

Managing Campsite Impacts on Wild Rivers

Are There Lessons for Wilderness Managers?

BY DAVID N. COLE

Abstract: Campsites on popular wild rivers in the United States are heavily used by large groups, creating extremely large campsites surrounded by webs of social trails and satellite sites. Many rivers carrying seasonally high volumes of water have extensive beach deposits below the high-water line that make highly durable camping surfaces. Along with the success of low-impact education and requirements to carry fire pans and portable toilets, high site durability has tempered some impact problems along rivers.

More people floated the Colorado River through the Grand Canyon in 1972 than ever before. Campsites along the river showed it. White sandy beaches were gray from the charcoal and ash of campfires. Webs of user-built trails led to piles of human waste. Toilet paper blooms and the aroma of urine were ever-present. In the year 2000, river use has increased 50%, but the trails only wander from beaches to tent pads and the beach sand is white again; the white blooms are the blossoms of *datura* and primrose, and the smells are of desert scrub.

Despite heavy use and its subsequent impacts along many wild rivers, impact management has enjoyed unprecedented success in the United States. To illustrate some of the problems and opportunities that are unique to river management, I use data on the condition of campsites along the Middle Fork and Main Salmon rivers in Idaho—data that were collected as a baseline for monitoring of long-term trends in condition. Lessons learned from wild-river management might be important to wilderness managers.

The Middle Fork and Main Salmon Rivers

The Middle Fork and Main Salmon are “wild” rivers, as defined by the Wild and Scenic River Act of 1968. Each segment offers opportunities for week-long, whitewater float trips through the Frank Church River of No Return Wilderness in central Idaho. About 10,000 people per year float the Middle Fork, while about 8,500 people per year



Article author David Cole with his children, Kristin and Dylan. Photo by Linda Henderson.

float the Main Salmon. On both river segments, commercial passengers outnumber private boaters, primarily because they travel in larger groups. For example, the average group size on the Middle Fork is about 24 for commercial groups and 10 for private groups. Guests on commercial trips book and pay a river outfitter. Private boaters must enter a lottery for a permit. The success rate for obtaining a private launch permit is about 4% on the Middle Fork (even less during the best floating season) and 12% on the Main

Salmon. On both rivers, boaters must carry fire pans and portable toilets, and pack out all human waste and campfire refuse. On the Middle Fork, boaters must camp in designated campsites, assigned for each night of the trip. On the Main Salmon, boaters can camp anywhere they want, except for a few locations where camping is not permitted. A few campsites are reserved for large groups.

Campsite Condition Survey

The Middle Fork and Main Salmon have about 100 campsites each, depending on the water level. In 1995–1996 I worked with a team to conduct a 10 to 15% systematic sample of these campsites. We collected detailed information about the condition of 11 campsites on the Middle Fork and 13 campsites on the Main Salmon.

We adapted established techniques used to assess campsite impacts in terrestrial wilderness (such as Cole 1983; Cole and Hall 1992). Challenges included the large size of river campsites, the complex maze of social trails and satellite tent pads, and difficulty in defining the edges of the camps. One edge is the river that fluctuates in height. We quickly realized that for ground-cover parameters (such as vegetation), it would be impossible to assess the amount of impact that had already occurred. Normally, impact to such parameters is assessed by comparing campsites with adjacent control sites. Good controls are hard to find along these rivers because any place with the characteristics of a campsite is already a campsite. Nevertheless, we did collect some data from undisturbed “controls.”

We established one (or more) center point(s)—a buried nail located above high water and referenced to three distinctive features. On the campsite perimeter we placed 15 to 25 flags where the boundary changed direction. Then, from the center point, we recorded azimuth and distance to each flag. Such measures are replicable and can be used to calculate campsite areas (Marion 1995).

Within the campsite perimeter, delimited by straight lines drawn between flags, we estimated the proportion of the site in the following ground-cover classes: vegetation, litter, mineral soil, sand, and rock. For each live tree within campsite boundaries we assessed tree damage as either none/slight, moderate (two or more nails, numerous small trunk scars, or exposed roots), or severe (numerous

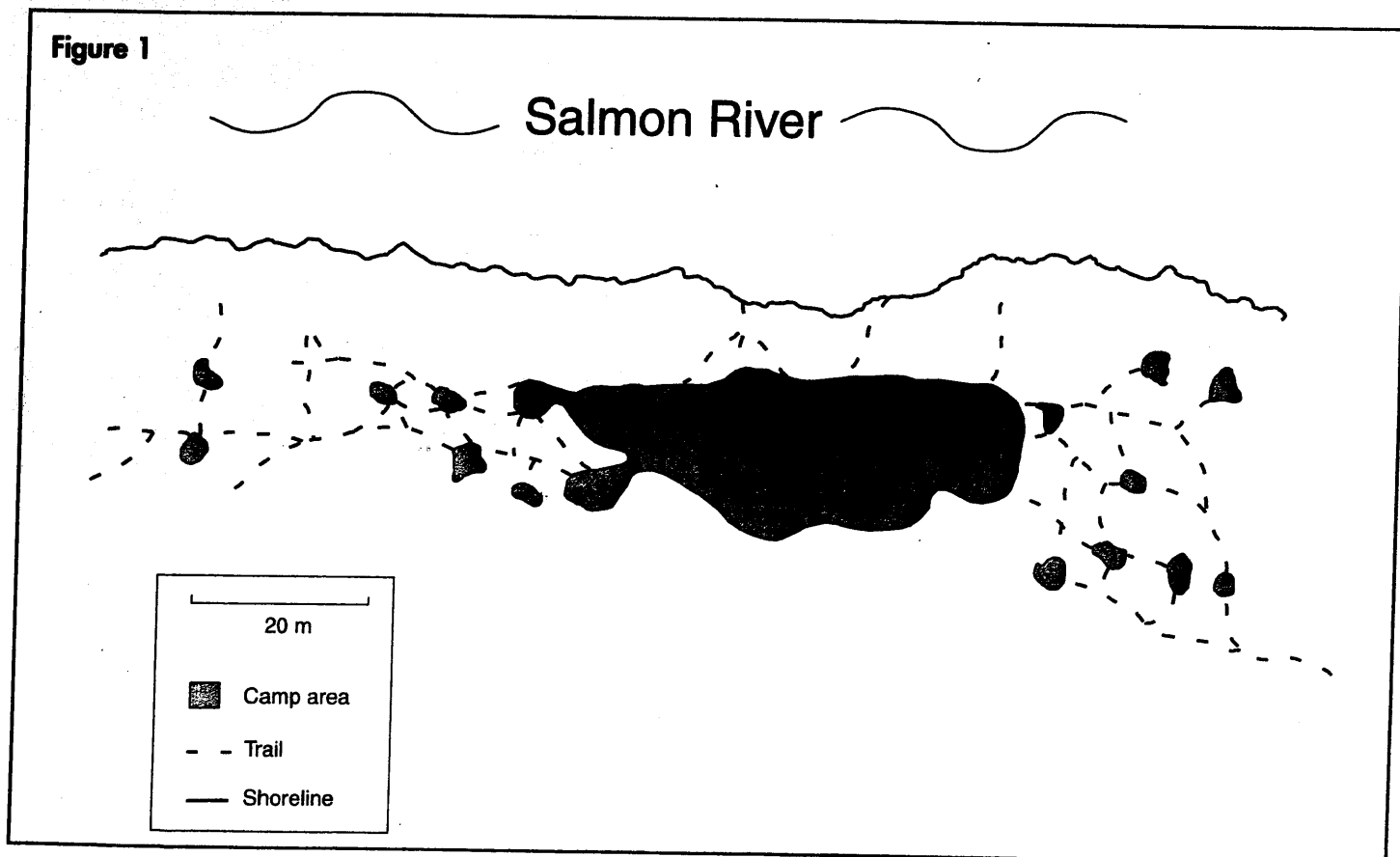


Figure 1—The Tumble Creek campsite on the Middle Fork of the Salmon River illustrates the large disturbed area and web of trails and satellite tent sites characteristic of many river campsites.

The most compelling lesson from rivers is the success of programs to manage campfires and human waste.

substantial trunk scars or girdled trunks or roots). We counted tree snags and "natural" stumps as well as stumps clearly cut by visitors. We counted the number of fire rings, ash piles, scorched sand sites, human waste sites, and constructed structures, and we measured the volume of garbage, in liters.

We mapped and measured the length of each user-created social trail that left the campsite perimeter, dividing each into segments according to the following condition classes: (1) worn, but with vegetation in the tread; (2) well-worn, with no vegetation in the tread; and (3) deeply worn, no vegetation, and tread eroding. At each satellite site (usually a tent pad), we estimated area, as well as percent cover of vegetation, litter, mineral soil, sand, or rock.

Campsite Conditions

The most notable characteristic of these campsites was their huge size and web of social trails to satellite sites (see Figure 1). For the Middle Fork, the median main camping area was 544 m², and satellite sites added another 126 m² (see Table 1). There were more than 250 m of social trails. On one site, the total camping area exceeded an acre, and the length of the trail web approached three-quarters of a mile. Main Salmon campsites typically had larger main sites (median of 905 m²) but fewer social trails and satellite sites. This difference between rivers results from Main Salmon campsites typically having more camping space below the high-water line; beach areas are typically larger. Along the Middle Fork, there is typically less camping area below the high-water

line. Large groups spread out above high water, creating a more extensive system of trails and satellite sites. The Middle Fork is also used more during peak flow periods, when camping areas below high water are unavailable. These conditions can be compared with typical camp areas of 200 m² in the Eagle Cap Wilderness, Oregon (Cole and Hall 1992), and 200 to 300 m² along several rivers in the eastern United States (Cole and Marion 1988). The larger Salmon River sites are similar to horse outfitter camps in the Bob Marshall Wilderness, Montana, where the combined area disturbed by cooking, tenting, and holding pack stock ranged from 400 to 10,000 m² (Cole 1983).

Although vegetation cover is sparse on these campsites (see Table 2), vegetation was probably never continuous on these sites prior to recreation use. Mean vegetation cover on the best "control" sites we could find was 56% on the Middle Fork and 42% on the Main Salmon. Along the Main Salmon, the typical campsite is mostly sand and rock below the high-water line. Such substrates are highly durable. They can be frequently used without substantial impact. On the typical Middle Fork site, however, more of the site extends above high water. Mineral soil, which was negligible prior to recreation use, is exposed over 36% of the median campsite.

Despite the huge area disturbed by camping, these campsites are clean and relatively undamaged. Most campsites had no evidence of fire-related impacts, no userbuilt structures, no evident human waste or toilet paper, virtually no garbage, and no significant tree damage. In contrast, most campsites elsewhere will have fire rings (often more than one), ash piles, and structures. Along several eastern rivers (Cole and Marion 1988), sites



Extensive deposits of unconsolidated sand, scoured every few years by seasonal floods, provide highly resilient surfaces for minimal impact camping. Photo by David Cole.

Table 1—Campsite area and extent of satellite sites and social trails.

	Camp Area (m²)	Satellite Sites (#) (m²)		Social Trails (#) (m)	
Middle Fork Salmon					
Median	544	5	126	22	257
Maximum	4,244	27	816	34	1,112
Main Salmon					
Median	905	3	41	4	89
Maximum	3,342	11	735	25	259

Median and maximum areas for 11 campsites on the Middle Fork and 13 campsites on the Main Salmon Rivers.

typically had evident human waste, more than 10 liters of garbage, and more than 20 damaged trees.

River Recreation Impact and Management

These results illustrate four points about recreation impacts and management along popular rivers. First, use levels are extremely high. Impacts would be even higher if management had not restricted use and implemented educational programs. Some campsites on rivers are used more than 100 nights per year. Without proper management such sites can degrade severely. Even with proper management, certain types of impacts will inevitably be severe.

Second, campsite conditions are strongly affected by the type of use

these rivers receive. Campsites along these rivers are unique in their large size and in their complex web of social trails and satellite sites. The significance of such impacts increases to the extent that such impacts occur above high water on terraces with better soil and vegetation but that are not "rejuvenated" by periodic floods. Although never formally studied, it seems intuitively clear that large groups and groups consisting of unaffiliated subgroups are particularly likely to cause such impacts. Large groups simply cannot be accommodated in a small campsite. They must spread out over a large site and, if that site is not large enough, disperse to satellite tent sites. Such dispersal is more likely when the group consists of numerous unaffiliated subgroups

(individuals, couples, families) as opposed to close family and friends. Privacy is often greater above the high-water line where screening vegetation is denser. Most outfitted groups are large and consist of unaffiliated subgroups, suggesting they may be particularly prone to causing such impacts. However, as permits become increasingly difficult to obtain, the size of private groups is also increasing, as is the likelihood that private groups will include unaffiliated subgroups.

Third, on high volume rivers like the Salmon River (particularly the Main Salmon), extensive beach deposits below high water create highly durable camping surfaces. This favorable attribute compensates substantially for the high impact potential of heavy use by large groups. Generally lower impact

Table 2—Ground cover on campsites.

	Vegetation	Litter	Mineral Soil	Sand	Rock
Middle Fork Salmon					
Median	17	16	36	12	13
Maximum	38	42	80	84	33
Main Salmon					
Median	16	3	3	56	15
Maximum	63	38	41	86	61

Median and maximum ground cover in percent for 11 campsites on the Middle Fork and 13 campsites on the Main Salmon Rivers.

on the Main Salmon, compared with the Middle Fork, results from larger camping beaches along the Main Salmon, as well as less use during peak flow periods, when the only option is to camp above the high-water line. River managers should discuss the desirability of confining use below the high-water line for all visitors. This may mean convincing subgroups to set their tents up closer to each other than they might prefer, and limiting group size so that tent sites are unnecessary above the high-water mark. With cooperation from boaters, managers could take actions to reduce the size of campsites, closing unnecessary trails and satellite sites and building subtle barriers to define the edge of the site.

Finally, Leave-No-Trace education and behavioral restriction (fire pan and portable toilet requirements) are readily accepted by river boaters. Their implementation has succeeded in nearly eliminating unnecessary high impact behaviors. Campfire remains and improperly disposed waste have largely disappeared along rivers. Such efforts should be continued.

Lessons for Wilderness Management

This analysis of campsite condition along rivers illustrates how camping on durable surfaces and appropriate

visitor behavior can keep certain impacts to minimal levels even where use pressure is extremely high. It also illustrates the unique problems created by extremely large groups, especially when the individual group members are unaffiliated. Concentration of use on durable surfaces is the most effective means of minimizing trampling impacts (Cole 1994). Large groups spread out more and, therefore, are more likely to impact fragile surfaces.

The most compelling lesson from rivers is the success of programs to manage campfires and human waste. Away from rivers—among backpackers and stock groups—such efforts have been much less successful. Why have river programs been more successful? First, management actions on rivers are more aggressive. Each group of boaters is informed of appropriate behaviors and required equipment prior to their trip. Required equipment is checked and an educational message is usually given before they launch. Second, it may be easier for boaters to transport low-impact gear such as fire pans and portable toilets. And third, boaters may simply be more committed to minimizing their impact than other recreationists.

Why would boaters have a higher level of commitment? The answer may lie in the difficult process of obtaining

a permit. Private boaters must plan far ahead. Most feel lucky to obtain a permit, feel their trip is a privilege, and are more likely to be granted a permit again if they take care of the river. If this is true, it suggests that there is value in portraying wilderness as a special, fragile place, a place one should feel privileged to visit. It also suggests that more wilderness managers should consider implementing permit systems. **IJW**

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