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The ecological implications of visitor transportation in parks and protected areas: Examples from research in US National Parks

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ABSTRACT

The demand for recreation and nature-based tourism experiences in parks and protected areas continues to grow in many locations worldwide and in response, many parks are employing transit services designed to improve visitor access. Transit services (e.g., public bus service) are a component of the overall park transportation system and are very desirable in park settings as they yield many advantages over personal auto access including reduced congestion in parking areas, a reduced carbon footprint, and an enhanced visitor experience. However, a growing body of research also suggests that the delivery of visitors via transit to destinations within a park or protected area may have unique ecological disturbance implications resulting from increased visitor use, density, and altered spatial and temporal use patterns. In this paper, we examine the relevant literature and present examples from recent research that illustrates the potential range of ecologic impacts from visitor deliveries via park transportation systems. We conclude while transit systems remain very desirable in park settings, depending on a range of situational factors, conventional, demand-driven planning and management approaches may result in unintended impacts to ecological conditions. Overall, this discussion provides a framework for improved management of the potential ecological impacts of protected area transportation systems.

1. Introduction

Worldwide, recreation and tourism activities in parks, wilderness, and protected areas continue to show trends of increasing participation (Cordell, 2008; Balmford et al., 2009). With the increase in urbanization worldwide, experiences in parks and protected areas are a primary means for people to interact with and experience nature. Combined with the potential for economic diversification and development, government agencies and local communities generally perceive nature-based tourism and recreation as social goods and often accommodate and encourage the increased demand by providing more services for visitors. Associated with this increasing visitation, and the increased services being provided, are concerns regarding both declining quality of visitor experiences and degradation of natural area resources (Manning et al., 2014).

One such strategy to accommodate increasing demand for recreation and tourism in parks and protected areas is the use of transportation systems as a visitor service. Transportation systems are often designed to provide opportunities for visitors to experience protected areas and to deliver visitors to key destinations so visitors can engage in desired activities. Recent reviews of these approaches suggest that in US National Parks, transportation systems are integral to not only delivering visitors to key destinations, but also to managing visitors and providing park experiences (Manning et al., 2014). For example, transportation can be designed in such a way as to serve as a primary means of experiencing the natural and cultural landscapes expressed in parks and protected areas. In the United States, many of the roads built in iconic parks such as Yosemite and Glacier were designed for visitors to experience the parks from their cars and demonstrate the longstanding connection among transportation, national parks, and outdoor recreation. More recently, these same roads are now serviced by transit systems, designed and operated by the parks to both relieve traffic congestion and provide a more convenient park experience. Moreover, several units of the US national park system were specifically designed to accommodate the demand for "driving for pleasure"—historically one of America's most popular recreation activities (Manning, 2011).

Recent literature also suggests that transportation systems are potentially powerful tools for managing visitor use in national parks and protected areas. The transportation networks and linkages in parks define where park visitors travel and accordingly can be managed by parks

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to help deliver visitors to locations according to resource and/or social capacities (Manning, 2007; Lawson et al., 2009; Lawson et al., 2011; Meldrum and DeGroot, 2012). In this way, transportation can be used to manage parks and outdoor recreation in a more appropriate way that serves to both protect park resources and quality visitor experiences (Manning, 2007; 2011). Recent work also suggests that to accomplish this, management perspectives must shift from “conventional, demand-driven” approaches to more sustainable solutions based on park management and conservation goals (Manning et al., 2014). In demand-driven scenarios, management responds to current and projected visitation with transportation services designed and operated according to demand. Expansion of services (i.e., more delivery of visitors to destinations) typically occurs when demand exceeds supply. A more sustainable approach to transportation management has been suggested by Manning et al., (2014) where transportation planning and management is conducted within an adaptive management framework based on park resource (ecological) and visitor experience condition indicators and associated standards. This approach can then lead to more intentional improvements in transportation systems while accomplishing park resource and experiential goals. Consequently, transportation systems become a solution to help manage parks in a more sustainable manner (i.e., to meet resource protection and visitor experience goals), rather than the cause of unintended degradation of ecological and social conditions.

Although using transportation systems as a tool to manage parks and protected areas more sustainably is gaining acceptance as a viable strategy, to date the majority of research has examined the effect of transportation on visitor experience conditions, investigating via various approaches, the effect of transportation deliveries on attributes such as crowding at park destinations (Manning, 2014; Lawson et al., 2011 Newman et al., 2010). A more limited, but equally relevant line of research has begun to examine the ecological consequences of park transportation systems to ecological conditions (Manning, 2014, D'Antonio et al., 2013, Monz et al., 2014). It should be noted that a well-developed literature exists on the negative effects of roads on the biotic integrity of both aquatic and terrestrial communities (e.g., Trombulak and Frissell, 2000) and on mass transit as a means of reducing carbon emissions and other pollutants produce by automobile travel (e.g., Betsill, 2001). Although these are clearly important considerations in protected area transit system design and planning, they are beyond the scope of this paper.

Here, we focus the discussion specifically on developing a better understanding of the ecological consequences resulting from the delivery of visitors via transportation systems to destinations within a park of protected area. For purposes of this discussion, we take a broad view of “transportation systems” and include all aspects of park design and services that function to deliver visitors to destinations within a park, including public transit services (typically bus service), automobile roads and parking, intelligent transportation systems (ITS), bike/pedestrian paths and associated facilities. We use the term “transit” to specifically identify public transportation, provided as a service to park visitors. To begin, we provide a basic discussion of the ways in which the typical visitor activities in parks can act as agents of ecological disturbance and then introduce a conceptual framework for understanding how transportation systems act as an influential factor. Some of the ideas presented are conceptual and uninvestigated to date, while others are illustrated with examples from several recent studies in US National Parks where an examination of the ecological consequences of transportation systems was a component of the study. We conclude with several recommendations to help managers of park transportation systems limit ecological disturbances and suggestions for future research.

2. Park and protected area visitor use and ecological change

Parks and protected areas are focal locations for visitors to engage in outdoor recreation and nature-based tourism activities. A considerable body of research has examined these human activities as agents of ecological change in parks and protected areas, with possible effects to soil, vegetation, wildlife, water, air and soundscape quality (Buckley, 2004; Monz et al., 2010; Hammitt et al., 2015). Various conceptual models have been presented illustrating how changes in the quantity, density, activity type, and spatial and temporal distributions of use can result in disturbance to the biological and physical ecosystem properties. These disturbances, particularly when combined with other use-related stressors such as the introduction and spread of invasive species, can ultimately lead to lasting changes in ecologic conditions. Moreover, in parks and protected areas, where preserving nature is often a management priority, a focus must be placed on preventing disturbances from exceeding thresholds of tolerance more than site modification to limit impacts. Therefore, it is important to understand the tolerance of the ecosystem and how to accommodate use without undesirable change.

Although a full review of recreation ecology knowledge is not possible here, several comprehensive reviews are available (e.g., Hammitt et al., 2015; Monz et al., 2013; Monz et al., 2010; Newsome et al., 2012; Buckley 2004). These detailed reviews suggest several general principles:

- Outdoor recreation and nature-based tourism activities often directly affect the soil, vegetation, wildlife, water, air and soundscape components of ecosystems.
- Recreation-caused disturbance varies spatially and temporally from the natural disturbance regimes to which ecosystems are adapted. Consequently, higher order ecosystem attributes of structure and function can be affected.
- For a given finite space, the relationship between ecologic change and use can be described with curvilinear, step, and linear functions. While not applicable to every response, the curvilinear response is a useful generalization since in many situations the majority of change occurs with initial use.
- Although some generalizations apply, the ability to withstand recreation disturbance (resistance) and the ability to rebound after disturbance (resilience) is ecosystem and often species specific.
- Visitor behavior, the amount of use, and the spatial and temporal distributions of use, are primary driving variables in determining the amount of ecological disturbance.

Several authors (e.g., Hammitt et al., 2015; Monz et al., 2010) have noted that from the perspective of minimizing ecological change, it is most important to understand the factors that influence the intensity and area of recreation disturbance such as the amount and type of use, behavior of users, timing of use, and type and condition of the environment. Managers of parks can often influence these factors and therefore understanding the nature of the relationship with ecological impact has important implications for sustainable management (Hammitt et al., 2015). The design and management of transit systems within a park or protected area has the ability to influence many of the aforementioned factors regarding visitor use, and thus it has also been suggested that transit services can be used to manage visitors in accord with park conservation objectives in addition to just accommodating demand (Manning, 2014).

3. Role of transit systems in visitor-related disturbance

Park transportation services historically have been managed by what might be described as a “demand-driven” approach (Manning et al., 2014; Lawson et al., 2011). Under this paradigm, as visitation increases in a park, capacity is added to transportation systems to meet the increased demand. This additional capacity may be manifest in various forms such as additional auto parking (formal or informal), road improvements, introduction of new bus service, higher capacity busses, and higher frequency of delivery to destinations. While these approaches are highly effective at enhancing convenience for visitors and providing increased access, it sometimes results in what has been described as the “unintended consequences” of a diminished visitor experience and ecological impacts to resource conditions (Lawson et al., 2009; Lawson et al., 2011; Manning, 2014). A conceptual model (Fig. 1) illustrates the interactions between transportation systems, visitor use-related factors and ecologic responses. Transportation systems affect the amount of use and spatial and temporal distributions of use and thus have the potential to increase and expand use-related disturbance.

3.1. Changes in the amount of use at transit destinations

Providing additional transportation capacity that is based exclusively on accommodating increasing demand almost inevitably results in increased visitor use at sites served by transit services. Once visitors depart the transportation facilities and enter into backcountry areas, this increased use has the potential to result in increased ecological disturbance. This phenomenon is illustrated well in recent work in Rocky Mountain National Park (Colorado, USA) (Newman et al., 2010; Lawson et al., 2011; Fig. 2), which demonstrates the combined effects of two modes of visitor deliveries to a destination in the park. This destination was historically served by only an automobile parking facility but is currently served by both the parking facility and a park transit (bus) system. Once the automobile parking lot fills to capacity, the additional demand is accommodated by the transit system and therefore the total use at the destination is a combination of these two delivery modes. Moreover, this situation is typically managed by adding more capacity to the transit system (i.e., more shuttle busses) as demand increases, resulting in no intentional direct or indirect management of use.

As previously discussed, the use-disturbance relationship is often non-linear and is highly influenced by a variety of factors including the durability of the natural environment, degree of site hardening to use, and visitor behavior (Monz et al., 2013; Hammitt et al., 2015). Increases in use can often lead to some increases in overall ecological impact, but depending on the circumstances these changes can be very small or quite profound. For example, doubling the total use on a hardened and maintained trail system might lead to only slight changes in trail characteristics (such as trail width) or no changes at all. This would likely remain the case for trail characteristics as use increases, provided that all use was confined to the hardened surfaces. Alternatively, if sensitive wildlife species are present in this same area, it is quite possible that increases in use may disturb or displace wildlife (Frid and Dill, 2002). These examples illustrate the situational nature of understanding relationships between use and ecological impacts.

However, in order to understand how increased use may result in increases in ecological impact, it is useful to consider the mechanisms by

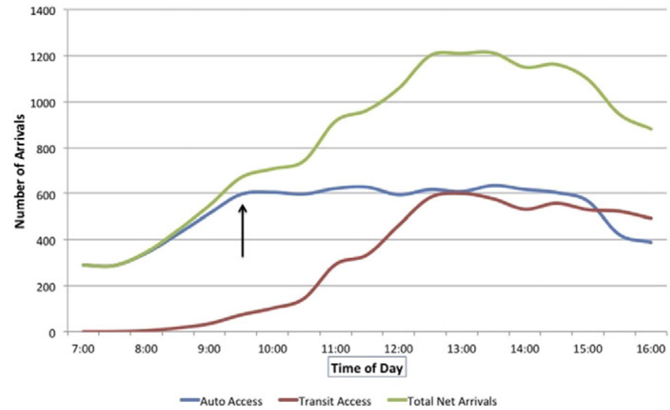

Fig. 2. An example of increased visitor arrivals resulting from auto and transit deliveries at a trailhead destination in Rocky Mountain National Park, Colorado, USA. The arrow illustrates the limit of auto parking availability and the increasing use of transit services. This pattern is typical of visitor arrivals at this location during the summer season.
Source: Lawson et al., 2011 and Newman et al., 2010.

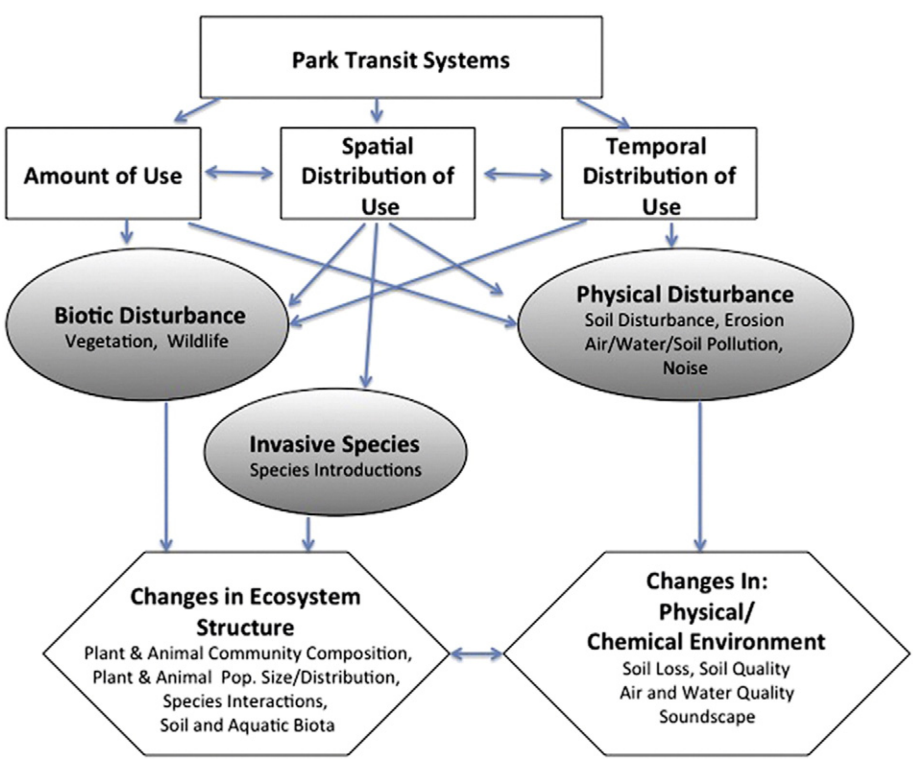

Fig. 1. A conceptual model of potential ecological consequences of transit system deliveries in a park and protected area context.
Adapted from Hammitt et al., 2015.

which ecologic conditions can be affected by visitors. For example, increases in visitor use often ultimately result in associated changes such as altered temporal and spatial patterns of use by visitors (Monz et al., 2013). Spatial changes in use have the potential to result in profound changes in ecological conditions, as use patterns expand to locations that previously experienced little disturbance. Some of the possible changes in spatial and temporal distributions and intensity of use will be explored further in the discussion that follows.

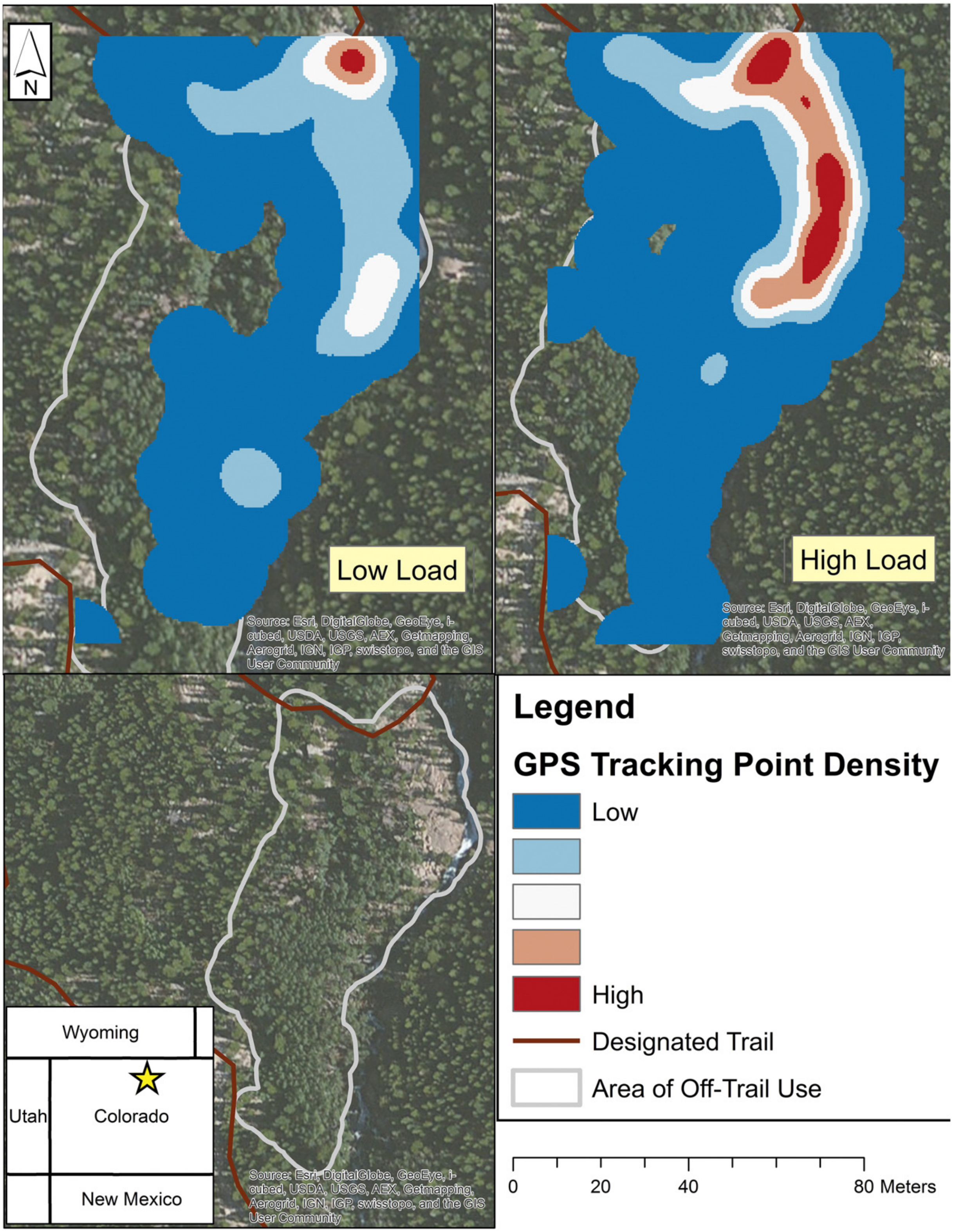

Fig. 3. GPS-tracking points were obtained from visitors hiking the Glacier Gorge Trail in Rocky Mountain National Park, CO. At the hiking destination shown here, visitors dispersed into off-trail areas. Densities were calculated for these off-trail GPS-tracking points during times of low visitor use (top left) and high visitor use (top right).
Source: D'Antonio 2015; Newman et al., 2010.

3.2. Altered spatial distribution and density at destinations

In addition to the increases in total use at destinations and along travel routes as discussed earlier, increased deliveries from transportation systems often result in behavioral changes in visitor use patterns. Although poorly understood at present, preliminary measurements and observations in two studies suggest that increased deliveries result in changes in both the density of use in particular locations and in the overall spatial extent of visitor use (D'Antonio, 2015; Newman et al., 2010). The implications of these effects are substantial as they suggest both increased density-dependent responses in established areas (i.e., trampling of vegetation, wildlife disturbance), and corresponding expansion of visitor use to new, previously unused areas that are most susceptible to resource degradation.

For example, a study in Rocky Mountain National Park investigated the spatial distribution and density of visitor use at key locations in backcountry areas accessed via trailheads served by the park transit system (Fig. 3). Visitor's spatial patterns of use were assessed via a GPS-based tracking methodology (D'Antonio et al., 2010) and under a high delivery (high use) scenario, visitor use exhibited increased dispersion, thereby increasing the overall use area. During periods of high use, this increased dispersion led to more visitor use occurring in areas off-trail and away from hardened surfaces. As visitors began to recreate further from hardened surfaces, visitor use was observed in low resistance, forest understory communities that are particularly susceptible to ecological change from recreation disturbance (D'Antonio, 2015). During periods of low delivery (low use), while some visitors did disperse into off-trail areas, the majority of visitor use was concentrated close to the designated trail and on hardened or resistant surfaces. These patterns indicate that there is greater potential for ecological degradation during periods of high delivery at some recreation destinations as the extent of visitor use increased into off-trail locations.

3.3. Density-related and pulse disturbance at destinations

By shifting visitor arrivals at destinations from automobile-based to a public transit system (i.e., shuttle bus service) the pattern of delivery to trailheads is altered from a more continuous arrival pattern to "pulses" of arrivals of more visitors at one time. Although largely unexplored, this altered pattern of arrivals has the potential to result in various density-related disturbance responses that would not be manifest in a more continuous arrival pattern. For example, wildlife "flight or fight" responses to visitor disturbance are often generalized as step functions that are highly dependent on visitor density (Monz et al., 2013). Data from Rocky Mountain National park illustrate this phenomenon (Fig. 4), where deliveries in private automobiles exhibit a more continuous, steady flow of visitor arrivals, while deliveries via the transit system occur in more discrete events, often at levels two to three times the automobile delivery rate.

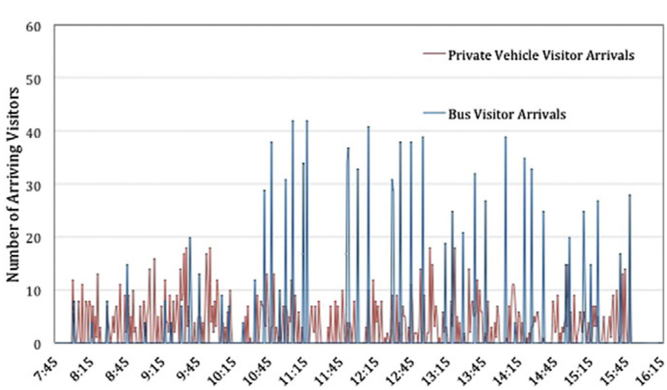

Fig. 4. Increased pulses of deliveries of visitors via a transit system (blue line) compared to private automobile deliveries (red line).
Source: Lawson et al., 2011 and Newman et al., 2010).

3.4. Effects of informal parking

In parks and protected areas, vehicle parking is often managed less intensively than in urban settings, and visitors often park along roadsides for convenience or in areas adjacent to established and maintained parking lots. This type of parking behavior has also been called "unattended parking "in the literature. Of concern is the potential for changes in the spatial extent of visitor use and the associated disturbance of roadside environments resulting from the effective expansion of the disturbance corridor created by roads (Fig. 5).

This issue has been explored in several studies and, for example, in Grand Teton National Park (Wyoming, USA) (Monz et al., 2014). This work reported extensive occurrences of roadside parking along roadsides in the study area (Fig. 6). While roadside parking is commonly observed, it remains unclear what the full range of factors are that influence this behavior and what thresholds of acceptability and/or impact exist. However, it is clear that roadside parking results in an alteration of the spatial pattern of visitor use as visitors are displaced, either by unavailability of parking or other reasons from established parking areas to roadside locations.

3.5. Congestion along resource sensitive corridors

The effect of roads and transportation infrastructure on ecological conditions, particularly on wildlife, is well established (i.e., Trombulak and Frissell, 2000; Foreman et al., 2003; Waller and Servheen, 2005). Although studies examining issues from a protected area management perspective are more rare, limited work suggests that careful management is needed from both an ecological and visitor experience perspective. For example, work in Denali National Park (Alaska, USA) demonstrated behavioral effects on both grizzly bears and Dall's sheep with increased traffic volumes. Dall's sheep were perhaps more affected, showing an increased avoidance of the roadway with even small increases in traffic volumes (Phillips et al., 2010). These results suggest that if transit services are provided in addition to existing traffic it is important to assess the possible effects on wildlife.

While traffic volume may be a significant concern, congestion along roadways may be equally important from an ecological as well as a visitor management perspective. For example, in Grand Teton National Park (Monz et al., 2014; Fig. 7), key travel corridors served by transportation systems are also prime locations for observing wildlife. Visitors in private autos and transit service providers often stop when opportunities to view wildlife and other resources of interest are present. This can result in "wildlife jams"—essentially an interruption of traffic flow and a congregation of visitors in sensitive habitat for wildlife. These events also tend to deliver visitors to locations not specifically designed to accommodate visitor use so in addition to the potential disturbance to wildlife, soil, vegetation and water resources in proximity to these events can be affected. For example, a spatial analysis of data from Grand Teton National Park of the density of informal parking areas (Fig. 6) and the density of wildlife jams (Fig. 7) shows these data to be moderately correlated ($r = 0.504$ using a band collection statistics procedure). This relationship suggests the potential for continued disturbance of soils and vegetation in adjacent roadside areas with the occurrence of these events on the roadway.

3.6. Transit system noise and soundscape alteration

An emerging body of research suggests that anthropogenic noise has both ecological and experiential consequences in parks and protected areas (Hammitt et al., 2015; Barber et al., 2010; Newman et al., 2010). Anthropogenic noise can originate from sources within parks and

Fig. 5. An example of vegetation loss resulting from informal parking along the Moose–Wilson Road in Grand Teton National Park, WY, USA. Photo: A. D'Antonio.

protected areas such as motorized recreation activities, and visitor transportation systems, and also from exogenous sources such as aircraft over flights and nearby highways. While visitor activities and services may not solely produce all noise in a protected area, managers generally have some ability to regulate these activities in order to minimize their impacts on quiet and natural sounds. Recent research has begun to address the issues of internal sources of noise in park settings, with most of the current research examining visitor experience consequences. This work has found that noise has the ability to decrease measures of esthetics and some perceived experiential benefits. For example, while nature sounds facilitate stress recovery, transportation noise may decrease positive feelings derived from the benefits of parks (Benfield et al., 2014, Weinzimmer et al., 2014). From an ecological perspective, published studies remain rare and much needs to be inferred from the broader literature on this topic. For the purpose of this discussion we will focus on transportation systems within a park and their potential to produce noise and thus potential ecological impact.

Concerns of ecological impacts due to noise from human activities have been raised in both terrestrial and marine environments (i.e., Weilgart, 2007) with the vast majority of research focusing on the effects of noise on wildlife species. Hearing provides wildlife with a panoramic awareness of an individual's surroundings which is important in sexual communication, territory defense, habitat quality assessment, and predator/prey interactions. Background noise can “mask” or

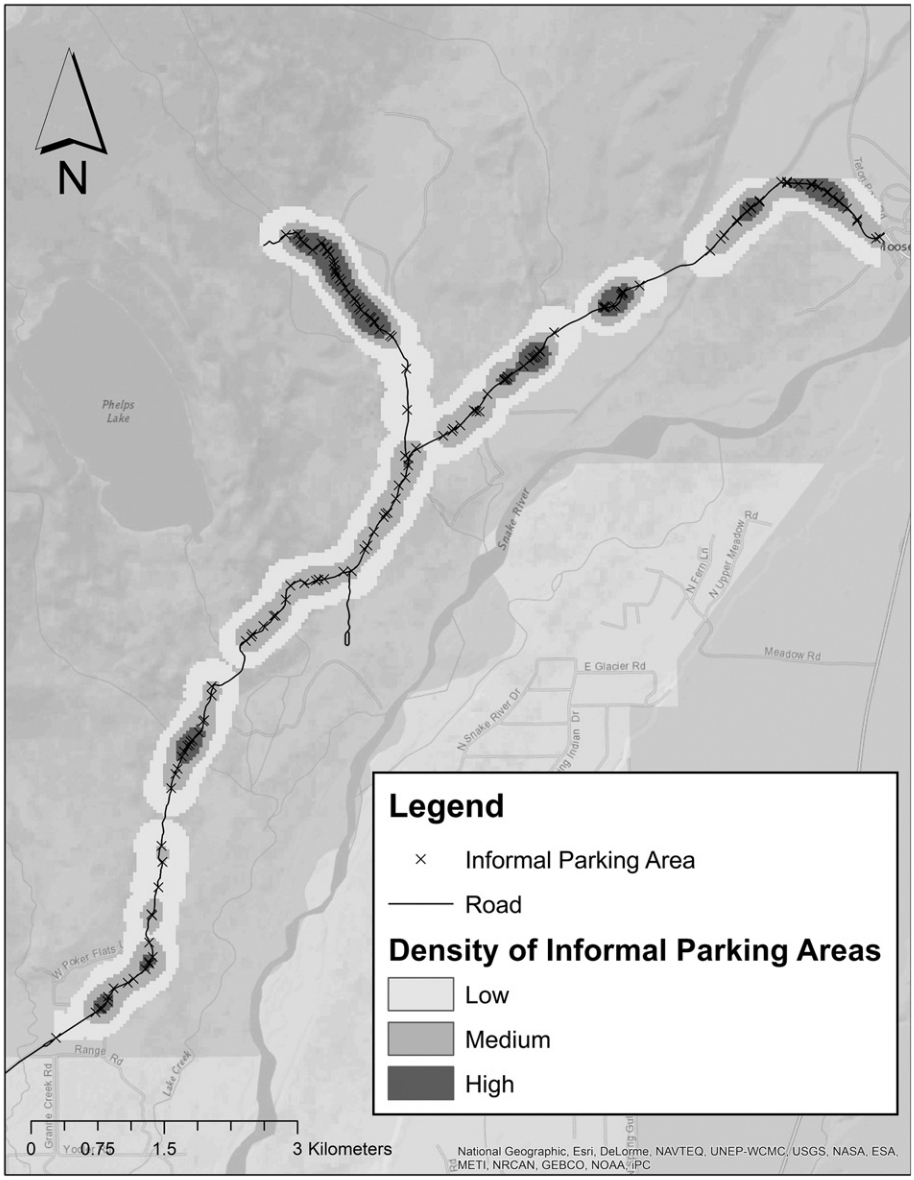

Fig. 6. Density of informal parking areas located along the Moose–Wilson Road and Death Canyon Road in Grand Teton National Park, WY.
Source: Monz et al., 2014.

interfere with the sounds of natural processes (Lynch et al., 2011) resulting in potential consequences to activities essential to survival (Barber et al., 2010; Francis and Barber, 2013). Very modest increases in noise levels can have substantial effects on “listening area” or the area within which wildlife can hear a particular sound. Some of this effect is due to the logarithmic nature of the decibel scale—for example, an increase in 3 dB results in approximately a doubling in sound power. While the effect varies depending upon species, as noise increases, decreases in listening area tend to exhibit exponential decay (Fig. 8) suggesting that much of the listening area reduction occurs with small increases in noise.

A recent study in Rocky Mountain National Park conducted an extensive investigation of transit system noise that included evaluations of visitor experience impacts (Park et al., 2010) and changes in noise as a consequence of use of the bus system to deliver visitors to trailheads (Newman et al., 2010). This work found that a standard bus generates the equivalent sound energy of eight private autos and is audible in an area five times as large. As the listener moves further from the roadway, traffic noise tends to become more continuous in nature compared to near/on the roadway. This is due to various aspects of sound propagation and due to the relative position of the listener to multiple sources of noise at any one point in time. The above two points and the findings in Newman et al., (2010) suggest that increases in bus service will increase noise intensity during finite events (the passing of a bus) on and in proximity to roadways. More busses suggest that both the area of and number of events in which ecological noise thresholds are exceeded will be greater in proximity to roadways. Francis and Barber (2013) suggest that for wildlife, these kind of acute, loud events are potentially disturbing, but are less likely to result a disruption of activities dependent on hearing. However, as the location of interest moves away from the roadway, the overall noise profile becomes more continuous rather than discrete noise events. At these types of locations (varying distances due to many factors) an overall reduction in noise with increased bus service may be observed. For example in a modeling exercise performed from data obtained in Rocky Mountain Park, with a 25% increase in ridership and an associated increase in bus frequency

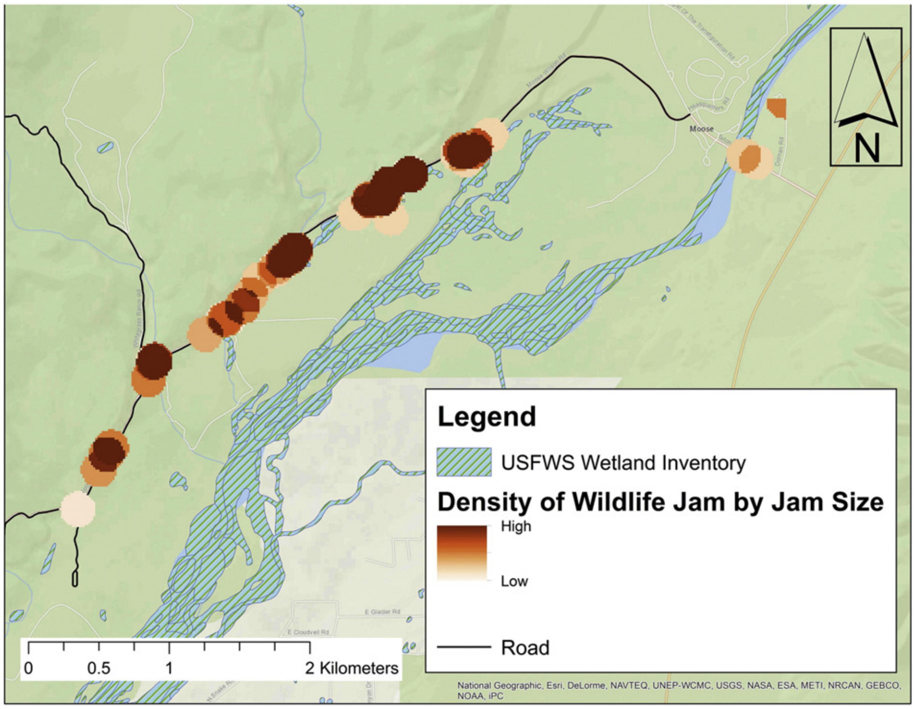

Fig. 7. Location and size of wildlife jams occurring along the Moose–Wilson Road, Grand Teton National Park, WY during the summer and fall of 2013. USFWS wetland inventory layer demonstrates the proximity of wildlife jams to ecological sensitive and low resistant wetland habitat.
Source: Monz et al., 2014.

on the roadway, a small overall reduction (1–2 dB) was estimated for points 1–2 km from the roadway. Perhaps more importantly, an 8 min per hour reduction in the time roadway noise exceeded 35 dB at these locations was also estimated under the increased bus use scenario.

These findings suggest increases in transit system use have implications for ecological impacts—shorter term noise events in areas close to roadways will likely increase substantially in both area and intensity but a small reduction (although potentially significant to wildlife) in more chronic noise will likely result in locations proximate to, but some distance away from roads. This generalization will likely hold in situations with a moderate increase in bus use such as the 25% increase in ridership scenario examined in Rocky Mountain. So as bus use is increasingly used to accommodate visitation, potential changes to the soundscape should be carefully considered.

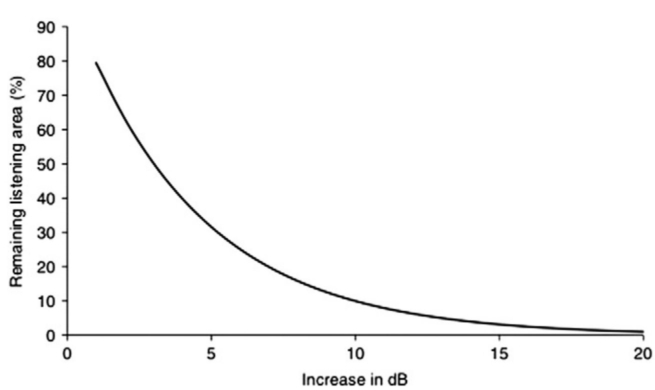

Fig. 8. The relationship between loss of "listening area" for wildlife and increase in decibel level of ambient noise.
Source Hammitt et al., 2015.

4. Conclusions

Recent research has emphasized that there are inextricable linkages between transportation and the opportunities for visitors to experience the cultural and natural landscapes parks and protected areas provide (e.g., Manning, 2014). Moreover, transit services in parks can be used to manage visitors by providing efficient, informed and sustainable access to destinations. In many cases, transportation systems can be implemented and managed in order to address many of the ecological impact issues raised in this paper, and are thus an integral component in long term sustainable use of parks and protected areas. However, although only evaluated in a few studies to date, existing research and analysis suggests that managing transportation systems strictly from a demand-driven perspective has numerous, potential consequences to visitor experience and ecologic conditions (Manning et al., 2014). This paper provides some initial perspectives for investigating and managing the ecological impacts of increased deliveries of visitors via park transportation systems as an emergent issue in park and protected area management, with the understanding that many of these issues have been investigated only to a limited extent to date.

The discussion in this paper suggests several conclusions that inform managers of park transportation systems and researchers concerned with the potential for ecological impacts. First, increases in transportation system capacity and transit delivery solely to accommodate visitor demand can result in altered spatial use patterns and changes in visitor densities at destinations. This is exemplified by visitors exceeding the physical capacity of hardened, maintained sites at destination areas due to crowding, and use extending into new, previously unused areas. This phenomenon is also present in areas served by private automobile access, where visitors park informally along roadways or in areas adjacent to established parking facilities when these locations are full. The specifics of these patterns appear to be highly situational and combined with the limited number of studies on these issues managers should be cautious and acquire sufficient data before developing specific transportation management policies. Moreover, understanding visitor demand, and what impels visitors to visit specific locations in a park is a complex and often poorly understood phenomenon. Regardless, park transportation needs to be managed in light of destination site capacities, so either use does not exceed the capacities of these locations spatially, or additional capacity is intestinally created through site modification. A focused delivery of visitors in a manner that reduces or maintains existing overall area disturbed is highly desirable from an ecological impact perspective.

Recent studies also suggest that increases in traffic volume, informal parking, and congestion events (i.e., "wildlife jams"), particularly in situations with private automobiles, are of potential concern. While related to overall changes in spatial and temporal distributions, these phenomena are highlighted because of the need to develop specific management strategies, particularly in situations where the increases in the occurrence of these events interact with rare species and critical habitats. The effect of noise emanating from transit systems is also an important broader spatial scale impact that should be carefully considered, particularly as protected areas consider introducing new transit systems to address demand issues. Overall, we conclude that the emerging literature in this field continues to demonstrate the benefits of transit-based solutions to visitor management issues in parks and protected areas. As with any management change, transit strategies need careful analysis to avoid unintended consequences to park resources and visitor experiences.

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