



Evaluation of the impact of human use on native vegetation in Bridge Bay Campground, Yellowstone National Park, Wyoming
by Robert Clarence Wagner

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE in Agronomy
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Abstract:

Two campsites with different use intensities were evaluated for camper use for two years in Bridge Bay Campground, Yellowstone National Park, Wyoming. Groundcover readings were taken inside and outside both campsites to compare the vegetative status of these campsites. These vegetative readings also allowed comparisons of the campsites. Measurements of use intensities were made inside the campsites with footstep counters and by soil compaction estimates. Flow patterns of use within campsites were determined by counts obtained with the footstep counters.

Human trampling has apparently caused deterioration of ground-cover in both campsites as shown" by the differences in % groundcover inside and outside. There was more vegetation present in the limited use site than in the heavy use site. Footstep counts also showed a difference in intensity of use of these two campsites. Soil compaction estimates were not correlated with use intensities in this study.

The areas of maximum trampling within a campsite were determined by flow patterns.

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EVALUATION OF THE IMPACT OF HUMAN USE ON NATIVE VEGETATION
IN BRIDGE BAY CAMPGROUND, YELLOWSTONE NATIONAL PARK, WYOMING

by

ROBERT CLARENCE WAGNER

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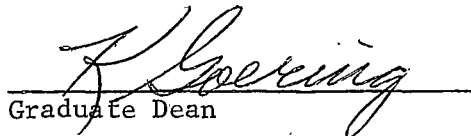
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ABSTRACT

Two campsites with different use intensities were evaluated for camper use for two years in Bridge Bay Campground, Yellowstone National Park, Wyoming. Groundcover readings were taken inside and outside both campsites to compare the vegetative status of these campsites. These vegetative readings also allowed comparisons of the campsites. Measurements of use intensities were made inside the campsites with footstep counters and by soil compaction estimates. Flow patterns of use within campsites were determined by counts obtained with the footstep counters.

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INTRODUCTION

The use of campsites and recreational areas is ever increasing in the United States. This increased use of recreational areas can in part be attributed to: 1) increased population, 2) shorter work weeks, 3) higher income per capita, and 4) increased numbers and use of pickup campers and camping trailers.

Groundcover conditions within many campsites and recreational areas are deteriorating due to the activities of man. Improvement of groundcover in existing recreation areas and effective development of new areas will be necessary in the years immediately ahead to preserve our environment and protect it from destruction. Previous research efforts on recreational sites have been limited to surveys based upon visual evaluations of damage caused presumably by human trampling. Accurate methods of measuring use intensities are needed as aids in the development of better design and management systems for recreational areas. Because factors such as topography, environmental, and climatic conditions differ from place to place, a variety of methods for measuring use intensities is needed in different areas.

The purpose of this study was to evaluate the impact of human use on native vegetation within campsites. Specific objectives toward this purpose were:

- 1) To survey the vegetative status within apparent heavy and light use campsites as related to adjacent minimal use areas.
- 2) To obtain quantitative measurements of use intensities within

campsites.

- 3) To determine flow patterns of traffic or use within campsites.

LITERATURE REVIEW

Increased technology has created more leisure time for more people resulting in a sharp increase in outdoor recreation. In man's attempt to escape from the urban congestion to less crowded areas, a new problem has occurred (8, 5, 11). Areas of retreat usually are established recreation areas, many of which are identified as campgrounds. However, with many moving to campgrounds and other outdoor recreational facilities, recreational areas, like cities, becoming over-crowded and in some instances seriously damaged.

DeVoto (5) pointed out the growing concern among the populus of the United States for the preservation of existing recreation areas and areas in planning and construction stages. The prime concern is for the restoration of areas deteriorated due to overuse.

Jones (11) reported that by the year 2000, the U. S. population will nearly double, and the overall demand for outdoor recreation will triple. Between 1946 and 1962, visits to Corps of Engineer reservoirs increased from 5 million to 126 million, nearly a 26 fold increase in use. Also, within this same period, visits to National Forest increased from 18 million to 113 million, an increase in use of approximately 6.3 fold. Clawson (3) estimated that recreational use of Federal lands is growing steadily at the rate of about 10% per year, with doubling of use about every eight years. With this increase in use of our lands for recreational purposes, we are faced with the problem of protecting our natural resources. Provision of minimum facilities are required in an

area for recreational use. For an area to reach its full use potential, more than minimum facilities are necessary. LaPage (12) stated, "... length of camping visits tends to increase directly with campground size, apparently because of a large number of attractions at big campgrounds".

A marked reduction in the abundance of vegetative cover and a decline in the number of plant species was noted after a single seasons use of the Buckaloons Campground in the Allegheny National Forest in Northwestern Pennsylvania (15). Magill (18) reported that heavy use of National Forest campgrounds and picnic areas in California resulted in critical site deterioration. Jilka and Beidleman (10) noted that three years after a season of heavy use, the effect of man's presence was still obvious in an outdoor recreation site. Paths could be detected and areas of heavy use could be recognized.

Some measure of the quality or character of recreational use is needed to explain the destruction of groundcover more realistically than simple visual appraisal. One of the most comprehensive studies in this area was done by LaPage (14). The effect of man's activities upon native vegetation was studied. Vegetative cover loss and change of plant species was determined over a three year period in a newly opened campground using a grid system. An initial and inevitable heavy loss of groundcover was observed following the onset of camper use; the extent of the loss was strongly related to the intensity of use the

first year. In heavily used areas, the plant species composition of the original cover underwent a gradual rearrangement the first year, in which species resistant to drought and to trampling become increasingly abundant. In following years, the species more tolerant to trampling spread while the original less-resistant species continued to diminish.

Changes in campsite vegetative composition have been reported in the Bear Trap Recreation Area - Madison County, Montana due to camper use, (2, 7, 20).

Vegetation changes are not the only method of estimating recreational use of an area. Changes in soil conditions also reflect use. An increase in soil density along with a decrease in pore volume and air capacity with recreational use of forest parks was reported by Lutz (16).

Soil compaction measurements in recreation areas have revealed that soil compaction as a result of trampling appears to be most severe in the surface six inches (root zone) of the soil (6, 13).

Due to the generally severe site damage in the immediate vicinity of the picnic table, it has been suggested that occasional shifting of tables will permit the heavily used areas to recuperate (9, 14).

As the recreational pressures continue to build in our country, satisfactory methods for assessing human impact on vegetation and soils will have to be developed. Data from assays will have to be used as

guides to protect and rehabilitate popular recreation areas, along with preventing deterioration of areas in the planning stages (8; 9, 17, 18, 19). Allison and Leighton (1) have developed tables useful in determining the feasibility of proposed forest campground sites for recreational use. These tables numerically rate a proposed site with respect to physical factors (such as water, topography, potable water, vegetation, natural attractions, vista, forest pests, animal and birdlife, and climate and microclimate) and socio-economic factors (such as location, economic and business management, and proposed campground facilities).

MATERIALS AND METHODS

In this study a "campsite" is considered to be a single camping unit consisting of a table and a fireplace; a campground being a composite of campsites. Frequently, campgrounds differ in the facilities and conveniences provided. Highly developed campgrounds have running water, wash rooms, and sanitary waste disposal facilities. Less developed campgrounds may have only a single community pump and toilets.

Following a study of campground history of Yellowstone National Park, Wyoming, the Bridge Bay Campground was selected as the test site for this study. Research data were collected during the 1969 and the 1970 camping seasons. Bridge Bay Campground is located in a lodgepole pine forest on the north shore of Yellowstone Lake about two miles southwest of Lake (Fig. 1). The elevation of the campground is approximately 7,735 feet. It has a frost free period of 50 to 90 days and receives approximately 25 inches of precipitation annually.

Based on use data, two campsites were selected within the Bridge Bay Campground which, due to location and management, had received different levels of use. The heavy use site chosen was number 47 in Loop-C (hereafter referred to as C-47) and the light use site was in Loop-E (Plate 1). C-47 is located near the entrance of the loop and about 150 feet from water and toilet facilities. The campsite in E-Loop is about 450 feet from water and toilet facilities. This loop is restricted to group camping and, therefore, receives considerably less total season use. All campers were excluded from E-Loop during the

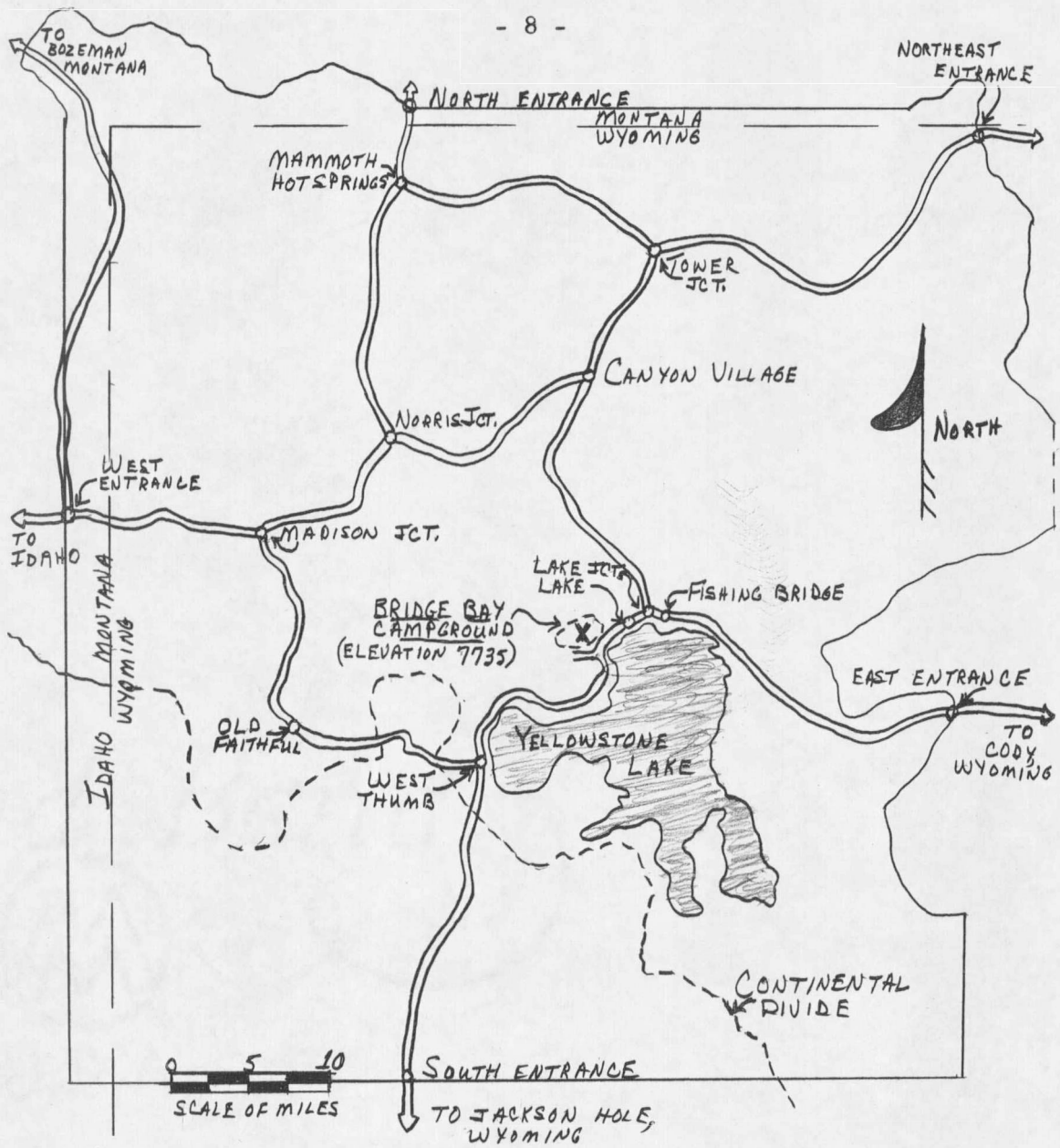


Figure 1. Map of Yellowstone National Park, Wyoming.
(Redrawn from a folder prepared by Sage Advertising Service, Helena, Montana, 1963).

