THE WHITE BIKES OF DE HOGE VELUWE NATIONAL PARK:
A Case Study for Consideration for U.S. Federal Land Managers

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July 2014

Word Count: 5,719 Words + 1 Table (250 Words) + 6 Figures (1,500 Words) = 7,469 Words

Key Words: Bike Sharing, Federal Lands, National Park, Netherlands, Hoge Veluwe

ABSTRACT

Federal land managers in the United States, particularly within the National Park Service, are becoming more interested in providing opportunities for visitors to experience a unit without a private vehicle. Alternative modes of transportation can help park units address numerous challenges, including preserving the resources for present and future generations and enhancing the quality of the visitor experience. Therefore, one mode of travel that is receiving considerable attention is the bicycle, particularly various forms of bike sharing. De Hoge Veluwe National Park, in the Netherlands, has had a bike share system since 1975 which has evolved over time. Federal land managers may be particularly interested in this system because 1) the bikes are provided free of charge, 2) there are provisions for children, 3) the bikes are not used to advertise private businesses, and 4) it is good for the environment and health. This paper briefly reviews the evolution of bike sharing, summarizes studies related to bicycles and pedestrians in the context of federal lands, presents information about De Hoge Veluwe National Park, describes its white bike share program, and concludes with considerations for implementing a similar system by federal land managers in the United States.

1. INTRODUCTION

In the United States (U.S.), touring federal land management areas, particularly National Park Service (NPS) units, by private automobile has been popular for decades. The significant increase in vehicles traveling through these lands via private automobile has led to growing problems related to visitor access, congestion, and resource protection. As a result, in recent years the NPS and individual land managers have shown an increased interest in promoting alternative modes of transportation within park units. For example, one challenge for park managers within the NPS's Green Parks Plan (1) is to encourage visitors to experience units outside of their private vehicles, particularly on foot or by bike.

One potential solution that federal land managers may consider is implementing bike share systems for their sites. While most bike sharing programs in the U.S. are relatively new, there are numerous long-standing and successful programs in Europe. This paper presents a case study of De Hoge Veluwe National Park in the Netherlands, which has had a bike share system since 1975.

This paper is divided into five sections:

- Bike Sharing Background
- Information about De Hoge Veluwe National Park
- De Hoge Veluwe's White Bikes
- Applicability to Other Locations
- Conclusions

The Background section will present an overview of bike sharing and a discussion of bike sharing in relationship to federal land management areas.

The next section will provide the reader with general information about De Hoge Veluwe National Park in the Netherlands, including the size, operating budget, origins, unique features about the park, and the present provisions for bicycling and walking.

The subsequent section will discuss De Hoge Veluwe's white bike program in more detail. Topics include a system overview, information about the operational and maintenance needs of the system, and the additional bicycles provided beyond the white bikes.

The Applicability section discusses keys points for a federal land manger to consider when implementing a bike sharing system.

Finally, the conclusion section summarizes the findings and presents key considerations that U.S. federal land managers may want to take into account when exploring the feasibility of implementing a bike share program.

2. BACKGROUND

Bike Sharing Overview

In 2010, Shaheen et al. summarized the past, present, and proposed a future direction for bike sharing in Europe, the Americas and Asia (2); they indicated that they had focused their analysis on systems open to residents and visitors, not those found on university campuses. Within the paper, the authors identify the characteristics of the three generations of bike sharing (free bike systems, coin-deposit systems, and information technology-based systems) and propose a fourth (demand-responsive, multi-modal systems). Regarding first-generation systems, also called free bike or white bike systems, the authors indicated that the anonymity created by the first generation made such systems "prone to bicycle theft." They highlight user convenience, like seat height adjustment limitations and the lack of cargo space as a current challenge for bike sharing. The authors cite the long-term experience that Europe has had with bike sharing as compared with North America.

A 2013 book by Jordan (3), which discussed the evolution of bicycling in Amsterdam, asserted that while the Provos' (a Dutch counterculture movement) created a White Bicycles Plan, its implementation never came to fruition. Instead, he identifies several international misinterpretations that helped to create the myth of its actual state of being.

Relevant to considering within this paper, both aforementioned sources indicated that almost all free bike (a.k.a. white bike) systems failed. However, the successful bike share system discussed herein can best be categorized as a free bike system.

Bike Sharing & Federal Lands

A 2008 report on bicycling as it relates to U.S. federal lands highlighted the presence of the white bike bicycles within De Hoge Veluwe National Park, although little information was provided regarding the system (4).

A 2012 study reviewed select existing bike share systems in the U.S., bicycle rental programs in two National Parks, and seven employee bicycle fleets (5). Two of the bicycle sharing systems reviewed connected to federal lands: Nice Ride (Minneapolis, MN) and Capital Bikeshare (Washington, D.C.). The document did not review the bike sharing system in San Antonio, Texas. The bicycle rentals reviewed were available in Grand Canyon National Park and Yosemite National Park. TABLE 1 shows the bicycle rental rates in 2011 for Grand Canyon National Park.

TABLE 1 Grand Canyon National Park Bicycle Rental Rates

	Adult	Children (17 and under)	Trailer
1 Hour	$10	$7	$6
½ Day (4 hours)	$25	$15	$10
Full Day (8 hours)	$35	$25	$12
Multi-Day	$30	$20	$15
24-hours	$45	$35	$15

The employee bicycle fleets reviewed were those that are available in federal lands including Glaicer National Park Red Bikes; Midwest Region NPS in Omaha, Nebraska; Yosemite National Park; National Capital Region NPS B-cycle; and Hawaii Volcanoes National Park. The study found that many bicycle sharing systems in the U.S. rely heavily on advertising and that they do not have provisions for children, which are both important considerations for federal land managers.

In 2013, Sherwood and Murphy (6) submitted a paper that presented a case study of the expansion of a bike share system from within the urban core of the City of San Antonio, Texas to San Antonio Missions National Historical Park (SAAN). SAAN encompasses four missions and other historical sites along an eight mile strecth of the San Antonio River. The park does not have distinctive boundaries; rather it is weaved into the urban framework. The park has been nominated for the United Nations Educational, Scientific and Cultural Organization World Heritage List, which is expected to attract an increased number of international visitors. The bike share system was launched in the downtown area of the City of San Antonio in March of 2011 with thirteen stations. Membership fees, advertising, corporate sponsorships, and private donations help to fund the operating budget of the bike sharing system. The bikes are designed for people ranging in height from 5’2” to 6’4”. They have a basket on the front and built-in locks. Day, week and annual memberships are available. Customer service is provided 24 hours a day, seven days a week. The park worked with city staff and the non-profit running the bike share system to linearly expand the original system so that the national park sites could be reached; however, it was also expected to benefit local residents and out-of-town visitors. Across two grants, a total of twelve stations were implemented; however, other funding had to be identified to purchase the bicycles. The addition of these twelve stations allows for all four missions within the park to be accessed. Findings to date have found that the expansion stations now account for about thirty percent of system-wide usage.

All of the aforementioned bike sharing systems found within national parks were not specifically designed with the primary or sole purpose of providing bicycles for visitors. By contrast, the white bikes of De Hoge Veluwe National Park in the Netherlands provide an example of a bike share system operated by a national park, which is specifically intended for visitor use. This system may serve as a model of interest to U.S. federal land managers who are exploring the feasibility of implementing a bike share system.

3. DE HOGE VELUWE NATIONAL PARK

De Hoge Veluwe National Park was designated in 1935 when the land was transferred from the Kröller-Müller family to the Hoge Veluwe National Park Foundation (8). Of the twenty national parks in the Netherlands, it is the most famous (9). The patrons, Anton and Helene Kröller-Müller, had the idea to make it a national park after having visited national parks in the U.S. De Hoge Veluwe is located in the east-central part of the country (FIGURE 1). It covers 5400 hectares (13,333 acres) with 43 km (27 mi) of bicycling/pedestrian paths.

FIGURE 1 De Hoge Veluwe in the Netherlands (7).

De Hoge Veluwe has approximately 500,000 visitors per year, with demand as high as 5,000 visitors per day. The majority of the park visitors come from within a 50 km (31 mi) radius of the park (10). The peak season for the park spans the months of July and August, although visitation is heavily dependent upon the weather. The lowest visitation occurs from November through February.

There are three entrances to De Hoge Veluwe: one on the west through Otterlo, one on the east through Hoenderloo, and one on the south through Schaarsbergen (FIGURE 2). The distance from each entrance to the museum/center of the park is about 3 km (1.9 mi), 5 km (3.1 mi), and 10 km (6.2 mi), respectively. The majority of visitors enter through Otterlo, and the least at Schaarsbergen.

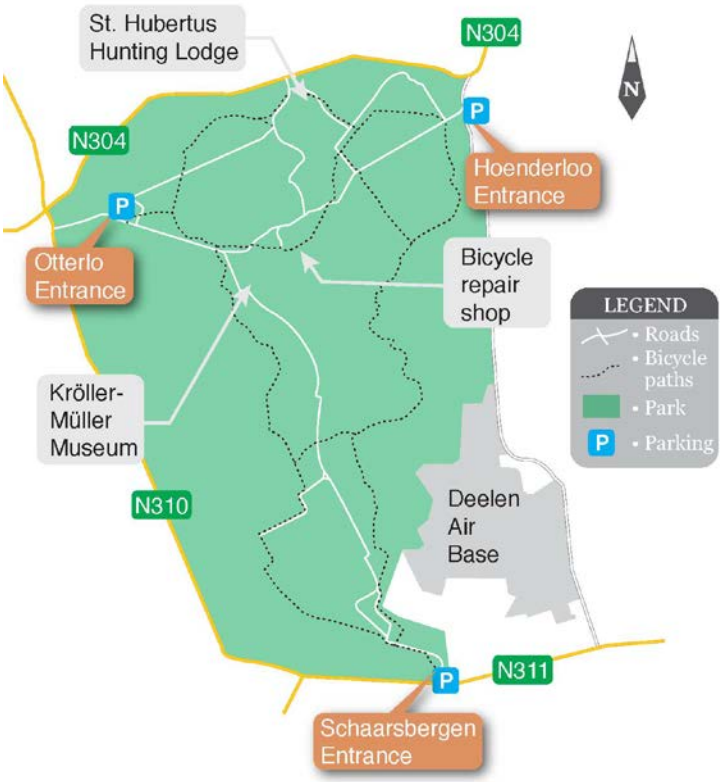

FIGURE 2 De Hoge Veluwe National Park map (7)

De Hoge Veluwe is unique from other parks because of the combination of nature, art and architecture. The park estimates that approximately one third of the visitors are drawn to the park for the Kröller-Müller Museum, one third for nature, and one third for some combination of the experience, like sipping on a cup of coffee and taking in the landscape.

The Kröller-Müller Museum houses almost 90 Vincent van Gogh paintings and more than 180 drawings; it has the second largest collection of Van Goghs in the world (11). It also houses work from other famous artists including Claude Monet, Georges Seurat, Pablo Picasso and Piet Mondriaan (11).

While more than two thirds of the Netherlands is below sea level, this park was named in part because of its relative high point; "hoge" meaning high. Therefore, in contrast to the rest of the Netherlands, the topography if De Hoge Veluwe has some inclines.

Currently, the bicycle/pedestrian paths are approximately 1.75 to 1.9 m (5.7 ft to 6.2 ft) wide, although the park is looking at increasing the width to 2.5 m (8.2 ft) because 1) they want to increase the number of visitors, 2) visitors are using wider bicycles, like tricycles, and 3) the extra width enables an ambulance or small truck to drive on the pathway for emergencies and maintenance. In addition, the park will replace the existing aspahlt pathways with concrete in the process of widening the pathways to reduce the maintenance costs and increase the service life.

Some visitors are attracted by the wildlife that can be viewed within the park, like ravens, night jar, wryneck, wheatear, red deer, moeflon, wild boar and others ((7) & (9)). Compared to the relative wildness of the national parks in the U.S., the landscape of the national parks within the Netherlands has typically been engineered (9). Until recently, there has been a fence that encompasses the entirety of the park. The presence of the fence creates a unique experience for wildlife and makes the creation of a system like the white bikes feasible. Since it was only in the past year that a portion of the fence was removed, the effect on the white bike program and wildlife has yet to be realized.

Unlike the other parks in the Netherlands, De Hoge Veluwe charges fees to enter the park, and to subsequently enter some of the other attractions like the Kröller-Müller Museum (9). De Hoge Veluwe and one other park are the only two privately managed national parks in the Netherlands. De Hoge Veluwe view themselves as a company – they are selling a (natural) product. The park operates on a €5,000,000 ($6,718,624 (12)) annual budget. Eighty percent of the operational budget is paid for by the Hoge Veluwe National Park Foundation and park entrance fees. Another ten percent of the budget is paid for by cut wood, hunting, and house rentals. Only the remaining ten percent (low as compared to the other parks) is paid for by public funds (subsidies for the management of nature by the Province of Gelderland).

De Hoge Veluwe offers an annual pass, good only for access to De Hoge Veluwe. Approximately 15,000 annual passes are purchased each year. There are two types, one that includes entry with a car and one that excludes entry with a car, at €90 ($121 (12)) and €60 ($81 (12)), respectively. The latter pass assumes that the visitor will arrive by bicycle or on foot. Unlike the annual passes in the U.S., each pass is only good for the entrance of one person. Therefore, if a family of four wanted to purchase an annual pass that would allow them to arrive by vehicle, they would purchase one €90 pass and three €60 passes.

Like the parks in the U.S., De Hoge Veluwe has a management plan. This management plan identified where they did (the northern part of the park) and did not (the southern part of the park) want to concentrate visitors. As a result, the infrastructure for both vehicles and bicycles was designed to support this plan. While camping is not allowed throughout the park, there is a designated campsite in the northeast corner.

4. THE WHITE BIKES

System Overview

FIGURE 3 White bikes at the Otterlo entrance.

Fifty white bikes were introduced to De Hoge Veluwe in 1975 (10). Today, the park has approximately 1800 white bikes. Management has concluded that the number of bikes has reached full capacity, considering the additional staff and resources that would be needed to purchase and repair more bikes. The white bikes are available year-round at six locations in the park: the three entrances, the Kröller-Müller Museum, the St. Hubertus Hunting Lodge, and next to the bicycle repair shop (FIGURE 2). The Kröller-Müller Museum and bicycle repair shop are clustered in the center of the park, and the St. Hubertus Lodge is located at the north.

The provision of complimentary white bikes was done with three primary purposes in mind: 1) park management's subtle policy to dissuade the use of a private automobile to tour the park (10), 2) allowing visitors arriving by bus to explore the park, and 3) drawing visitors in. Most everything has a cost in the Netherlands, so providing

something free, like the white bikes, has significant appeal.

The white bikes are not necessarily like bike share systems found in the U.S. or elsewhere in the world, as discusssed by Shaheen et al. (2). For example, there are no locks on the bikes themselves or at their "stations" (FIGURE 3). This means that if you use a bicycle to get to a certain part of the park, and you decide to get off of the bike to explore, there is a possibility that the bicycle may not be there when you return from your walk. It is unknown how often this may be an issue; however, park staff are not aware of complaints from visitors.

Like most bikes of bike sharing systems, the white bikes were designed simply with single gears. The single gears allow for easy repairs to be made. They are also relatively heavy, which means that they can withstand some abuse. The bikes are not equipped with bells or lights because the former would disturb the wildlife and peace of the park and the latter are unnecessary because the park closes at sunset.

FIGURE 4 White bikes with child seats.

Every adult-sized white bike now has a child seat on the rear of the bicycle (FIGURE 4). This design was implemented because approximately 10 to 20 accidents per year occurred prior to the provision of the child seats. The accidents were occurring as a result of children's feet getting stuck in the spokes when they rode on the rear of the bicycles. Since the provision of the child seats, there have been no known accidents. Alternatively, many visitors without children often use these seats for carrying items. There are also 150 child-sized white bikes. However, these bikes are also popular with certain adult visitors who are smaller in stature. Therefore, these two innovations, child seats and child-sized bikes, address two of the user convenience issues that Shaheen et al. (2) identified. It also expands the potential range of users discussed by Sherwood and Murphy (6).

Each year, 300 white bikes are retired. These bikes are replaced with another 300 white bikes that cost about €230 ($309 (12)) per bicycle (at bulk rate). Retiring approximately 300 white bikes per year results in a life-cycle of six years for each white bike. The retired white bikes are repaired by at-risk youth, and then transferred to a distant location, using a partnership with the airlines KLM. For example, some of the white bikes can be found in the Galapagos Islands. A distant location is chosen so as to maintain the integrity of the white bike brand.

As a result of the fence surrounding the premises, most white bikes do not leave the park. However, there have been a few cases in years past where a white bike has been removed from the park. One such white bike was found in Amsterdam. Yet, as a result of the brand that was created for the white bike, the bike was recognized, the park alerted, and the bicycle was returned.

The white bikes currently do not have any form of advertisement on them, and have not since the system began. This was primarily because it did not fit the style of the park when the bikeshare system was implemented. However, park officials may consider advertisement in the future.

Volunteers from the Royal Dutch Touring Club assist the park by searching, several times each year, for bikes left in remote areas of the park (10).

Safety

The park has developed a safety system for white bike users. Every bike has the emergency number stenciled on it that visitors can call if they need assistance (FIGURE 5). [Note: while the bike shown in FIGURE 5 is a blue rental bike, the white bikes of the bike share system have this same information.] Furthermore, the pathways within the park have markings every 200 m (656 ft), which allow callers to better identify to park personnel where they are located in the park (FIGURE 5). The park keeps maps at several locations within the park and in game keeper vehicles that provide information on the location of the markings. The park estimates approximately 50 calls per year.

FIGURE 5 Safety System.

Employees

To maintain the white bikes, the park employs four staff members. Their shifts rotate so that there are maintenance staff members on-site from 8 AM to 6 PM for the entire year. They spend 100% of their time on maintenance of the white bikes. Excluding staff salary, it costs approximately €100,000 ($134,372 (12)) per year to maintain the bikes.

During the peak season, they repair on average thirty white bikes per day. Their responsibilities also include redistribution of the white bicycles. They are distributed at the entrances based on historical numbers and counts of visitors entering the park. During the winter, the maintenance staff performs a more comprehensive check of each white bike and makes more extensive repairs, as needed.

In addition to making repairs to the white bicycles, the park mechanics also make repairs (excluding the cost of parts), free of charge, to visitors riding their own bicycle while touring the park. This supports the park's initiative to promote viewing the park by bicycle, and it also provides people with the impression that they are "taken care of."

Because of the international interest in the white bikes, the employees who repair them have been provided courses to teach them additional English so that they can answer questions from a wider range of visitors.

Specialty Bicycles

In addition to providing the white bikes free of charge, the park also provides special bicycles for those with disabilities (FIGURE 6). Those making use of the special bicycles are able to enter the park for free and bring one additional guest for free.

FIGURE 6 Bicycle options for disabled visitors.

Bicycles for Rental

For those who do not want to worry about whether their bicycle will be at the location when they return, there are also bicycles available for rent. They are blue in color, locks are provided with these bicycles, and they have three gears. The bicycles come in different styles and sizes, including bicycles that are designed to haul pets. They can be rented online prior to one's arrival and cost €10 ($13.4 (12)) per day. As shown in TABLE 1, the daily cost offered for bicycle rentals at De Hoge Veluwe are almost equivalent to those for an hour at Grand Canyon National Park.

5. APPLICABILITY TO OTHER LOCATIONS

De Hoge Veluwe National Park's white bikes have been shown to be a successful first generation of bike sharing, in contrast to that found by Shaheen et al. (2) and Jordan (3). However, there are several components about De Hoge Veluwe's system that likely differ from others. First, although there is some level of anonymity, which was highlighted as a reason why other free bike share systems were not successful, there is a catchment area for the bikes (i.e. the fence). While it will be interesting to see if the removal of the fence poses any issues to the system in the future, it is likely that most visitors are not aware of its removal; therefore, there will still be the perception that it exists. In the end, it may be that the park will create a new virtual fence, by implementing GPS tracking devices on each bicycle. Second, the size of the service area is relatively small as compared to most cities. Third, the operational expenses of the bike sharing are paid for by park operating expenses.

De Hoge Veluwe National Park has addressed many of the key issues that federal land managers may have to consider if implementing a bike sharing system solely serving visitors. First, they have found a way to provide a bike sharing system that can be used by families as a result of providing child seats on the back of every bicycle. Second, they have found a way to enable users with disabilities to make use of the bicycle/pedestrian pathway by offering bicycles specially designed with these considerations in mind. Third, they are concurrently providing bicycle rentals and the bike sharing option. Many U.S. parks have heard concerns from established bicycle rental concessionaires regarding other offerings. This example shows that both can exist in harmony with differing options (i.e. additional storage). Fourth, while historically they have relied upon the fence encompassing the facility to contain the white bicycles, their experience in the near future will likely be of interest to U.S. federal land managers

as a result of its removal. De Hoge Veluwe National Park has talked about using technology, like GPS, to track the bicycles. A federal land manager in the U.S. could consider using a virtual fence in lieu of a physical fence. Fifth, the bike sharing system does not fund its operation by advertisement, an aspect that concerns many federal land managers. However, it is interesting to note that the popularity of the system is in part because of the brand created by the white bikes. Sixth, De Hoge Veluwe National Park has developed an innovative system that addresses safety concerns by providing a number to call that is stenciled on each bike and markings on the pathways to provide location information. This is a relatively simple system to implement and as discussed, very few calls are received annually. The only potential challenge that a federal land manager within the U.S. might face in contrast to that discussed for De Hoge Veluwe is cell phone reception.

An important point to make regarding De Hoge Veluwe's bike share implementation is that they started out small and expanded the system as the popularity increased. A similar expansion was seen for the Red Bikes of Glacier National Park. The Transportation Scholar had set up the system for park employees and it has since expanded (13). Approaching the development of a system in this manner will 1) help to ensure that the capacity of the system is balanced with the demand and 2) allow challenges to be addressed as the system expands, in particular expanding costs. For the former, this was seen with De Hoge Veluwe National Park where the slow expansion has allowed them to understand the balance between the appropriate number of employees, the cost to maintain the bicycles, and the number of bicycles offered.

There is another important point to consider regarding the provision of the white bikes at De Hoge Veluwe: they provide infrastructure specific for bicycling and pedestrians – the pathways. The Dutch are proponents of separating bicyclists and motor vehicles. While bicycles are not restricted from the park roadways used by vehicles, a visitor will find very few other visitors using these roadways with a bicycle. Therefore, a federal land manager in the U.S. who may consider implementing a bike sharing system should consider if there are facilities that can support such an installation, as it will likely affect use.

Some might argue that the topography, size and climate of some U.S. federal lands may make implementing a bike sharing system challenging. However, with respect to topography, while some of the more popular western parks are not flat, the most utilized areas of the federal land are often located in a valley area. In addition, the topography could almost act as a fence. Similarly, regarding size, the bike sharing system could be planned to only span a narrow area. A U.S. federal land manager may want to consider if a size similar to De Hoge Veluwe would serve the purpose that the bike share may need to address. It may be, for example, that the bike share is designed to reduce the service area of a shuttle system in that the two would complement one another. Finally, as discussed in this case study, although the bike sharing system is available during the winter months, the use clearly dissipates. This allows the maintenance staff to make needed repairs to the bikes. U.S. federal land managers, considering the climate of their site, could either choose to shut down the bike sharing system, as many systems in U.S. cities do, or they could expect reduced demand.

De Hoge Veluwe's white bikes are free to visitors. However, visitors pay to enter the park and for entering additional attractions within the park, like the museum or hunting lodge. Therefore, U.S. federal land managers would have to consider how to incorporate the cost of offering a system like the white bikes into their operating expenses. However, it is likely that these costs would be significantly less than offering or expanding a shuttle system, which has historically been the more popular type of alternative transportation system offered in U.S. federal lands.

6. CONCLUSIONS

De Hoge Veluwe's white bike sharing system is an example of a first generation system that has succeeded. However, there are likely characteristics specific to the system that lend well to this type of offering. First, the fence that historically surrounded the park likely significantly helped with ensuring that the white bikes remained within the park. Second, while the white bikes are offered as free, the operating revenue for the park aided to pay for this service.

Federal land managers in the United States have mission statements, such as that of the NPS, that require preservation of the resources for present and future generations, while at the same time providing quality visitor experiences. To achieve this challenging balance between providing access and resource protection, there is an increased interest in encouraging bicycling and walking to and within federal lands. One way to encourage such modes of travel is the provision of a bike share system. While a few parks have leveraged local partners to provide bike share systems, there may be other units that do not have the opportunity to partner due to their shear size or locational constraints. As a result, they may be interested in implementing a bike share system within their unit that serves their visitors. This paper provided an example of a bike share system that has been implemented in a specific

entity for a prolonged period of time. The charactertistics, current configurations, and challenges identified may help federal land managers in the U.S. assess the feasibility of a bike share system.

Cost is one of the characteristics of the De Hoge Veluwe system that makes the use of bicycles attractive to visitors for park access. Highlighted within this case study, De Hoge Veluwe National Park provides cost incentives, as shown via the annual pass (i.e. €60 for entry without a car, €90 for entry with a car). Also, when comparing a daily bicycle rental at De Hoge Veluwe to that at Grand Canyon National Park, bicycling is considerably less expensive (and therefore more appealing) at the case study site.

In general, some of the lessons that De Hoge Veluwe have learned over the years, can also be adopted by other bike sharing systems in the U.S. For example, providing child seats on the rear of a bike would enable bike sharing systems to be available to a wider demographic. This particular expansion could be of great interest to bike sharing systems like Nice Ride, Capital Bikeshare, and the bike sharing system in San Antonio where the connectivity to a federal land has been achieved. In addition to potentially enabling families to use these systems, it would provide additional storage space to those without families.

ACKNOWLEDGEMENTS

The authors would like to express their appreciation to Jaime Eidswick, Laurie Miskimins, Marisa Rodriguez-McGill, Krista Sherwood, and Kevin Witte for reviewing and providing feedback on the document. They would also like to recognize the technical editing provided by Carla Little and the park map created by Neil Hetherington both of WTI.

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