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If you build it, will they come?



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ABSTRACT

National forests have a wealth of natural amenities that attract over 175 million recreational visitors a year. Although natural amenities draw visitors to national forests, many of the recreational activities that they engage in require built amenities, such as roads, campgrounds, boat ramps, and trails. We estimate regression models of the effect of two common built amenities—campgrounds and picnic areas—on national-forest visitation controlling for natural amenities and accounting for the endogenous relationship between visitation and built amenities. We found that campgrounds and picnic areas are significantly and positively correlated with visitation.

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1. Introduction

Between 2005 and 2009, an annual average of 173 million people made recreational visits to national forests in the United States (NVUM, 2009). These visitors spent \$13 billion a year in nearby communities, which helped sustain 224,000 full- and part-time jobs (NVUM, 2009). The natural amenities of national forests no doubt play an important role in attracting visitors. However, most of the recreation activities that visitors engage in also depend upon built amenities such as trails, roads, and boat ramps. For example, hiking, the most common recreation activity on national forests, requires trails for people to hike on and trailheads for parking.

Although the link between built amenities and recreation visits is intuitively clear, no research has quantified the effect of built amenities on national-forest visitation. This is an important, policy-relevant question, as a better understanding of how built amenities affect visitation would help land managers focus recreation spending where it is most effective, which could increase visitation and provide an economic boost to nearby communities.

Although no studies have quantified the effect of built amenities on national-forest visitation, research in several fields provides insight into how and why built amenities might affect visitation. The following review is not intended to be comprehensive; rather it is a sampling of literature pertinent to the research question at hand.

Two related studies (Deller et al., 2001; English et al., 2000) quantified the effect of built and natural amenities on tourism in the United States. They found that natural amenities, including proximity to national forests, were associated with higher tourism. They did not consider the effect of national-forest built amenities on tourism, but they

did find that other built amenities—such as swimming pools, tennis courts, and golf courses—were associated with increased tourism.

Landscape architects and recreation researchers have explored the effects of built amenities on recreation decisions. Early recreation studies examined desired conditions and user preferences for recreation facilities, particularly developed campgrounds. Empirical studies of both recreation behavior and attitudes conclude that campers select campsites that have features they prefer (Cordell and James, 1972). Use of recreation sites appears to depend on many factors, including the camper's experience, activity preferences, duration of visit, and familiarity with the area (McCool et al., 1985). Several studies found a positive correlation between campground use and elements of the natural environment, such as access to water features, scenic views, and fishing reputation (Lime, 1971; Lucas, 1970). Others found a positive relationship with the presence of built amenities such as utilities and covered picnic tables (Bumgardner et al., 1988). In addition, research has investigated the influence of built amenities in backcountry settings. Backcountry visitors generally prefer seeing interpretive signs, rustic trails and bridges, but not corrals, hitching posts, pit toilets or fire rings (Cole et al., 1995; Stankey, 1973). These findings are supported by other work showing that people prefer built amenities that are appropriate for their setting (Kaplan et al., 1998). Finally, research into recreation-choice behavior shows that built amenities may influence the choice of one recreation site over another (Clark and Downing, 1985).

Several studies have examined the effect of natural and built amenities on economic development (Deller et al., 2008; Deller et al., 2001; Marcouiller and Prey, 2005; Nzaku and Bukenya, 2005). They found that natural amenities alone do not ensure economic growth. Rather, complementary built amenities are also required for natural amenities to have their greatest effect. This supports the hypothesis that built amenities positively influence national-forest visitation, but it also suggests that investments by the Forest Service in built amenities may encourage economic growth in nearby tourism-dependent communities.

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Other research has shown persistent demographic and racial differences between visitors to public land and the overall U.S. population. Specifically, African Americans are proportionally less likely to visit public land than Whites (Chavez, 2000; Johnson et al., 2004; Johnson et al., 2007). Kaplan and Talbot (1988) found racial differences in preferences for natural settings. Specifically, they found that African Americans prefer natural settings with more built amenities. Gobster (2002) found that Asian visitors preferred water features; African Americans sought sites with cultural activities and facilities for social programs, and Latinos preferred sites with open spaces and facilities for large family gatherings. Therefore, built amenities may influence not just the number of visits a national forest receives but also the type of visitors.

Numerous studies have examined why people develop attachment to places in the natural environment. Natural amenities can be influential: the clarity of the water at a favorite fishing spot, for example. However, sociocultural factors can also be important: memories of fishing with a favorite relative. In two related studies (Beckley et al., 2007; Stedman et al., 2004), researchers gave residents cameras and asked them to take pictures of the most important elements of places they were attached to. Participants took photographs of waterfalls, lakes, and forests, but they also photographed built amenities such as trails and baseball fields.

Finally, any study of national-forest visitation should be placed in the context of the well-documented decline in visitation to natural areas (Pergams and Zaradic, 2008). If the Forest Service is to remain relevant in a climate of declining visitation, it is important to quantify the effect of investments in built amenities.

1.1. Recreation, facilities and the U.S. Forest Service

The USDA Forest Service oversees national forests and national grasslands in 44 U.S. states. These lands are managed for multiple uses, including timber, grazing, minerals, water, wildlife, wilderness, and recreation. National forests have served as places for people to spend leisure time since the agency's inception in 1906. Visitation data were first collected in 1924 showing that national forests had 4.6 million visitor days annually. By 1950, visitation had increased six fold to 27 million visitor days (USDA, 2011a).¹ The popularity of national forests was bolstered in 1962 with the publication of *Outdoor Recreation for America*, a report that led to growing awareness of the health benefits of recreation and leisure and a movement to expand recreation opportunities on state and federal lands (Douglass, 1999). More than 133 million visitor days were logged by 1965. Growth continued, and thirty years later national forests were experiencing more than 345 million visitor days annually (USDA, 2011a).² Recent reports suggest that recreation visits to national forests and national parks have declined (Pergams and Zaradic, 2008), although some dispute this claim and cite evidence for continued growth in visitation (Cordell 2008). Using a new accounting system, the USDA Forest Service reported 173 million annual visits to national forests between 2005 and 2009.³

The USDA Forest Service has a legacy of recreation facilities that extends back into the 1920s. Early motorists came for restorative outdoor vacations in resorts, lodges, and cabins (Steen, 2004). In 1933, New Deal programs to stimulate the depressed economy resulted in another

major wave of recreation facilities. The Civilian Conservation Corp (CCC) and similar groups constructed miles of trails and scores of cabins, shelters, and other facilities on state and federal lands (Douglass, 1999; McClelland, 1998). In 1958, the Outdoor Recreation Resources Review Commission inventoried and evaluated the status of recreation resources to project future demand. From this point on, national forests were charged with mapping, inventorying and classifying recreation sites.

Recreation management in the Forest Service has primarily been based on the “if you build it, they will come” approach. In other words, management has focused on the supply side (facilities and infrastructure). Since the 1980s, recreation management has been guided by planning frameworks that integrate visitor-experience information with recreation site attributes. The Recreation Opportunity Spectrum (ROS) was one of the first planning tools used by national forests that embraced this approach. Developers of ROS believed that by providing a diverse array of six recreation opportunity classes from ‘primitive’ to ‘modern,’ a range of visitor experiences would logically result (Clark and Stankey, 1979). The ROS approach stipulated what features each site category would provide, related to degrees of access, on-site management, facility comforts, opportunities for social interaction, visitor impact, and other elements. National forest managers used ROS as both a planning framework and an inventory tool to catalog and categorize sites (McCool et al., 2007). The underlying assumption was that each national forest should provide opportunities for a full range of recreational experiences. Recent funding cuts have, however, forced managers to question whether each management unit can or should continue to offer a full range of recreation opportunities.

The USDA Forest Service has a wealth of built amenities. In 2010, it was responsible for more than 152,000 miles of trail, 5000 campgrounds, 5600 trailheads, 1300 picnic sites, 1000 boating sites, 700 interpretive sites, and 680 cabins (USDA, 2011b). Maintaining these built amenities is expensive, and recreation budgets have been declining in real terms. From 2002 to 2010, the budget line for recreation, wilderness, and heritage increased at a rate of 1.6% annually, compared to a 4.4% annual increase for the entire agency (In 2010, the budget for recreation, wilderness, and heritage was \$280 million). Adjusted for inflation, recreation funding has declined. In consequence, the agency has cut more than 1000 recreation jobs (USDA, 2004, 2010b). These trends suggest that fewer resources are available to address the vast network of recreation facilities on the nation's forests and grasslands. Since many of these resources were built in the 1930s, maintenance needs are great. As a result of both agency budget constraints and a desire for greater public involvement in forest stewardship, partner agencies have become increasingly responsible for the maintenance of trails, campgrounds, and built facilities with guidance from agency staff (Seekamp et al., 2011).

In 2005, to address the problem of how to maintain recreation facilities given declining budgets, the USDA Forest Service required each national forest to review their existing recreation facilities and make decisions about which sites to fund and at what level (USDA, 2011b). The Recreation Facilities Analysis process required national-forest staff to determine their forest's recreation niche by considering local recreation use trends and demographics, projecting future demand, and prioritizing sites for a 5-year program of work. This process resulted in reallocation of resources toward recreation facilities and in some cases, sites were decommissioned. Deferred maintenance of Forest Service facilities totaled \$5.2 billion in 2010. Some of these facilities are recreation-related. For example, trails and trail bridges require \$307 million of maintenance (USDA Forest Service, 2010a). To focus on this challenge, the USDA Forest Service Strategic Plan for 2007 to 2012 specified performance measures dealing with increases in the number of recreation sites maintained to standard from 2005 (65% maintained) to 2012 (80% maintained) (USDA, 2007). These changes aim to improve the quality of the visitor experience and improve safety in national forests.

¹ A recreation visitor day (RVD) is a statistical reporting unit consisting of 12 visitor hours. A visitor hour is the presence of a person engaged in one or more recreation activities during a period aggregating 60 min.

² Beginning in 1965 the units of recreation use were changed to reflect better estimates and the passage of the Wilderness Act and the Land and Water Conservation Fund Act.

³ Visits to national forests are counted by the National Visitor Use Monitoring (NVUM) program. Studies are conducted every few years to determine visitor use of national forests. These data cannot be compared with the previous accounting system that used RVDs as the unit of analysis.

2. Methods

2.1. Data

The unit of observation for the study is the national forest ($n = 115$); variables describe the total number of visits to a national forest, the total number of campsites on a national forest, and so forth. Visitation data estimates were obtained from the Forest Service's National Visitor Use Monitoring (NVUM) Program. For details of the NVUM methodology, see Zarnoch et al. (2005). Built amenity data came from the USDA Forest Service's, 2007 Recreational Developed Sites Summary.⁴ To minimize temporal differences between visitation and built-amenity data, we only used data from the first round of NVUM sampling.

Built amenities are not the only variables that could affect national forest visitation. Natural amenities (such as lakes and mountains), weather, and population around a national forest may also be influential.

We obtained weather data from the Parameter-Elevation Regressions on Independent Slopes Model⁵; elevation data from the Shuttle Radar Topography Mission⁶ and the U.S. Geological Service⁷; data on streams, roads, and lakes from the National Atlas.⁸

We calculated total population in 50-mile and 100-mile network buffers around the boundary of each national forest using TIGER census block information from the 2010 census. We used network rather than Euclidean distance buffers, because Euclidean distance may not well represent the distance that visitors must travel to reach a national forest. This is especially true for national forests with few road entrances, low road density in surrounding areas, or mountainous topography.

We first identified the entry points to each national forest by overlaying a network of all improved roads for the continental United States with a layer of the boundaries of all national forests. Next, we skeletonized census block polygons. If a centroid fell outside a polygon, we moved it back within a polygon's borders. We identified the closest road network segment to each polygon centroid. Finally, we calculated the shortest distance between each census block centroid and the closest national forest entry point. As an illustrative example, Fig. 1 summarizes this process for the Mark Twain National Forest.

Table 1 gives a list of the candidate variables used in the analysis.

2.2. Model estimation

National forest visitation and levels of built amenities may be endogenous: national forests with more built amenities may attract more visitors, but national forests with more visitors may also provide more built amenities. If conventional regression techniques are used in the presence of endogeneity, then parameter estimates may be both inefficient and biased (Hausman, 1978). The control function approach is an instrumental-variables method that can be used to estimate regression parameters in the presence of endogeneity (Heckman and Hotz, 1989). It involves using estimated, as opposed to observed, values for the potentially endogenous variable (β 's denote coefficients to be estimated in the regression step):

$$y = \beta_0 + \beta_X \mathbf{X} + \beta_z z + \varepsilon \quad (1)$$

where,

- y = dependent variable;
- \mathbf{X} = vector of exogenous variables;
- z = estimated values of the endogenous variable z ;
- ε = normally distributed error term.

Prior to estimating Eq. (1), the endogenous variable, z , is estimated (α 's denote coefficients to be estimated in the regression step):

$$z = \alpha_0 + \alpha_X \mathbf{X} + \alpha_I I + \theta \quad (2)$$

where

- I = instrument;
- θ = normally distributed error term.

In this study, the dependent variable in all models is the natural log of annual national-forest visits. We chose to model the natural log of visitation, as unlogged visitation data were significantly skewed. The endogenous variable is the built amenity under study (number of campgrounds, for example). Instruments were chosen to satisfy two conditions. First, an instrument must significantly ($p < 0.05$) explain variation in the endogenous variable. Second, it must be uncorrelated with annual nation-forest visits. Only one instrument was used for each model, because using fewer instruments reduces the chance of biased coefficient estimates (Angrist and Krueger, 2001).

The endogenous relationship between visitation and built amenities is intuitively clear. To empirically verify endogeneity, we used a Hausman test (Hausman, 1978), which compares coefficients from a model assuming built amenities are exogenous to a model that assumes that built amenities are endogenous.

The control function approach is similar to the more commonly employed two-stage least squares method. However, it has two significant advantages. First, because it involves two separate stages, it is more transparent. One can easily check the significance of an instrument in the first stage of the estimation, for example. Second, unlike the control function approach, two-stage least squares requires the estimation of asymptotic standard errors.

The sample size for this study is modest (115) and many of the variables describing built amenities are collinear. Therefore, we estimated separate regression models for each built amenity. The disadvantage of this approach is that the marginal effects of built amenities aren't additive across different models, and, therefore, it is not possible to estimate the total effect of built amenities on visitation. In addition, because different built amenities are positively correlated, individual regression models may overestimate the effect of a built amenity on visitation. However, this approach does identify the effects of built amenities that might be undetectable in a joint model.

We used a two-stage model selection approach (coefficients were estimated using ordinary least squares). First, we excluded all variables with a p value greater than 0.25 when individually regressed against visitation. The purpose of this initial cut was to reduce the number of independent variables to a number that could be accommodated by our modest sample size. Some groups of related variables—those describing roads, for example—were highly collinear. In these cases, we only included the variable from each group with the lowest p value. Next, we excluded additional variables using iterative, backward selection based on progressively lower p -value thresholds of 0.8, 0.6, 0.4, and 0.2.

3. Results

Five built-amenity variables had individual p values of less than 0.25 when regressed against visitation: boating-site capacity, number of campsites (sum of developed and primitive campsites), number of interpretive sites, number of picnic areas, and number of trailheads. However, only two (number of campsites and number of picnic area) were significant ($p < 0.05$) in the fully-specified models (Tables 2 and 3). We chose to use total visits as the dependent variable in each model rather than number of visitors who engaged in a particular activity (camping, for example), because a built amenity may have a broad influence on visitation. For example, providing more campgrounds may increase the number of people who camp, but these visitors may also engage in other recreational activities such as hiking or boating.

⁴ Unpublished data on file with the author

⁵ <http://www.prism.oregonstate.edu/>

⁶ <http://srtm.csi.cgiar.org/>

⁷ <http://agdc.usgs.gov/agdc.html>

⁸ <http://nationalatlas.gov/atlasftp.html>

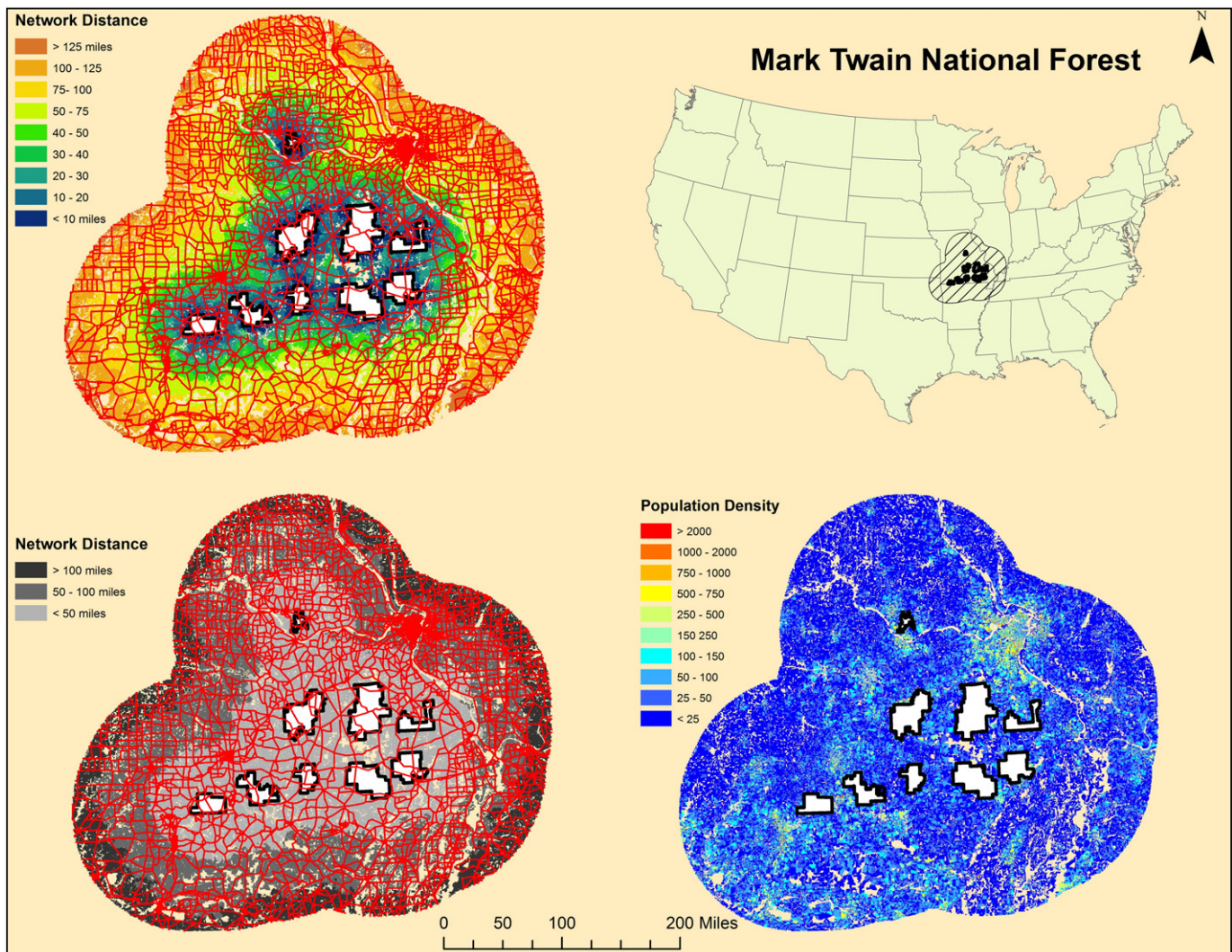


Fig. 1. Calculating total population in network-distance buffers around the Mark Twain National Forest.

In both models, population was significantly associated with visitation. In the campsite model, an additional 1 million people living within 100 network miles was associated with an additional 52,600 annual visits, whereas, in the picnic-site model, an additional 1 million people living with 50 network miles was associated with 97,000 additional annual visits. These results are consistent with past research showing that the majority of national forest visitors live within 50 miles of a national forest (NVUM, 2009). We modeled the natural logarithm of annual visitation, so these marginal effects only hold at the median value of annual visitation.

An additional campsite was associated with 52,600 more annual visits. Note that we modeled total visitation, so these additional visits may not all have been for camping. Lake area and August precipitation were also positively associated with visitation, although the size of these effects was orders of magnitude smaller than the impact population or campsites.

An additional picnic site was associated with 97,000 more annual visits. More wilderness area was also positively associated with visitation, whereas greater variation in elevation was associated with lower visitation. This may be because people prefer less mountainous national forests, or it may be because topography is correlated with other drivers of visitation. For example, more mountainous national forests may also have more extreme weather.

Correcting for endogeneity in a regression model raises two important questions. First, have you adequately corrected for the endogeneity

Second, in correcting for endogeneity, have you introduced additional sources of bias? In both models, the Hausman test found significant evidence of endogeneity. In correcting for this endogeneity, theory suggests that if you choose instruments with care and use them parsimoniously, then regression coefficients should be unbiased (Angrist and Krueger, 2001). However, careful instrument selection does not provide positive proof that the underlying endogeneity has been adequately addressed.

4. Discussion

We estimated the effect of five built amenities—boating sites, campgrounds, interpretive sites, trailheads, and picnic areas—on national-forest visitation. After accounting for the endogenous relationship between built amenities and visitation, campgrounds and picnic areas were significantly, and positively, correlated with national-forest visitation. This suggests that the built amenities on a national forest are an important complement to its natural amenities. This finding is consistent with previous research, which has shown that built amenities are an important component of the outdoor-recreation experience.

Previous research has identified racial preferences for built amenities within natural settings (Kaplan and Talbot, 1988). Therefore, built amenities may influence more than the number of visitors; they may also affect the demographic mix of visitors. Investing more in built amenities may be an effective policy tool to encourage underserved groups

Table 1
Candidate variables.

Definition
Estimated visitation in 2008 (thousands of visits)
Population (millions of people) in 50-mile and 100-mile network buffers around national-forest boundary
Total area of lakes in (hectares)
Total area of reservoirs in (hectares)
Total area of glaciers in (hectares)
Length of major streams (km)
Length of minor streams (km)
Length of designated wild and scenic rivers (km)
Length of major roads (km)
Length of minor roads (km)
Length of other roads (km)
Maximum elevation (meters)
Minimum elevation (meters)
Mean elevation (meters)
Standard deviation of elevation (meters)
30-year average summer (June, July, and August) rainfall (mm*100)
30-year average summer (June, July, and August) temperature (°C)
Total length of dirt trails (km)
Total length of snow trails (km)
Number of trailheads
Number of boating sites
Boating-site capacity: maximum number of annual users of boating sites
Number of primitive campsites
Number of developed campsites
Number of interpretive sites
Number of picnic areas

For more information on the distinction between minor and major streams, see the National Atlas: <http://nationalatlas.gov/atlasftp.html>

to visit national forests. In parts of the country that are experiencing significant demographic changes—the Southwest, for example—built amenities may also help land managers respond to changing environmental preferences.

In response to research that suggests forest visitation is declining, among youths in particular, the USDA Forest Service has launched several new programs and sponsored grants to reverse this trend, including the 'Kids in the Woods' program (Pergams and Zaradic, 2008; Collins and Brown 2007). Our results suggest that providing built amenities has a significant effect on national-forest visitation. Given capacity constraints in budget and personnel and the backlog in deferred maintenance, efforts by the agency to increase forest visitation may gain more traction with greater efficiency, if a focus on high-visitation sites is pursued. Yet, an exclusive focus on high-visitation sites contrasts with implicit agency policy that suggests a range of recreation experiences is desired. What we know from this study, is that the built environment matters. If you build it, they (the public) will indeed come to the forest. It is up to managers and policy-makers to decide who exactly they want to attract, what activities and experiences to provide and promote, and how to manage high-use sites once they do come.

Table 2
Campsite regression results (n = 109).

Variable	Coefficient	Standard error	p-value	Marginal effect on visitation ^a
Intercept	4.69	0.440	<0.001	–
Number of campsites ^b	0.0402	0.00794	<0.001	52,600
Population within 100 network miles	0.0412	0.0151	0.008	54,000
Lake area (hectares)	0.0000103	5.31E-06	0.055	19.6
Rain in August (mm*100)	0.0000888	0.0000253	<0.001	120
R-squared	0.295			
Instrument	Length of other (minor) roads			

^a At the median of annual visitation (1,282,000).

^b Estimated number of campsites.

Table 3
Picnic-site regression results (n=106).

Variable	Coefficient	Standard error	p-value	Marginal effect on visitation ^a
Intercept	6.31	0.142	<0.001	–
Number of picnic areas ^b	0.0729	0.01808	<0.001	97,000
Standard deviation of elevation (m)	–0.000839	0.000455	0.068	–1100
Area of wilderness (hectares)	4.69E-07	2.10E-07	0.028	70
Population within 50 network miles	0.0476	0.0240	0.050	62,500
R-squared:	0.460			
Instrument:	Maximum elevation			

^a At the median of annual visitation (1,282,000).

^b Estimated number of picnic areas.

This study has limitations. The sample size is modest, so relationships that might be identified in a larger data set aren't identified here. In addition, the models describe visitation at a coarse scale: all visits are counted equally irrespective of their purpose or duration. Finally, the models contain no information on visitors. Therefore, it's not possible to identify the effect of built amenities on different demographic groups. These questions could be fruitfully addressed by future research.

In conclusion, results strongly suggest a relationship between built amenities and national-forest visitation. Land managers could invest in built amenities to encourage visitation and to reach underserved demographic groups.

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