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Effects of Facility Developments and Encounter Levels on Perceptions of Settings, Crowding, and Norms in a Korean Park

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Abstract This article examines potential effects of two physical developments (presence or absence of an aerial tramway, a road vs. a trail) and one social variable (increasing encounters with other people) on individuals' perceptions of settings (i.e., perceived settings), crowding, and acceptance of encounters (i.e., norms) in Mudeungsan Provincial Park in South Korea, where there have been proposals for a new aerial tramway. Data were obtained from 241 students at Chonnam National University, almost all of whom had previously visited this park (e.g., 66 % visited at least one of the two study locations in this park, 55 % visited this park in the past 12 months). Simulated photographs showed encounter levels (1 or 15 hikers), the presence or absence of a tramway, and a road versus a trail. Respondents encountering low numbers of other people felt less crowded, considered these use levels to be more acceptable, and perceived the area as more pristine and less developed. Locations containing an aerial tramway were perceived as more developed and less natural, and higher encounter levels were considered to be more acceptable at these locations. Whether settings contained a road or a trail did not influence perceived settings, crowding, or norms. Implications of these findings for future research and management of parks and related outdoor settings are discussed.

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Introduction

Development of recreation facilities and services such as buildings, campgrounds, boat ramps, roads, and trails changes the landscape. Whether these changes are desirable or undesirable, however, is debatable. Opponents may argue that developments change ecological systems, sometimes with negative or unpredictable consequences. They may also point out that aesthetic impacts of natural landscapes are impaired and natural areas should remain more primitive from an ethical perspective (Manning et al. 2004). Opponents may also contend that economic benefits for some groups, such as local business owners, may not justify publicly funded costs of expanded infrastructure or increased management needed for accommodating greater use (Loomis and Walsh 1997). On the other hand, proponents may favor developments because they facilitate use, offer greater convenience, provide a more hardened site that can withstand use, or bring economic benefits from increased visitation (Manning 2011). Proponents of facilities may also point to greater accessibility for the elderly, handicapped, or those with less time to visit (Jackson and Burton 1999; Bullock et al. 2010). Studies of recreationists offer examples of both sentiments. For instance, summer users opposed widening trails and operating more chairlifts at ski areas (Needham et al. 2004b, 2011), whereas visitors supported more facilities such as toilets and trash cans at coastal recreation areas (Needham and Szuster 2011).

Embedded in these issues are concerns about recreation resources and experiences. Providing users with high

quality experiences is a major management goal, but the possibilities range "from the paved to the primeval" (Stankey 1979, p. 141). This issue has traditionally been addressed in the literature under the rubric of the recreation opportunity spectrum (ROS, see Driver et al. 1987; Manning 2011 for reviews). Settings can range from relatively natural with low amounts of use and development on one end of the spectrum to more altered and less natural settings with higher amounts of use and development on the other. Along this continuum, different settings provide opportunities for experiences ranging from wilderness recreation where natural landscapes dominate, developments are limited, and solitude is expected, to more developed recreation at campgrounds or other high use density frontcountry areas.

Although any development can be controversial, the most contention is usually generated when a proposal would dramatically change a particular setting from one type to another along this opportunity spectrum (Manning 2011). This article investigates the potential effects of two physical developments (presence or absence of an aerial tramway, a road vs. a trail) and one social variable (increasing encounters with people) on recreationist experiences and perceptions at Mudeungsan Provincial Park in South Korea, where there have been serious proposals for a new aerial tramway. Similar proposals have surfaced in North American national parks such as Jasper, Grand Canyon, and Yosemite. This article addresses how facility developments and encounter levels could impact user perceptions of resources and the quality of their experiences in terms of perceptions of settings on the ROS continuum (i.e., perceived settings), crowding, and acceptance of encounters (i.e., norms).

Conceptual Background

Use Levels and Perceived Crowding

Perceived crowding has received substantial attention in the recreation literature, and the concept has been the focus of several meta-analyses and hundreds of empirical studies (see Manning 2007, 2011; Vaske and Shelby 2008 for reviews). Crowding is defined as a negative evaluation of a use level or number of encounters (Shelby et al. 1989), and it plays a role in planning and management frameworks such as limits of acceptable change (LAC, Stankey et al. 1985), visitor impact management (VIM, Graefe et al. 1990), carrying capacity assessment process (CCAP, Shelby and Heberlein 1986), and visitor experience and resource protection (VERP; see Nilsen and Tayler 1998; Manning 2004 for reviews).

Density or overall use levels are generally believed to affect encounter levels, and these encounters influence perceptions of crowding (Shelby 1980; Manning 2011). These relationships, however, are complex and can be influenced by other variables. Reported encounters, for example, can be affected by travel patterns and topography, and recreationists may perceive and report encounters differently than trained observers (Shelby and Colvin 1982; Manning 2007; Bell et al. 2011). Similarly, evaluations of use levels or encounters as being crowded can depend on expectations and preferences (Absher and Lee 1981; Shelby et al. 1983; Lee and Graefe 2003), experience or skill level (Vaske et al. 1980; Needham et al. 2005), characteristics of groups encountered (e.g., small or large groups, hikers or horseback riders; Manning 1985; Vaske and Donnelly 2002; Arnberger and Haider 2007), demographic characteristics such as country of origin (Vaske et al. 1996; Doorne 2000), and situational characteristics such as location within a recreation area (e.g., frontcountry, backcountry; Needham et al. 2004a). Research has shown, however, that higher use or encounter levels are often associated with greater perceived crowding (see Vaske and Donnelly 2002; Vaske and Shelby 2008; Manning 2011 for reviews), so the following hypothesis is tested:

H_1 Recreationists encountering higher numbers of other people will feel more crowded than those encountering lower numbers of other people.

Use Levels and Encounter Norms

Although there have been studies examining relationships among use levels, encounters, and crowding, it is somewhat less clear how use levels or reported encounters directly affect encounter norms. One line of research defines norms as standards that individuals use for evaluating activities, environments, or conditions as acceptable or unacceptable (Shelby et al. 1996). Norms clarify what people believe conditions should or should not be in a given context (Bell et al. 2011). This concept has been used in many studies to understand encounter norms, or the maximum number of people that users will accept seeing (see Vaske et al. 1993; Shelby et al. 1996; Manning 2007, 2011 for reviews). Research has shown that different norms are associated with different kinds of experiences, and norms also form the basis for evaluating different numbers of encounters as more or less crowded (Shelby et al. 1989; Vaske and Donnelly 2002). Even within the same resource area, for example, recreationists can report different encounter norms when they are asked to consider different types of experiences, and higher normative tolerances can sometimes be associated with experiences involving higher

use levels (Shelby et al. 1996; Needham et al. 2004a). This article examines how increasing use levels may directly influence encounter norms and hypothesizes that:

H_2 Recreationists encountering low numbers of other people will have norms that consider high encounter levels to be less acceptable.

Use Levels and Perceived Settings

Recreationists appear to experience and be more tolerant of higher use levels or encounters in more developed or popular settings. According to Manning (2011), however, "that different use levels are appropriate for different types of recreation areas seems obvious in a conceptual way, though not much is known about the issue in a quantitative sense" (p. 127). In studies on three separate rivers, Shelby (1981) asked respondents to consider three options: "a wilderness, a place generally unaffected by the presence of humans;" "a semi-wilderness, the kind of place where complete solitude is not expected;" and "an undeveloped recreation area, the kind of place where a natural setting is provided, but meeting other people is part of the experience." Freimund et al. (2002) used a similar approach by differentiating among "wild places," "attraction sites," and "access areas." Asking about these types of settings has helped managers consider different options for the types of opportunities to be provided along continuums analogous to the ROS. Results showed that most respondents who encountered large numbers of people perceived the places to be more developed where meeting other people was expected. It could be argued that people who encounter high use levels will perceive an area to be more developed and those who encounter few people will perceive the area to be more primitive, so the following hypothesis is advanced:

H_3 Recreationists encountering higher numbers of other people will perceive that the area is more developed, whereas those encountering fewer people will perceive that the area offers a more natural and less developed experience.

Levels of Development and Perceived Settings

Although the ROS concept has been used widely in recreation management, it is a planning principle and there are fewer empirical research applications and less data on ROS than there are for crowding (see Manning 2011 for a review). The most commonly used logic in ROS applications is that the managing entity specifies goals for a setting and these decisions are then used for guiding future levels of development, types of uses, and use levels (Driver et al. 1987; Manning 2011). This article, however, somewhat changes this logic by examining how future developments that are proposed but not yet built might alter the type of recreation setting and future experiences from the recreationist's point of view. Studies have examined user evaluations of how site alterations such as the construction of wider or hardened trails (Manning et al. 2004; Needham et al. 2011) and permanent camps or lodges (Freimund et al. 2002) could impact user experiences and perceptions of settings. These studies have suggested that these types of physical developments could be associated with perceptions of resources and settings at the more developed end of the ROS continuum, so the following hypotheses are advanced:

H_4 Recreationists will perceive that a setting containing an aerial tramway is more developed, whereas a setting without a tramway offers a more natural and less developed experience.

H_5 Recreationists will perceive that a setting containing a road is more developed, whereas a setting with a trail offers a more natural and less developed experience.

Levels of Development and Encounter Norms

Again, because ROS is primarily a planning concept, it has not been widely associated with the extensive research and literature on encounter norms in recreation settings (Manning 2011). Several empirical studies, however, suggest a relationship between these two concepts. Compared with recreationists at easily accessible and more developed frontcountry settings, those at more remote and primitive backcountry areas typically rate encounters with other people as less acceptable (Williams et al. 1992; Basman et al. 1996; Manning et al. 1996; Needham et al. 2004a). Therefore, the following hypotheses are advanced:

H_6 Recreationists will be more likely to accept higher encounter levels at a location with an aerial tramway than at an area without a tramway.

H_7 Recreationists will be more likely to accept higher encounter levels on a road than on a trail.

Levels of Development and Perceived Crowding

Settings that are easily accessible by developments such as roads or aerial tramways are typically more heavily altered and associated with larger numbers of people (Shelby and Heberlein 1986; Manning 2007). This assertion is also embedded in the logic and practice of ROS as a planning tool. If recreationists at settings with greater levels of physical development are more likely to accept higher encounter levels as hypothesized, it is plausible that these settings will also be perceived as less crowded despite these higher encounter levels, so it is hypothesized that:

H_8 Recreationists will feel less crowded at a location with an aerial tramway than at an area without a tramway.

H_9 Recreationists will feel less crowded on a road than on a trail.

Methods

Data Collection

This study focused on Mudeungsan Provincial Park in South Korea, which is a popular nature park of over 30 km^2 (11.5 mi^2) located in Gwangju city and Damyang and Hwasun counties in the southwest region of the country. This park accommodates approximately three million visits annually, mainly because it is easily accessible and several high peaks provide popular attractions for visitors to interact with nature. This study focused on two locations in this park that tend to have fewer visitors and quieter conditions, and both are considered by managers to be in a "nature preservation area." Both of these locations are close to Cheonwangbong, the highest peak in the park, and offer similar background views of Seoseokdae, another high peak. Seoseokdae has been suggested as a likely location for constructing an aerial tramway. In the foreground, one of these study locations has a trail and the other has a road. Together, these study locations allow analysis of perceptions and experiences potentially impacted by a road versus a trail, a tramway up Seoseokdae, and encounters with different numbers of hikers. This study explored impacts of these conditions on perceptions of settings, crowding, and norms.

Data were obtained in February 2010 from 241 college students at Chonnam National University in South Korea. Almost all of these students had visited this park in their life, 66 % had visited at least one of the two specific study locations, which are less developed, and 55 % had visited this park in the past 12 months. These respondents viewed photographs depicting two physical developments (presence or absence of an aerial tramway, a road vs. a trail) and one social variable (increasing encounter levels). They responded to questions measuring their perceptions of settings, encounter norms, and perceived crowding.

Independent Variables

Respondents were given a questionnaire and viewed simulated color photographs 24 × 18 cm (9.5 × 7 in) in size (Figs. 1, 2). Original photographs were taken of the trail and road study locations, which provided otherwise similar foregrounds and identical background views of Seoseokdae, the prospective aerial tramway site. The number of hikers and presence of a tramway were simulated in the images. The following photographs were produced: (a) one hiker without the tramway, (b) one hiker with the tramway, (c) 15 hikers without the tramway, and (d) 15 hikers with the tramway. The largest number (i.e., 15 hikers) was chosen to create an atmosphere that tramway development might bring with hiker congestion across the trails and roads (see Figs. 1, 2). These four conditions were created with hikers either on the trail (Fig. 1) or the road (Fig. 2). This resulted in a total of eight photographs with three "treatment" or independent variables: (a) presence or absence of a tramway, (b) number of hikers/encounter levels (1 or 15), and (c) location (road or trail). Each respondent was exposed to only one photograph, resulting in eight groups of approximately 30 respondents each ($n = 241$).

Dependent Variables

Three dependent variables were examined: (a) perceived crowding, (b) encounter norms, and (c) perceived settings. Perceived crowding in response to the photograph being viewed was measured on the 9-point crowding scale of 1 "not at all crowded" to 9 "extremely crowded." This scale has been used extensively and tested rigorously in past studies (see Shelby et al. 1989; Vaske and Shelby 2008 for reviews). Encounter norms were measured by asking respondents to rate their acceptance of the number of hikers in the photograph being viewed on the common 9-point scale for measuring encounter norms, with response categories ranging from 1 "very unacceptable" to 9 "very acceptable" (see Manning 2007 for a review).

Perceptions of settings were measured by asking respondents, "what kind of area do you think is represented in the photograph?" Similar to the ROS continuum, a 5-point response of 1 "developed park area" to 3 "natural environment area" to 5 "nature preservation area" was used. This response reflects management's current classification of areas in this park where a "developed park area" was explained in the questionnaire as "an area similar to an amusement park in urban areas where development and visitor convenience are emphasized rather than natural experiences. It is common to encounter many visitors in this area and difficult to expect solitude and related experiences." The "natural environment area" was described in the questionnaire as "an intermediate area functioning as a buffer between developed and preservation areas, where some human developments such as buildings and facilities are allowed. It is common to encounter some other visitors and hard to expect complete solitude and related experiences in this area." A "natural preservation area" was described in the questionnaire as "a well preserved natural area that is generally not impacted by human development such as buildings and facilities. Visitors encounter only a few other people and the area almost always provides solitude and related experiences."

Fig. 1 Photographs of low and higher use levels, and presence and absence of a tramway from the *trail* location at Mudeungsan Provincial Park in South Korea using data from college students in 2010

Data Analysis

A series of 2 × 2 × 2 three-way analyses of variance (i.e., *n*-way ANOVA) examined the main effects of encounter levels (1, 15 hikers; recoded to dummy variable coded 0 and 1), absence or presence of a tramway (dummy variable coded 0 and 1), and a trail versus a road (dummy variable coded 0 and 1) on each of the three dependent variables (crowding, encounter norms, perceived settings). In addition, all possible interaction effects were examined, and correlations among all of these variables were also explored. Data were then analyzed and presented graphically using ordinary least squares (OLS) regression path analysis to estimate relationships among all variables simultaneously based on theoretical assumptions about the underlying ordering of these variables.

Results

The first hypothesis (H_1) predicted that recreationists encountering higher numbers of other people should feel more crowded than those encountering lower use levels. Results of the three-way ANOVA showed that the number of hikers was significantly related to perceptions of crowding, $F = 106.81$, $P < 0.001$ (Table 1). The partial eta squared effect size statistic (η_p^2) measures the proportion of the effect of the independent variable (e.g., encounters) and the error variance attributable to the effect together on the dependent variable (e.g., crowding; Cohen 1973; Levine and Hullett 2002; Vaske 2008). The η_p^2 of 0.31 suggests that encounters accounted for approximately 31 % of the overall variance (i.e., effect plus error) in crowding (Table 1). There was also a strong positive correlation between encounters and crowding, $r = 0.55$, $P < 0.001$ (Table 2), with mean crowding increasing from $M = 2.59$ or "slightly crowded" for images showing one hiker to $M = 4.65$ for 15 hikers (Table 3). Taken together, these findings support H_1.

According to the second hypothesis (H_2), the number of encounters depicted in the photographs should be related to respondent encounter norms. The three-way ANOVA showed that the number of hikers in the images was significantly related to encounter norms, $F = 21.06$, $P < 0.001$, accounting for approximately 8 % of the overall variance (i.e., effect plus error) in these norms ($\eta_p^2 = 0.08$, Table 1). The correlation between encounters or use levels and norms was negative and significant,

Fig. 2 Photographs of low and higher use levels, and presence and absence of a tramway from the *road* location at Mudeungsan Provincial Park in South Korea using data from college students in 2010

$r = -0.27$, $P < 0.001$ (Table 2), with one hiker being more acceptable ($M = 5.75$) than 15 hikers ($M = 4.80$; Table 3). These results support H_2.

The third hypothesis (H_3) suggested that users encountering high numbers of hikers should perceive the setting as more developed, whereas those encountering fewer hikers should perceive that the area offers a more natural and less developed experience. Encounter levels depicted in the photographs were significantly related to perceptions of the setting, $F = 7.70$, $P = 0.006$, but accounted for only 3 % of the overall variance (i.e., effect plus error) in these perceptions ($\eta_p^2 = 0.03$, Table 1). The correlation between encounter levels and perceptions of the setting was negative and significant, $r = -0.16$, $P < 0.05$ (Table 2), with photographs containing one hiker being considered a slightly less developed setting ($M = 3.19$) than the image of 15 hikers ($M = 2.83$; Table 3). Although these relationships between encounters and perceptions of settings are relatively weak, they are still statistically significant and support H_3.

According to the next two hypotheses, recreationists should perceive locations containing a tramway (H_4) or a road (H_5) to be more developed and less natural compared to locations without these physical developments. The three-way ANOVA showed that the presence of a tramway was significantly related to perceptions of the settings, $F = 34.68$, $P < 0.001$, accounting for approximately 13 % of the overall variance (i.e., effect plus error) in these perceptions ($\eta_p^2 = 0.13$, Table 1). The correlation between tramway presence and perceptions of the settings was negative and significant, suggesting that tramway construction would cause respondents to consider this area to be more developed and less natural ($M = 2.62$) compared to the same area without a tramway ($M = 3.40$), $r = -0.35$, $P < 0.001$ (Tables 2 and 3). The presence of a road versus a trail, however, did not impact perceptions of the setting, and the correlation between these variables was not statistically significant, $F = 0.75$, $P = 0.387$, $\eta_p^2 = 0.01$, $r = -0.05$ (Tables 1 and 2). These findings support H_4, but fail to support H_5.

The sixth and seventh hypotheses predicted that recreationists would be more likely to have norms accepting higher encounter levels at locations with an aerial tramway (H_6) or a road (H_7) compared to areas without these physical developments. The presence of a tramway was significantly related to encounter norms and accounted for approximately 7 % of the overall variance (i.e., effect plus error) in these norms, $F = 17.70$, $P < 0.001$, $\eta_p^2 = 0.07$ (Table 1). The correlation between norms and the tramway was also negative and significant, suggesting that encountering higher numbers of people at a location without a tramway would be less acceptable ($M = 4.84$) than at an area with a tramway ($M = 5.72$), $r = -0.25$, $P < 0.001$ (Tables 2 and 3). The presence of a road versus a trail,

Table 1 Three-way ANOVAs for number of hikers, presence of the tramway, and location on perceived setting, crowding, and norms at Mudeungsan Provincial Park in South Korea using data from college students in 2010

	df	*SS*	*F* value	*P* value	Partial eta squared (η_p^2)
Perceived crowding[a]					
Presence of tramway	1	6.15	2.56	0.111	0.01
Number of hikers	1	256.57	106.81	<0.001	0.31
Location (road, trail)	1	5.53	2.30	0.131	0.01
Tramway × hikers interaction	1	2.09	0.87	0.352	0.00
Tramway × location interaction	1	10.89	3.62	0.071	0.02
Hikers × location interaction	1	3.20	1.33	0.250	0.01
Tramway × hikers × location interaction	1	0.17	0.70	0.791	0.00
Encounter norms[b]					
Presence of tramway	1	46.32	17.70	<0.001	0.07
Number of hikers	1	55.11	21.06	<0.001	0.08
Location (road, trail)	1	0.03	0.01	0.912	0.00
Tramway × hikers interaction	1	20.05	7.66	0.006	0.02
Tramway × location interaction	1	0.01	0.01	0.961	0.00
Hikers × location interaction	1	5.06	1.93	0.166	0.01
Tramway × hikers × location interaction	1	0.49	0.19	0.667	0.00
Perceived settings[c]					
Presence of tramway	1	36.81	34.68	<0.001	0.13
Number of hikers	1	8.17	7.70	0.006	0.03
Location (road, trail)	1	0.80	0.75	0.387	0.01
Tramway × hikers interaction	1	1.64	1.55	0.215	0.01
Tramway × location interaction	1	0.02	0.02	0.891	0.00
Hikers × location interaction	1	0.07	0.07	0.793	0.00
Tramway × hikers × location interaction	1	3.33	3.13	0.078	0.01

df Degrees of freedom, *SS* sum of squares, *F* *n*-way ANOVA test statistic

[a] Measured on 9 point scale from 1 "not at all crowded" to 9 "extremely crowded." Adjusted $R^2 = 0.32$

[b] Measured on 9 point scale from 1 "very unacceptable" to 9 "very acceptable." Adjusted $R^2 = 0.15$

[c] Measured on 5 point scale from 1 "developed park area" to 5 "nature preservation area." Adjusted $R^2 = 0.15$

Table 2 Correlation coefficients among all independent and dependent variables examined at Mudeungsan Provincial Park in South Korea using data from college students in 2010

	Presence of tramway	Number of hikers	Location (road, trail)	Perceived setting	Encounter norms
Presence of tramway					
Number of hikers	−0.01				
Location (road, trail)	0.00	−0.01			
Perceived settings	−0.35***	−0.16*	−0.05		
Encounter norms	−0.25***	−0.27***	0.01	0.43***	
Perceived crowding	0.08	0.55***	0.08	−0.28***	−0.49***

* $P < 0.05$, *** $P < 0.001$

however, did not impact these normative evaluations, and the correlation between these variables was not significant, $F = 0.01$, $P = 0.912$, $\eta_p^2 = 0.00$, $r = 0.01$ (Tables 1 and 2). These results support H_6, but fail to support H_7.

The final two hypotheses predicted that recreationists would feel less crowded at locations with an aerial tramway (H_8) or on a road rather than on a trail (H_9). However, there were no statistically significant relationships between

Table 3 Mean responses to settings, crowding, and norms based on the influence of the number of hikers and presence of a tramway at Mudeungsan Provincial Park in South Korea using data from college students in 2010

	No tramway		Tramway		Total	
	Mean	95 % Confidence interval (±)	Mean	95 % Confidence interval (±)	Mean	95 % Confidence interval (±)
Perceived crowding[a]						
1 Hiker	2.33	0.39	2.84	0.39	2.59	0.28
15 Hikers	4.58	0.39	4.72	0.40	4.65	0.29
Total	3.46	0.28	3.77	0.28	3.61	0.28
Encounter norms[b]						
1 Hiker	6.48	0.41	5.03	0.41	5.75	0.29
15 Hikers	4.95	0.41	4.65	0.41	4.80	0.29
Total	5.72	0.29	4.84	0.29	5.28	0.29
Perceived settings[c]						
1 Hiker	3.67	0.26	2.72	0.26	3.19	0.18
15 Hikers	3.13	0.26	2.52	0.26	2.83	0.19
Total	3.40	0.19	2.62	0.18	3.01	0.18

Descriptive statistics and parameter estimates from three-way (i.e., *n*-way) ANOVAs. All means differ at $P < 0.05$ for each comparison. "Location" (road, trail) is not shown given the insignificant results in Tables 1 and 2

[a] Cell entries are means on 9 point scale from 1 "not at all crowded" to 9 "extremely crowded"

[b] Cell entries are means on 9 point scale from 1 "very unacceptable" to 9 "very acceptable"

[c] Cell entries are means on 5 point scale from 1 "developed park area" to 5 "nature preservation area"

these two physical developments and perceptions of crowding, $F = 2.30$ to 2.56, $P = 0.111$ to 0.131, $\eta_p^2 = 0.01$, $r = 0.08$ (Tables 1 and 2). These findings fail to support both H_8 and H_9.

All possible interactions among the independent (presence or absence of a tramway, a road vs. a trail, encounter levels) and dependent variables (perceived settings, norms, crowding) were also examined. Only one of the 12 possible interactions (between tramway and encounters on norms) was statistically significant, but it only accounted for approximately 2 % of the overall variance (i.e., effect plus error) in these norms, $F = 7.66$, $P = 0.006$, $\eta_p^2 = 0.02$ (Table 1). None of the other interaction effects were significant, $F = 0.01$ to 3.62, $P = 0.071$ to 0.961, $\eta_p^2 = 0.00$ to 0.02.

Given that the effect of a road versus a trail was not statistically significant in any of these tests, this variable was removed from further analysis. With this variable removed, Table 3 helps to summarize the findings. On average, when an aerial tramway was absent and only one hiker was present, the setting was considered to be the most preserved and natural ($M = 3.67$), encounter conditions were considered to be the most acceptable (i.e., norms; $M = 6.48$), and perceived crowding was the lowest ($M = 2.33$). Conversely, the setting was considered to be the most developed ($M = 2.52$), encounter conditions were the least acceptable ($M = 4.65$), and crowding was the highest ($M = 4.72$) when an aerial tramway and 15 hikers were present (Table 3).

As a final step in the analysis, the data were analyzed and presented graphically using OLS regression path analysis. This is an analytical technique for estimating relationships among all variables simultaneously, based on theoretical assumptions about the underlying ordering of variables (Duncan 1975; Vaske 2008). Taken together, the model predicted 43 % of the variance in perceived crowding ($R^2 = 0.43$; Fig. 3). Direct effects on crowding were split between encounter levels (i.e., number of hikers; $\beta = 0.45$, $P < 0.05$) and norms ($\beta = -0.37$, $P < 0.05$). Respondents who reported higher crowding encountered higher use levels and conditions that were less acceptable and more likely to violate their norms. Both perceptions of the setting and norms were also correlated with perceived crowding, $r = -0.28$ to -0.49, $P < 0.001$ (Table 2). The initial correlation between crowding and perceptions of the setting, however, disappeared when norms were introduced into the model, whereas the relationship between norms and crowding remained significant, $\beta = -0.37$, $P < 0.05$ (Fig. 3). This suggests that encounter norms fully mediated the observed direct relationship between perceived settings and crowding (Baron and Kenny 1986). This relationship between norms and crowding is consistent with previous studies showing that recreationists who encounter conditions violating their norm typically report higher levels of crowding than those

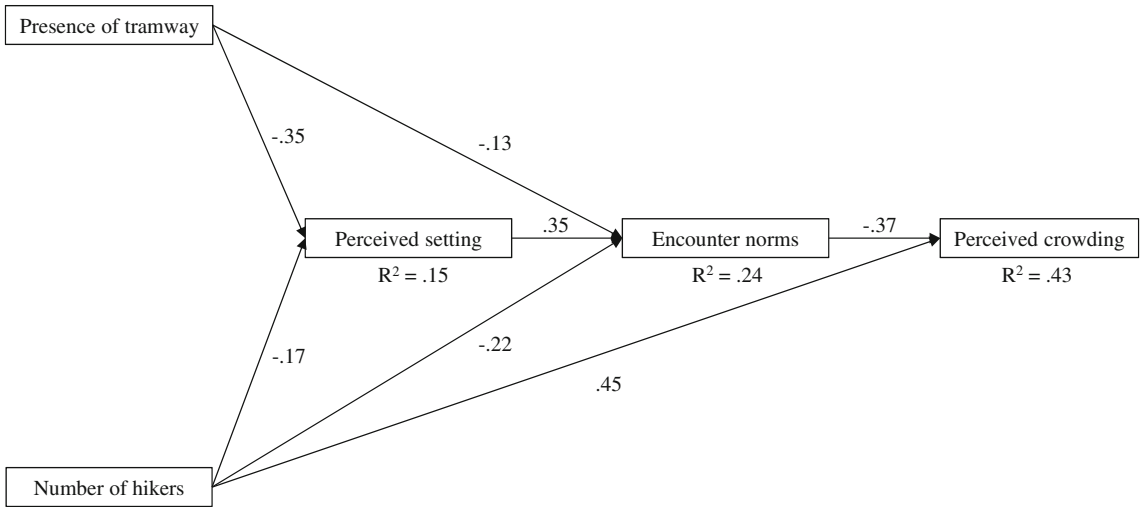

Fig. 3 Regression path analysis among independent and dependent variables at Mudeungsan Provincial Park in South Korea using data from college students in 2010. Path coefficients are standardized regression coefficients (β). Only path coefficients significant at $P < 0.05$ are shown; all other paths not shown were not statistically significant. All paths from the exogenous variable "location" (*road*, *trail*) were also not significant and are not shown given the insignificant results in Tables 1 and 2

who encounter conditions consistent with their norm (Vaske and Donnelly 2002; Needham et al. 2004a; Bell et al. 2011). There were also indirect effects on crowding from: (a) encounters and tramway presence through encounter norms and (b) encounters and tramway presence through both perceived settings and encounter norms. The size of these indirect effects, however, was minimal (encounters → norms → crowding = 0.08; tramway → norms → crowding = 0.05; encounters → setting → norms → crowding = 0.02; tramway → setting → norms → crowding = 0.05; Vaske 2008).

The model also predicted 24 % of the variance in encounter norms ($R^2 = 0.24$; Fig. 3). There were direct effects on norms from the presence of a tramway ($\beta = -0.13$, $P < 0.05$), perceptions of settings ($\beta = 0.35$, $P < 0.05$), and encounter levels ($\beta = -0.22$, $P < 0.05$). These relationships suggest that lower encounters or use levels, absence of a tramway, and perceptions of an area as more pristine and less developed were considered by respondents to be more acceptable. There were also indirect effects on encounter norms from the presence of a tramway and encounter levels through perceived settings, but these indirect effects were minimal (encounters → setting → norms = −0.06; tramway → setting → norms = 0.12; Vaske 2008).

Finally, the model explained 15 % of the variance in perceptions of the settings ($R^2 = 0.15$; Fig. 3). The presence of the tramway had the largest impact on perceptions of settings ($\beta = -0.35$, $P < 0.05$), about twice the effect of encounter levels ($\beta = -0.17$, $P < 0.05$). Recreationists encountering a tramway and higher numbers of other people were more likely to consider the area as more developed and less natural.

Discussion

Use Levels, Crowding, and Norms

These results showed that use levels or the number of people (e.g., hikers) were related to crowding and encounter norms. This suggests that use levels are an important consideration in recreation settings, both theoretically and for resource management, and is consistent with the extensive literature on social carrying capacity and crowding in these settings (see Shelby and Heberlein 1986; Manning 2007, 2011 for reviews). Previous research, for example, has shown that overall use and encounter levels can influence the quality of recreation experiences and perceptions of impacts occurring during these experiences, such as crowding (Vaske and Donnelly 2002; Needham et al. 2004a). Results presented here are consistent with these studies showing that recreationists who report higher crowding tend to encounter high use levels.

The number of encounters with other people was also related to normative acceptance of these encounters. Although there have been studies examining relationships among use levels, encounters, and crowding, it has been somewhat less clear to what extent these use levels and reported encounters directly affect encounter norms (see Shelby and Heberlein 1986; Manning 2007, 2011 for reviews). Results showed that recreationists encountering higher numbers of other people

were more likely to have norms accepting this condition, whereas those who encountered low numbers considered higher encounter levels to be less acceptable. This finding is somewhat consistent with the handful of previous studies showing that recreationists visiting remote areas with low use levels would accept seeing just a few small groups of people instead of many people or large groups (e.g., Stankey 1973; Needham et al. 2004a).

These results also extend previous research showing that use levels and encounters are related to perceptions about specific settings. Although this relationship between concepts has not been well documented empirically (Manning 2011), some studies have shown that different use levels are experienced and considered to be more or less appropriate depending on the type of setting along a continuum from remote and relatively primitive to more developed and less pristine (Shelby 1981; Basman et al. 1996; Freimund et al. 2002; Needham et al. 2004a). Results here showed that recreationists encountering many people considered this condition to be less acceptable and perceived the setting to be more developed and less natural.

From a managerial perspective, these findings help to tie the planning-oriented ROS approach to the empirical literature on social capacity issues, which is consistent with the logic of both the ROS and capacity-based frameworks such as LAC, VIM, CCAP, and VERP (Driver et al. 1987; Nilsen and Tayler 1998; Manning 2004). In fact, the ROS concept has been adopted as an integral component of these frameworks (especially LAC) to explicitly recognize the diversity of settings and experiences ranging from remote recreation areas where natural landscapes dominate and developments are limited, to more developed campgrounds or other high use frontcountry settings. This article presents data that can be used for empirically linking these capacity frameworks to ROS by showing relationships between this continuum of settings and capacity-based issues in these areas such as encounters, norms, and crowding.

In addition, the importance of examining use levels, crowding, encounter norms, and perceptions of settings is consistent with legislation identifying capacity-related issues as important tools for protecting resource values and visitor experiences (e.g., 1964 Wilderness Act, 1964 Land and Water Conservation Fund Act, 1968 Wild and Scenic Rivers Act, 1968 National Trail System Act, 1978 National Park and Recreation Area Act). In fact, recent court cases have required managing agencies to include these types of capacity and setting issues within their management plans (e.g., Merced River in Yosemite National Park; Whittaker et al. 2011).

Levels of Development

Results also showed that the presence of an aerial tramway was related to perceptions of settings. As predicted, respondents perceived that a setting with a tramway is more developed, whereas an area without a tramway offers a more natural and less developed experience. This finding is consistent with a few studies examining user evaluations of how site alterations impact experiences and settings toward the more developed end of the ROS continuum (e.g., wider or hardened trails, permanent camps or lodges; Freimund et al. 2002; Manning et al. 2004; Needham et al. 2011). An aerial tramway is a physical characteristic and its impact on perceptions of the overall setting and the kinds of experiences that it may create are consistent with the overall logic of the ROS and add empirical evidence to these concepts and relationships that have been an important part of resource planning (Manning 2011). The most common approach in applications of the ROS, however, is that the managing entity specifies goals for a setting that guide future development, types of activities, and use levels (Driver et al. 1987). This study changed this approach by focusing on how proposed developments could alter the type of experiences and settings from the individual recreationist's perspective, rather than the manager's. This is appropriate given that frameworks such as LAC, VIM, CCAP, and VERP emphasize integration of descriptive information about a recreation system (e.g., use levels) with evaluative data addressing the more subjective issue of what settings are appropriate and how much impact is acceptable in these areas (Manning 2004). These frameworks also require planning and management to be participatory by integrating evaluations by stakeholders such as recreationists (Manning 2011). Management efforts incorporating these evaluations about settings can be useful for avoiding complaints or opposition to management, loss of interest in visiting a site, and lack of financial support for a site (Needham and Szuster 2011).

The presence of this aerial tramway was also related to encounter norms, with respondents being more likely to accept higher encounter levels at a location with a tramway than at an area without a tramway. This finding is consistent with studies showing that recreationists at more remote and primitive backcountry areas typically rate encounters with other people as less acceptable compared to those at more accessible and developed settings (Williams et al. 1992; Basman et al. 1996; Manning et al. 1996; Needham et al. 2004a). Settings that are easily accessible by developments such as aerial tramways are typically more heavily altered and associated with larger numbers of people.

Unlike this aerial tramway, however, whether settings contained a road or a trail was not related to perceived settings, crowding, or encounter norms, even though results from other studies suggested that it could be important. These studies have shown that developments such as the construction of wider or hardened trails (Manning et al. 2004; Needham et al. 2011) and permanent camps or

lodges (Freimund et al. 2002) could impact experiences and perceptions of settings. There are several possible reasons why comparisons between a road and a trail had no effect in this study. First, the color photographs used here are somewhat similar in all other aspects (e.g., background, number of hikers), and just alternating between a road and a trail perhaps was not enough to cue different perceptions (Basman et al. 1996). Second, Manning et al. (2004) indicated that, unlike managers and scientists, recreationists are typically less sensitive to these types of physical or environmental impacts unless conditions change dramatically. Third, Mudeungsan Provincial Park is a high use park and even though natural settings were important to respondents, the "width of the track" for a road versus a trail may not be as important. In fact, people may base their evaluations on the utility of impacts (e.g., a wide road is acceptable because space is needed for people to pass each other in high use areas) rather than potential biophysical or experiential impacts (Needham et al. 2011). Fourth, it is possible that Koreans may be less sensitive to this issue than respondents of studies conducted in other countries. Previous research, for example, has shown differences in encounters, norms, and crowding between individuals in Asian countries versus other locations (Vaske et al. 1996).

Issues for Future Research

Given that this study was exploratory, subjects were college students and data were collected in laboratory and classroom settings. Many studies have surveyed students to investigate aesthetic and experiential issues (e.g., Daniel and Boster 1976; Shelby et al. 2005). These studies and others have shown that evaluations of college students are often similar to those of the general public (e.g., Daniel and Boster 1976; Brunson 1991; Brunson and Shelby 1992; Brunson and Reiter 1996; Teel et al. 2006). In addition, landscape evaluation studies have shown that off-site evaluations of landscape images tend to be similar to those made in the field (e.g., Schroeder and Daniel 1980; Shuttleworth 1980; Kellomaki and Savolainen 1984; Shelby and Harris 1985; Stamps 1990). It is also likely that a survey from a random sample of onsite visitors would have yielded similar findings to those reported here given that almost all of the students had visited this park and 66 % had been to at least one of the two study locations. It is important, however, to explore the representativeness and generalizability of these findings in future research, which should build on this exploratory study by sampling other groups such as onsite park visitors and other diverse interest groups.

Photographs in this study also showed only two levels of encounters (i.e., 1, 15 hikers). This design was intended to contrast what might be expected in a "developed park area" with tramway development (15 encounters) with what might be expected in a "nature preservation area" at the other end of the ROS continuum (1 encounter). This approach may exaggerate the effect, but it avoids possible method effects of smaller increments. In addition, it reduces respondent burden that can be problematic with these types of visual approaches. Adding increments and other conditions exponentially increases the number of possible combinations and as a result, more photographs usually need to be created and evaluated. Asking respondents to evaluate an exhaustive set of images could increase burden and decrease response rates. Previous research, however, has typically involved more than two images of encounters with several studies presenting respondents with a series of images (see Manning and Freimund 2004; Manning 2007 for reviews). It is important that future studies, therefore, examine additional encounter levels (e.g., 5, 10 hikers) within the two extremes used here (i.e., 1, 15 hikers).

Although this study found a significant relationship between the number of hikers seen (i.e., in the images) and encounter norms, more research is needed regarding the relationship between these encounter levels and norms. Norms are often used for developing standards of quality that help managers address social and environmental conditions. Conceptually, it makes sense that norms would be affected by the number of encounters that people experience, particularly in settings where experience definitions may be less clear (Shelby et al. 1996; Shelby and Vaske 1991). Some studies, however, have showed that norms are considerably different from existing encounter and use levels, particularly in well-defined settings such as wilderness areas where there is considerable agreement that the number of encounters is important and that number should be low (Vaske and Donnelly 2002; Manning 2007, 2011). It would be good to know more about these dynamics among concepts.

This study also showed that the presence of a tramway and the number of hikers encountered were related to perceptions of the setting (i.e., developed vs. natural). Other variables not measured here, such as acceptance of the tramway or how experiences would be affected by this type of development, could also be related to the concepts examined. Research should continue examining other variables and concepts that could impact evaluations of settings and experiences. This study was also conducted in one park with specific designations, sets of natural characteristics, and use levels. The applicability of findings to other types of places, both less developed (e.g., wilderness) and more developed (e.g., resorts), remains an issue for future research. In addition, only one proposed tramway location in this park was studied and it would be interesting to examine if other possible locations would show similar or different effects.

Conclusion

Major developments (e.g., aerial tramways) and high use levels (e.g., numbers of hikers encountered) can be contentious, with good reason given the findings here. These characteristics can have substantial effects on physical settings, perceptions of areas, and the types of experiences these settings provide. They also impact other factors that are important for social capacities, such as encounter norms and perceived crowding. Management prescriptions need to consider all of these variables—physical developments, numbers of people, types of settings, and quality of experiences—because once in place, developments can be extremely difficult both politically and physically to remove or restore, as recent efforts such as dam removal suggest.

Given their substantial effects and potential irreversibility, it is important to consider how people will respond to proposed developments and increasing use levels ahead of time. Simulations and evaluations such as those documented here are valuable tools in this regard and help to document the extent that changes will be visible and "harmonious" with the naturalness of the area. If a tram were to be built in Mudeungsan Provincial Park, for example, this study predicts that, aside from the obvious changes in the biophysical setting, it could impact the definition of the recreation setting, encounter norms, and perceptions of crowding. This means that the area could shift along the ROS continuum from a "nature preservation area" to a more "developed park area." There is nothing inherently wrong with such a shift and this park already has a mix of these types of areas, but changing the mix will alter the "balance" of recreation opportunities that has already been established in this park.

Given that these changes are likely to be irreversible, recreation management frameworks (e.g., LAC, VIM, CCAP, and VERP) indicate that these changes should be considered carefully in light of management objectives for types of experiences, the current allocation of resources within the park, and the need for different types of recreation opportunities consistent with the ROS continuum. If Mudeungsan Provincial Park is one of the few areas that supplies relatively scarce opportunities at the "nature preservation area" end of this spectrum, further development might make less sense than if such opportunities are widely available.

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