



# Efficacy and perception of trail use enforcement in an urban natural reserve in San Diego, California



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## ABSTRACT

This article presents results of enforcement efforts to curb unauthorized trail uses in an urban nature reserve of San Diego, California. We assessed the effectiveness and longevity of enforcement efforts by measuring behavioral changes to redirect users to authorized trails. The study was conducted from May through December 2013 and included photo motion cameras to document human use in three periods: prior to enforcement, during enforcement and after enforcement conducted by California Department of Fish and Wildlife Wardens. In addition, social media sites were monitored to determine user perceptions and attitudes. A total of 7155 photo captures were collected over the 170-day study period. Mountain bikers were the greatest number of users (both legal and illegal) and declined significantly post enforcement. Results demonstrated that enforcement was an effective tool in reducing and sustaining the amount of unauthorized uses in the open space reserve (66.0% decline). Enforcement, however, led to hostility among key user groups that may be counterproductive to larger management effectiveness, as users may go to other unenforced areas for recreation. Lessons learned include the need to balance enforcement; with ample authorized trails for recreational opportunities in natural areas, and the importance of social media in providing ongoing user education, outreach and self-policing forums to discourage unauthorized activities.

### Management Implications:

- Management activities to change user behavior through education, signage and outreach can be ineffective in some areas leading to chronic, self-perpetuating problems affecting those resources that were set aside for conservation and outdoor recreation.
- While hard enforcement actions was shown to be a highly effective tool in changing the behavior of users, it can lead to hostility, miscommunication, and create adversity among constituents that could be some of the greatest stewards of urban natural areas.
- Social media was determined to be a highly powerful outreach tool for recreationalist, yet untapped by land managers for promoting prosocial behavior.
- A better understanding of user precipitations, rational for non-compliance and utilization of self-policing polices is needed prior to initiating a hard enforcement campaign.

## 1. Introduction

The demand for outdoor recreation and nature-based tourism has increased globally over the past fifty years due to increased population, increased leisure time, rise in ecotourism, and increased access to outdoor recreation (Balmford, Beresford, & Green, 2009; Cordell, Betz, & Green, 2008; Jensen & Guthrie, 2006; Page & Dowling, 2002; Steven, Pickering, & Castley, 2011; Monz, Pickering, & Hadwen, 2013). In the United States, almost half of all Americans, or 141 million people, participate in outdoor recreation (Outdoor

Foundation, 2015). Non-consumptive outdoor recreation use such as hiking, mountain biking and horseback riding (sometimes referred to passive recreation) (Duffus & Dearden, 1990), is perceived by many users to cause little disturbance to open space areas (Marion & Wimpey, 2007), but can cause unintended negative impacts, especially in sites with high sensitivity (Hadwen, Hill, & Pickering, 2007).

The field of Recreation Ecology studies the impacts of recreation users on various biotic and abiotic elements of the landscape (Wagar, 1964). Studies have shown that various types of passive outdoor recreation can result in displacement and reduction of wildlife

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(George & Crooks, 2006; Miller, Knight, & Miller, 2001; Taylor & Knight, 2003; Reed & Merenlender, 2008, 2011), the trampling of native habitat and species (Boyle & Samson, 1985; Hardiman & Burgin, 2013), and impacts to soil and water resources (Leung & Marion, 1996; Marion & Wimpey, 2007). Marion and Wimpey (2007) point out users may not be aware of their impacts or legality of their actions. This balance between recreational use and natural resource conservation has become a key element of land management around the world (Leung & Marion, 2000).

To ameliorate the unintended consequence of recreation users, land management strategies include: (1) education of users about potential impacts, (2) containment of uses to areas more resistant to impacts, and (3) disbursement of users to reduce the volume of use (Leung & Marion, 1999). Wynveen, Bixler, and Hammitt (2007) further characterize management activities into soft and hard enforcement actions (this is synonymous to Manning, 1999 indirect and direct management). Soft enforcement aims to reduce illegal use through education, interpretive signage and community relations, while hard enforcement relies on use of tickets, citations and arrests. Education and other soft enforcement actions have been shown to lessen the unintentional consequences of outdoor recreation (Bromley, Marion, & Hall, 2013; Marion & Reid, 2007). For example, Littlefair and Buckley (2008) reported using interpretive messages with the presence of a role model and verbal appeals as the most successful combination in reducing non-compliant behavior in trail usage. Unfortunately in areas with chronic cases of non-compliant use, soft enforcement actions become less effectual and hard enforcement actions become necessary (Gibson, Williams, & Ostrom, 2004; Hilborn et al., 2006; Leung & Marion, 1999). Park, Manning, Marion, Lawson, and Jacobi (2008) noted that 20 years of research points towards the combination of soft and hard enforcement as being most effective in promoting compliance. Hendee and Dawson (2002) recommended that land managers try to use soft enforcement actions first before switching to hard, authoritative direct management techniques.

### 1.1. Non-compliance theory

Non-compliant behavior is one of the most significant problems reported by management at nature based tourist establishments (Fredman, Romild, Emmelin, & Yuan, 2009; Gramann, Bonifeld, & Kim, 1995; Ward & Roggenbuck, 2003). An outdoor user can identify themselves as having strong environmental conservation values, but still perform non-compliance behavior with environmental regulations (Goh, 2015). So what causes this behavior?

In psychology, the Theory of Planned Behavior (abbreviated TPB) links values and behavior. The three elements of TPB include; an individual's attitude to perform a particular action, the subjective societal norm about that action, and an individual's perceived ease or difficulty in performing a particular behavior. Reviewing non-compliance with trail regulations, Goh (2015) states, "*if a visitor has positive attitudes towards venturing off-trail, has support from important reference groups to venture off-trail and perceives little difficulties in venturing off-trail, he/she will have a higher chance of performing the off-trail behavior.*"

Land managers must look at non-compliant behavior as a summation of user's attitude, societal norms and the ease or difficulty of the non-compliance behavior. While values remain relatively fixed for an individual, attitudes are more flexible depending on the surrounding context and social norms. This is related to Wilson and Kelling's (1982) "broken window" theory, where observed unenforced illegal activities encouraged others to expand and continue to reinforce the behavior (also see Stevens (2009)). Using Goh's example, a user's value may be towards natural habitat conservation, but the combination of observed non-compliance by other users, and the ease of non-compliance, may soften or switch their attitude toward unauthorized off-trail use. Additional studies in applying TPB to non-compliance behavior in

National Parks include: hunting (Hrubes, Ajzen, & Daigle, 2001), petrified wood theft (Ward & Roggenbuck, 2003), walking dogs off leash (Nesbitt, 2006), and feeding wildlife (Ballantyne & Hughes, 2006).

Land managers aim to encourage prosocial behavior of outdoor users through education and other soft enforcement activities. These efforts are aimed to reinforce a user's attitude towards regulatory compliance and maintain a larger positive societal norm for compliant behavior. Land managers also make it more difficult for non-compliance through hard enforcement activities (International Network for Environmental Compliance and Enforcement, 2009).

### 1.2. Hard enforcement effectiveness

Little literature exists on how effective hard enforcement actions are in curbing illegal use in nature reserve areas, and how long the effectiveness lasts (Budruk & Manning, 2003; Chavez & Tynon, 2000; Wynveen et al., 2007). While there is limited topic specific literature, general literature from criminology can be used to help guide an enforcement program for trail use, and understand its efficacy. De Waard and Rooijers (1994) evaluated the effectiveness of different methods and intensities of hard enforcement activities to reduce driving speeds on motorways. Their results showed that the largest and longest lasting reduction in driving speed occurred after a high intensity of enforcement, giving support for a direct relationship between fear of citation and speed of choice (De Waard & Rooijers, 1994). The potential of enforcement deters the current non-offender from speeding. Similar experimental approaches have been used to determine the effectiveness of hard enforcement actions for compliance with seat belt (Rood, Kraichy, & Carmen, 1987) and bicycle helmet laws (Gilchrist, Schieber, Leadbetter, & Davidson, 2012). Similar to findings by Park et al. (2008), these studies found that a combination of soft (education) and hard enforcement (ticketing and/or seizure) were more effective in combination than separate. They conclude that a successful, cost-efficient enforcement program would start with an education and outreach blitz and then integrate enforcement into regular traffic duties. Rood, Kraichy, & Carmen (1987) further state that an ongoing public information effort is key to "*enhance and maintain the public's perception of enforcement*" and retain a positive attitude toward the law.

Gavin, Solomon, and Blank (2009) indicate that there is no panacea, and conservation would benefit from more research on the cost effectiveness and time efficiency of hard enforcement efforts. In addition, hard enforcement actions may have consequences on the user's outdoor experience (both for legal and illegal users) and their future support for conservation (Goh, 2015; Marion, 1998; Wynveen et al., 2007). To be effective stewards of natural areas, we must understand the efficacy of hard enforcement actions as a resource management tool, and any unintended consequences of its use.

### 1.3. Focus of study

The focus of this paper is to determine if hard enforcement actions involving regulations across an urban nature reserve are an effective method of land management. Specifically, this enforcement study (hereafter: Study) focuses on three questions: (1) what is the effectiveness of enforcement leading to a change in non-complaint behavior, (2) if there is a change, does it persist after enforcement is stopped, (3) what are the users attitudes during and after the enforcement activities. The consideration of user attitudes toward the reserve and enforcement methods helps to gain insight into the societal implications of this type of management action.

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