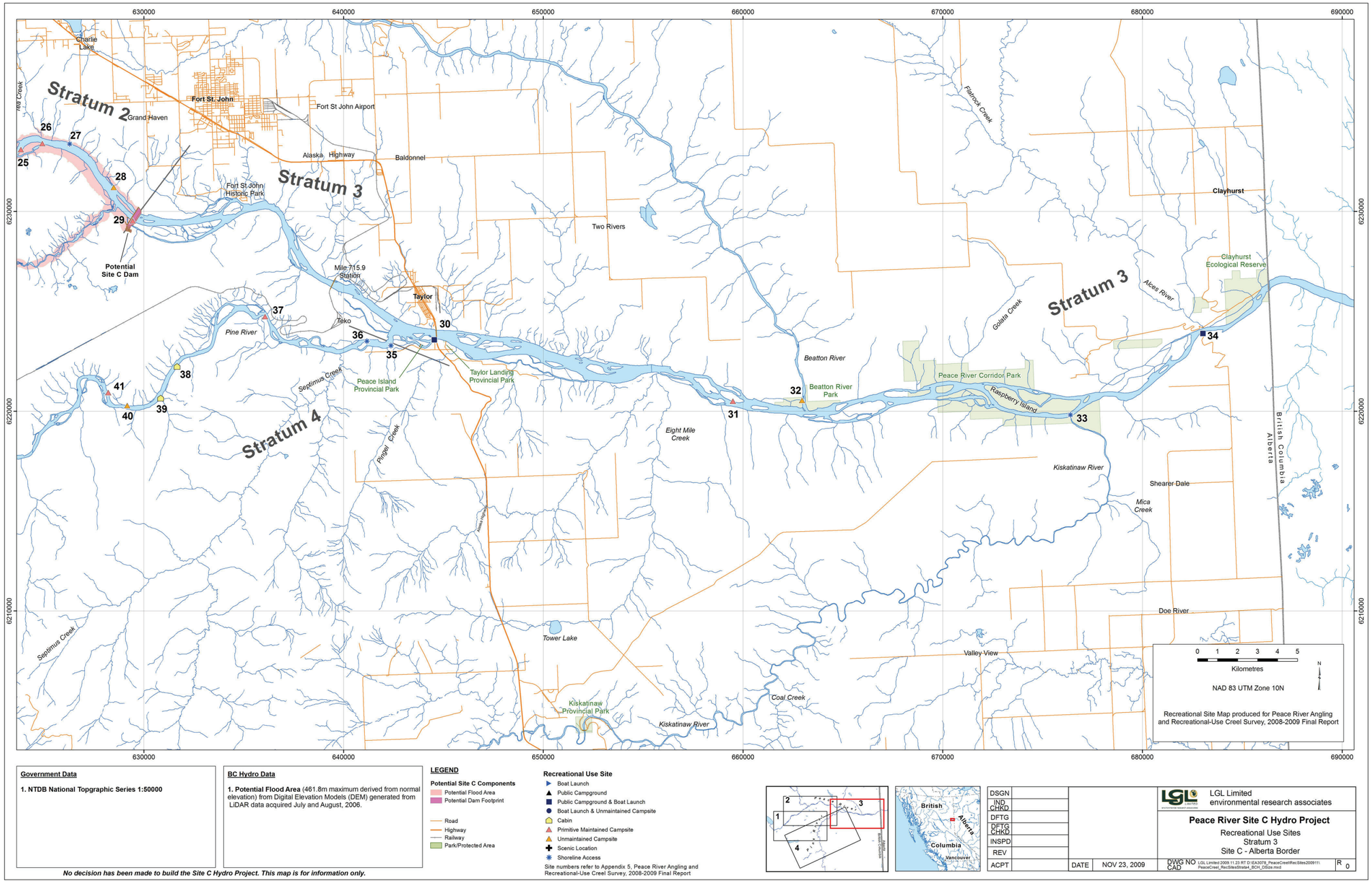

Figure 11 (continued).

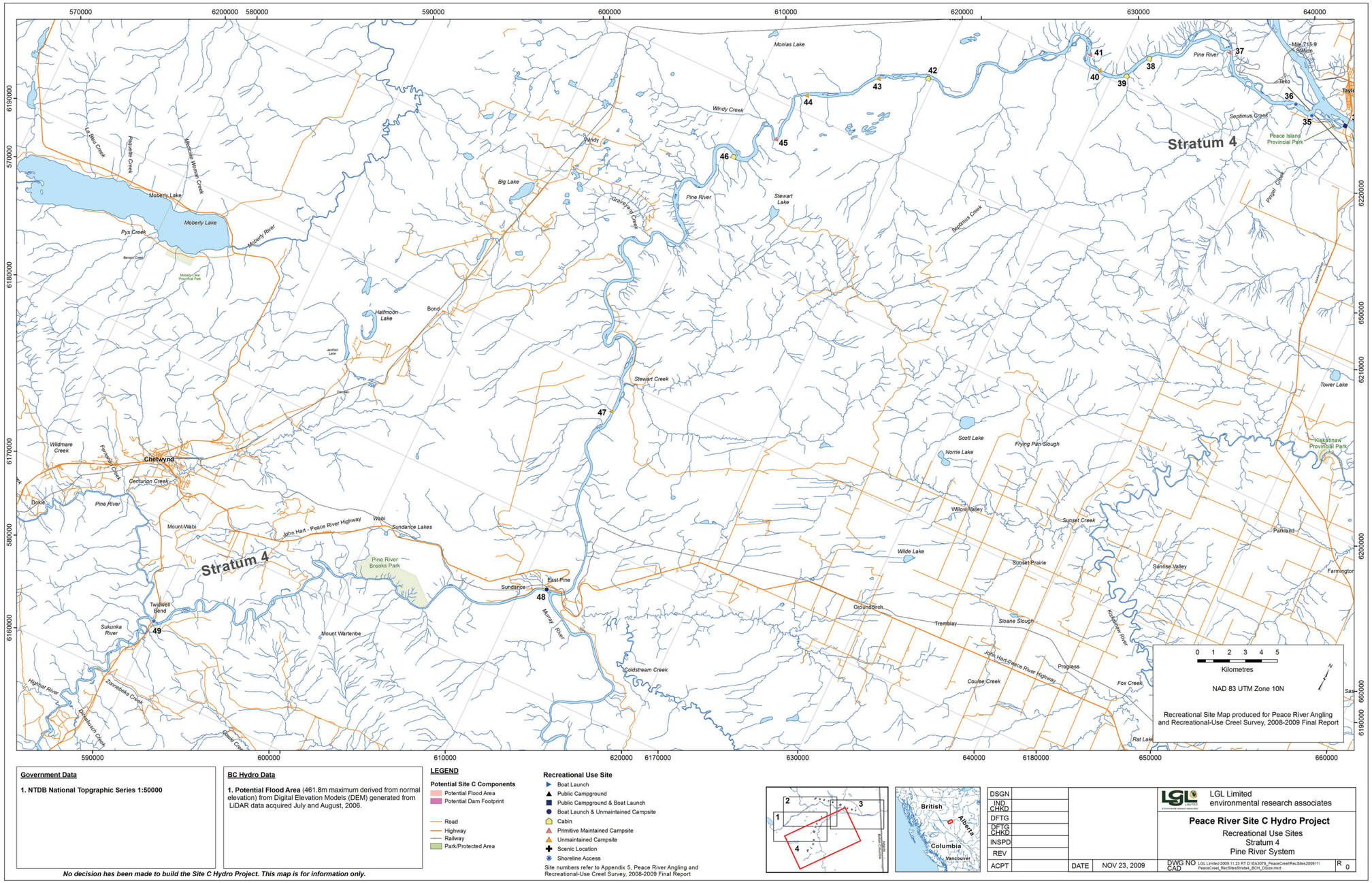

Figure 11 (continued).

300 cross country skiers active in the Peace Valley, and many informal outings occur on un-groomed trails. The club reports that some members do ski along the Peace River, however this often proves difficult as skiers must cross private land. The Northland Trailblazers Snowmobile Club has a membership of 50 people, 20 of which are active members. Snowmobiling does occur along the Peace River mainstem in various areas, but trails are sometimes blocked by landowners, and the terrain along the banks is sometimes difficult. The M.O.O.S.E. ATV Club, which has a membership of greater than 100 (current in 2007), has one trail which follows the Peace River just east of Peace Island Park to the confluence of the Beatton River, and another which follows the Halfway River. Recreation activities by these local groups occurring along the Pine River were not discussed.

Recreational Survey Results

Over the 17.5 month study period, 5,096 recreational users were surveyed during 1150 interviews. In all, 2671 users reported complete trips. In addition, 2580 users reported their previous-days activity. Data were pooled over years. Based on the percentage of people interviewed who said they were participating in each activity (Table 20), camping was the most common activity from May through September (44-51% of respondents), and jet-boating was the most popular in April, October and November (57%, 66% and 100% of respondents, respectively). Fishing was a popular activity until October; and hunting was popular in the fall. In the summer months, swimming, camping, picnicking and shoreline leisure were popular activities. Ten or fewer respondents were tabulated from December to March. Fishing was the predominant activity in the stratum from Peace Canyon Dam to Hudson's Hope, jet-boating was most popular in the stratum from Hudson's Hope to Site C and in the Pine River stratum, and camping was most popular in the stratum from Site C to the Alberta border (Table 21). In stratum from Peace Canyon Dam to Hudson's Hope, camping (29% of respondents) followed after fishing (44%) in terms of popularity. In the stratum from Hudson's Hope to Site C, jet-boating, fishing and camping (32-38% each) predominated. In the stratum from Site C to the Alberta border, camping (49%) and jet-boating (45%) were the leading recreational activities. In the Pine River stratum, jet-boating was the main use (84%).

Recreational use of the Peace River area varied depending on day type (Table 22). However, camping (43-46% of respondents) and jet-boating (30-39%) were the two most common activities, regardless of day type. Fishing activity was relatively insensitive to day type (16% of respondents on both weekdays and weekend/holidays).

In terms of river access, participants said they used Peace Island Park more than any other site from early spring to late fall (Table 23) regardless of day type (Table 24). Of the participants who accessed the river from Peace Island Park, 10% passed the potential Site C location by moving into the HH-C or PCD-HH strata; and 30% traveled into the Pine River. It should be noted that snow and ice closed the boat launches at Highway 29, Hudson's Hope, Lynx Creek RV Park, Farrell Creek, and Halfway River Bridge over the winter months. Regardless, ten or fewer respondents were tabulated from December to March, making results tenuous.

Table 20. The percentage of people interviewed who said they were participating in each activity, by month. The largest values for each month are shown in bold font.

	Month											
Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fishing	30	**100**	**100**	25	25	15	15	14	16	20		
Hunting					1	0			13	46		
Birding					3	0						
Wildlife Viewing					6	0	0		1			
Jet boating				**57**	25	22	**47**	40	32	**66**	**100**	
Boating					1	6	2	1		2		
Canoeing					1	2	0	1	1			
Kayaking					1	0	0	0	1			
Swimming						1	3	7	5			
Plant Gathering						0						
Rock/Fossil Hunting					2	0						
Picnicking				13	17	9	7	7	6	16		
Camping				7	**44**	**50**	**47**	**45**	**51**	11		
Hiking	20			1	2	2	1	1	1			
Shoreline Leisure					8	9	20	9	3			
Other	**50**			8	6	9	3	1	3			**100**
People Interviewed	10	3	2	178	485	1259	1598	1438	644	91	13	1

Recreational Activity Patterns

Recreational activity patterns, pooled over years, are plotted by month (Figure 12), by river stratum (Figure 13), by day type (Figure 13), and by access method (Figure 13). During over-flights, land and water-based recreational users were not distinguished, thus it was necessary to pool recreational activity data by access method, despite an obvious difference in pattern between them: shore-based activity was consistent over time due to the popularity of all-day activities such as camping, whereas water-based activities were concentrated during daylight hours.

For subsequent analyses, interview data were pooled across years, access methods and river strata; and monthly data were pooled into two seasons: “winter” (October-April) and “summer” (May-September). Activity in summer was more consistent over time due to the increase in popularity of all-day activities such as camping, but also due to the increased proportion of daylight hours in each day.

The pooling resulted in sample sizes of 65, 1659, 151 and 3372 for weekday users in winter, weekday users in summer, weekend/holiday users in winter, and weekend/holiday users in summer, respectively. Recreational activity patterns differed by day type and season (Figure 14). Summer activities extended later into the day, compared to winter activities. In summer, weekday activities peaked in the evenings (‘after work’), whereas weekend and holiday activities peaked in the middle of the day.

Table 21. The percentage of people interviewed who said they were participating in each activity, by river stratum. The largest values for each river stratum are shown in bold font. Abbreviations are as in previous tables.

	River Stratum			
Activity	PCD-HH	HH-C	C-AB	Pine
Fishing	**44**	33	6	4
Hunting	1	3	2	4
Birding	1	1	0	
Wildlife Viewing	2	2	0	0
Jet boating	10	**38**	45	**84**
Boating	1	2	2	2
Canoeing	2	1	1	0
Kayaking	1	0	0	0
Swimming	1	1	3	4
Plant Gathering			0	
Rock/Fossil Hunting	1	1	0	
Picnicking	7	7	8	6
Camping	29	32	**49**	11
Hiking	4	1	1	0
Shoreline Leisure	11	6	11	4
Other	2	3	4	4
People Interviewed	712	1271	3872	1197

Recreational Activity Levels

From the over-flight data, total recreational effort was estimated for each month, day type and river stratum (Table 25). Total recreational activity was strongly influenced by month ($\chi^2_6 = 28.2$, $P < 0.0001$), river stratum ($\chi^2_3 = 11.9$, $P = 0.008$), day type ($\chi^2_1 = 6.9$, $P = 0.009$), and season ($\chi^2_1 = 24.3$, $P < 0.0001$). After adjusting α for the number of tests performed (i.e., using the Bonferroni adjustment), all of these effects remained statistically significant.

Total annual recreational activity (i.e., the sum of the 12 monthly estimates) summed across all strata was estimated to be 144,892 user-hours per year (Table 25). July and August were the months with the greatest activity (over 40,000 user hours per month), followed by June (~33,000 user hours), May and September (~12,000 user hours each). On average, there was ~350 hours of user activity per month in April, and ~225 hours per month from October to March (Table 25).

Recreational activity was distributed over the entire study area (Table 25), with 3% in the relatively small stratum from Peace Canyon Dam to Hudson's Hope, 25% occurring from Hudson's Hope to Site C, 37% between Site C to the Alberta Border, and 35% in the Pine River watershed.

Table 22. The percentage of people interviewed who said they were participating in each activity, by day type. The largest values for each day type are shown in bold font.

	Day Type	
Activity	WD	WE
Fishing	16	16
Hunting	4	2
Birding		0
Wildlife Viewing	0	1
Jet boating	30	39
Boating	1	3
Canoeing	0	1
Kayaking	0	0
Swimming	5	3
Plant Gathering		0
Rock/Fossil Hunting	0	0
Picnicking	8	8
Camping	**43**	**46**
Hiking	2	1
Shoreline Leisure	13	10
Other	4	4
People Interviewed	1279	4443

Table 23. The percentage of people interviewed who said they used each access site, by month. The largest values for each month are shown in bold font.

	Month											
Access Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Highway 29 Bridge				2	5	3	1		0	3		
Alwin Holland Park				6	14	6	4	11	7	7		
Hudson's Hope Launch			**100**	18	8	1	4	1	1	1		
Lynx Creek Launch	20	**67**		12	6	7	7	3	8	2		
Lynx Creek RV Park					22	7	6	5	6	9		
Farrell Creek Mouth		33			1	0	0					
Halfway River Bridge	**50**				3	1	2	4	1	20		
Peace Island	30			**48**	**28**	**56**	**60**	**65**	**60**	**44**	**100**	**100**
Clayhurst				11	16	10	9	7	7	11		
East Pine					1	1	2	1	4			
Twidwell Bend				3	1	0	5	2	4			
Sukunka FS Road					1	9		0	1	3		
People Interviewed	10	3	2	178	485	1259	1598	1438	644	91	13	1

Table 24. The percentage of people interviewed who said they used each access site, by day type. The largest values for each day type are shown in bold font.

	Day Type	
Access Site	WD	WE
Highway 29 Bridge	3	1
Alwin Holland Park	10	7
Hudson's Hope Launch	5	2
Lynx Creek Launch	5	7
Lynx Creek RV Park	5	8
Farrell Creek Mouth	0	0
Halfway River Bridge	4	2
Peace Island	**51**	**59**
Clayhurst	13	8
East Pine	4	1
Twidwell Bend	1	3
Sukunka FS Road	0	3
People Interviewed	1279	4443

The average number of hours per day spent on recreational activities was calculated by day type and season. Averages were 6.58 hours for 'weekdays in winter', 6.66 hours for 'weekend/holidays in winter', 8.62 hours for 'weekdays in summer, and 9.31 hours for 'weekend/holidays in summer'. Using these averages, total annual activity summed across all strata was estimated to be 15,909 user-days per year.

Comparisons between Years

Recreational activity patterns were similar between years (Figure 15).

Summertime recreational activity levels increased by 14% from 2008 to 2009 (Figure 16). The increase was marginally more pronounced on weekend/holiday days (16% increase) compared to weekdays (9% increase). Most of the increases occurred in June (101% increase) and Sept (354% increase), whereas July levels were relatively unchanged, and levels in August declined by 38% from 2008 to 2009(Figure 16).

The increases in summertime recreational activity was largest in the stratum from Site C to the Alberta border (104% increase), and in the stratum from Hudson's Hope to Site C (60% increase). In contrast, summertime recreational activity levels in the Pine River declined by 46% from 2008 to 2009.

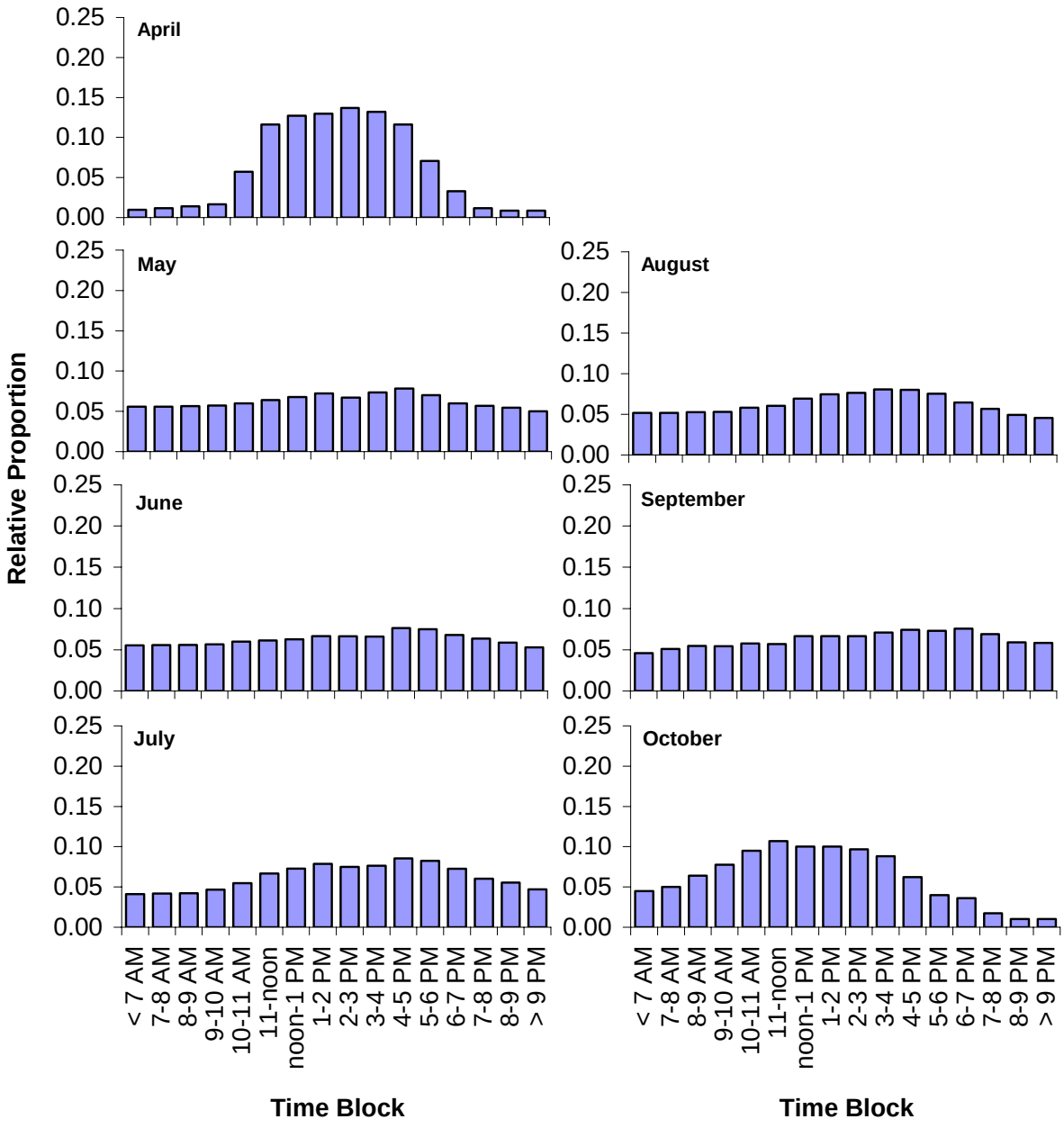

Figure 12. Recreational activity patterns, by month (Nov-Mar were data deficient), from interview data collected from 15 May 2008 through 31 October 2009.

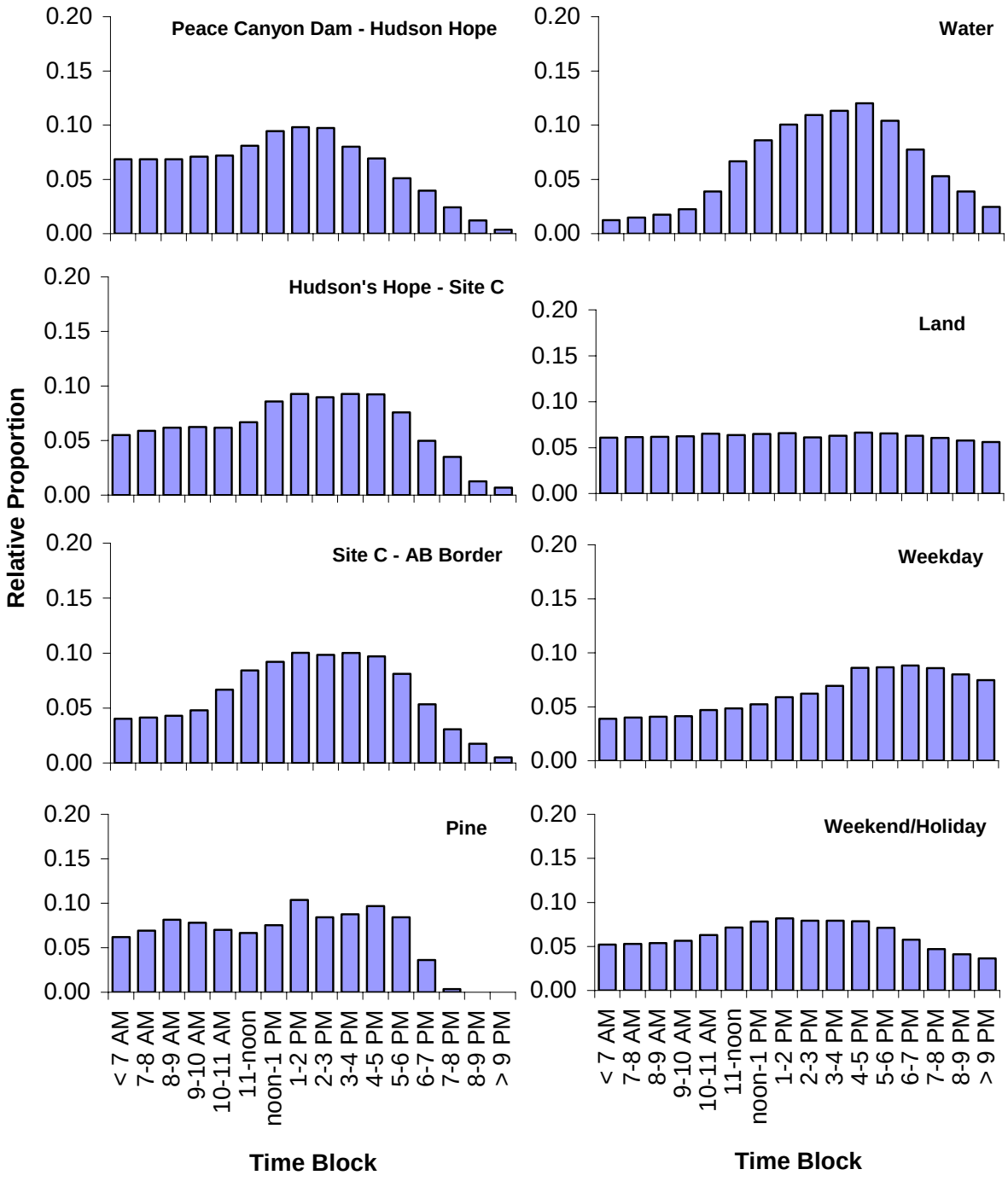

Figure 13. Recreational activity patterns, by river stratum (left column), access method (upper right column), and day type (lower right column) from interview data collected from 15 May 2008 through 31 October 2009.

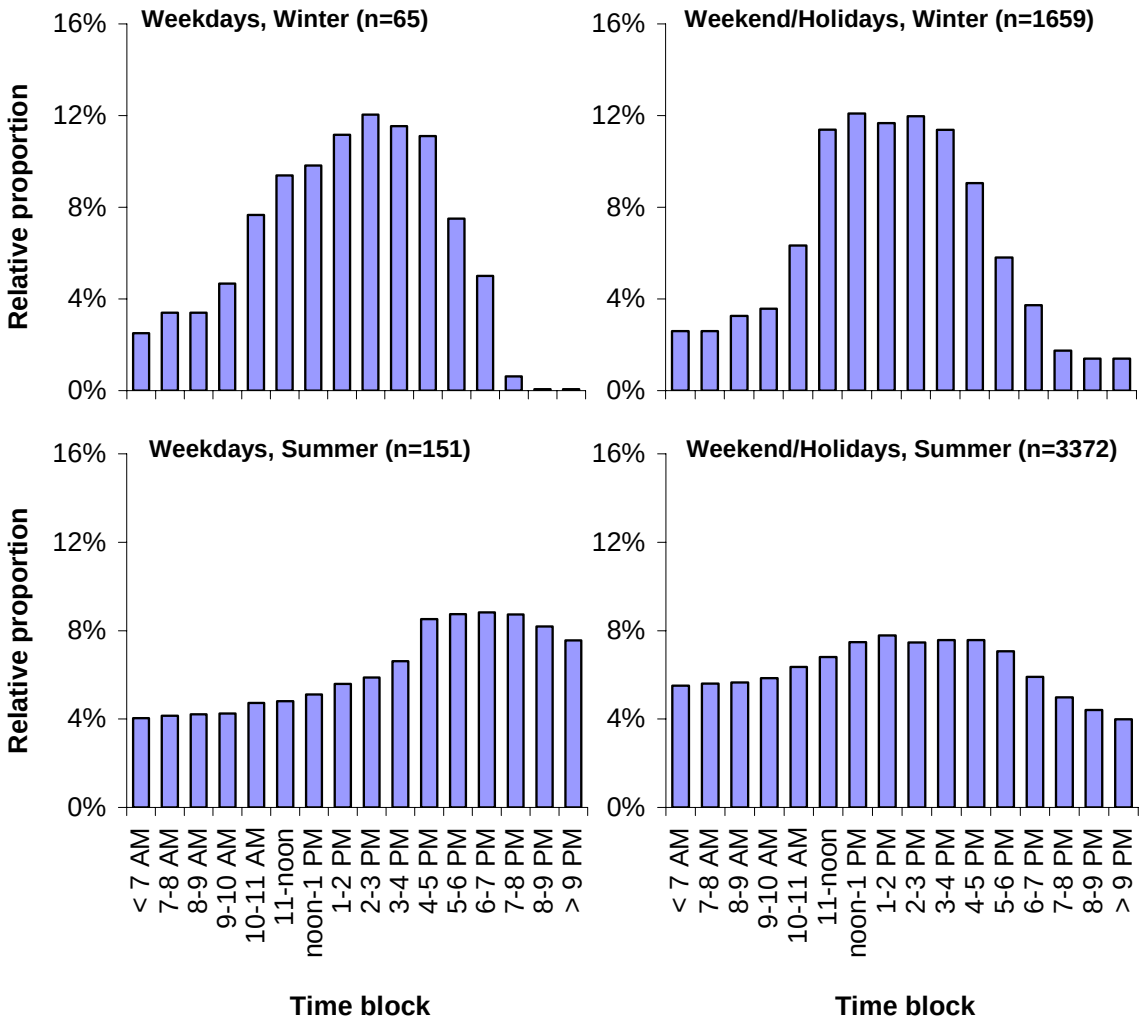

Figure 14. Recreational activity patterns, by day type and season, from interview data collected from 15 May 2008 through 31 October 2009.

Table 25. Recreational activity levels (recreational-hours per month), by month, day type and river stratum. Standard errors in parentheses. Abbreviations are as shown in previous tables.

		River Stratum			
Month	Day Type	PCD-HH	HH-C	C-AB	Pine
April	Weekday	0	0	0	0
	Weekend	0	44 (59)	220 (293)	84 (111)
May	Weekday	0	1,423 (1,808)	185 (309)	117 (196)
	Weekend	1,099 (1,780)	4,095 (6,635)	3,482 (5,039)	1,674 (2,244)
June	Weekday	0	472 (315)	689 (607)	239 (275)
	Weekend	1,126 (628)	6,334 (2,774)	16,853 (12,161)	7,350 (6,476)
July	Weekday	344 (792)	5,309 (7,539)	5,017 (4,323)	6,483 (6,241)
	Weekend	335 (263)	3,653 (2,171)	9,291 (7,471)	10,887 (6,241)
August	Weekday	76 (110)	1,949 (1,195)	2,100 (2,332)	2,701 (2,153)
	Weekend	950 (1,316)	8,639 (5,208)	11,068 (9,544)	16,640 (11,800)
September	Weekday	60 (116)	1,508 (208)	616 (1,033)	2,048 (2,280)
	Weekend	141 (165)	2,707 (1,801)	3,006 (3,766)	2,527 (2,706)
Oct-Mar	Weekday	0	0	87 (208)	n/a
	Weekend	0	42 (90)	96 (208)	n/a

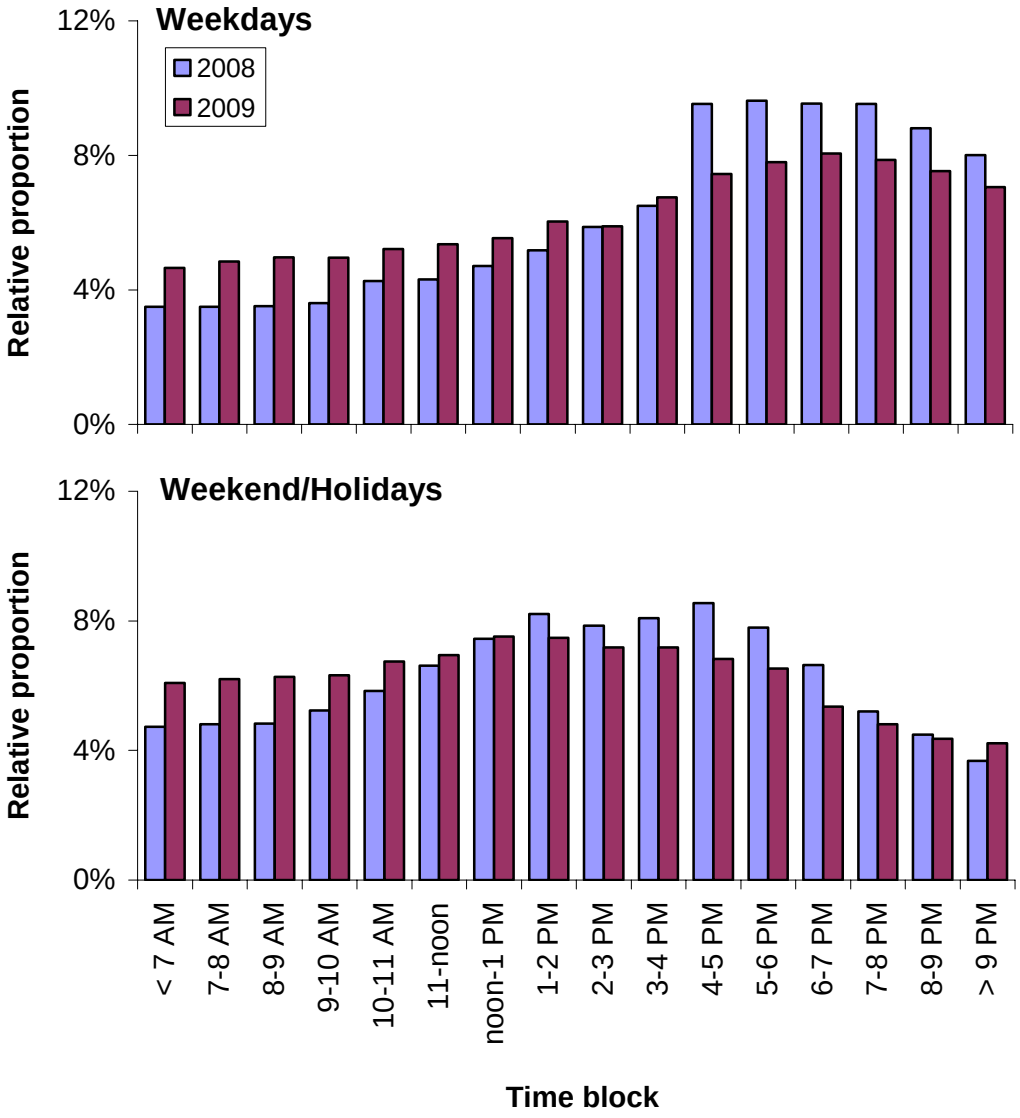

Figure 15. Comparison between 2008 and 2009 of summertime activity patterns of Peace River recreational users on weekdays and weekends/holidays..

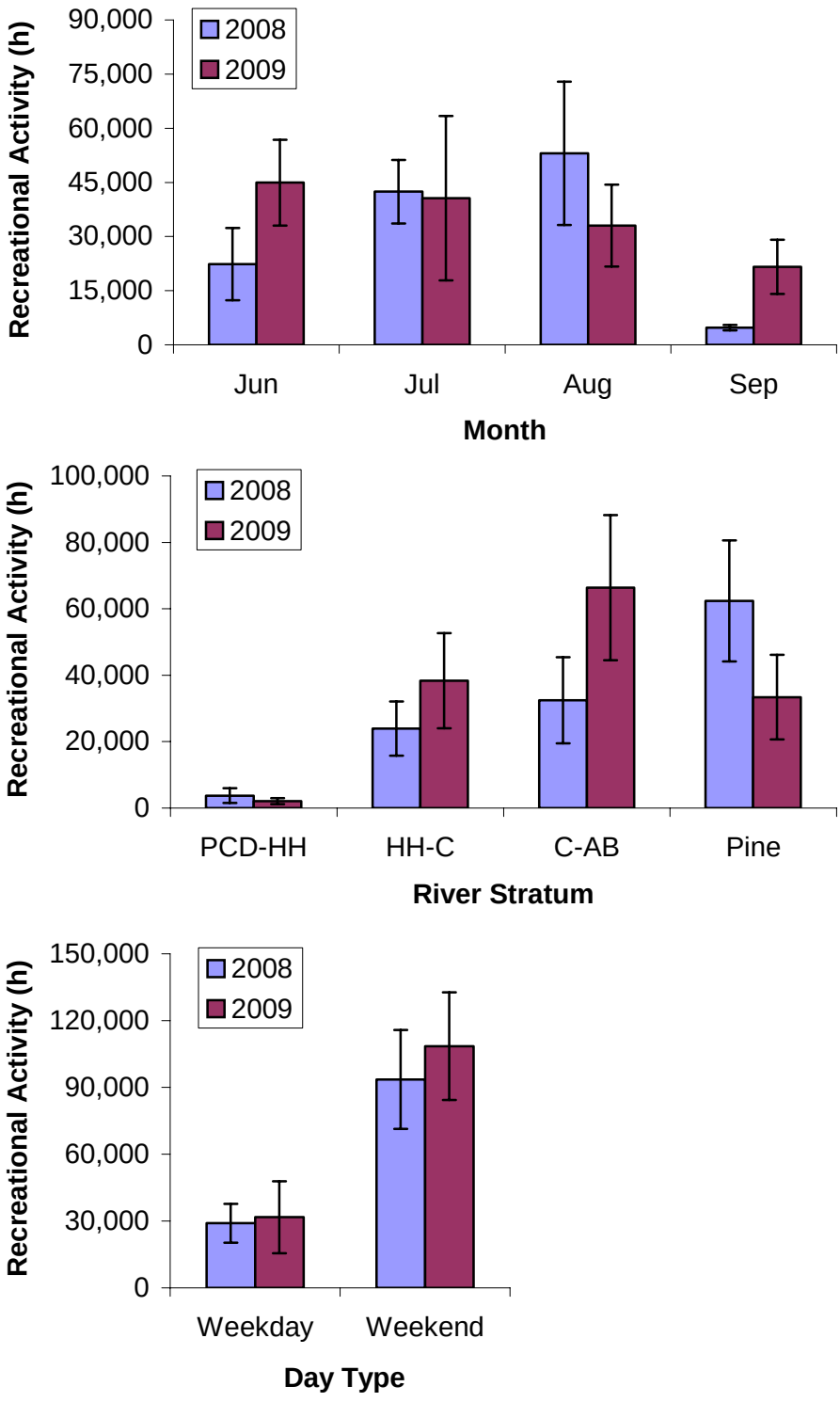

Figure 16. Comparison between 2008 and 2009 of recreational activity levels by month (upper panel), river stratum (middle panel), and day type (lower panel). Data include June to September activity only.

Recreational User Characteristics

The recreational users interviewed were overwhelmingly from the local area (Table 26), especially in the winter. Overall, 84% of recreational users were from the Peace River area, 6% were from the rest of BC, and 8% were from the rest of Canada. The average age of recreational users was 32 years. 22.5% of respondents were under the age of 16 years. Over all, 59% of respondents were between the ages of 20 and 49 (Figure 17).

Of the 2809 recreational users that were interviewed, 50 (<1%) said they were making use of a guide as part of their activities (Table 26). The 50 users were in two parties of 25 people each, and were enumerated in two interviews in the summer of 2008 (22 June and 1 July). Both groups were made up of documentary filmmakers, thus were arguably not 'recreational' users, *per se*.

Table 26. Characteristics of recreational users interviewed from 15 May 2008 to 31 October 2009, by month.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Overall
Number of Users	7	0	0	136	410	1128	1454	1314	560	73	0	0	5096
% led by Guide	0%			0%	0%	2%	2%	0%	0%	0%			0.98%
Residence													
% Peace Area	100%			77%	90%	78%	87%	89%	74%	95%			84%
% Rest of BC				13%	6%	7%	5%	3%	16%	3%			6%
% Rest of Canada				10%	1%	12%	7%	7%	10%	3%			8%
% US					2%	2%	1%	0%	1%				1%
% Other					1%	0%		1%	0%				0%

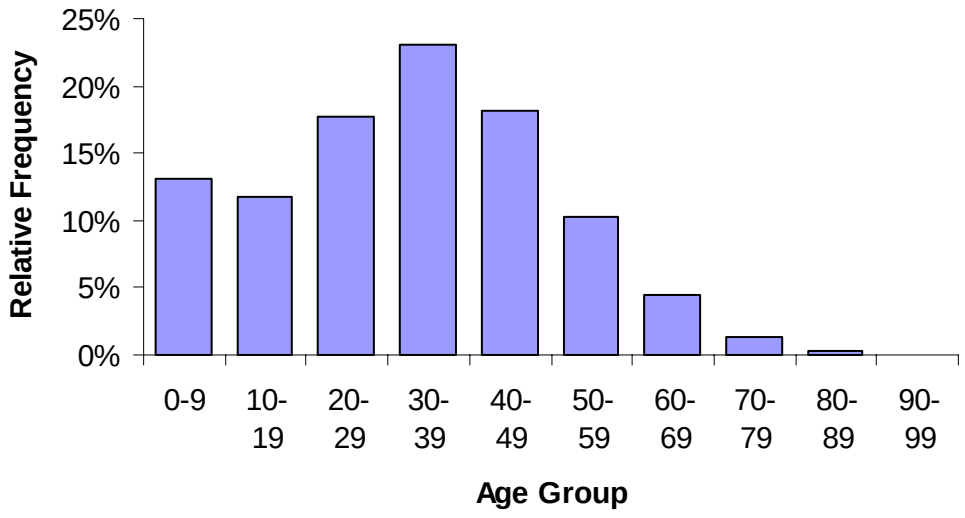

Figure 17. The age distribution of recreational users interviewed from 15 May 2008 to 31 October 2009.

Interviewees were also asked where else they have previously gone or planned to go for recreational activity. The top 10 responses (accounting for >75% of the choices) were all within the Peace region and included: the Peace region; the Peace River; Peace Island Park; and Halfway, Pine, Murray and Moberly rivers (Table 17).

Supporting Businesses

As of the end of December, 2008, a total of 143 businesses which may support recreational use in the Peace River area were identified, of which 114 were located in Fort St. John, seven in the District of Taylor and 22 in the District of Hudson's Hope (Table 27). The majority (81) of these were categorized as 'Service' and included such business types as food stores, restaurants, sporting goods stores and outfitting / adventure companies. In addition to 'Service,' businesses classified as 'Accommodation' (40) included hotels, motels, bed & breakfasts and campgrounds while those considered 'Transportation' (22) included gas stations, and rental facilities for RVs, all terrain vehicles and snowmobiles.

Table 27. Total number of businesses that support recreational use along the Peace River, by business type (as of December 31, 2008).

Business categories supporting rec use	Municipality			Total
	City of Fort St. John	District of Taylor	District of Hudson's Hope	
Accomodation[1]	26	3	11	40
Service[2]	69	3	9	81
Transportation[3]	19	1	2	22
Total	114	7	22	143

[1] Accomodation includes hotels, motels, bed & breakfasts, campgrounds, etc.

[2] Service includes food stores, restuarants, sporting goods stores and outfitting / adventure companies.

[3] Transportation includes gas stations, RV, all terrain vehicle and snowmobile rentals.

DISCUSSION

Estimates of Angler Effort and Catch

Confidence Limits

Typical of creel surveys, this Peace River creel analysis produced estimates with a relatively low level of precision. In many cases, the standard errors of estimates are as large as the estimates themselves (Table 11). To understand why, it is important to know that the variance in the catch estimates result from two factors: 1) the natural variability within the population; and 2) the sampling error. In the present study, both factors played important roles in generating variability in the estimates, and each is discussed below.

One of the main factors affecting estimation error is natural variability. The natural variability in catch rates is such that they tend to follow a negative binomial distribution: most catches are of zero fish; and the larger the catch the rarer the event. For example, the rainbow trout CPE for the Peace River study area was 0 fish per angler-hour for 217 of the 290 angler parties interviewed, <1 fish per angler-hour for 41 other parties, was >1 for only 32 parties, and only two groups had catch rates over five fish per rod-hour. If catches always tended to be the same, then there would be considerably less variability in the CPE estimates. However, given the wide range of possible outcomes for a fishing event, it is difficult to predict with confidence how many fish an angler is going to catch. This difficulty translates into wide confidence limits around the any estimate of total catch.

Sampling error is the other main source of estimation error. As with any sampling program, the confidence you have in your final estimate is greater when a larger proportion of population has been sampled. In this study, the number of interviews per month ranged from 13 (October to March, pooled) to 86 (July); this equates to 0.8 to 5.3 interviews for each of the 16 "day type × access method × river stratum" categories (Table 4). With catches expected to be widely variable, it follows that the precision of estimates drawn from a sample of $n \leq 5$ would be low. One solution is to pool data among categories, but this is not ideal since we know *a priori* that catch rates differ among years, months, river strata, and between boat and shore-based anglers. For example, we pooled data from 2008 and 2009 in an attempt to increase precision of our monthly catch estimates (for the May through September period), yet effort and catch both varied widely between years, thereby increasing the natural variability in the pooled sample. The other solution is to increase interviewing and over-flight effort. To simulate a doubling of survey effort, all interview and over-flight data was copied twice into the model platform, which resulted in a reduction of total catch standard error from 83% down to 51%. Thus, even if sampling effort had been doubled, standard errors in our catch estimates would still be relatively large.

In addition to the preceding discussion about precision of the creel results, a comment should also be made about their accuracy. The accuracy of our creel methodology is only as good as that of the data provided by the anglers to the interviewers. In this study, interviewers were able to inspect very little of the catch that was reported by anglers. For

the most part, corroboration of catch rate data was impossible, since the majority of the reported catch was released after capture. In addition, inspection of the harvested fish was rarely permitted. Without verification of the catch, we cannot be sure of the level of accuracy of the data provided by the anglers to the interviewers, a caveat that must be made clear when the results of this report are interpreted.

Data Pooling

In this report, both the angling and recreational interview data were pooled across years in order to produce monthly estimates of the highest possible precision. We did not have 24 full months of interview data, thus it did not make sense to produce two separate annual estimates. Without data pooling, we could have produced 16 monthly angling estimates (from June 2008 to September 2009) and 17 month recreational use estimates (from June 2008 to October 2009), but each would have been highly imprecise due to the limited number of interviews obtained. In fact, so few interviews were conducted from October to March that we had to pool all six of these months together for proper analyses. In the end, it made more sense to combine the data from both years in the hopes of producing reasonably accurate estimates for the four months for which we had 'double the sample size'. Differences between years were presented wherever possible, but limited sample sizes and wide confidence limits meant that the results must be interpreted with caution.

Angling Survey Results

This study provides CPE and catch data for all six fish species identified by the BC Ministry of Environment as 'indicator species' for the assessment of management objectives (MOE 2009). Many of the results presented in this report will act as baseline data that will allow development of empirical relationships to link the physical impacts from Site C to factors such as fishing effort, distribution of fishing effort, catch per unit effort, species harvested, and catch rate. Such that our results may feed into such models, we have included with this report a data appendix (Appendix 7) which includes all the detailed output from the creel analysis.

Total annual angling effort was estimated to be 24,622 angler-hours (SE = 20,106), or 6,757 angler-days. This estimate included 18,489 angler-hours in the Peace River mainstem (SE = 14,393), and 6,134 angler-hours in the Pine River watershed (SE = 5,714; Table 9). About 20 years prior (from 1989 to 1990), a similar creel survey of the Peace River mainstem was conducted (DPA 1991), which found similar levels of angler effort: a total of 18,510 angler-hours between Peace Canyon Dam and Taylor. The similarity of these effort estimates, despite 20 years difference between the studies, is not surprising given that the overall demand for recreation and tourism appears to be declining in the Peace area (Lion's Gate Consulting et al. 2002), and population growth has not kept up with projections (MacLaren Plansearch 1991). On the other hand, this study and DPA's results contrast strongly with those of another survey from the 1980s (Hammond 1986). Hammond (1986) estimated total angling effort for a limited part of our study area (from the Peace Canyon Dam to Farrell Creek) over a five month period (June to October, 1985) to be 16,898 angler-hours: a value similar to what we found for

the entire Peace River over the entire year. Given that our catch rates varied widely between 2008 and 2009, it is possible that some of the differences among studies resulted from year-to-year variability in angler effort levels. However, it is also important to note that our confidence limits are large (the standard errors are nearly as large as the estimates), and Hammond's calculation methods are not described, thus the reasons for the differences between reports cannot be determined. Nevertheless, the disagreement between the Hammond (1986) and DPA (1991) results may call into question the validity of any comparisons of our angler effort estimates to those from the late 1980s.

The annual catch estimates showed that mainstem catches were dominated by rainbow trout (1,786 fish, SE = 1407), bull trout (983 fish, SE = 850), mountain whitefish (978 fish, SE = 1009) and walleye (638 fish, SE = 701; Table 11). Mainstem catches of Arctic grayling, northern pike and goldeye were estimated to be 395 (SE = 314), 350 (SE = 655) and 242 (SE = 398), respectively. Hammond (1986) reported a similar dominance by rainbow trout, and found whitefish to be the next most frequently caught species (with a similar rainbow-trout-to-whitefish ratio as in our study). Contrary to our results, Hammond (1986) reported bull trout and Arctic grayling catches to be very minor, and did not even mention walleye (the latter likely due to the location of his study area in the upstream sections of our area). DPA (1991) reported a total catch estimate (9,782 fish), which was similar to that presented here. DPA (1991) reported mountain whitefish to be the species most commonly caught, followed by rainbow trout and Arctic grayling. Similar to Hammond (1986), DPA (1991) reported very little catch of bull trout, or walleye. For example, DPA (1991) reported that kokanee was caught more often than walleye; whereas no kokanee catch was recorded in the current study. The increase in bull trout catch appears to be real: we estimated 42% of bull trout catches to occur above Site C (Table 11), whereas both previous studies (which were restricted to the upstream parts of our study area) found very little bull trout. The increase may have resulted from a bull trout population increase, an upstream shift in bull trout distribution, an increase in angler efficiency, or an increase in the proportion of anglers targeting bull trout over the last 20 years. It is also possible that some of the differences among studies were artifacts of year-to-year variability in angler effort levels, especially given the differences observed between 2008 and 2009.

A small fraction of the total Peace River mainstem catches were made in areas downstream of Site C, specifically ~1,725 fish (32% of total mainstem catch). Nevertheless, this proportion is considerably higher than the 6% reported by DPA (1991). Some of this difference may stem from the fact that our study area was larger than that in DPA (1991), including an additional 48 km of the Peace mainstem between Taylor and the Alberta border.

Mountain whitefish was not the most commonly caught species, despite community indexing studies (e.g., Pattendon et al. 1991, Mainstream Aquatics Ltd. and Gazey 2009) which shown it to be the most numerically dominant species in the Peace River. Mainstream Aquatics Ltd. and Gazey (2009) estimated mountain whitefish to be 10 times more numerous than Arctic grayling and 50 times more numerous than bull trout. Pattendon et al. (1991) estimated mountain whitefish to be 100 times more numerous than rainbow trout, and 80 times more numerous than walleye. Despite their numerical

domination, we estimated that Peace River mainstem catches of mountain whitefish were on par with bull trout and about half those of rainbow trout (Table 11). Although this could be evidence for a difference in catchability among species, it also stems from the fact that anglers preferentially targeted rainbow trout (34% of respondents) and bull trout (10%) over mountain whitefish (4%; Table 16).

The estimated catch of bull trout in this study can be partitioned into what is likely several different populations. Catch made in the Peace River mainstem was likely comprised primarily of bull trout that spawn in the Halfway River system, and that regularly move into the Peace River. Radio telemetry results (AMEC and LGL 2009b) indicated that 64% of the bull trout radio-tagged in the Halfway moved into the Peace River, both upstream and downstream of the Halfway-Peace confluence. In contrast, the bull trout that were caught in the Pine during this study were likely largely of the resident non-migratory population. Radio telemetry (AMEC and LGL 2009c) indicated that <5% of the bull trout radio-tagged in the Pine moved into the Peace River. Radio telemetry studies also showed that rainbow trout and Arctic grayling had strong fidelity to spawning tributaries. Thus, the Arctic grayling population in the Moberly (see AMEC and LGL 2009a) was likely that which was most vulnerable to anglers in the Hudson's Hope to Site C Stratum, whereas the fish caught in the Pine were likely resident there (AMEC and LGL 2009b,c). Rainbow trout radio-tagged in the Peace River showed fidelity to areas upstream of Site C (AMEC and LGL 2008), and those tagged in the Pine rarely moved downstream into the Peace River (AMEC and LGL 2009a,c). The majority of rainbow trout caught in the Peace and Pine rivers during this study were likely part of local populations.

The creel analysis produced several surprising results, which are discussed below. In particular, we discuss the lack of interviews with shore-based anglers on July weekend days in River Stratum 3; and the catches that were estimated in the Pine in August, which are based on very limited angler interview data.

One unexpected result was the lack of interviews with shore-based anglers on July weekend days in River Stratum 3. In both July 2008 and July 2009, three interview shifts were scheduled for each day type in each of the three mainstem river strata (Table 2). For weekend days in River Stratum 3, four shifts were scheduled for the Peace Island boat launch (5 and 26 July 2008; 18 and 19 July 2009), and two were scheduled for Clayhurst (27 July 2008; 26 July 2009). Although the 2008 Clayhurst interview shift did not occur (due to a change in interviewer staff), all other shifts were performed. However, one of these shifts (5 July at Peace Island boat launch) was during the "River Rats" jet-boating event: a total of 362 recreational users were interviewed, but the number of anglers (interviewed or not) was zero for the day. During the second Peace Island shift (26 July 2008), 19 anglers were interviewed, all of which were boat-based, and 14 anglers were not interviewed. The majority of these latter anglers would have been shore-based, observed fishing on the opposite bank of the river, thus not accessible for interview. In 2009, no shore-based anglers were observed in any of the three shifts. In the end, the CPE estimate for July shore fishers in River Stratum 3 was calculated by pooling the interview data with those from July shore fishers in River Stratum 2.

Catch estimates for the Pine River stratum (Table 11) were derived by pooling all the CPE values for that area (Table 6) because of the limited number of angler interviews (Table 4). The relatively large catch estimates for August reflect the high effort estimates for that month (2,585 angler-hours), relative to other months (September: 1566 h; July: 1479 h; April to June combined: 504 h; Table 9). Lower effort in the Pine in the earlier months was in part a result of extreme high water and turbid conditions that made fishing very difficult. There were also catch restrictions on bull trout that may have influenced fishing. Also, the poor quality of fishing below Peace Canyon Dam in August 2008 may have resulted in anglers shifting to the Pine. However, since the CPE estimate was likely unreliable for each month, the resulting catch estimates are equally unreliable. Angler interview effort along the Pine River would have to be substantially increased if reliable catch estimates are desired for this area.

Biosampling

During this study period, too few fish of each species were biosampled for strong conclusions to be drawn. Interviewers were not met with great cooperation from anglers when asked to inspect, weigh or measure the fish they landed. The lack of data precludes meaningful comparison to previous studies. Nevertheless, the mean weights and lengths presented in this report were within the expected ranges for these species in the Peace River (see Mainstream Aquatics and Gazey 2009).

Recreational Use Patterns

Recreational Site Assessments

The majority (29) of recreational use sites on the Peace River (and potentially inundated tributaries) have been documented within the potential inundation zone of Site C. Within the potential zone of inundation, all types of sites were present and all types of activities that were documented throughout the entire study area occur, with the exception of dog sledding (cross country skiing most likely occurs). This current assessment of 29 sites is comparable with past studies which have identified 40 (includes known sites and additional locations with evidence of some type of continuous use), six and 24 sites (Edwin Reid & Associates Ltd. 1979, DPA 1981a and MacLaren Plansearch Corp. 1991, respectively) with regard to potential affects from Site C. Some of the current sites assessed were also identified in these past studies, such as the Halfway River Bridge Boat Launch, which was identified in all three studies, while others were only noted in some, such as Farrell Creek (DPA 1981a, MacLaren Plansearch Corp. 1991). A portion of the current sites, in particular primitive campsites, unmaintained campsites and shoreline access sites, were not previously described. It is possible that some of the current sites were described in these past studies; however confirmation is difficult since detailed mapping and location descriptions were often lacking. Similar to our results, these previous reports also identified campsites as the most common type of site occurring; others included boat launches, view points, picnic areas and springs. Unlike the current study, site descriptions in some previous studies rarely mentioned fishing as an activity. A recent review of Site C related documents (Lions Gate Consulting Inc. et al. 2002) found that sightseeing, picnicking, canoeing, boating, fishing and hunting occurred

throughout the area as general recreation. The Lions Gate review also stated that many rustic campsites were unofficially developed by the River Rats Association in the 1980s and early 1990s; and these are believed to be the sites we are currently considering 'primitive maintained sites'.

Determining the types of activities that occur at the identified recreational use sites was difficult as users may not have been visiting the site or partaking in the particular activity on the day of the field assessments. This proved to be most difficult for winter activities, as field assessments were not done during this season and many sites experience less use during the winter. Recreational use during the winter season is inherently more difficult. Access is often an impeding factor as snow levels are a constraint at many sites. Also, sites which are only used during winter may not have been identified, since fewer local residents are aware of them. Due to these factors, it was particularly important to hold discussions with local recreational groups and residents to determine where and how often the activities occurred throughout the Peace River area. These discussions suggested that recreational activities occur in many areas along both the Peace River mainstem and the Halfway River, in particular for the winter-based activities which may span more than designated sites.

While the recreational use site assessments indicate the majority of sites occur within the inundation zone, the recreational surveys remind us that various recreational activities occur throughout all strata. Documentation of recreational use sites and recreational surveys also both indicate extensive recreational activities occurring throughout the Pine River.

Recreational Activity Survey Results

The results of the recreational use surveys indicated that camping and jet-boating were the most popular summer-time recreational activities in the Peace River area. The jet-boating 'season' appeared to be more protracted than that of camping, which appeared to start later in the year, and end earlier than jet-boating. Jet-boating was the most popular activity in the Pine River, and camping was most popular in the Peace River between Site C to the Alberta border.

Fishing was the most popular activity between Peace Canyon Dam and Hudson's Hope. As a recreational activity, fishing appeared to be of relatively constant popularity (14 to 25% of respondents) from April until October (regardless of day type).

Total annual "non-fishing" recreational activity (Table 25) was estimated to be 144,892 user-hours (SE = 125,521), or 15,909 user-days. This estimate included 94,141 hours (SE = 84,797) in the Peace mainstem (10,353 user-days), and 50,751 hours (SE = 40,724) in the Pine watershed (5,555 user-days). By adding the estimates of fishing activity, we calculated total recreational activity levels to be 169,514 hours overall (22,666 d), including 112,630 h (15,423 d) in the Peace River, and 56,885 h (7,243 d) in the Pine River.

Almost 20 years ago, MacLaren Plansearch (1991) published an assessment of recreation and tourism in the proposed Site C region. They based their calculations on 1970s recreational activity estimates (from "1979 Recreation Impact Assessment Study"; no citation given in MacLaren Plansearch 1991), adjusted to account for measured population increases. They estimated 29,283 user-days in 1991 and projected that activity would increase to 35,626 user-days by 1996. Our Peace mainstem estimate (15,423 d) represents only 53% of their 1991 estimate and only 43% of their 1996 projection. Although our confidence limits are large, the difference is nevertheless striking between our and the MacLaren Plansearch's (1991) estimates. Lion's Gate Consulting et al. (2002) reported in 2002 that the overall demand for recreation and tourism appears to be declining in the Peace area. However a 53% decline was not evident in their analysis. It is possible that the original 1979 recreation activity estimate was an overestimate.

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