

# UNIVERSAL CAMPSITE DESIGN: AN OPPORTUNITY FOR ADAPTIVE MANAGEMENT

Jason R. Biscombe

Graduate Student, Faculty of Landscape Architecture,  
SUNY ESF, Syracuse, NY 13210

Jeri E. Hall

Branch Chief, Resource Protection and Wilderness  
Management, Yosemite National Park, Yosemite, CA  
95389

James F. Palmer

Associate Professor, Faculty of Landscape Architecture,  
SUNY ESF, Syracuse, NY 13210

---

**Abstract:** The basic design of campsites has changed little since the 1930s in Yosemite National Park. In heavily used areas, such as Yosemite Valley, this design is leading to environmental impacts from soil compaction, erosion, vegetation damage, and lack of regeneration for many plant species. These sites are also inaccessible to many people with physical disabilities.

In the spring of 1998, four campsite prototypes were installed in an effort mitigate some of these environmental impacts, as well as address accessibility issues for the physically disabled. Special features of these designs included: (1) a flat parking-campsite surface of crushed granite, (2) a clearly defined, permanent boundary for the campsites, (3) new designs for picnic tables, food storage lockers, and campfire rings.

These prototypes were evaluated using a survey questionnaire and systematic daily observations. The results indicate that the new designs are indeed an improvement. The value of evaluating design prototypes as an adaptive management tool is discussed and recommendations are suggested.

---

## Introduction

The increasing popularity and changing nature of outdoor recreation is creating unprecedented management pressures. For instance, the growth in camping has increased from 13 million or 10 percent of the US population over the age of 12 in 1960, to 58.5 million or 29 percent of the population in 1995 (Cordell 1999:235). The pressure from this increase comes in two forms. First is the need to accommodate this increased demand for access, including access by those with disabilities. Second, resource managers, scientists and the public all agree upon the need to maintain healthy ecosystems and protect natural and cultural resources from unnecessary damage caused by overuse. These pressures are being felt throughout the country's outdoor recreation system, but are particularly acute in the nation's 'crown jewels', such as Yosemite National Park.

In response to diverse conflicts over natural resource use and protection, managers, scientists and the public are developing an approach to constructively address these problems called "adaptive management" (Shindler et al. 1999). Rather than implementing sweeping changes before they have been tested, managers are advocating smaller trial runs that can be evaluated before making large commitments that are difficult to change. "Adaptive management is an approach ... that imbeds a simple imperative: policies are experiments; learn from them" (Lee 1993:9). While traditional researchers are accused of never having studied any issues sufficiently to make a decision, the attitude of adaptive managers is quite different. "The adaptive approach favors action, since experience is the key to learning" (Lee 1993:63). Actions implemented at a manageable scale create the opportunities to learn and make better decisions.

The use of "small experiments" is also advocated by Kaplan (1996) as a way to bring useful information to bear on local planning and design decisions. Her approach is very similar to adaptive management: "Small experiments provide ways to try things out. They are unabashedly imperfect. They are 'small' in cost, in number of participants involved, and especially in their intention" (Kaplan 1996:170). She offers succinct advice about four attributes of successful small experiments. First, do not skimp on conceptualization, or "thinking through what one hopes to learn." Second, "while sampling may be an important issue, it may not deserve all the emphasis it has received. A well-conceived study can yield useful results even if it is based on a nonrandom sample." Third, keep track of pertinent information, look for convergent results from different sources (e.g., surveys, observations, interviews), and avoid "the temptation to add questions to a survey 'while one is at it'." Finally, pay attention to effective dissemination and "be mindful of the intended audience." Research of all types can be made ineffectual because it is communicated in the wrong way or to the wrong audience.

This paper summarizes our experience applying some of the principles of "adaptive management" and "small experiments" to the redesign of campsites for Yosemite National Park.

## The Situation in Yosemite Valley

Yosemite National Park (YNP) receives over four million visitors a year, making management of the 1200 square mile area a challenge. YNP is also the host to nearly 200,000 overnight campers on an annual basis at 13 campgrounds throughout the park. The high demand for access to recreational camping in YNP requires increased emphasis on campground management in order to meet the mandate for resource protection and visitor enjoyment. The majority of visitation to the park is concentrated in Yosemite Valley (YV). There are currently three drive-in campgrounds in YV: Lower Pines, Upper Pines, and North Pines. They contain 441 campsites and provided overnight camping to approximately 30,460 individuals during the 1998 season. Camp 4 (a walk-in campground) has a

capacity of 210 people a night. The number of campsites was greater before the 1997 flood and the future number of campsites is under consideration as part of the YV Plan. Such large numbers of people concentrated in an area for extended periods of time can lead to undesirable impacts. In the YV campgrounds these include: vegetation damage, soil compaction, erosion, and stream bank failures.

The existing campgrounds in YV were designed in the 1930s and are inadequate for protecting resources while accommodating this number of modern campers. It was thought that universal campsite design might be appropriate for addressing some of these problems (Hultsman et al. 1998; PLAE 1993). Universal campsites were originally designed to provide full site access to people with disabilities. The Americans with Disabilities Act (ADA) of 1990 requires that public places be as accessible to people with disabilities as they are to those without disabilities. Universal campsites also provide clearly defined boundaries that help contain camper activities. This decreases widespread impacts on natural and cultural resources beyond the campsite area. It is also thought that all campers would appreciate that the universal design provides adequate space for a large variety of vehicles and equipment, and flexibility in how individuals arrange their campsite.

### A Small Experiment

To replace the existing campsites with a universal design will create a significant disruption for visitors during the construction period and require a major a commitment of resources by YNP. Before embarking on such a large project, it was decided to install four prototype campsites and evaluate them as a "small experiment." These campsites were constructed in a very wet area of the Lower Pines campground during the spring of 1998. Some of the design objectives were to, (1) provide a site surface, furniture, and arrangement accessible to more potential campers, including those with disabilities, (2) provide a well drained and dust-free surface that provides flexibility for individual needs, equipment and activities, (3) minimize resource damage around and between sites, limit the amount of sprawl and trampling outside the site, and allow for the reestablishment of herbaceous vegetation and regeneration of canopy trees, and (4) test a variety of edging materials and campsite furniture to determine the functionality and camper preferences.

The universal campsites were constructed in the late-spring and early summer. The heavy spring runoff from the Merced River caused campsites near the river to be inundated with water. The new universal campsites were used as emergency sites for campers who held reservations at sites that could not be used because of their wet condition. After July 15 the universal sites were placed in the reservation system.

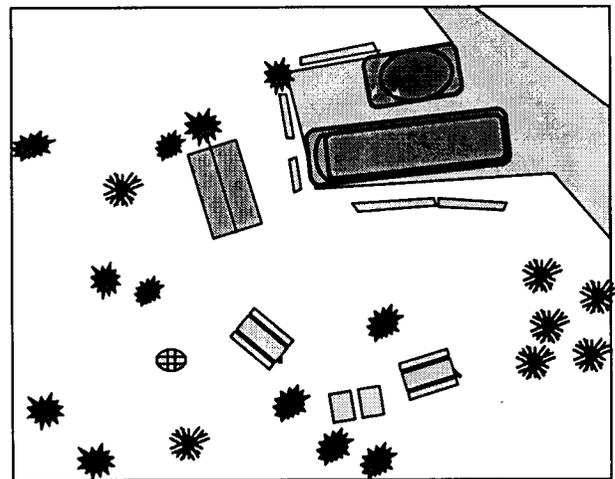
Two methods were employed to gather data about these prototypes, a camper survey and observation of the campsites' condition. Survey questionnaires were distributed between June 12 and October 26, 1998.

Surveys were given to campers by NPS rangers or volunteers when they checked into their site. The prototype sites were occupied by 307 groups during their first season. A total of 90 completed questionnaires were returned to the campground kiosk. It is estimated that approximately 20% of the groups did not receive questionnaires. For instance, some campers arrived late at night and left before a ranger could offer them a questionnaire. The responses represent approximately 35% of the groups believed to have received a questionnaire.

In addition, a ranger monitored the prototype and neighboring campsites. A simple observation worksheet was used to evaluate and record the condition of each site. Most of the observations could be made from the campground road, and an effort was made not to disturb campers. A total of 169 groups of campers were observed between July 15 and October 26, 1998.

### Campsite Design

**Existing campsites.** YV campsites, like the one in figure 1, have asphalt-parking areas (spurs) bounded with concrete half-rounds that have the appearance of half-buried logs. Campers park their vehicles and RVs (recreational vehicles) on the spur. The campsites are in mixed oak-conifer woodland. The understory is sparsely vegetated with dogwood, but younger age classes are notably absent. The majority of the campground surface consists of bare ground, which is often covered with pine needles.



**Figure 1.** This schematic plan of the existing campsite 11 shows parking on the paved spur is crowded, the camping area has no boundaries, and the site furniture is not ADA accessible.

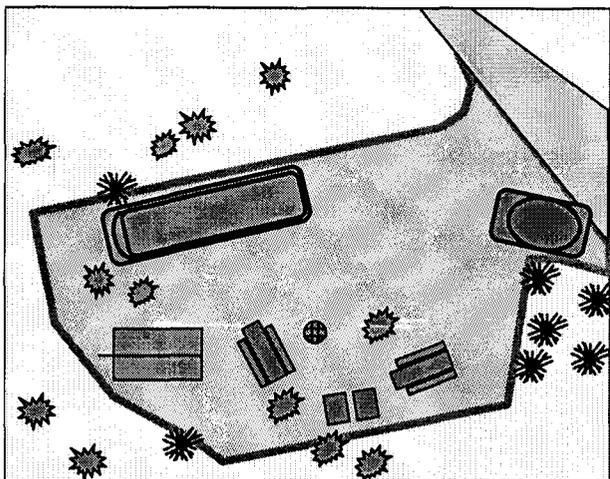
The provided furnishings stay fairly constant: a 4' x 3' x 2' metal food storage locker, a non-accessible campfire ring (1' x 32" diameter) with a flip grill, and a non-accessible steel frame wooden picnic table (6' x 29" table top) chained in place. "Accessible" refers to usability by persons with disabilities. Campers place their non-vehicular equipment on the bare ground. Examples of the types of equipment

placed on the dirt include tents, dining flies, chairs, tables, and bicycles.

There are no clearly defined boundaries to the existing campsites. Sometimes the wear on the campsite indicates a tentative boundary. Signs are occasionally posted on the edge of the campsite in an attempt to limit the amount of camper sprawl and resource impact.

**Prototype campsites.** The general characteristics of the prototype universal campsites are summarized in Table 1. In contrast to the existing campsites, these campsites have an area bounded by an edging material. The area of the campsite is well defined in order to limit the sprawl around the campsite. Three different edging materials were tested: rectangular concrete curbing, granite coping, and peeled log rounds.

The surface of the campsite is 4" of compacted crushed stone (3/8" screen) over an 8" aggregate base (3/4" screen). This material is graded at 2% and provides a well-drained campsite that is not muddy when wet. The surface also reduces dust when dry. This surface provides the desirable level, firm, stable, slip-resistant surface that allows access for people with disabilities. After mid-summer, pine needles were scattered over the crushed stone to provide a look more reminiscent of the forest floor.



**Figure 2.** This schematic plan of the universal design for campsite 11 shows that the camping area is a well drained crushed granite surface with clear boundaries, vehicles can park anywhere on this surface, and the site furniture is ADA accessible.

The provided furnishings included food storage lockers, picnic tables, and fire grills. The steel food storage lockers (4' x 3' x 2') were the same those used on the existing campsites. A new larger concrete food storage locker with steel doors was also tested.

Two types of accessible picnic tables were tested. One had a steel frame and a wooden top (8' x 2.5') with a 2.5' overhang at one end to allow wheel chair accessibility. Campers could move this picnic table, allowing greater flexibility in site arrangement. The second picnic table had

brown concrete supports and a top of cast brown wood-textured concrete (8' x 2.7') plastic topped concrete seats. The concrete picnic table has a 2' overhang on both ends to allow wheel chair accessibility. The concrete picnic table was not movable.

Three fire grills were evaluated: An older design with a flip-top grill over a ground-level concrete pad, an accessible metal campfire ring (15" high x 32" diameter) with an adjustable flip grill, and a waist high accessible concrete picnic grill not designed for campfires.

**Table 1. Characteristics of prototype campsites.**

	Campsite			
	6	8	10	11
<b>Area (sq. ft.)</b>	1488	1870	2376	2120
<b>Max. group size</b>	6	6	12	10
<b>Camp edging:</b>				
Concrete	X	X		
Granite				X
Peeled log			X	
<b>Food locker:</b>				
Metal	1	1	2	2
Concrete	1#			
<b>Picnic table:</b>				
Metal/wood		1	2	2
Concrete/plastic	1			
<b>Camp grill:</b>				
Old flip-up grill		1*	2*	2*
ADA fire ring		1	2	2
ADA picnic grill	1			

*Notes:* \* Old grills were replaced June 28. # A metal locker replaced the concrete one August 17.

The campers were instructed to place all their vehicles, RVs, tents, and other equipment within the defined campsite boundaries. The campsite area defined by the edge tends to be smaller than the average area of the existing adjacent campsites with the same visitor use limits. The entire surface of the universal campsite is crushed aggregate; vehicles, RVs, tents, and other equipment could be placed anywhere on the site.

### What We Learned

**Who are the campers?** The campers came primarily from California (57%), but they also represented other Western states (10%), other parts of the US (13%), and Europe (18%). The average group size for campsite 6 was 3.7 people, for site 8 it was 4.1, for site 10 it was 7.3, and for site 11 it was 6.4 people. They were mostly tent campers (54%), but a significant number brought RVs (22%) or used both tents and RVs (24%). Only 4 of the 90 responding groups reserved one of these prototype sites because it was accessible to persons with a disability. Six groups reported having at least one member with a disability.

**What accommodations did they bring?** Every group brought some sort of vehicle and some brought more than one, as summarized in Table 2. Almost a third of the groups brought a passenger only vehicle. Almost a quarter

brought a RV intended to accommodate sleeping. A large number also brought a van or camper-truck, but it was uncertain whether they intended to sleep in these vehicles.

**Table 2. Type of vehicles brought.**

Type of vehicle	Percent
Motor home	17.2
Camper trailer	4.6
Tent trailer	1.1
Van/Camper-truck	28.7
Car/Truck/SUV	63.3
Other	3.4

n = 87. Some groups had multiple vehicles.

A major change in camping during the past 30 or so years has been the increasing popularity of large RVs in campgrounds. In this study almost half of the groups had some sort of RV. The design changes required for a tent campsite to accommodate large RVs can be substantial--the primary problem is their size. A typical family sedan may be 15 to 18 feet long, while RVs are often twice this length. Table 3 gives the reported distribution of RV sizes.

**Table 3. Size of motor home or RV trailer.**

Size of RV (ft.)	Percent
18-21	20.0
21-24	25.0
24-27	40.0
27-35	25.0
35-40	5.0

n = 17. Some groups had multiple RVs.

Tents are still the most common form of camping accommodation, being used by 78% of the groups. Both smaller tents and larger family tents are popular. The percent of groups using tents of these sizes are shown in Table 4.

**Table 4. Size of tents.**

Tent size (ft.)	Percent
< 9' x 12'	71.2
> 9' x 12'	47.0

n = 66. Some groups had multiple tents.

**How did they like the prototype sites?** The overall reaction to the prototype campsites was very positive -- 34% thought they were excellent, 52% good, 8% adequate, and 6% poor. The overall mean rating was 1.85 (1 = excellent, 2 = good, 3 = adequate, 4 = poor). The ratings for the several alternative attributes of the prototype campsites and tests for the significance of their differences are given in Table 5.

The crushed rock surface was rated excellent or good by almost 60% of the respondents. The surface material fulfilled the design specifications -- throughout the summer these sites were never muddy or dusty. The surface accommodated most types of vehicles and tents, and never showed tire impressions. However, some comments were received indicating that the surface was too hard or that it appeared constructed rather than natural. Distributing pine needles over the sites was an attempt to

respond to the psychological reaction to a crushed granite appearance. This experiment did not improve ratings; to the contrary, they dropped slightly. It was interesting that in a couple of instances groups were observed sweeping all the pine needles to one side, apparently in an effort to keep the site "neat and clean." Positive responses were highest for RV users (87% excellent or good) and lower for tent campers (50% excellent or good) and people with both tents and RVs (45% excellent or good).

Both the new concrete and traditional metal food storage lockers received very high ratings by the campers. Unfortunately, the concrete locker turned out not to be bear-proof. The first bear break-in occurred August 3, apparently because the locker was not properly latched. On August 15 it was broken into a second time, serving testimonial to the resourcefulness of YV bears! Experience has taught YNP rangers to respect bear ingenuity, so the concrete lockers were replaced by the proven metal locker design.

**Table 5. Ratings of campsite attributes.**

Attribute	n	$\bar{X}$	F-test
<b>Surface material:</b>			
Crushed granite	41	2.23	F = 0.43
Pine needle duff	46	2.39	p = .515
<b>Food locker:</b>			
Concrete	16	1.44	F = 0.04
Metal	74	1.39	p = .833
<b>Picnic table:</b>			
Concrete/plastic	21	1.29	F = 0.62
Metal/wood	68	1.43	p = .435
<b>Camp grill:</b>			
Old flip-up grill	7	2.71	F = 4.20
ADA fire ring	60	1.62	p = .018
ADA picnic grill	17	1.94	

Ratings: 1 = excellent, 2 = good, 3 = adequate, 4 = poor.

Both types of picnic tables were also highly rated. While one feature of the lighter metal and wood tables was that they could be moved around the site, there was also the possibility of abusing this flexibility. However, no group was observed placing their table outside the campsite boundary.

Campfires are an important part of the camping experience for many people. In VY, fires are only permitted in the provided camp grills. The old style flip-up grate over a concrete base was judged as adequate, but significantly less desirable than the new ADA compliant fire rings. The new ADA picnic grill was also rated as good, though it was not suitable for 'campfires.'

The theme of cooking and campfires was explored further. Table 6 shows that over 80% of the groups used equipment they brought with them for cooking, so the provided campfire grills are not usually necessary for cooking. On the other hand, the campfire grills are popular for campfires. It was hoped that campers would be amenable to sharing campfires with another campsite, since campfires in intensively used areas such as YV can cause

management problems. When asked, 45% of campers responded with a flat-out "No," while the rest indicated some willingness to give it a try.

**Table 6. Cooking equipment brought.**

Type cooking equipment	Percent
None/no answer	19.1
Own BBQ grill	21.4
RV stove	5.7
Camp stove	68.6

n = 89. Some groups had multiple equipment.

**Is the campsite boundary respected?** The new universal design establishes clear campsite and path boundaries in an effort to contain human activities to areas designed to withstand their impact. One of the purposes of observing the campsites was to determine whether activities were being restricted to within the clearly bounded areas. Table 7 reports the percent of times a ranger observed an indication that human activity was not being contained, or that it was damaging the surrounding natural resources.

Only 11% of the groups were observed placing equipment outside the campsite boundaries, and equipment brought by 12% of the groups was observed to have potential impacts on resources. This included hanging equipment in trees or placing equipment on ground cover. The results from the survey are similar, where 13% of the groups indicated they did not have adequate space. In contrast, the rangers only observed a couple of instances (1%) where a group appeared to have insufficient space.

There were several observed indicators that campers were impacting areas beyond the defined site. Ropes were observed strung to trees beyond the edge of the site for 11% of the groups. People were also observed walking outside their campsite's border (8%), using unofficial trails (7%), and cutting through another campsite (6%). When one thinks about the large population of campers using YV, these numbers could result in substantial negative impacts. In contrast, observations of older existing sites in the same campground indicate that these problems are approximately twice as common there.

**Table 7. Campsites with observed problems.**

Problem	Percent
Equipment placed off-site	11.2
Equip. potentially damaging resource	12.4
Ropes strung to trees off-site	10.7
See walking outside boundary	8.3
See social (unofficial) trail use	6.5
See cutting through campsite	5.9
Insufficient room on site	1.2

n = 169.

## Conclusions

This modest evaluation of four prototype campsites indicates that the universal design approach meets both campers' needs and helps protect the surrounding resources. Equipment assessments were successful in determining types of ADA campsite furniture for future

use. The Yosemite prototype campsites best meet the needs of people with disabilities and visitors with recreational vehicles (RV). The universal campsite design is recommended for future use by adapting its form and function to the site conditions, range of access needed (e.g., ADA compliance), the types of suitable edging and surface materials available, and the shape and size requirements. In order for the universal design to be successful in protecting resources, campsite design must be incorporated into the entire circulation system for vehicles and pedestrians throughout the campground. This will alleviate impacts to resources from short-cutting caused by inadequately designated trails, poor way-finding, and off-pavement parking. Campsite screening through revegetation is also needed to provide a sense of campsite boundary, noise reduction, shade, and enhanced visitor experience through connection to the natural environment. In the spirit of adaptive management, the effectiveness of future changes should also be monitored.

## References

- Americans with Disabilities Act of 1990* (Public Law 101-336).
- Biscome, Jason R. 2000. *Design evaluation of universal campsite prototypes in Yosemite Valley*. (report on file with Protection and Wilderness Management, Yosemite National Park). 79 p. + appendices.
- Cordell, Ken H., Barbara L. McDonald, R. Jeff Teasley, John C. Bergstrom, Jack Martin, Jim Bason, and Vernon R. Leeworthy. 1999. Outdoor recreation participation trends. In Cordell, et al., *Outdoor Recreation in American Life: A National Assessment of Demand and Supply Trends*. Champaign, IL: Sagamore Publishing. pp. 219-321.
- Hultsman, John, Richard L. Cottrell, and Wendy Hultsman. 1998. *Planning Parks for People*. State College, PA: Venture Publishing, Inc.
- Kaplan, Rachel. 1996. The small experiment: achieving more with less. In J.L. Nasar and B.B. Brown (eds.) *EDRA27: Public and Private Places*. pp. 170-174.
- Lee, Kai N. 1993. *Compass and Gyroscope: Integrating Science and Politics for the Environment*. Washington, DC: Island Press.
- PLAE, Inc. 1993. *Universal Access to Outdoor Recreation: A Design Guide*. Berkeley, CA: MIG Communications.
- Shindler, Bruce, Kristin Alder Cheek, and George Stankey. 1999. *Monitoring and evaluating citizen-agency interactions: a framework developed for adaptive management*. Gen. Tech. Rep. PNW-GTR-452. Portland, OR: USDA FS Pacific Northwest Research Station. 38 p.