Cost of Operating Public Campgrounds[1]

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ABSTRACT: *We sampled and analyzed 111 U.S. Forest Service (USFS) Region 6 campgrounds representing experience levels 1 through 5 to estimate facility, operation and maintenance, and opportunity costs for the entire Region. Facility costs were most significant, representing 66 percent of the total cost per site and per recreation visitor-day (RVD). Total annual costs per campground ranged from $800 (experience level 1) to $65,000 (experience level 5) at a 10 percent interest rate. Costs averaged $1.53 per RVD and $886 per site across all experience levels. Cost functions were estimated by multiple linear regression analysis to predict the effect of size (number of sites) and use (RVD) on cost. Functions such as these should help planners better predict average costs of both existing campground facilities and new developments. Once users' needs have been determined, managers should be able to use such cost estimates as a basis for more accurate resource-allocation decisions.*

KEYWORDS: *Cost analysis, campgrounds, economic analysis, cost functions, USFS campgrounds.*

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Camping in recent years has become a way of life in the United States. Both public agencies and private firms provide camping facilities which vary from primitive to very modern. Although past research has

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estimated average costs of providing campgrounds (Manthy and Tucker 1972; Tyre 1975; Reiling 1976), none has attempted to quantify the relationship between cost and size or cost and amount of use. How much will it cost to provide certain campground facilities? What cost component is the most significant? How will costs change if use changes? Managers must be cognizant of both campers' desires for different experiences and the costs of providing a wide range of facilities.

This paper uses U.S. Forest Service (USFS) campgrounds in Oregon and Washington to illustrate costs per site (designated area within a campground) and per recreation visitor-day (12 hours) of operating public campgrounds of various development levels. But even though such public campgrounds are popular places for people to relax and enjoy themselves and are thereby valuable to society, substantial costs are incurred to provide these facilities. Because public campgrounds must be subsidized by tax revenues, recognizing how much it really takes to provide them is important. Our results and their implications will help managers make more accurate decisions concerning the provision of campground facilities.

Accurate knowledge of development costs is not all that is necessary in making wise resource-allocation decisions. We must also know users' preferences. Is a new campground relatively more important than a back-country trail, a road, timber harvesting, or new silvicultural methods? Cost information can be extremely useful, but the other side of the coin must not be forgotten.

Costs

Associated campground costs fall into three general categories: facility costs, annual operation and maintenance costs, and opportunity costs (benefits foregone from other uses due to the presence of the campground). Recognizing the traditional limitations in these types of data, we sought to gain the most useful information through cost-component breakdowns rather than totals. For example, determining labor costs meant obtaining the numbers of full-time recreation employees hired, seasonal staff, persons "borrowed" from other crews, district recreationists, and contract jobs. For each person in each category, we combined the governmental rating, annual salary, and number of hours (or days) worked on each campground in 1977. Total labor costs were then calculated. A similar procedure was applied to each cost component.

Data sources were primarily personal interviews with recreation and timber specialists and other personnel at USFS Ranger Districts; campground usage figures from Recreation Information Management (RIM) data also were used in conjunction with these consultations. Revisions were made based on specialists' personal knowledge and experience with each campground. Despite the inherent limitations in the RIM data, we believe our estimates of costs and physical characteristics of camp-

grounds are quite accurate.[2] The weakest data were the visitor-day estimates, taken from revised RIM information; however, this should not significantly alter the usefulness of our results.

Facility Costs

Campground facilities include items such as picnic tables, roads, traffic barriers, toilet facilities, signs, trails, parking spurs, and water. The relevant facility cost is the current replacement value of the entire campground if it were to be built at its present location today, including not only the cost of each facility but also related transportation and labor costs.

However, the total facility replacement value cannot be levied against a single year because facilities are estimated to have nearly a 20-year useful life. The initial capital cost must be amortized over the 20 years at an appropriate interest rate to determine the annual payment required to repay the construction cost plus interest. Interest cost must be included because even if the campground's construction were not financed, the money could still have earned a return elsewhere.

Determining the appropriate interest rate for governmental capital investment projects has created substantial controversy. We estimated amortized costs using three different interest rates: 6, 10, and 13 percent.

Operation and Maintenance Costs

Annual costs incurred to operate and maintain campgrounds include repairs due to vandalism and natural wear, trash removal, toilet pumping, water-system servicing, patrolling, brush removal, road and trail maintenance, and administration. Both labor and minor equipment and material purchases are recorded here. Where CETA, YCC, or labor crews funded under a different administrative unit perform routine maintenance, no cost is included in the USFS budget for recreation maintenance, although this is still a cost to society. These costs were estimated in this study and included in the operation and maintenance costs. No amortization is necessary because operation and maintenance costs occur annually. Revenue from camping fees was not deducted from these costs.

Opportunity Costs

The opportunity cost of a resource is the value that resource would have enjoyed in its next best alternative use. The primary alternative use of USFS lands in Oregon and Washington was determined to be timber production. Thus, the opportunity cost of using portions of this area for

[2] See van Hees (1978) for a detailed comparison with another cost study.

campgrounds is equivalent to the revenue foregone from timber production on these same acres.

Each campground in our study was individually analyzed. The number of acres in and immediately adjacent to the campground was recorded and the management plan most likely to exist if the land were not classified recreational determined. Management plans were categorized as either clearcut or some variation of shelterwood. Discounted present net worth of all future timber harvests was established by considering the site index, stand age, and volume of each area. Volume estimates for those stands in clearcut regimes were taken from McArdle (1930), whereas those under shelterwood management were derived from managed-stand yield tables (provided by USFS personnel). Volume from intermediate cuts was included. Actual dollar values for harvested timber were analyzed from outputs of neighboring sales in the same year to calculate average stumpage values.[3] The discounted present net worth of all future rotations was then amortized over 20 years to arrive at the annual timber opportunity cost attributable to recreational campgrounds.

Cost Models

Our objectives were to calculate average campground costs and estimate their relationships with experience level, fee, campground size, and amount of use. Total annual campground cost (TC) can be expressed as:

$$TC = FC + O\&M + TOC$$

where FC is the amortized facility cost, O&M is the annual operation and maintenance cost, and TOC is the amortized timber opportunity cost.

Average costs are simply costs per unit, where units refer to either number of sites or number of recreation visitor-days. A campground site (S) is an area designated for one group to spend the night. A recreation visitor-day (RVD) is an aggregate of 12 visitor-hours of use (one person for 12 hours, 12 people for 1 hour, or any combination of continuing or intermittent use). Average total cost per site (AC_s) and average total cost per RVD (AC_v) are defined as:

$$AC_s = \frac{FC + O\&M + TOC}{S}$$

$$AC_s = \frac{FC + O\&M + TOC}{RVD}$$

Facility, operation and maintenance, and opportunity costs can be averaged individually by dividing by either S or RVD.

[3] For more detail on opportunity-cost calculations, see van Hees (1978, pp. 32–38).

Average cost relationships derived in this study are expressed as:

$$AC_s = f\ (S, NF, EL_i)$$
$$AC_v = f\ (RVD, NF, EL_i)$$

where NF is a shifter variable for the presence of a fee, EL_i is a certain experience level, and all other variables are as previously defined.

Study Area

We studied campgrounds in USFS Region 6 (Oregon and Washington). The geography is varied and the types of recreation available are many. In the western part of the Region, the recreationist can camp in the rain forest on the Olympic Peninsula, on or near sand dunes in southern Oregon, or in the steep, low-elevation terrain of the coastal mountains. Towards the center of the Region, recreational environments vary from high alpine conditions in parts of the Cascade Mountains to pine and sagebrush in central Oregon and Washington. The eastern section of the Region contains both mountains and gently rolling hills. In south-central and southeastern Oregon, desert and near-desert conditions prevail.

All USFS campgrounds are classified according to the type of recreation experience opportunity provided. Five categories (experience levels) are delineated according to the amount of modification an area has undergone and the degree of interaction a camper has with other campers. Experience-level 1 campgrounds, containing little site modification, are called "primitive;" few facilities (such as toilets and tent pads) exist, and the degree of social interaction among campers is minimized. Conversely, experience-level 5 campgrounds, considered "modern," have been highly modified, have a larger number of higher standard facilities (such as showers), and provide a high degree of camper interaction.

Region 6 contains approximately 1,020 USFS campgrounds, of which nearly 840 may be used without charge; at the remaining facilities, fees range from $1 to $4 per site. We sampled and analyzed 111 campgrounds representing both various experience levels and geographical locations. These were apportioned by experience level from selected Ranger Districts.

Cost Analysis

Calculating Mean Values

Average campground size (number of sites) increased with experience level (Table 1), as did the number of RVDs per campground. Use per site within a campground was not a function of experience level.

As interest rates rose, indicating better alternative opportunities for funds, so did total annual costs (Table 2); however, cost increases due to interest rates were not significant for any experience level (van Hees

TABLE 1

Relation of Campground Size (Number of Sites) and Use (RVDs), by Experience Level, for USFS Region 6 Campgrounds, 1977.

	Experience Level					
	1	2	3	4[1]	5	All
Sampled campgrounds	8	35	47	18	3	111
Average number of sites	5.5	6.7	17.4	49.7	49.0	19.3
Average annual RVDs	3,062.5	3,594.3	7,412.8	37,583.3	21,566.7	11,170.3
Average annual RVDs/site	556.8	536.5	426.0	756.2	440.1	578.8

Source: Sample averages

[1] High average size and unduly large number of RVDs was attributed to one large, very popular campground.

TABLE 2

Estimated Total Annual Cost ($) per Campground, by Experience Level, at Three Interest Rates for USFS Region 6 Campgrounds, 1977.

	Experience Level					
Interest Rate, %	1	2	3	4	5	All
6	807	4,845	12,209	47,267	61,777	16,090
10	843	5,116	12,929	50,118	65,106	17,051
13	894	5,479	13,942	54,052	70,687	18,371

Source: Sample averages.

1978). At either 6, 10, or 13 percent interest, level 1 campgrounds were estimated to cost less than $1,000 per year compared to more than $60,000 for level 5. As anticipated, total costs are an increasing function of experience level because those requiring more construction and maintenance have larger annual costs.

The most significant cost was facility cost, accounting for 66 percent of the average campground's cost per site and per RVD (Table 3); the least significant cost was timber opportunity cost, representing less than 2.5 percent. Both facility and operation and maintenance costs varied directly with experience level, but timber opportunity costs did not. Some campgrounds had no or nominal timber opportunity costs because they were located in nontimber areas (within National Recreation Area boundaries, scenic restrictions, or buffer strips). In these cases, even though timber was present, opportunities for harvest would have been low due to other constraints even if the campground were removed. Our estimates indicate that operation and maintenance cost per site increases nearly continuously for the higher (more modern) development levels,

TABLE 3

Average Campground Costs ($), by Experience Level, at 10 Percent Interest for USFS Region 6 Campgrounds, 1977.

Cost[1]	Experience Level 1	2	3	4	5	All
			Per Site			
O&M	85.34	238.24	220.89	336.80	348.56	277.13
FC	77.97	436.12	488.14	671.66	978.37	584.35
TOC	0	95.28	35.58	0	1.75	24.13
AC_s	163.31	769.64	744.61	1,007.96	1,328.68	885.61
			Per RVD			
O&M	0.14	0.45	0.52	0.45	0.79	0.48
FC	0.14	0.81	1.14	0.89	2.22	1.01
TOC	0	0.18	0.08	0	—[2]	0.04
AC_v	0.28	1.44	1.74	1.34	3.01	1.53

Source: Sample averages.

[1] FC = facility cost; O&M = operation and maintenance cost; TOC = timber opportunity cost; AC_s = average cost per site; and AC_v = average cost per RVD.

[2] Less than one cent.

whereas most costs per RVD fluctuate according to use. Average site costs increase progressively with development level, but costs per RVD indicated level 4 campgrounds to be more efficiently used.

Estimating Cost Functions

Two total cost functions were estimated by multiple linear regression analysis using a quadratic functional form.[4] A 10 percent interest rate was used.

$$TC_s = \underset{(0.1)}{243.3} + \underset{(0.8)}{73.3}(S) + \underset{(12.6)}{5.1}(S)^2 + \underset{(1.9)}{5{,}428.4}(NF) + \underset{(1.1)}{3{,}973.7}(EL_2)$$

$$+ \underset{(1.9)}{7{,}115.9}(EL_3) + \underset{(2.5)}{13{,}064.0}(EL_4) + \underset{(5.7)}{43{,}365.0}(EL_5)$$

$$R^2 = 0.94 \qquad F = 225 \qquad d.f. = 103$$

$$TC_v = \underset{(0.1)}{204.7} + \underset{(1.4)}{0.18}(RVD) + \underset{(10.7)}{0.000006}(RVD)^2 + \underset{(1.8)}{5{,}638.2}(NF)$$

$$+ \underset{(1.0)}{4{,}087.7}(EL_2) + \underset{(2.1)}{8{,}598.0}(EL_3) + \underset{(2.6)}{15{,}022.0}(EL_4) + \underset{(6.8)}{51{,}881.0}(EL_5)$$

$$R^2 = 0.93 \qquad F = 193 \qquad d.f. = 103$$

[4] Student's t-statistics associated with each regression coefficient are listed in parentheses below the coefficient.

where:

TC_s = total annual campground cost for sites
TC_v = total annual campground cost for RVDs
S = number of overnight sites per campground
NF = 1 if a fee campground; 0 if no fee
EL_i = 1 if campground is an experience level i; 0 if not (i = 2, 3, 4, 5)

We can substitute values for the independent variables in these estimated cost functions to predict total cost. For example, if a manager considered constructing an experience-level 5 campground with 50 sites and charging a fee, total annual costs (TC_s) of $65,452 could be anticipated. Similarly, to predict total cost of existing campgrounds, a manager might use the TC_v equation and substitute projected use to estimate yearly costs.

To analyze the cost relationship for a certain experience level, place 1 or 0 in the equation for the experience level desired. For example, the total cost function for experience level 1 is found by entering 0 for EL_2, El_3, EL_4, and EL_5; for experience level 2, a 1 is substituted for EL_2 and 0s for the remaining EL variables; and so forth.

The equation coefficients can help determine the contribution, on the average, of changes in each variable. For example, the coefficient on the NF variable in the TC_s equation implies that total annual campground cost will increase $5,428 as a campground changes from non-fee to fee. Using the RVD model, the coefficient on the EL_5 variable indicates that, on the average, experience-level 5 campgrounds costs $51,881 more annually than level 1 campgrounds.

Average cost functions are derived from total cost relationships by dividing each equation by either S or RVD. This relationship can elucidate how campground use, size, and experience level influence average costs. Average cost functions, by experience level, for RVDs and numbers of sites are shown graphically in Figures 1 and 2, respectively. A manager could use these functions to estimate how average costs would change as use changes and then compare these estimates against anticipated fee revenues.

Implications

Nearly 70 percent of the costs of providing campgrounds are facility costs, which do not change with the level of use. However, the relationships between costs and both campground size (number of sites) and use (RVDs) indicate that facilities should be fully utilized to reduce unit costs. Most campgrounds in this study are experiencing high costs per RVD and per site, indicating that fewer facilities should have been built. Information on the demand for camping and the costs of providing this opportunity is essential for properly designing efficient, economical campgrounds in the future.

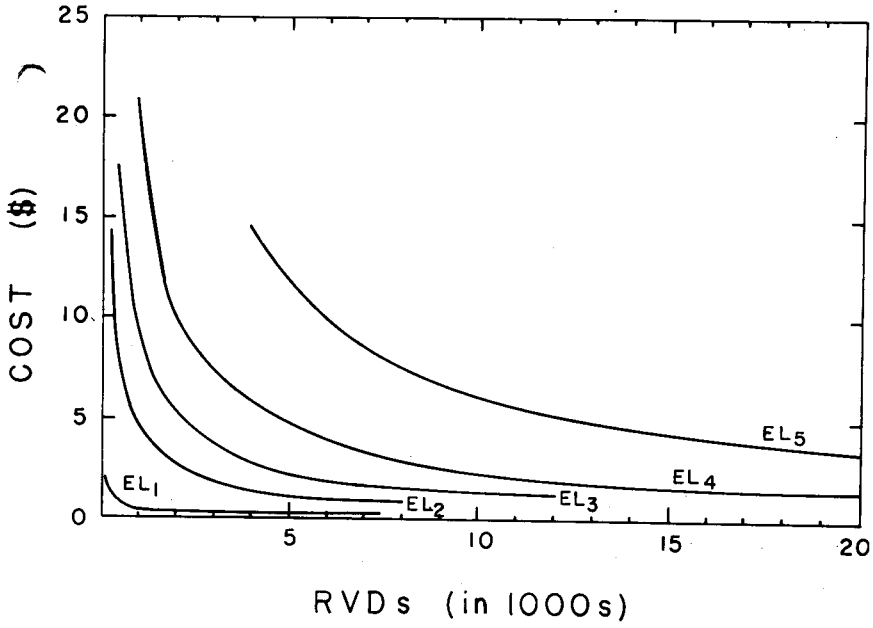

FIGURE 1

ESTIMATED AVERAGE COST OF CAMPGROUND MANAGEMENT FOR USFS REGION 6 CAMPGROUNDS, 1977, BY EXPERIENCE LEVEL (EL), ACCORDING TO USE (RVDs).

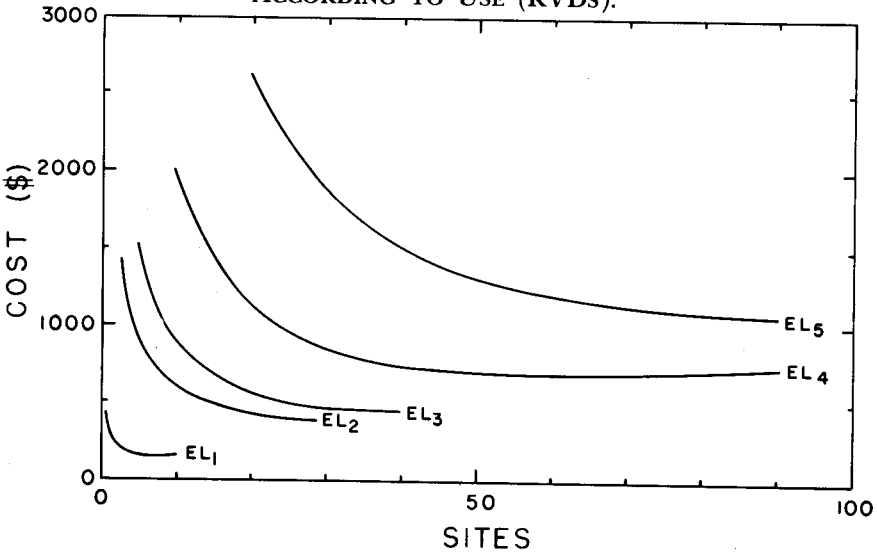

FIGURE 2

ESTIMATED AVERAGE COST OF CAMPGROUND MANAGEMENT FOR USFS REGION 6 CAMPGROUNDS, 1977, BY EXPERIENCE LEVEL (EL), ACCORDING TO SIZE (NUMBER OF SITES).

The average and total costs presented in this paper can help show how costs of individual campgrounds compare with average, region-wide costs. In this way, a manager may identify a campground as having high cost per site but low cost per RVD, perhaps indicating a high level of use. Alternately, the average cost per RVD may be very high, perhaps reflecting under-utilization of facilities. Because many qualitative variables (such as specific campground characteristics) explaining variations in recreational use among campgrounds were not included in this analysis, our results should be treated as averages and not directly applied to individual campgrounds. Relative efficiency for other campgrounds can be inferred from this analysis.

Managers can compare these results with fee revenues collected or use them to address the question of what fee to charge to just cover costs. For instance, the average level 3 campground must collect $0.52 per RVD (or about $4.16 per 24 hours for a group of four people) to cover operations and maintenance costs; fees to cover all costs must total $1.74 per RVD (or $13.92 for 24 hours for the same group of four). Knowing the projected costs, managers can then decide what fees to charge. However, fees may or may not cover costs depending on management goals.

Planners can use cost-function figures to anticipate costs of new developments and to more accurately predict costs for a specific campground type and size. For example, to estimate costs for a proposed level 2 campground with five sites and no fee, a planner could use the TC_s relationship to predict annual costs of $4,711 (an average of $942 per site). Similar estimates are possible for other anticipated levels of use.

This cost information also can indicate which cost components are most significant and how costs change as either experience level, size, or use changes. For example, to estimate costs for a level 5 campground generating 10,000 RVDs but potentially generating 25,000 RVDs if its access road is improved, a planner could use the TC_v relationship to predict an annual increase in total costs of $5,850 but an average daily reduction per RVD of from $6.01 to $2.64, reflecting considerably increased efficiency of operation.

Public campgrounds afford a real opportunity for recreationists, but we can no longer ignore the costs of providing these facilities. Managers must efficiently allocate their limited budgets to make the greatest contribution—managers must know what campgrounds cost.

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