflight information does not estimate the number of groups because it only counts boats, and number of groups on a lake or river does not equal the number of encounters, because encounters are affected by geography, schedules, and travel patterns. As a result, overflight information provides only a rough sense of encounter rates, based on assumptions about group sizes and likelihood of encounters among groups.)

#### **Observations by Season, 2000-2004**

To examine seasonal variation for each segment, we calculated the average number of motorized and non-motorized boats per day for each month. Results are given in Figures 33 and 34. Non-motorized use levels are higher in July on most segments except for the Upper Delta, which is higher in August. Motorized use on the Upper Tangles and Lower Delta is higher in August and September (coinciding with the hunting season). On Round Tangle Lake, other Lower Tangles, and the Upper Delta, motorized use is higher in July. Results are consistent with survey responses regarding the timing of "most recent" trips.



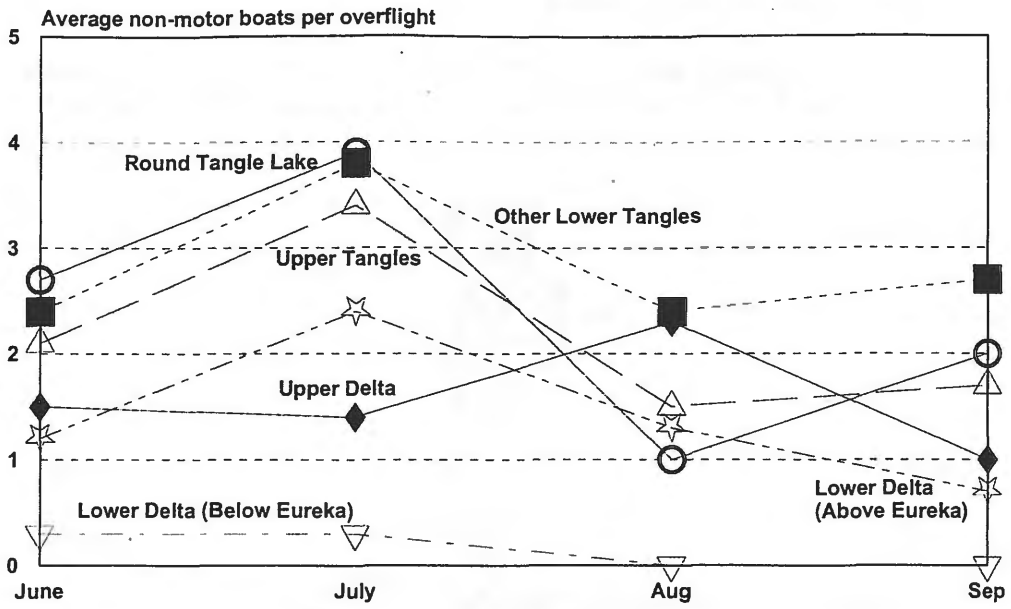


Figure 33. Average non-motorized boats per day on segments in different months

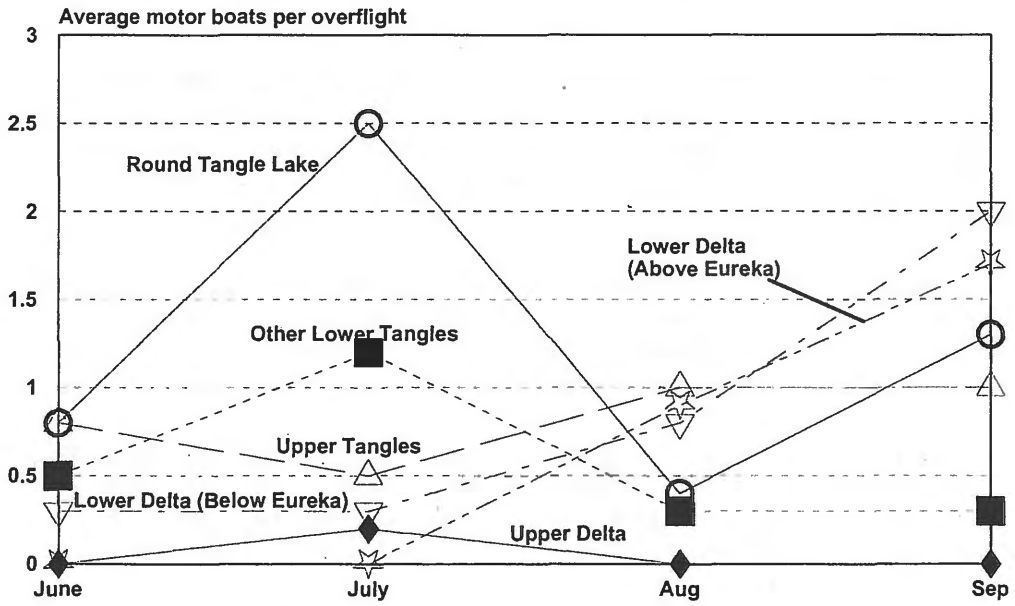


Figure 34. Average motorized boats per day on segments in different months.

## Motorized vs. Non-Motorized Use on Various Segments

Of the 560 boats observed on overflights from 2000 to 2004, 422 or 75% were non-motorized and 138 or 25% were motorized. Although we don't know the average number of people per boat in either type of craft, these data suggest that most current use is non-motorized.

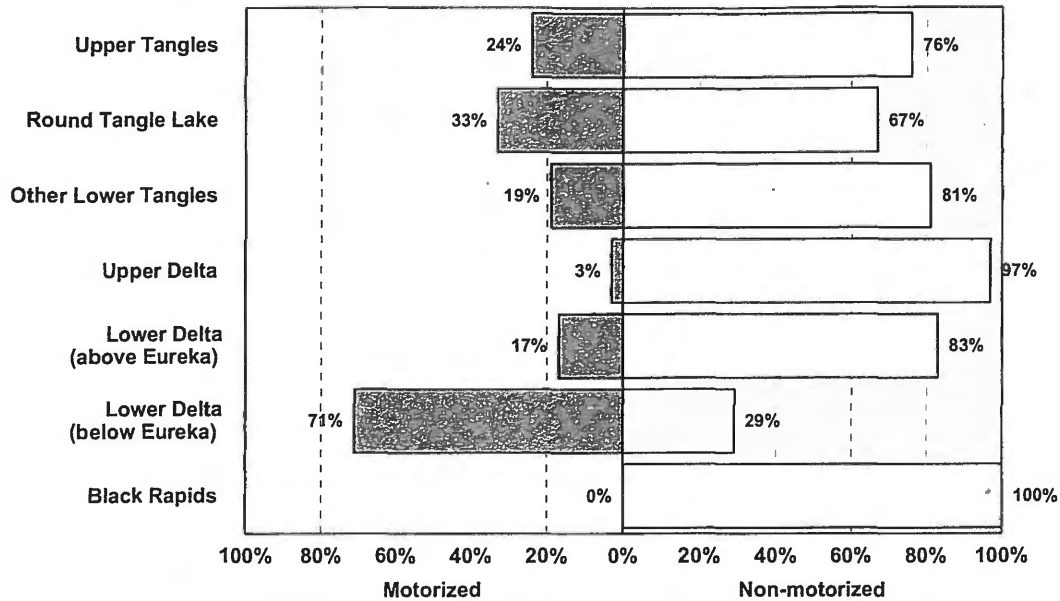


Figure 35. Proportion of motorized and non-motorized craft by segment, 2000-2004

Relative proportions by segment (Figure 35) show that 67 to 100% of boats were non-motorized, except for the Lower Delta below Eureka Creek (this is the braided glacial section and few boats of any kind were observed there).

Overflight information might be used to improve assumptions in the RMIS system described below (which requires estimates of the proportion of use in motorized and non-motorized categories). Based on these data, we would argue for a 75-30 split on the lakes, and an 85-15 split on the river.

Having noted that non-motorized use is more widespread overall, there are times of the year when proportions of motorized and non-motorized use are more similar on certain segments. For example, in August there are only slightly higher numbers of non-motorized craft on the Lower Delta (1.3 to 0.9) and Upper Tangles (1.5 to 1.0).

### Type of Boat

Only two of all the motorized boats observed during overflights were PWCs (in 2001), and no air boats were observed, suggesting these craft are currently rare. Among non-motorized boats, about 84% canoes, 14% rafts, and 2% kayaks. Because overflights cannot discern which boats on the lakes will continue through to the river segments, we did not calculate proportions of canoes and rafts on the lake vs. river segments. The conventional wisdom is that few users take rafts on "through trips" because of the difficult portage, which is confirmed by survey data.

## Observed ATV Use

ATVs were rarely seen during overflights. ATV use was observed on 6 out of 37 flights (16% of days), and the number of ATVs rarely exceeded 2 per observation. Nearly all the observed ATVs were near the lower river (Top of the World Trail); the exception was two ATVs seen on the Upper Tangles (perhaps related to use from the Middle Fork Gulkana trail). ATVs were never observed during June or July, suggesting they are generally associated with hunting.

## BLM RMIS Information

BLM has a nationwide system called the Recreation Management Information System (RMIS) that tracks annual recreation use at recreation facilities, and on its public lands and waters. This system tracks broad indicators of use and proportions of use engaged in different categories of activities, focusing on annual visits (any person using a location for any amount of time). The system is probably most useful for exploring long-term use trends and informing national or regional budget decisions. Because RMIS focuses on annual use and data are not precise, it has lower utility for making on-the-ground management decisions.

### Delta River / Tangle Lakes Facilities

For the Delta River, RMIS data provide broad estimates of annual use in the corridor for several facilities: Tangle Lake Wayside trailhead and interpretive site (Upper Tangles), Tangle Lakes Campground (Lower Tangles), Tangle Lakes Wayside boat launch, and Lower Tangle Lakes boat launch. Data from 2000 to 2004 are given in Figure 36. Information was developed from voluntary registration forms and campground host counts, with estimates based on formulas and multipliers developed from registration compliance checks conducted in 2001. Note: Compliance during the checks was very low (about 13%), so even small variation in these multipliers from year-to-year makes these estimates relatively imprecise.

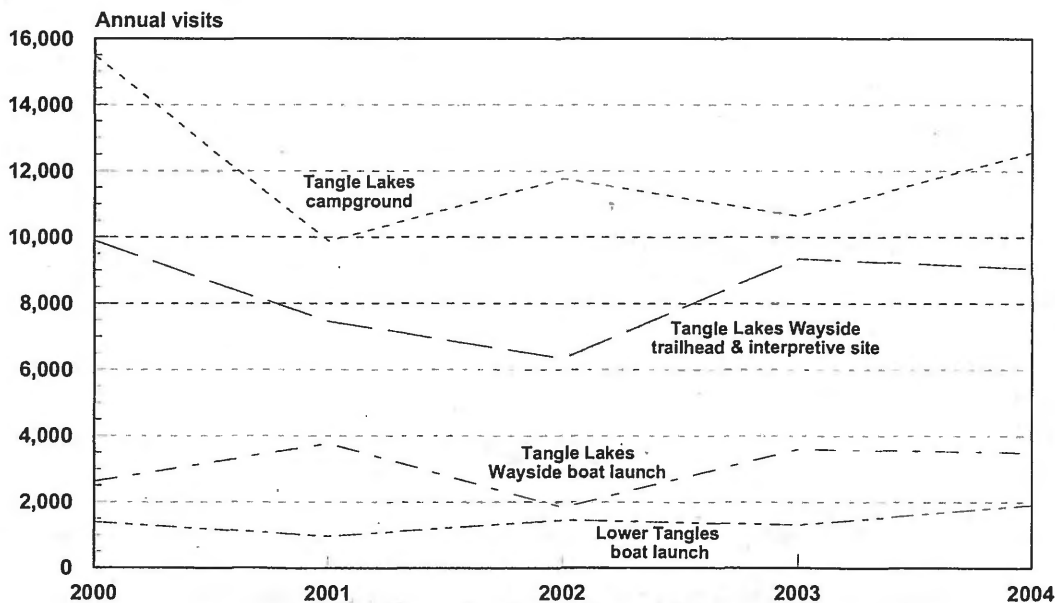


Figure 36. Annual visits at Delta River corridor facilities on Denali Highway, 2000-2004.

Figure 36 indicates that the highest use levels in the system occur at Tangle Lakes Campground and Tangle Lakes Wayside interpretive site. Lower boat launch use, in contrast, suggests fewer visitors to the corridor take boats on the water; of those that do, more use is associated with the Upper Tangles launch (where all upper lake trips start and finish) than the Lower Tangles launch (perhaps because “through trips” put-in here but take-out elsewhere). For all four facilities, there is no trend over time; data instead suggest year-to-year variation that is probably due to factors such as weather, fires in the area, flow levels, etc.

### Delta River / Tangle Lakes Use Estimates

Estimates for on-water use on the Lower Tangle Lakes, Upper Tangle Lakes, and Delta River (including “through trips” and Lower Delta powerboat trips) are given in Figure 37. Results indicate that use is generally higher on the Lower Tangles than the Upper Tangles (2004 was the only exception; discussions with BLM staff indicate 2004 decreases may be due to changes in calculation methods rather than a true drop in Lower Tangle use).

More importantly, estimates suggest that lake use (on either the Upper or Lower Tangles) is substantially higher than “through trip” or lower river powerboat use, which is consistent with the responses on this survey and anecdotal evidence from patrol trips. Tangle Lakes estimates include shore-based fishing from the campground or wayside, as well as short day trips by people renting canoes or small powerboats from nearby lodges.

As with facility use, on-water data do *not* show an upward trend in recent years, although Delta River estimates were higher in 2004. Review of specific registration data suggests 2004 estimates may be due to several large scout trips (25+ per group) who signed the register (which multipliers then magnified). The number and size of those types of trips appears to have been smaller in previous years.

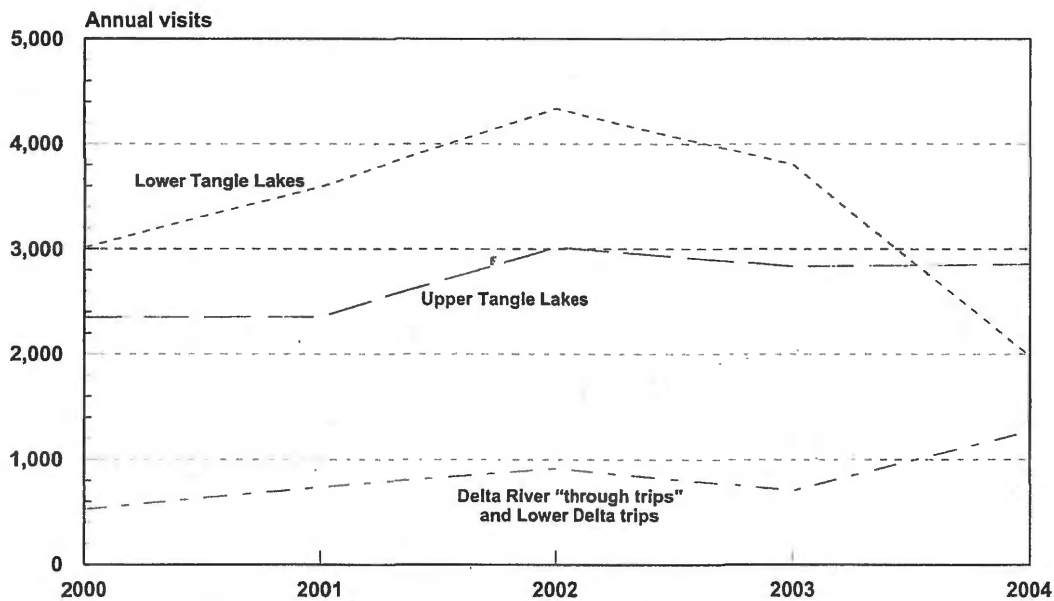


Figure 37. Annual visits to the Tangle Lakes and Delta River, 2000-2004.



## Other BLM Use Estimates

Other components of the RMIS system require estimating the proportion of visitors using an area involved in various activities and the length of time they spend doing them. For the Delta River, BLM has made simplifying assumptions about proportions and time based on professional judgments, and most of these have remained static over the past five years. However, it is notable that BLM estimates 66% of the use on the Delta River and Upper Tangle lakes as non-motorized, compared to 33% on the Lower Tangle Lakes. Based on overflight data (discussed above), these non-motorized proportions should be revised upward, at least for the Lower Tangles.

Prior to the current RMIS system, the previous use information system also required BLM to estimate use in the area. While data cannot be specifically compared across systems because of the different ways they were developed and reported, broad comparisons of past and more recent estimates are interesting.

For example, 1987 BLM estimates suggest about 1,600 people took Lower Tangles or Delta River trips, which is substantially lower than current estimates of about 4,000 to 5,000 (even though most of this discrepancy may be attributable to the inclusion of shore-based anglers in the Lower Tangle estimates). However, 1987 data also suggest there were about 1,600 users on the Upper Tangle lakes, which would mean that current use levels of 2,200 to 3,000 people are substantially higher. On the other hand, total camping use in the area in 1987 suggests there were about 29,000 visits, which is much larger than recent estimates of about 16,000 at the Tangle Lakes campground.

1997 use data are also interesting for comparisons. These suggest that Tangle Lakes campground use in 1997 was similar to current use levels (16,000 visits per year), but that Wayside visits were actually higher (15,000 in 1997 compared to 7,000 to 10,000 in recent years). Similarly, Delta River use (presumably "through trips" and lower river use) was estimated at 1,660 in 1997, which is higher than the 500 to 1,200 in recent years.

It is difficult to ascertain long term use trends from RMIS information. Use estimation in remote, relatively low use areas based on low compliance registration data and professional judgment simply does not provide sufficient precision. Increased state population and summer out-of-state visitation probably have increased use in the area over the past two decades, but hard data are not available to support this conclusion, and some types of trips (e.g., through trips) may have declined or remained static. However, there is evidence that use levels in recent years are *not* trending upward, which provides some "breathing room" for addressing capacity and conflict issues.

**Appendix B:  
Survey Instrument**

[Following this page]

## Bureau of Land Management • Alaska Tangle Lakes / Delta River User Survey



Dear Tangle Lakes / Delta River user:

The Bureau of Land Management, in cooperation with the State of Alaska, is revising the management plan for the Delta National Wild and Scenic River corridor. This includes the Upper and Lower Tangle Lakes, and the Delta River from Tangle Lakes to Black Rapids (see map inside).

The goal is to maintain natural resource conditions and outstanding recreation opportunities. To do this, planners need to know about you – how you use area, and what you think it should provide. This survey asks about your trips and your opinions about impacts and management strategies.

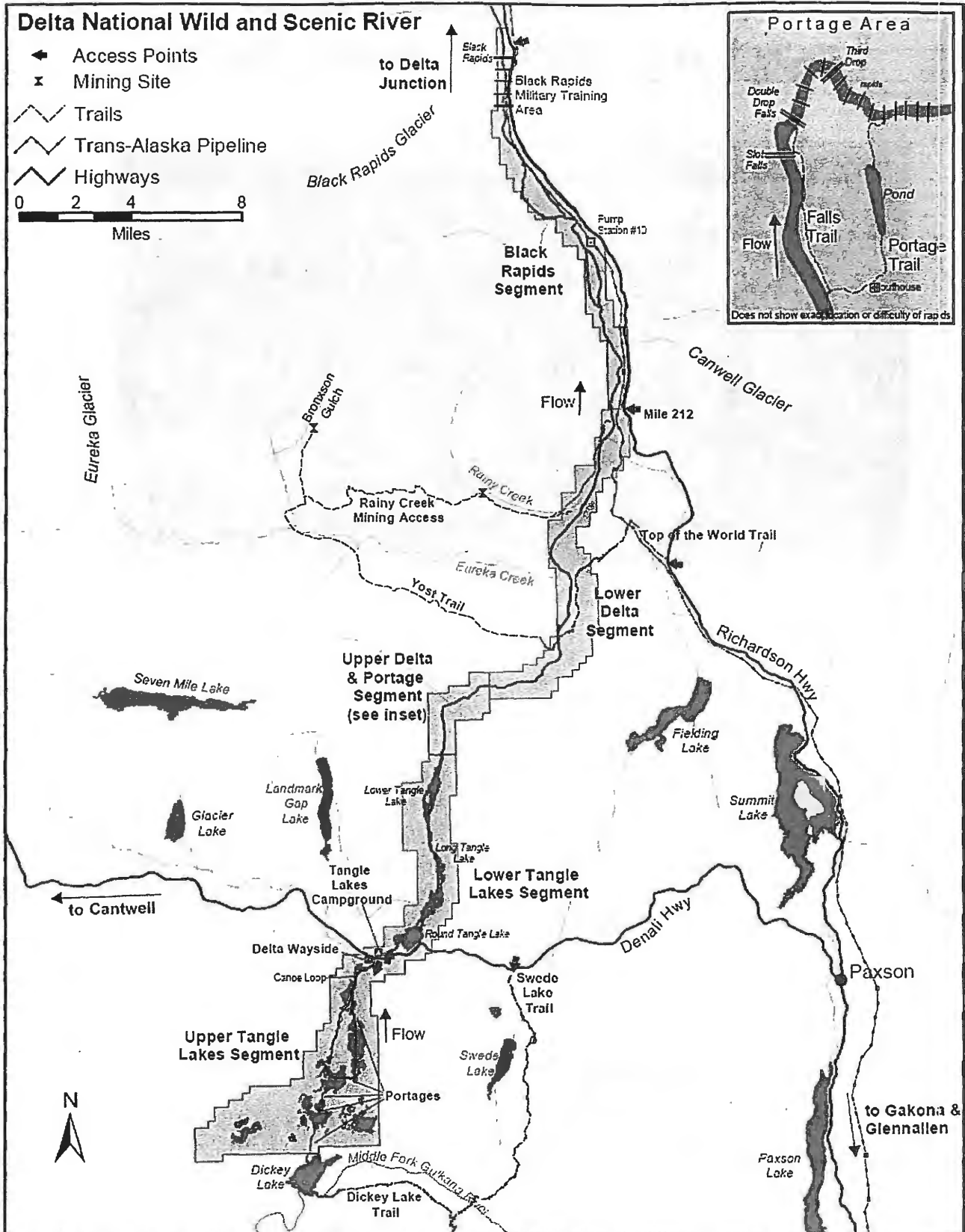
Participation in the survey is voluntary, but we need your help. The survey was sent to a limited number of people, so your response is needed to accurately represent users' views. Your name was randomly chosen from people who registered at the access points, or from a list of Tangle Lakes & Delta River users developed through clubs, lodges, and outfitting stores.

There are no right or wrong answers; the best responses reflect your own feelings and beliefs. Please try to answer every question, because missing responses decrease the value of your other responses.

For more information about the survey, please call Bruce Rogers at the Bureau of Land Management, Glennallen Field Office at (907) 822 – 3217.

*Note: The identification number on this survey only helps us know who returned it. Once a survey is returned, we remove your name from our mailing list, no more reminders will be sent, and your answers cannot be associated with your name (assuring confidentiality).*

OMB NO. 1004-0181 • Expires July 2005



Great care has been taken to ensure that the information represented is as accurate and complete as possible at the time of compilation. However, the information displayed on this map is intended to be used for graphic representation only. Questions regarding information displayed should be directed to BLM/GFO at (607) 622-3217. G:\XDC\EAPMF\Delta\_Survey.mxd TL Dec 2004

This survey is divided into separate sections that refer to specific trip types or areas. Instructions indicate who should complete each section (or who should skip to the next).

**Section A. Your experience on the lakes or river • ALL USERS PLEASE ANSWER**

1. How many trips have you taken on the Tangle Lakes or Delta River in the past 10 years? (Write a number)

	Number of trips
Boating trips on Upper Tangle Lakes (motorized or non-motorized)	
Boating trips on Lower Tangle Lakes (motorized or non-motorized)	
Float trips on Delta River (from the Denali Highway to Mile 212 on the Richardson Highway)	
Powerboat trips on the Lower Delta River (Mile 212 upstream)	
"Black Rapids" Delta River trips (any trip along river from Mile 212 through Black Rapids)	
ATV-based trips into the Lower Delta River area (access from pipeline / Top of the World trail)	

2. If you have taken more than one trip, what was the year of your first trip?

3. Please describe your **most recent trip** by completing the following table:

Year & month of trip (write year and circle month)	Year: _____	May	June	July	Aug	Sept	Oct
Type of transport (check all that apply)	<input type="checkbox"/> Canoe/kayak	<input type="checkbox"/> Raft	<input type="checkbox"/> Powerboat	<input type="checkbox"/> ATV or tracked vehicle			
Segments visited (Check all that apply) (See map to identify the segments)	<input type="checkbox"/> Upper Tangle Lakes		<input type="checkbox"/> Lower Tangle lakes				
	<input type="checkbox"/> Upper Delta River		<input type="checkbox"/> Lower Delta River				
	<input type="checkbox"/> Black Rapids section of Delta River						
Number of days (write number)							
Number of people (write number; include yourself)							
Did you fish or hunt? (check all that apply)	<input type="checkbox"/> Fish	<input type="checkbox"/> Hunt (moose)	<input type="checkbox"/> Hunt (caribou)	<input type="checkbox"/> Hunt (other)			

4. If you use a **powerboat** to access the Tangle Lakes / Delta River, please list the type, length, and horsepower.

Type of boat (check one)	Length in feet	Horsepower
<input type="checkbox"/> Jetboat <input type="checkbox"/> Propeller-driven <input type="checkbox"/> Airboat <input type="checkbox"/> Boat with kicker <input type="checkbox"/> Other		

5. If you use **ATVs** (also known as OHVs, ORVs, 4-wheelers) to access the Tangle Lakes / Delta River, please identify the type(s) you use. (Check all that apply).

4-wheeler     Tracked vehicle     Argo     Other:

6. Please report the number of years you have been doing the following activities (not just on the Tangle Lakes / Delta).

	Number of years of experience
Boating in canoes, kayaks, or rafts (non-motorized craft)	
Powerboating on rivers or lakes	
Riding ATVs or tracked vehicles	



**Section B. Setting preferences and reasons for visiting • ALL USERS PLEASE ANSWER**

1. Please indicate the importance of reasons for taking trips on the Tangle Lakes / Delta River. (Circle one number for each row).

Potential reasons for trips	Not important	Somewhat important	Important	Very important	Extremely important
Fishing	1	2	3	4	5
Camping	1	2	3	4	5
Viewing or photographing scenery	1	2	3	4	5
Viewing or photographing wildlife	1	2	3	4	5
Waterfowl or small game hunting	1	2	3	4	5
Big game hunting	1	2	3	4	5
Boating whitewater	1	2	3	4	5
Boating in general	1	2	3	4	5
Being in a natural place	1	2	3	4	5
Opportunities for solitude	1	2	3	4	5
Being with friends/family	1	2	3	4	5
Meeting other river users	1	2	3	4	5

2. People seek different kinds of recreation experiences in different settings. Listed below are five "experience settings" available on different segments of the Tangle Lakes / Delta River. Please choose the letter that best describes...

- the setting you **experienced** during your **most recent trip** (for each segment you visited)
  - the setting you **prefer to experience** on those segments
- A. **Primitive Setting:** Where one expects to find solitude, very few traces of previous use, no motorized use or ATV trails, and no development.
  - B. **Primitive Motorized Setting:** Similar to primitive setting, but motorized use may occur and ATV trails may occasionally be visible.
  - C. **Semi-Primitive Setting:** Where one expects to meet few other groups, but solitude is still possible, particularly at camps. There is little or no motorized use or ATV trails, occasional evidence of previous use, and a few developments such as trails or outhouses.
  - D. **Semi-Primitive Motorized Setting:** Similar to a semi-primitive setting, but motorized use may occur and ATV trails may occasionally be visible.
  - E. **Undeveloped Recreation Setting:** Where one expects to meet other groups, and solitude is difficult to find. There is motorized use, ATV trails are visible at several locations, evidence of previous use at many sites, and some developments such as trails and outhouses.

Segment	Letter of setting on your most recent trip	Letter of setting that should be provided
Upper Tangle Lakes		
Lower Tangle Lakes (don't include Tangle Lake Campground)		
Upper Delta River (above portage)		
Portage area on Delta River		
Lower Delta River (portage to Mile 212 on Richardson Highway)		
Black Rapids segment		

**Section C. Crowding • ALL USERS PLEASE ANSWER**

1. In general, how crowded did you feel on your **most recent trip** to the Tangle Lakes / Delta River? (Circle one number for each row. If you didn't use a segment, leave that row blank).

Segment	Not at all crowded		Slightly crowded		Moderately crowded		Extremely crowded		
Upper Tangle Lakes	1	2	3	4	5	6	7	8	9
Lower Tangle Lakes	1	2	3	4	5	6	7	8	9
Upper Delta River (above portage)	1	2	3	4	5	6	7	8	9
Portage area on Delta River	1	2	3	4	5	6	7	8	9
Lower Delta River (portage to Mile 212)	1	2	3	4	5	6	7	8	9
Black Rapids segment	1	2	3	4	5	6	7	8	9
<b>Overall trip</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>

2. Do you plan your trips to avoid high use levels on the Tangle Lakes / Delta River? (Circle one number).

1. No → **SKIP TO QUESTION 3 BELOW**

2. Yes → **CHECK ALL THAT APPLY BELOW**

- Take trips during the middle of the week
- Take trips during the low use part of the season
- Take a shorter trip
- Take a longer trip
- Spend time in lower use areas
- Other (please specify): \_\_\_\_\_

3. Have you taken more than one trip on the Tangle Lakes / Delta River?

1. No → **SKIP TO SECTION D ON NEXT PAGE**

2. Yes

4. Do you think the quality of trips on the Tangle Lakes / Delta River has improved, declined, or stayed the same over the years? (Circle one number).

1. Improved

2. Stayed the same

3. Slightly declined (Please check all that apply...)

- ...so I've adjusted by changing my expectations
- ...so I've taken fewer trips than I used to
- ...so I've stopped taking trips

4. Substantially declined (Please check all that apply...)

- ...so I've had to substantially change my expectations
- ...so I've taken fewer trips than I used to
- ...so I've stopped taking trips

5. If you reported a decline in quality, please list what you consider to be the major problems:

\_\_\_\_\_

**Section D. Encounters with others • BOATING USERS ONLY – ATV USERS SKIP TO SECTION E BELOW**

1. We are interested in the number of **encounters** you have with other groups on the Tangle Lakes / Delta River, as well your preferences and tolerances for encounters. Please estimate the average number of groups per day...
- ...you saw on your **most recent trip**
  - ...that are **preferable** for the best experience
  - ...that you will **tolerate** before your trip is compromised

If encounters do not matter to you, place X's in the "preferable" and "tolerable" columns.  
 If you did not use a segment, just leave those lines blank. Use the map on page 2 to identify segments.

Segment	Number you saw on your most recent trip	Preferable number for an optimal experience	Tolerable number before your trip is compromised
Upper Tangle Lakes			
Lower Tangle Lakes			
Upper Delta River & portage area			
Lower Delta River (below portage)			

2. What is the **largest group** you have encountered on trips to the Tangle Lakes / Delta River, and what is the largest number you will tolerate before your trip is compromised? (*Write a number or "X" if this doesn't matter to you*).

Number of people in largest group you have actually encountered  
 Largest number of people you consider **acceptable to encounter**

**Section E. Campsite impacts • OVERNIGHT USERS ONLY – DAY USERS SKIP TO NEXT PAGE**

1. We are interested in other impacts you experienced on **your most recent trip**, as well as your tolerance for those impacts. For the following questions, please...
- estimate the **amount you experienced** on your **most recent trip**.
  - estimate the **amount you will tolerate** before your trip is compromised.
- If an impact does not matter to you, place an X in the "tolerance" column.

NOTE: This question asks about percentages. Please round estimates to the nearest ten percent (0%, 10%...90%, 100%).

Impact	Percent you experienced on your most recent trip	Percent you will tolerate before your trip is compromised
Percent of sites with substantial litter (more than a handful)		
Percent of sites with visible human waste or toilet paper		
Percent of nights you camped within sight or sound of others		
Percent of nights you had to share a camp with another group		
Percent of times you passed up campsites because they were occupied		
Percent of campsites that were "beat out" (had unacceptable levels of fire ring scars, bare ground, or cut trees)		

**Section F. Prioritizing impacts • ALL USERS PLEASE ANSWER**

Different impacts affect people's trips differently. Please prioritize the impacts you think deserve more management attention on the Tangle Lakes / Delta River. (Circle X if you don't notice this impact or circle a number to indicate how important it is to you.)

Impact	Not an issue on Tangle Lakes / Delta River	Low Priority	Moderate priority	High priority	Very high priority
Litter	X	1	2	3	4
Visible human waste / toilet paper	X	1	2	3	4
"Spider-web" of trails in portage areas	X	1	2	3	4
"Spider-web" of trails near some camps	X	1	2	3	4
Camping in sight or sound of others	X	1	2	3	4
Having to share camps with other groups	X	1	2	3	4
Competition for fishing areas	X	1	2	3	4
Competition for campsites	X	1	2	3	4
Encounters with other groups (in general)	X	1	2	3	4
Encounters with motorboats	X	1	2	3	4
Encounters with large groups	X	1	2	3	4
Discourteous behavior from other groups	X	1	2	3	4
"Beat out" camps (bare ground, fire rings)	X	1	2	3	4
Launch congestion	X	1	2	3	4
ATV trail conditions	X	1	2	3	4
Encounters with ATV users	X	1	2	3	4
Other (please specify):					

**Section G. Questions about fishing • ALL FISHING USERS PLEASE ANSWER**

1. Please estimate how many hours per day you spend fishing on your trips to Tangle Lakes / Delta River?

\_\_\_\_\_ hours per day or...

I don't fish → Skip to next page

2. Please estimate the number of fish you typically catch and evaluate fishing on each segment on your most recent trip by completing the following table (leave row blank if you didn't fish that segment).

Segment	Target species	Typical number caught per hour	Overall fishing evaluation				
			Poor				Excellent
Upper Tangle Lakes			1	2	3	4	5
Lower Tangle Lakes			1	2	3	4	5
Upper river (above portage)			1	2	3	4	5
Lower river (below portage)			1	2	3	4	5

**Section H. Overall evaluations • ALL USERS PLEASE ANSWER**

Please rate overall environmental conditions and your experiences on the Tangle Lakes / Delta River on your **first** and **most recent** trips. (Circle one number for each; if you have only taken one trip just rate your first trip).

	Poor										Excellent									
Overall environmental conditions on my <b>first</b> trip were...	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Overall environmental conditions on my <b>most recent</b> trip were...	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Overall quality of experience on my <b>first</b> trip was...	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Overall quality of experience on my <b>most recent</b> trip was...	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10

**Sections I – P. Opinions toward management strategies**

Managing impacts may involve trade-offs. The following sections ask about different management strategies that might be used to help improve trips. These strategies have been mentioned by the public or used on other rivers. No decisions have been made to implement any strategy; we are interested in what you think.

**Section I. General management strategies and user fees • ALL USERS PLEASE ANSWER**

Potential strategy	Strongly Oppose	Oppose	Neutral	Support	Strongly Support
Continue river clean-up programs (2 to 3 patrol trips per year)	1	2	3	4	5
Increase river clean-up trips (4 to 5 patrol trips per year)	1	2	3	4	5
Increase information about "leave no trace" practices	1	2	3	4	5
Increase enforcement of existing laws / regulations	1	2	3	4	5

BLM facility maintenance and river patrols are currently funded by the general public through federal taxes. Do you support having users pay a fee if it were used to help support Delta River management or facility improvements? (Circle one number)

1. No → **SKIP TO SECTION J BELOW**
2. Yes

If you are willing to pay a fee, how much should it be? (Write a dollar amount for each box; if you don't think a type of fee is appropriate place an X in that box).

I am willing to pay...

- dollar(s) per person per day
- dollar(s) per person per season
- dollar(s) per group per trip

**Section J. General facility improvements • ALL USERS PLEASE ANSWER**

Potential strategy	Strongly Oppose	Oppose	Neutral	Support	Strongly Support
Develop new outhouses at 2 to 4 high use campsites	1	2	3	4	5
Create steps (with rocks or logs) to/from camps with erosion problems	1	2	3	4	5
Improve access at Mile 212 take-out (road grading)	1	2	3	4	5

**ATV USERS SKIP TO PAGE 9 – BOATING USERS CONTINUE TO NEXT PAGE**



**Section K. Toilets and fire pans • OVERNIGHT BOATERS ONLY – DAY USERS SKIP TO SECTION M**

Potential strategy	Strongly Oppose	Oppose	Neutral	Support	Strongly Support
Require fire pans and prohibit open fires on the ground	1	2	3	4	5
Require portable toilets (users would carry out solid waste)	1	2	3	4	5

**Section L. Delta River portage area • SKIP TO SECTION M IF YOU DO NOT USE THIS AREA**

Potential strategy	Strongly Oppose	Oppose	Neutral	Support	Strongly Support
Improve main portage trail with wood boardwalks and/or steps	1	2	3	4	5
Improve main portage trail with "local" materials (mostly rock)	1	2	3	4	5
Leave the main portage trail "as is" to avoid attracting more use	1	2	3	4	5
Improve trails to the falls and "vista overlook" in the portage area	1	2	3	4	5
Close or rehabilitate some side trails in the portage area	1	2	3	4	5
Limit camping to designated areas at the downstream end of portage	1	2	3	4	5
Remove outhouse to provide a more primitive setting	1	2	3	4	5
Remove "warning-falls ahead" sign to provide a more primitive setting	1	2	3	4	5

**Section M. Use and group size limits • BOATING USERS ONLY**

Potential strategy	Strongly Oppose	Oppose	Neutral	Support	Strongly Support
Limit the number of private overnight trips that can launch per day	1	2	3	4	5
Limit the number of guided overnight trips that can launch per day	1	2	3	4	5
Limit the number of all overnight trips (private and guided trips)	1	2	3	4	5
Require all overnight groups to register (on a free website) so people can adjust their plans to avoid crowding	1	2	3	4	5
Set up a reservation system for campsites	1	2	3	4	5
Develop more campsites along the lakes/river to handle peak use	1	2	3	4	5
Limit the length of stay at heavily used campsites to one night	1	2	3	4	5
Limit the size of groups	1	2	3	4	5

Groups on the Tangle Lakes / Delta River are usually small, but some have had as many as 29 people. Typical group size limits on other rivers are between 12 and 25. If you support a **group size limit**, what do you think it should be? (*Fill in the blank or check the box*).

I support a limit of \_\_\_\_ people per group, or...

I don't support group size limits

Would you be willing to compete for a limited number of **river permits** to take overnight trips on the Tangle Lakes and Delta River (if it meant that there would be fewer other users)? (*Circle one number*).

1. Yes, some limits on use are needed now.
2. Maybe, but it depends upon how many permits would be available each day.
3. Maybe, but it depends upon how the permit system works.
4. Maybe, but it depends on how many permits would be available and how the permit system works.
5. No, I'll always want unlimited access to the river / lakes, even if use and impacts increase.
6. It doesn't matter to me.

**Section N. Motorized boating use • ALL BOATING USERS PLEASE ANSWER**

The existing BLM plan recommends motor boat restrictions on parts of the Tangle Lakes / Delta River, and some people are interested in other potential restrictions. Please indicate whether you support or oppose the following. (Circle one for each).

Note: BLM may not have the authority to implement some of these restrictions, but they have been suggested by the public and we are interested in your opinions about them.

Segment and potential strategy	Strongly Oppose	Oppose	Neutral	Support	Strongly Support
Upper Tangle Lakes: Prohibit all motorized use	1	2	3	4	5
<b>Lower Tangle Lakes</b>					
Prohibit motors larger than 15 horsepower "downstream" of Round Tangle Lake (the first lake)	1	2	3	4	5
Prohibit motors "downstream" of Long Tangle Lake (shallow area approximately 6 miles from put-in)	1	2	3	4	5
Prohibit PWCs (jet skis)	1	2	3	4	5
Prohibit all motorized use	1	2	3	4	5
<b>Upper Delta River: Prohibit motorized use</b>					
<b>Lower Delta River (between portage and Mile 212)</b>					
Prohibit motorized use <b>except</b> during subsistence hunting season (usually after mid-August)	1	2	3	4	5
Prohibit airboat use	1	2	3	4	5
Prohibit all motorized use	1	2	3	4	5

People have suggested potential reasons for restricting motor use; please rate the importance of these reasons. (Circle one number or X for each reason).

Potential reasons for restricting motor use	Restrictions would not address this	Not important	Slightly important	Moderately important	Extremely important
Concern about erosion from boat wakes	X	1	2	3	4
Concern about other biological or physical impacts	X	1	2	3	4
Concern about impacts on cultural resources	X	1	2	3	4
Concern about noise	X	1	2	3	4
Concern about discourteous behavior	X	1	2	3	4
Concern about safety	X	1	2	3	4
To minimize use levels in general	X	1	2	3	4
To minimize hunting pressure	X	1	2	3	4
To minimize fishing pressure	X	1	2	3	4
To ensure the availability of non-motorized experiences	X	1	2	3	4
Because motorized use is inappropriate in some places	X	1	2	3	4

**Section O. Access to mining claims • ALL USERS PLEASE ANSWER**

1. An access route to valid, existing mining claims crosses and follows the glacial water segment of the Lower Delta River between Rainey Creek and Mile 212. Please check if you have... *(Check all that apply)*.
  - ...encountered mining equipment or vehicles in this area.
  - ...seen evidence of mining access (routes created by mining equipment) in this area
2. Mining laws and regulations allow "reasonable access" to valid claims, but mining access may be restricted by season or limited to specific designated routes to minimize impacts. Please indicate whether you support or oppose these options.

	Strongly Oppose	Oppose	Neutral	Support	Strongly Support
Limit mining access to a designated road that is routed away from the river and sensitive terrain	1	2	3	4	5
Prohibit mining access across the corridor from June to September.	1	2	3	4	5
Prohibit mining access across the corridor for new claims if other reasonable access exists.	1	2	3	4	5

**Section P. ATVs and trail conditions • ALL USERS PLEASE ANSWER**

ATVs are allowed in the Tangle Lakes and Delta River corridor on existing trails. However, BLM is responsible for managing ATV use to minimize impacts on outstanding recreation, scenic, or ecological values. The following questions ask about ATV use in the corridor, the acceptability of trail conditions, and opinions about ATVs and management options. Note: Questions do not refer to ATV management at Tangle Lake Campground or within 100 yards of the Denali Highway.

1. Have you seen or traveled on trails used by ATVs within a half mile of the water's edge on the river or lakes? *(Circle one number. Do not include ATV trails at Tangle Lake Campground or within 100 yards of the Denali Highway)*.
  1. No → **SKIP TO QUESTION 3 ON THIS PAGE (BELOW)**
  2. Yes, I have seen trails used by ATVs near the river or lakes
  3. Yes, I have traveled on ATV trails near the river or lakes
2. Please identify where you saw or used these trails *(Check all that apply)*:
  - Near Dickey Lake or the south end of the Upper Tangle Lakes
  - Near or along the Lower Tangle Lakes (don't include ATVs you saw at the campground or Denali Hwy)
  - Along the river between the portage area and Mile 212
  - Other (please specify): \_\_\_\_\_
3. Have you personally encountered people riding ATVs near the lakes or river (not including the campground)?
  1. No
  2. Yes
4. Photos in a **survey insert** show three levels of ATV trail conditions. Please rate the acceptability of conditions in each photo for ATV trails in the Delta River corridor.

	Totally unacceptable	Somewhat unacceptable	Neutral	Somewhat acceptable	Totally acceptable
Photo 1	1	2	3	4	5
Photo 2	1	2	3	4	5
Photo 3	1	2	3	4	5

5. People have different opinions about ATV conditions or management options in the Delta River corridor. To help us understand your opinions, please indicate whether you agree or disagree with each statement below.

	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
I don't think ATV impacts are increasing in the corridor, so additional management is unnecessary.	1	2	3	4	5
BLM should improve trails to minimize places with unacceptable impacts (geo-block, planking, or water bars).	1	2	3	4	5
Rough or muddy conditions are part of the fun of some ATV trails and should not be "improved."	1	2	3	4	5
BLM should re-route ATV trails in some steep or wet areas.	1	2	3	4	5
As long as ATV-caused erosion does not put sediment in the river or cause other biological impacts, ATV use is not a problem.	1	2	3	4	5
Even if they don't cause many biological impacts, ATVs detract from the primitive setting of the corridor.	1	2	3	4	5
Reducing ATV impacts is important, but ensuring motorized access is more important.	1	2	3	4	5
Existing ATV trails are not a problem, but it's important not to let new trails develop in the corridor.	1	2	3	4	5
As long as impacts only occur on existing trails, ATV use in the corridor is not a problem.	1	2	3	4	5
It is okay for ATV trails to cross the corridor to provide access to other areas, but trails along the river should be minimized.	1	2	3	4	5
It is important to leave the trails "as is" because improvements may attract more ATV use.	1	2	3	4	5
Existing trails are not a problem, as long as the number of people using them does not increase substantially.	1	2	3	4	5
It doesn't matter if use or impacts are low, motorized use is not appropriate in some areas.	1	2	3	4	5

**Section Q. Questions about you • ALL USERS PLEASE ANSWER**

1. How old are you? \_\_\_\_\_ years
2. What gender are you? 1. female 2. male
3. What is your zip code? \_\_\_\_\_
4. Are you an Alaska resident? 1. No 2. Yes

*Thanks for your help!*

*Please place this survey in the self-addressed and stamped envelope and mail it back to us (you don't need to include the insert with photos of ATV conditions). You are also welcome to include additional comments about the river and how management can be improved.*

## Appendix C: Users' Verbatim Survey Comments

### User or Trip Information

Delta corridor experience	Hiking Trips in corridor-15 years.
Year of first trip	Using area yearly since 1982
	Ever? 1960. In past 10 years? 1995.
Description of recent trip	I hike the Eskers on west &/or East side of upper Tangles at least annually (last was 2 people, 2 days in 2004). Every few years I hike Eskers on West side of Lower Tangles.
	Some in our group (fish or hunt).
Segments visited	Rock Creek, Dickey Lake Trail, Middle Fork Gulkana
	1 trip backpacking in Upper Tangle Lakes, 1 trip backpacking west of Lower Tangle and Upper Delta.
Use of powerboats.	Jetboat 21 ft 240 hp, and boat with kicker 17 ft 3.5 hp
	Also a jetboat 18 ft 65 hp jet
	[I use] multiple boats, jetboat and boat with kicker
	Propeller-driven, other (raft)
	Boat with kicker - inflatable
	Jetboat-but most trips still canoe & kicker
Use of ORVs.	Not used in Tangle Area
Years of experience.	Dirt bikes (for years riding ATVs)
	With father (for years boating)
	Canoe (38 yrs - 21 yrs - no motor, 17 yrs - 3.5 motor)
	Life Long (powerboating)
Other reasons for visiting	Picking berries
	Berry picking, sight seeing.

### Fishing Questions

Will fish in future trips
We only fished because we stayed extra days in good weather and needed a little extra food.
Not "most recent trip" but most recent to this section.
Did not fish.
Dependent on time of year
[Reason for low numbers of fish caught] Bright sunny day – not the fish's fault
Typical number caught: lots.
[Lake trout] population is not migratory but captured so some regulation should be imposed to protect it further before it is totally decimated.



## Setting Preferences, Crowding, and Planning to Avoid Crowding

Setting preferences	Hard question to answer because you mix ATV and outhouses
	Like it the way it is.
	Evidence of previous campsites was seen. (Lower Tangles)
	Semi-primitive in portage areas. This is mostly because of the outhouses. In an area like this, it is better to control where people poop.
	[Portage area] I like it the way it is.
	Semi-primitive motorized for first lake, Semi-primitive above 1st lake (Upper Tangles)
	First lake – Undeveloped recreation. Upper lakes - semi-primitive.
	Saw lots of people no motors.
	I'm using most recent hiking/camping trip (2004).
	Good
First lake – undeveloped recreation, Upper lakes – primitive.	
Crowding ratings	More crowded on weekends
	Lower Tangles. Boy Scout group of 30 as we were leaving (whew!)
Plan to avoid high use?	In the last ten years – no. But before that yes.
	[Take trips during low season?] after state hunt closes
	[Take trips during low season?] not possible

### Problems (if you consider there to be a decline)

[Substantially declined]...so we have portaged farther and farther
[Substantially declined] ...wolves killed most of the moose.
Our last trip included taking our young girls kayaking across Round Tangle Lake. On our return trip to the campground (Lower Tangle Lake), we rested on the gravel bar across from the lodge. We watched in awe as 2 caribou swam across the lake in front of the lodge to a bank west of us. To our surprise (and shock), when the caribou climbed up the bank after crossing the lake, 2 hunters appeared out of nowhere and shot the larger caribou. We were perhaps 200 yards away. We then had to explain what happened to our children. I noticed an audience on the shore at the lodge. It was an interesting experience that I don't want to repeat.
1. ATVs, noise, traffic, speed & availability of camping in the Tangle Lakes Campgrounds. 2. Algae / pollution between Upper and Lower Tangle lakes (south to north side of the Denali Hwy). 3. Too many motorhomes and/or motorhome specific camping spots.
Limited Access. People need areas to use ATV's unrestricted Alaska has more restricted land than some state in the lower 48 have land. If people do not want to see ATV's or land tore up by ATV's they need to go to the National Parks like (Denali 6,000,000 acres) (Gates Arctic Natl. Parks 8,400,000 acres) (Wrangell-St. Elias National Parks 13,000,000 acres) (Lake Clark Nat. Parks 4,000,000 acres) (Katmai Nat. Park 4,000,000) to mention only 5 national parks with over 354,000,000 ACRES RESTRICTED from ATV's.
Improvements of the road side campground increase the number of users, but that is okay so far.
There's too many people in the state for me anymore. I strongly try to avoid the crowds.
Motorized use, especially "play", instead of low-speed point-to-point travel. One person I know took a Hovercraft on Round Tangle several times and circled the lake repeatedly. It's at least as loud as an airboat. He also took it up the northern most Upper Tangle and the Tangle River.
If I knew where they were.
Alcohol and hunters, need behavior, ATV damage, disrespectful users, damage to trees, litter, human waste.
Group canoers & rafters leave trash & cutting trees for camp fires, extremely low numbers of fish and dead fish sightings on the river bottoms, toilet paper in the river and brush . Floaters with bad attitudes based on their expectations from bad advertisements of the river systems, wet, cold & disoriented floaters because of wind & low water conditions.

## Encounter Impacts and Tolerances

General encounters	OK so long as group passes quickly
	This number is fine with us (referring to "3" for Upper Tangles.)
	Quiet, well behaved groups can be tolerated (reluctantly)
	Never would compromise me.
	3 couples-labor day
	2 couples is best but all are nice people!
	We enjoy solitude much more than the 3 we saw; would have gotten a bit much.
	Not "most recent trip" but most recent to this section.
	"Your trip is compromised." This needs definition in order to be answered with statistical relevance.
	Larger groups don't really bother me
	I noticed more people around Denali Park!
	Boy scouts and other users @ portage.
	Depends: floating by on river is a higher number than those occupying campsites nearby . . . Seems to be a limited number of viable campsites so I would not want to be there if there were all 7 per day groups camped.
	Depends on user – say 2 on average.
	2 groups of boy scouts
	0-100 it depends on the people you meet.
	Much more so long as they don't have large motors and no jet skis!
	The motors are the problem not the numbers.
	In this area (Tangle Lakes) only, different for river.
	Smaller groups.
[In answering reason for visiting: solitude]: Need to share	
Largest group encountered	10-12 ---- total for day (I don't camp in campgrounds - much further out)
	Four groups of kayaks
	Totally depends on group! And place!
	Not a fair question. Depends on whether it's parents and kids or whether it's AVTers with beer.
	A few – it depends on how they behave
	In one group.
A few.	

## Other Types of Impacts

Litter	We picked up and carried out around 10 pounds (8lbs litter, 2lbs TP). Most back country users don't have a clue about litter. Mostly inexperienced folks struggling to do without normal amenities
Human waste impacts.	What do you mean by this? I'm on a 5 day float trip, I don't turn around and leave instantly if I see a piece of toilet paper. But I don't like seeing the toilet paper.
Camp impacts	I backpacked into the Upper Tangles for just one night. Impacts matter to me a great deal, but the only physical scars I saw on the landscape were trails, and they were tolerable. In a couple of hours at our campsite, I occasionally saw and heard 2 flyfishers in float tubes. I would rather not have seen/heard them, but they weren't a major intrusion. Hasn't happened so don't know. We thought Tangle Lakes was great compared to many State campgrounds
Camp competition	Again, depends on place Few Had to camp because it was late Regarding the 2nd column of the question: Does not fit: once I'm on a trip, I'm there - we have to camp someplace. No choice. If you mean by "compromised" that I don't like it, then all these are 0% - my preference, but probably unrealistic. You can't regulate where the good spots are!
Beat out camps	Improved campsites are often very handy. A few At campground Ours was. Ok to concentrate and localize impact to a degree. Sacrifice.
Camping in sight or sound.	Not counting Tangle lakes campground. [Circled the word <i>sounds</i> and put a line to it with] boats, guns, aircraft [written]. Sharing campsite. Depends on where.
Prioritizing impacts: general	These answers reflect what is important to me. When I go in May/midweek I never see anyone, or any litter, etc. I'm usually the first one through for the year. We only go in June _ I don't know how bad it is later in the season These are impacts I haven't experienced in the part of the Tangles use, but they would be high priority if they occurred.
Discourteous behavior	Never have. Bad.

## Overall Evaluations

The smoke was bad!

Smoky

ATV trail at beginning of trip (and end) was major impact.

1975 4th of July very crowded/ uncontrolled use/ trails all over / pipeline was just starting up - use soured for next 4 or 3 years.

Due to lack of fish.

The loud group, ATV erosion.

Except rain and snow-constant! :)

## Fees

For motorized users
Tax structure should support this basic activity. Cost of collecting fees would be more than collected.
\$10 / trip - keep it per person
\$10.00 a night per campsite
If a mine is put in nearby they should have to pay to improve area and help BLM hire river rangers
It galls me that they're needed, otherwise I'd strongly support.
Make it easy to pay, even to pay after the trip by credit card
We pay enough.
I'm not against paying usage fees. But I pay \$10 to launch my boat at Harding Lake. The "no wake" law is not enforced, boat launch & parking is congested, launch pad need to be extended, channel needs to be dug out (extended) due to water table dropping which in turn has caused the State to close pike (a fish which was once considered trash & now has an quantity and size limit) fishing due to breeding grounds diminishing. This could be fixed by BLM or Uncle Sam Sr. (the State) would take care of the water source problem (beavers).
How about yearly fee for use of BLM lands - sticker on window?
Only if the money stayed right there.
Must be global across AK. Can't do at 10 places each summer.
I'm willing to pay a fee, however, Tangle Lakes should be free to non-motorized users.
What a stupid question.
Depends on facilities provided.
Personally, I'm willing to pay, but I don't want poor people to be discouraged, and I see there been inevitably leading to increased commercialization.
I/We wouldn't go more than once a season.
Get out of Iraq and spend our tax \$ on rivers!!!
[I wouldn't mind paying, but I don't think folks on low income should; it's better and simpler to not have fees].
For floaters that put in at lower Tangles and their skill levels should be checked along with supplied & gear. I use the lower delta by river boat where I pick up trash and debris from up river floaters and I will refuse to pay for that.
Floaters that don't pack it out should pay a fee. We power in and in general pick up after users therefore feel we contribute to the quality of the environment and should not be required to pay a fee.
Boat launching, hunting license -- permit license should cover that.
\$50-100
\$15-\$20 (or vehicle)
For campground use only
Per boat per trip (or per ATV?)
Depends on group size 25\$ per person
Large group should pay more than small group.

## General Management Actions

Outhouses and steps	Avoids human waste and TP in wild areas!
	Would rather see 10 to 12 outhouses.
	I didn't notice any such camps [that would need steps or toilets].
Mile 212 improvements	Not worth the \$ would have to re-grade annually.
	Access is fine as is.
Firepans	(stoves?)
	Depends on location - on lower part of river - gravel bar are washed clean by high water.
Waste carry-out	High river use areas only - yes.
	Carry a shovel.
	Not practical for canoe / portage.
	Only if necessary.
	We do on McKinley now!
	Raft trips, not canoe trips.
Remove outhouse	Hard to make sure that people have them/use them.
	What outhouse?
Remove portage sign	What, are you nuts?
	Must make more obvious!
	What the hell is wrong with you?
	This is a safety issue!
	Need that.
	Duh!
Rehab portage trails	There have always been game trails. Not needed.
	Assume you mean foot-trails. ATV trails would be very high priority for attention.



## Use Limits and Group Size Limits

Philosophy of use limits	Alaska residents should have priority
	Require guides, only guides can get permits - limit guides to traditional users.
	I don't believe limits need to be placed now, but they might be needed in the future.
	How can you tell me I can't use a river or lake that is public property??
	I'll always want unlimited access for private, non-motorized users.
	No.
	I have not observed conditions that would require a permit. My experience is limited to only 3 trips. I would support permit, if conditions regularly exceeded my tolerance conditions.
	With my job, I cannot plan trips far in advance
	High use rivers, yes. Lake use, no
	I don't see the need to limit # of users, or at least not for the whole season. Maybe 5 closed weekends limited to permit (drawing) entry so those users know how many groups will be there. Other times should be open to any & all. Hopefully river conditions are self-limiting.
	Everyone <u>does not</u> have a computer. The <u>commercial</u> use may be the problem. It will be a sad day if you start restricting Alaskans from the area. This is not what I retired here for.
	What a concept!
	I haven't had enough problems to justify any of these measures yet, but if it becomes a problem, guided trips would probably be the cause.
I'm not sufficiently familiar with the situation here, but as a general concept I support limits on both boating and backpacking (and of course any motorized recreation).	
General use limits	Do not use campsites.
	BLM managers should decide maximum available number of campsites and thereby limit number of users / groups.
	My experience is limited since I have not been there at peak season.
	I would allow a Boy Scout group (10-15 scouts plus a few parents).
	I favor permits for guides making money from public resources but not limiting general public use.
Group size limits	It's easy enough to split the group.
	Campsites are small.
	Because family camping is very important.
	Small groups.
	15 commercial, I don't support group size limits for non commercial.
	A family should be able to camp together. Even 2 families should be able to camp together. Has to do with the type of group. If it's commercial, limit to 4.
	Depends on need.
10 / group has been adopted by Gates of the Arctic NP and Arctic National Wildlife Refuge.	
Reserve camps	Between 3 and 4.
	For large groups only.
Limit length of stay	Limit 2 nights ok.

## Motorized Boat Issues

Motorized restrictions	Also, if reduce horsepower, will limit impact to small outboard only! [Prioritizing motorized boat encounters question]: Last fall a couple of big boats were playing up and down Upper Tangle zooming around. Big wakes made me think that motor size should be limited. Also had a bad experience with fan boats on the Lower Tangles several years ago. Those machines are very noisy.
Motorized restrictions except in subsistence season	If it's subsistence only, <b>NOT</b> sport. I oppose motorized use at all times so how do I answer this?
Lower Tangles	Another option for Lower Lakes is electric motors only.
Airboat restrictions	I hate airboats! YES! No airboats.
Restrict PWCs	Please!!! Limit speed noise.
Motorized safety	<u>Many</u> inexperienced canoers and rafters have been saved by power boaters. Need more info on how difficult river really is!
Horsepower limits	Restrict to 10 hp – OK This is a wild and scenic river. Large motors are not appropriate.

## Mining Issues

Mining	Mining should not be permitted in areas of natural beauty particularly owned Most places in Alaska would have no access if it wasn't for mine roads. Depending on [what you mean by] "reasonable access" - No if this is more environmentally harmful
Prohibit mining access in summer	Frozen ground only?
Prohibit across corridor	only if other reasonable access exists

## ATV Issues

Prioritizing: ATV conditions	Get rid of trails, eliminate trails.
	Erosion.
	Saw none, lots of erosion.
Prioritizing: ATV encounters	Don't Want 'Em!
Seen or traveled in ATV trails?	No - they are too hard to walk on. They mess up a footpath
	I think that's where I saw them, it's hard to remember
	Was in campground.
	Remember I have been using this area for over 20 years.
ATV encounters	Only on a trail west of the lakes.
ATV access	I'm also handicapped, and depend on ATV's to get to some areas.
ATVs and bio impacts	Rivers breakdown and dump a lot more sediment than ATVs.
	Our soils are NOT appropriate for ATV use in the summer.
	Motorized vehicles are not permitted in anadromous fish streams.
	I don't believe we know enough to correctly answer about biological impacts.
ATVs crossing corridor	Be specific [where].
Re-route steep/wet areas.	Have to be specific [where].
Important to leave ATV trails "as is."	I strongly agree in the absence of responsible ATV Management.
BLM should improve ATV trails.	I strongly agree in the absence of responsible ATV Management.
It doesn't matter if use is low; motorized use is not appropriate in some areas.	Perhaps some sensitive areas - common sense dictates this.
Existing trails a problem?	Don't think there should be any in corridor.
	Existing trails are a problem.
	Strongly disagree -- existing ATV trails are not a problem. Strongly agree -- it's important not to let new trails develop in the corridor.
BLM should re-route in steep or wet areas.	I don't think BLM should have to cater to uneducated ATV users.
	Eliminate, don't reroute.
	Trails should be re-routed only if BLM's unwilling to eliminate them.
	Don't think there should be ATV trails in corridor.
Difficulty of some ATV attitude questions... (particularly last 7, for users who oppose all ATV use)	All these questions are problematic because the clauses are contradictory.
	Can't answer - don't agree with ATV use.
	Don't think there should be any in corridor.
	Not good wording. You don't know which part of the question I'm agreeing/disagreeing.
	I don't know whether crossings are necessary, or whether trails along the river should be allowed at all.
	Don't think there should be any in corridor.
	ATV trails should not be improved. They should be eliminated.
	Don't know how to answer.
	This is 2 questions/statements.
	Existing trails are not a problem (disagree). But it's important not to let new trails develop in the corridor (agree).
	No answer, loaded question.
	I don't know whether crossings are necessary, or whether trails along the river should be allowed at all.
	Can't answer because of way question is worded.
Trick question.	

Evaluations of ATV impacts in photos	Even animals prefer to travel on ATV trails
	Keep ATV's on approved trails - apparently none of the ATV pictures are on one of the approved trails?
	Where were the photos taken?
	This is not Tangle Lakes!!
	Caribou can make these.
	Motorized use shouldn't be allowed in these special areas; in addition, how do you prevent #1 from quickly turning into #2 & #3.
	If a designated ATV trail.
	Depends on how many.
	How big and where?
	1) Where is this? This is a disconcerting way to try and get people to vote against this and this and this?
	[Medium and higher impact photos 2 and 3] will look just like picture #1 after one year of no use. I have seen this over and over.
	This was a cause by a ATV. But it the fault of BLM to not let other people fix the trail.
	This is not Tangle Lakes!!
	Caribou can make these.
	Motorized use shouldn't be allowed in these special areas; in addition, how do you prevent #1 from quickly turning into #2 & #3.
	I do not believe these pictures were taken in the Delta River corridor. Would appreciate to know the mile post. It is not down the river or in front of our place - people have not been able to go down the corridor for years.
	NO ATV (motorized use) in the corridor.
	Acceptable on what grounds? Photo 3 may be fine in the eyes of an ATV rider - unacceptable to a biker and may or may not be acceptable in terms of erosion and runoff into creeks depending on location.
	BLM should utilize their resources to fix these area rather than spend money on surveys, hiring more managers, & creating a huge bureaucracy.
	Those trails may not look good to some people but they are a very small part of all land in Alaska if you do not like it go to the majority of the state and Fed. Land that is restricted.
Photo's 1-2-3 can be found any different times - Depends on use - Have seen all - #3 will be like #1-2 in one year - Depends on use, weather, etc.	
I believe that the main ATV trails should remain in the Delta corridor. But be restricted to them. No restrictions what so ever for snowmachines in the winter.	
Obviously I am NOT pro-ATV. In a nation where obesity is epidemic, I see no reason to allow ATV's in otherwise wilderness -type areas. These areas ARE open to use, but you have to use muscle-power to enjoy them. This is a good thing.	

### General, Longer, or Multiple-topic Comments

Dear Sir, Thank you for your work. We like this area and have had no problem with people or litter or ATV's. My concern is that it stay fairly close to wilderness-which has always been the way it was when we found it. We camped where we liked, only saw a couple of groups at established sites. The sign at the falls and the outhouse were our only intrusion. So much better than the National Park where you feel like a policeman or biologist is going to jump out of the bushes with a different regulation than the one you thought applied! I hate manicured trails, steps, bridges, signs, firepits, and all the other paraphernalia that goes with management. THANKS AGAIN! A Great place!
Don't restrict existing access trails - clean them up and improve them. It's a lot of country.
Horse damage is severe in some places.
I am strongly <u>against</u> a permit system or fee structure at this time!
I appreciate that this survey is being taken. Thank you! I have ridden ATV's on trails off the Denali Highway for the past twenty years. I also kayak the Delta River. I am an avid ATV owner / rider, but I strongly believe that ATVs should be kept out of this corridor. There are plenty of other ATV trails branching off the Denali Highway. I have traveled nearly all of them, and will continue to do so, but I believe that the Tangle Lakes / Delta River corridor should be free from ATV use for aesthetic and environmental reasons.

I love Alaska and have visited different areas 6 times including driving the Alaskan Highway, and I'll be back again.
I support management actions necessary to ensure that this special area is passed on undiminished future generations. This may include limits on launches and group sizes for floaters and limits/restrictions on use of motorized vehicles and boats. Thank you!
I understand that some people will only get out using ATVs. I believe their access should be limited to preserve terrain, not bother animals or non-motorized visitors. If ATV users want a mud hole - provide a mudhole for these adolescents. Other ATV trails upgraded to prevent further deterioration. Main Tangle Lakes Campground is definitely not a wilderness experience. Well, there are places. I have camped in a number of sandpits to avoid people.
Instead of spending so much effort pointing out what people do not like about other users - you should be working to develop tolerance amongst users - we all use the same space. Tolerance is the answer.
It's been a few years since I've floated the Delta River so I don't have a good feel for its current condition. I was planning a trip for this year but now-from the sound of your survey-it looks like I may be disappointed in the experience. I love the "Wild & Scenic" nature of this river in the past. It's my primary reason for going there. Solitude. Wildlife. Scenery. All accessible from the road system on either end. Places like these are too rapidly disappearing and I appreciate the chance to help protect it. Thanks for Listening.
I've floated the Delta River but I won't ever float it again because I know where the problems are coming from and I won't be a part of that problem. Mining & power boating have been part of the Delta River System well before the Wild & Scenic Rivers Act. The problems have developed since the river became an adventure system for floaters & advertised by BLM.
My trips to the area are from the early 80's to mid 90's.
Please keep the freedom we have in the Delta River corridor. I spent my honeymoon on the River - conceived a son and travel back to places on the river that hold these memories. Alaskan's have used powerboats on rivers & lakes for hunting, fishing, berry picking and scenic pleasure for years. To take away these privileges and give to "tourists" (floaters) is unfair to those who are full time in this environment.
Tangle Lake area/Denali Hgwy is a wonderful treasure for us, thank you.
Tangle Lakes Campground need to be expanded with more overnight sites. Old traditional campsites near bridge are now blocked. Old overnight sites are now day use only, which detracts from area.
Thank you at the BLM for your work on management!
Thank you for all the work you do. Please do not add a fee system but limit motorized access and the pressures will balance out.
Thank you for the opportunity to fill out this survey. I look forward to many years of use in this are.
The area is a fantastic, accessible recreation resource that needs to be maintained for future generations. I appreciate the challenge you face. If there are volunteer opportunities to assist, I would be interested.
The most important things you can do are 1.) prohibit motorized watercraft of all kinds (with the possible exception of electric motors on Round Tangle) and 2.) enforce that prohibition & prohibitions on ATV use off designated Trails. Thanks for this Opportunity.
We were extremely distressed to see motorized boaters on the lower Delta River last September.
We had a great trip - good campsite, privacy, and good fishing. Main problem was the smoke from forest fires. We could have used maps designating campsites & portage more accurately. Very hard to get a good map! Had a heck of a time finding one portage [Upper Tangles]. Thanks!
I applaud your efforts to manage use. Although this was my first trip (2004), I was really happy to find a road accessible lake system in the interior, which still had a "semi-wilderness" feel once you got away from the Round Tangle Lake. PLEASE keep it this way. Don't allow motorized and/or mining interests to destroy it, as has happened in other places. Would be nice to have space for this! See notes scratched throughout.
I won't go on a heavy use weekend. I'll only plan one off season trip a year
Require guides with permits. Only guides can have permits - like Quetico superior. Get out of the business - give it to guides, regulate them. Ban ATVs.
I appreciate the concern and interest BLM is showing in preserving the Tangle Lakes area. It is a very special area. I have filled out the survey, but many of my answers may not be representative. My trip was in mid-August on my way home from a 3 week solo canoe/backpack trip on the Alatna river in the Brooks Range. It had been raining for a week, and the water level was high. I only encountered one party camping on Lower Tangle Lake, and saw no one for the rest of the trip. I had a great trip. If I had come in July and the weather had been good, I might have more complaints about the over use especially in relation to where I have been. As it was I cannot judge the need for permits and limitation on use except second hand. One thing that did bug me was the apparent ignorance of campers regarding toilet paper. I don't know if it is necessary to require people to carry out all their waste, but some education regarding carrying out or burning toilet paper rather than leaving it in a heap on the ground seems in order. I am not fond of outhouses, but in high use area they do solve problems. They would be less offensive than toilet paper piles.



<p>Along the same line, it may be that some people just don't know that aluminum foil does not burn! Nor do beer cans. It is hard to believe that people would despoil the area if they really knew how long their trash remained an eyesore. In general I am interested in wilderness experience, so I would vote against improvements unless they are required to preserve water quality or maintain some other aspect of the ecosystem. I see no reason to improve the portage trail or other trails. Extra side trails are a problem so perhaps better marking on the main trails would help keep people from wandering down other trails. That said, I can see that there could be a need for a venue for less experienced people to get on the water and do a river trip in a more amusement park like setting with neatly graveled portage trails etc. It just does not interest me.</p>
<p>We had a great trip - an Alaska showcase for my brother and then kids - affordable. The last thing the place needs is a mine nearby or more motors. Thanks.</p>
<p>I have no experience with ATV, don't like them and would prohibit them from wilderness.</p>
<p>Thank very much. I am a motorized and unmotorized user of the area. I would gladly go back to my canoe if motorized use was restricted / eliminated. It is a top 10 spot to visit.</p>
<p>I think the archeological value and assets of the area are largely ignored by the public who is probably unaware of what they are and the importance. I would certainly like to know more about what happened here in terms of geology and human history, so I am a better traveler.</p>
<p>I am 60 years old and cannot access many areas for hunting or fishing without motorized access. The last time I used a boat on the lower river was approx 25 years ago. Fishing was great at that time. I could support an outboard horsepower limit on the river or lakes of 35 jet horsepower similar to the restrictions on the Kenai River. This would cut down on noise pollution, erosion, and boat size thus party size also unless they have more than 1 boat. I use my small 16 foot river boat for hunting near and around the upper tangles. It's the only way I have to access this area. ATV use. I have used 3 and 4 wheelers since 1983. They have been a large part of my outdoor experience. Most people cannot afford an plane or large track rig but the average person can access the trails with 4 wheeler. I have long considered problems such as seen in Photo 3 of your survey. All or most of these areas as in photo 3 look like fertile soil. Consider this solution. Set up a track rig as a mini hydro-seeder. Every spring send out a crew to hydro-seed the bad spots. I do not know the proper seed or fertilizer -- that's for your experts. But I think this could mend some areas and would help all areas. It would most likely have to be done every spring. The construction people do this on new road construction and with the aid of jute can stop erosion even on gravel hill sides. If you can come up with an acceptable seed I think this could work.</p>
<p>Good luck with the survey. This is one of the most beautiful places on earth. I applaud effort to conserve and preserve it.</p>
<p>I'm sorry to take so long to return this survey and appreciate the reminder. My moose hunt via canoe in 2003 was one of the nicest experiences I've had. Please work to decrease/eliminate ATV impacts, motorized boats, and jet skis impacts. Keep the area a controlled-use area that allows traditional - hiking, canoeing priorities.</p>
<p>I have been floating the Delta for 40 years and also have experiences with permits on the Green River, Utah, Middle Fork and the Grand Canyon. I would be happy to participate in further discussions about the mechanics of permitting.</p>
<p>I have been coming to Tangle Lakes since 1961 and I still enjoy the experience. Please continue to keep it in this condition.</p>