

Boundary Waters Canoe Area Wilderness—A Long History of Management Guided by Science

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The Boundary Waters Canoe Area Wilderness (BWCAW) in northern Minnesota is one of the most iconic and cherished wilderness areas in the United States. One of the original wilderness areas established in 1964, the BWCAW protects a glaciated landscape of about 1,175 lakes, connected by several hundred miles of streams. Located adjacent to Canada's Quetico Provincial Park (also managed as wilderness), the two areas form a transboundary wilderness of about 2 million acres. Among the most heavily used wilderness areas in the United States (Cole 1996), most travel is by canoe, although motorized boating is allowed on a few lakes, and some hiking occurs. One of the unique things about the BWCAW—and something few people are aware of—is that more pioneering wilderness science has been conducted there than anywhere else in the United States. The purpose of this case study is to describe the role the BWCAW played in the early development of wilderness science and to show how some of the science conducted there has contributed to good wilderness stewardship.

The lineage of most of these studies can be traced to the influence of Dr. Robert Lucas, the pioneering wilderness researcher hired by the USDA Forest Service in 1960. Although one study of wilderness visitors predates Lucas' work (Taves et al. 1960), Lucas published two groundbreaking reports on recreational use of the BWCAW (Lucas 1964a) and the relationship between amount and type of recreation use and the nature and quality of visitor experiences (Lucas 1964b). These studies and the techniques used have influenced much subsequent wilderness visitor research. Lucas was able to hire other USDA Forest Service scientists to conduct research in the BWCAW on fire ecology (Heinselman 1973) and wilderness plant communities (Ohmann and Ream 1971) and to conduct additional studies of BWCAW visitors (Lime 1970, Stankey 1973).

Although a variety of research has been conducted in the BWCAW, most studies have focused on the wilderness' recreational visitors and their impacts. Pioneering research on campsite impacts and wilderness visitors has had a profound effect on the field of visitor use management and has contributed greatly to improved wilderness stewardship in the BWCAW and wilderness areas throughout the world.

Research on Campsite Conditions

Lucas commissioned the first rigorous studies of ecological impacts on wilderness campsites and how they might be managed. Frissell and Duncan (1965) related campsite impact in the BWCAW

to amount of use, finding that impacts are inevitable and that the goal of management should be to keep impact within acceptable levels. Frissell (1978) also developed one of the early approaches to monitoring campsite conditions. Today, a key concept behind the BWCAW's campsite management program is to concentrate camping use and impact, as suggested by Merriam and Smith's (1974) research showing that most campsite impact occurs with initial and relatively low levels of use. Concentrating higher levels of use on relatively few sites and sustaining this use for long periods typically causes much less additional impact than spreading use over a larger number of less frequently used campsites. Use concentration is accomplished at multiple scales, by requiring campers to use designated campsites that have steel fire grates and latrines rather than pioneer their own campsites and by actively working to keep those campsites as small as possible and as attractive places to stay (Marion and Sober 1987) (Figures 1 and 2). Although required to camp at a designated site, visitors are not required to reserve specific campsites, allowing them greater freedom and spontaneity in their trip planning and decisionmaking. Rangers regularly patrol campsites, periodically monitoring conditions that now can be traced back almost 50 years.

Research on Managing Visitor Use

The early carrying capacity work of Lucas (1964b), refined by Lime (1970) and Stankey (1973), established the need to limit the amount of recreation use in the BWCAW. With overuse threatening the very values for which it was preserved, in the early 1970s the BWCAW became one of the first wilderness areas to limit use. In contrast to many use limitation systems, in which visitors are required to stick to a fixed itinerary for their entire trip, the BWCAW used an entry point quota system. Still in use today, once visitors obtain a permit to enter at a specific entry point, they are permitted to travel wherever they want, free to alter their travel plans based on weather or whatever strikes their fancy. However, this requires planners to predict what will occur in the interior of the wilderness, according to how many people are allowed to enter at the more than 80 entry points scattered around the wilderness perimeter. Based on research by Peterson and Gilbert (1971), a travel simulation model was established for this purpose. This model has been updated several times, including a recent effort (Watson et al. 2013) to establish launch point quotas based on maximum campsite occupancy level predictions within zones of the wilderness.

In addition to limiting use, additional management actions were taken, including regulations on maximum group size, many of which were suggested by the early work of Lucas and other Forest Service scientists (Peterson and Lime 1979). In 1991, during an era when reductions in group size limits were proposed and many proactive regulations and education efforts were implemented to protect this unique resource, Forest Service scientists replicated early studies of BWCAW visitors to provide updated information on trends in use and users and their perceptions of wilderness conditions (Cole et

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al. 1995). In 2007, after implementation of user fees, changes in the permit distribution process and several large-scale disturbances (fire and blowdown) that affected visitor experiences, visitor studies were replicated once again (Dvorak et al. 2012).

Much has been learned from this rich history of wilderness research. The early research conducted in the BWCAW was pioneering and remains seminal. It continues to influence the research being conducted by successive generations of wilderness scientists. Equally important, it contributed substantially to the identification of innovative wilderness management approaches—strategies and tactics capable of protecting wilderness conditions in perpetuity. Early implementation of these approaches at the BWCAW has gone a long way toward protecting this most popular, iconic, and cherished wilderness gem.

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