Identifying Capacity for Local Community Participation in Wildlife Management Planning

Case 3: White-tailed Deer Issues at Prince William Forest Park

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EXECUTIVE SUMMARY

This project, supported by a cooperative agreement between Cornell University and the National Park Service (NPS), studies human dimensions of issues related to white-tailed deer and their management in the Northeast and National Capital Regions of the NPS. The research project consists of three phases. During Phase I, interviews were conducted with NPS natural resource managers and staff to describe the deer situation in northeastern parks and develop an approach for subsequent inquiry. In Phase II, interviews with public participation practitioners were completed to determine how public participation and civic engagement methods fit within NPS wildlife management. Phase III involves two types of studies with specific parks: Phase IIIA, interviews with local community residents near three parks (Fire Island National Seashore, Valley Forge National Historical Park, and Prince William Forest Park, PRWI), and Phase IIIB, a mail survey of local community residents. This report details Phase IIIA research conducted at PRWI, in Virginia.

Interviews with local community residents were used as an orientation to community members' understanding of park wildlife management, expectations for public input in management planning, and experiences with the park related to wildlife management. Two types of interviews were conducted. Type A interviews were in-depth, semi-structured, open-ended interviews with known stakeholders and influential community residents. Type B were brief interviews with residents intercepted in local gathering places. Type A interviewees included: members of the Friends of Prince William Forest Park and other park volunteers, park neighbors who regularly contacted PRWI, representatives of other local governmental entities, and board members of Homeowner Associations. Type B interviewees included: adjacent park neighbors, residents of surrounding communities, local businesses, and local teachers.

PRWI was chosen as a research site with *emerging* deer issues. As expected, the intensity and frequency of negative deer impacts were relatively low in comparison to the other two study sites, which had a longer history of deer issues. The most pervasive negative impacts were deer-vehicle collisions (DVC's) and damage to landscaping and gardens. Deer sightings were still rare enough to be highly valued and, for the most part, compensated for the negative impacts that were experienced. Instead of impacts from deer to humans, much of the dialogue at PRWI focused on anthropogenic influences that were seen to negatively impact both deer and humans alike.

The rapid rate of land conversion in the area resulted in a belief among interviewees that the park soon would become a sanctuary for deer. There was an equally pervasive belief that development was responsible for deer seeking refuge in communities. The relative strength of these beliefs may determine whether PRWI is primarily seen as a source of deer problems for local communities or as a recipient of deer problems from development. The extent to which the deer herd will inhabit the park and the surrounding communities in the future will depend on: (1) PRWI natural resource management regimes that maintain edge habitats, such as fire management and meadow management, and (2) landscaping and open space choices made by communities outside the park. Continued efforts to monitor deer population trends and impacts of deer, coupled with clear communication of results to local community members can help in developing accurate public expectations for where deer are likely to be encountered.

For most interviewees, deer were an important symbol of nature that provided a welcome contrast to the ever-present evidence of human activities in the surrounding area. White-tailed deer are a highly adaptable species, and if human-deer situation unfolds as it typically has elsewhere, as the area surrounding PRWI continues to be converted to suburban landscape it is likely that residents will begin to encounter deer in unexpected settings with greater frequency and intensity. Interviewees described very low levels of habituation in areas surrounding PRWI, which indicates another opportunity to influence people's expectations for future interactions with deer, either by increasing people's awareness that habituation is a natural process or by efforts to change human behavior that causes habituation.

Like deer, PRWI itself was an important symbolic representation of nature in the area. Most interviewees did not have a detailed understanding about ecological processes or natural resources preserved by the park but also did not appear to value these aspects as much as the psychological qualities the park offered as a peaceful meditative retreat or as recreational open space. Public participation in general was a low priority in the region, and a large proportion of interviewees were unaware of opportunities to provide input in PRWI management planning. Together, these observations suggest that future efforts to engage the public in natural resource management planning would likely need a significant amount of effort. While the majority of interviewees had not interacted directly with staff at PRWI, those who did had extremely positive interactions. Proactive efforts to extend these positive relationships and make the park more broadly visible throughout the community may improve future public participation efforts.

It is generally recognized that suburban development is creating an ecological niche to which some wildlife are better able to adapt than others. As the area surrounding PRWI reaches build-out, the length of time and extent to which deer retain their "natural" status will likely depend on: how people in the area collectively behave towards deer, and consequently the response of deer to people; and whether people's symbolic associations with deer are based on expectations for encounters with deer in "the wild" or in suburbia. Either scenario can be influenced by proactive communication with residents to establish realistic expectations for future human-deer interactions.

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INTRODUCTION

This research project examines human dimensions of white-tailed deer *(Odocoileus virginianus)* issues in National Park Service (NPS) units in the northeastern U.S. as part of a cooperative agreement between the NPS Biological Resource Management Division (BRMD) and Cornell University's Human Dimensions Research Unit (HDRU) in the Department of Natural Resources. The project consists of three phases:[1]

Phase I: A web-based survey and semi-structured in-depth discussions with NPS natural resource managers and staff were used to describe the deer situation in northeastern parks and develop an approach for inquiry to aid in management practice and policy interpretation, resulting in a study plan. Managers described a multi-tiered complex of influences shaping a park's management environment and identified five key elements for the foundation of successful management plans: understanding the park's unique management environment, internal NPS coordination, coordination with external stakeholders, effective planning processes, and adequate resources. For each of these elements, local communities were seen as significantly affecting management activity and will be the focus of future inquiry (for full report, see Leong and Decker 2005).

Phase II: In-depth semi-structured interviews with 20 public participation practitioners were completed to determine how public participation and civic engagement methods fit within NPS wildlife management, including (but not limited to) NPS policies that fulfill the purposes of the National Environmental Policy Act (1969). Interviewees included: natural resource managers, superintendents, rangers, and scientists with the NPS, USDA Forest Service, U.S. Fish and Wildlife Service, Bureau of Land Management, and US Geological Survey, and; specialists in community planning, dispute resolution, and public participation who regularly provide their services to federal land management agencies. Practitioners identified participatory strategies that integrate the substance of negotiations, relationships between stakeholders, and process design. A manuscript based on these interviews currently is in progress.

Phase III: Conduct studies with specific parks. ***Phase IIIA:*** Interviews with residents of communities near parks were used as an orientation to community members' understanding of park wildlife management, expectations for public input in management planning, and experiences with the park related to wildlife management. Capacity needs were identified to improve future public participation efforts in wildlife management planning. ***Phase IIIB:*** Scheduled for implementation in 2007 (pending approval by the Office of Management and Budget), this phase employs a mail-back survey to NPS managers and residents of communities near parks. The survey is designed based on results from Phase IIIA to describe and understand the differences in values and assumptions of NPS managers and stakeholders with respect to deer issues, and suggest how NPS staff might utilize this understanding to enhance management practices. In addition, the survey will help determine whether the perspectives of Phase IIIA

[1] For more information and copies of project reports, please contact the Human Dimensions Research Unit or visit our project website: http://www.dnr.cornell.edu/deerpeopleparks.

respondents are representative of a random sample of local residents and whether responses differ for parks with longer histories of deer impacts.

This report focuses on results of Phase IIIA inquiry.

The goal of Phase IIIA in this research project is to gain an in-depth understanding of a variety of stakeholder beliefs and attitudes regarding deer-related impacts. Impacts are the socially-determined important effects (e.g., ecological, economic, psychological, health, and safety, etc.) of events or interactions involving (a) wildlife and other natural resources, (b) humans and wildlife, and (c) wildlife management interventions (Riley et al. 2002).

White-tailed deer have been a major concern in park units of the northeastern U.S. for over two decades, and biological studies have been undertaken at a number of parks to determine deer population density, movement, and impact on park resources (for example: Frost et al. 1997, Lovallo and Tzilkowski 2003, Porter and Underwood 1999, Shafer-Nolan 1997, Underwood 2005, Underwood and Porter 1991, Warren 1991). In an effort to reduce adverse impacts of deer to park resources, the NPS may propose actions that are consistent with NPS policy and the park's enabling legislation. Deer can have profound impacts not only on a park's natural and cultural resources, but also on the residents of neighboring communities. In addition, any management actions considered by park management also may impact stakeholders (i.e., may cause collateral impacts, Decker et al. 2006), either tangibly or intangibly. Likewise, actions taken by park neighbors can exacerbate or diminish impacts experienced in the park that are associated with deer.

While park management decisions ultimately are made by NPS, such decisions are guided by the fundamental purpose of the NPS, which includes "…providing for the enjoyment of park resources and values by the people of the United States," with types of activities and use level that avoid impairment of the resource condition or value (National Park Service 2000:12). In addition, the NPS has adopted a civic engagement philosophy "… that will help ensure the relevance of NPS resources and programs to people, as well as ensure NPS responsiveness to diverse public viewpoints, values, and concerns" (National Park Service 2003:2). NPS policies also recognize that "…parks are integral parts of larger regional environments, the service will work cooperatively with others to anticipate, avoid and resolve potential conflicts…and address mutual interests in the quality of life of community residents" (National Park Service 2000:12). Local stakeholders often are crucial to the initial identification and articulation of wildlife issues at parks, such as those related to deer, although park management objectives and policy influence the degree to which NPS becomes involved in management of those issues (Leong and Decker 2005). After the NPS formally identifies, defines, publicizes and is in the process of planning actions, regional or national stakeholder groups also may become involved in management planning. In addition, NPS policies place emphasis on public participation in wildlife management planning, especially local stakeholders (National Park Service 2000, 2003). Federal agencies also are required to engage stakeholders whenever any action is considered that may significantly impact the environment (National Environmental Policy Act 1969). In addition to these policy directives, a growing body of literature recognizes the role of deliberative stakeholder engagement in resolving conflicts, improving the quality of decisions, and building relationships (for example, Beierle and Cayford 2002, Halvorsen 2003, Wondolleck and Yaffee

2000). Yet few studies have addressed the ways in which human values and attitudes affect wildlife management planning in national parks.[2] This phase of research examined the values and attitudes of residents living in communities near parks, i.e. those who had potential to experience direct impacts from deer or deer management at parks.

Potential study sites were identified based on discussions with BRMD staff, Regional Chief Scientists from the Northeast and National Capital Regions of NPS, and Natural Resource Managers at NPS units throughout the northeast. Seven NPS units volunteered to participate in the project; three sites were ultimately chosen to represent various stages of maturity of their deer issues and amount of outreach effort related to these issues. Fire Island National Seashore, on Long Island, New York, represents a park with a long history of deer issues and experience with outreach activities with communities and visitors about deer. Valley Forge National Historical Park, in southeastern Pennsylvania, represents a park with a long history of deer issues and limited public outreach activities about deer. Prince William Forest Park (PRWI), in Virginia, represents a park where deer issues are emerging only recently and relatively few outreach activities have occurred related to deer. No parks were identified that were experiencing recently emerging deer issues yet had engaged in many outreach activities about deer.

This report details experiences at Prince William Forest Park.

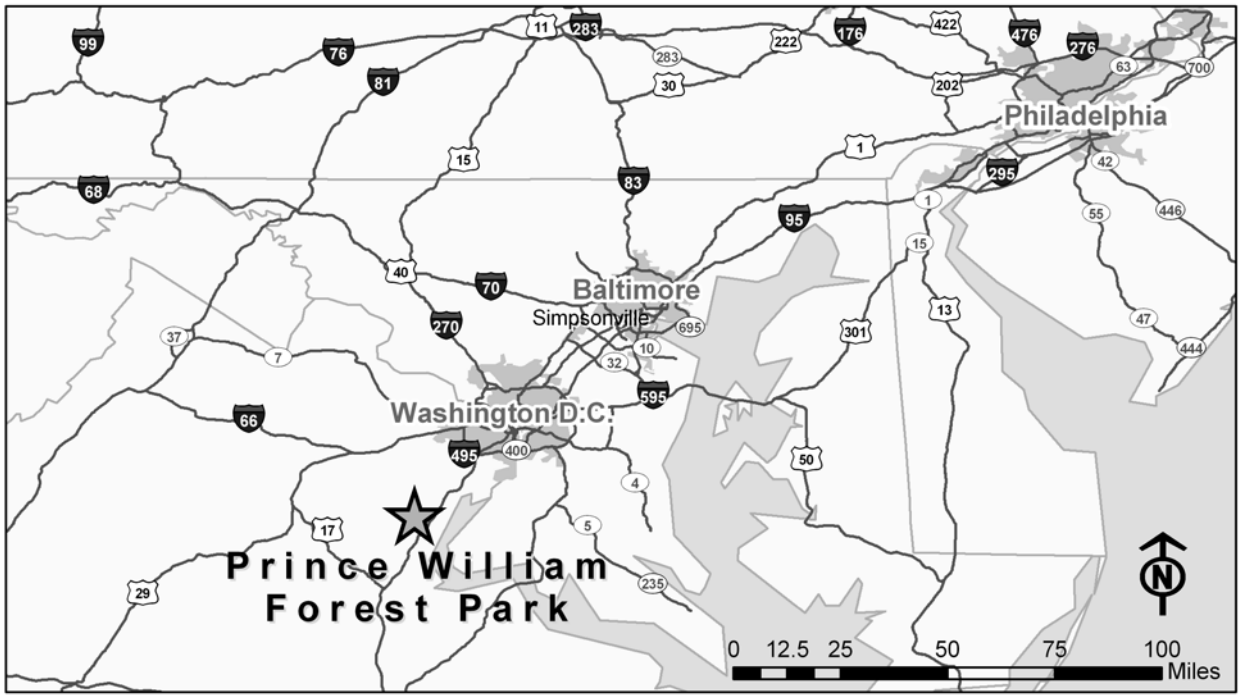
Prince William Forest Park and Deer

Located approximately 35 miles south of Washington, D.C. (Figure 1), PRWI contains about 6,000 hectares (15,000 acres) of mixed hardwood forest and is the largest example of a piedmont forest system preserved by the NPS. PRWI was originally established as the Chopawamsic Recreation Demonstration Area (RDA) in 1933 under the Roosevelt administration's New Deal program. Civilian Conservation Corps (CCC) workers were used to develop recreational facilities and restore the area, which had been disturbed by intensive early settlement (National Park Service 1999). Administrative and operational responsibility was transferred to the National Park Service in 1936, and the name was changed to Prince William Forest Park in 1948.

Today, PRWI "conserves and protects outstanding and significant natural, cultural, and historic resources and objects while providing for resource-based recreation that does not impair resource values" (PRWI Mission Statement, National Park Service 1999:41). These resources include: Piedmont and Coastal Plain forests; the Quantico Creek watershed; diverse flora and fauna, including rare and threatened species; historic structures constructed by the CCC; archeological sites dating from the pre-Colonial period; and diverse recreational opportunities in the midst of a rapidly growing urban area. Over the past 25 years, Prince William County has had one of the fastest rates of population growth in the nation (National Park Service 1999) and was one of the 100 fastest growing U.S. counties in 2005 (U.S. Census Bureau Population Division 2006).

[2] The NPS currently administers many different types of units, one of which is National Park. However, for convenience, the term "national park" will be used throughout this paper to refer to any unit administered by the NPS, regardless of actual designation.

Figure 1. Map showing the location of Prince William Forest Park, Virginia.



As part of an ongoing monitoring effort in the NPS National Capital Region (NCR), white-tailed deer have been surveyed in PRWI since 2001 using distance sampling. Population densities of deer are lower at PRWI than any other NCR park and are below 40 deer per square mile, the density at which negative effects on other wildlife species have been reported (effects on vegetation and especially rare plants may be seen at lower densities, see Bates 2006). Unlike at many other parks throughout the northeastern U.S., PRWI managers have not experienced high levels of negative impacts from deer, either to other park resources (e.g., effects on vegetation regeneration or biodiversity) or park visitors. Similarly, severe problems caused by deer have not been reported to the park by residents of local communities. Managers at PRWI believed that participation in this study offered a unique opportunity to learn more about neighboring community perceptions while impacts from deer are relatively low. Based on experiences in similar NCR parks and current trends in development of surrounding communities, PRWI managers believe that deer impacts will likely increase in the future, both within PRWI boundaries and in adjacent and nearby communities. This baseline study will assist in ongoing communication between park management and local community residents so that managers and stakeholders more accurately understand each other's perceptions of deer and deer impacts. The sociological research conducted during this phase of the project uncovers a range of local community members' opinions and experiences related to: deer issues and deer management at PRWI, the role of PRWI in deer and other wildlife management, and the influence of public input in wildlife management at PRWI.

METHODS

To become familiar with the physical setting and better understand the perspective of local community residents, the senior author resided in Dumfries, VA from October 25-November 10, 2005. A qualitative, inductive, interview-based approach was used to discover more detailed, in-depth understanding about a few key classes of local community perspectives than would be expected from a quantitative survey instrument. These interviews provide insights into the deer situation at PRWI and nearby areas, and inform development of the instrument to be used in the mail survey for the subsequent, quantitative phase of inquiry (IIIB). Such interviews often are used to reveal the scope of an issue in a community and to provide richer understanding of various perspectives. The qualitative nature of these findings does not permit inferences about the proportions of members of the community who hold particular views. To achieve that ability requires random or systematic sampling, as will be used in Phase IIIB, the design of which will be informed by results of this phase (IIIA) and will provide statistics that describe the populations of concerns.

Two types of interviews were conducted in and around PRWI. Type A were in-depth, semi-structured, open-ended interviews with known stakeholders and influential community residents (N=19). Type B were brief interviews with residents intercepted in local gathering places (N=47). Community leaders, local homeowners, and long-time residents were purposefully targeted (not randomly selected) as subjects because this study focuses on local community participation in management planning. Thus, subjects should not be considered a random sample representative of the general public. Interviewees were asked about their experiences related to deer and deer management in and around PRWI, the role of PRWI in deer and other wildlife management, and the influence of public input in wildlife management at PRWI (Appendix B).

For Type A interviews, subjects were identified through snowball sampling (Babbie 2003). This method ensured that community leaders and individuals with a known stake in deer issues were included in the study. First, NPS natural resource managers identified individuals with whom the park had regular contact related to deer or other natural resource issues. Interviews were conducted with these individuals, who were then asked to identify other influential local residents as potential subjects, whether or not those individuals typically interacted with the NPS. The sample reached saturation when the same individuals were named repeatedly. Subjects were interviewed either individually or in groups at a day, time and location that was most convenient and comfortable for the subject(s). Face-to-face interviews were preferred, but telephone interviews were used when necessary based on interviewee schedule and preference. Interviews lasted from 35 to 110 minutes; approximately half were audio recorded and later transcribed by one of three transcriptionists. All transcriptions were checked for accuracy by the senior author. Some interviewees preferred not to be audio recorded while others could not be recorded effectively due to environmental conditions (e.g., wind, background noise, etc.). For interviews that were not audio-recorded, hand-written notes were taken during the interview and detailed notes were written up as soon as possible following the interview (usually within one day).

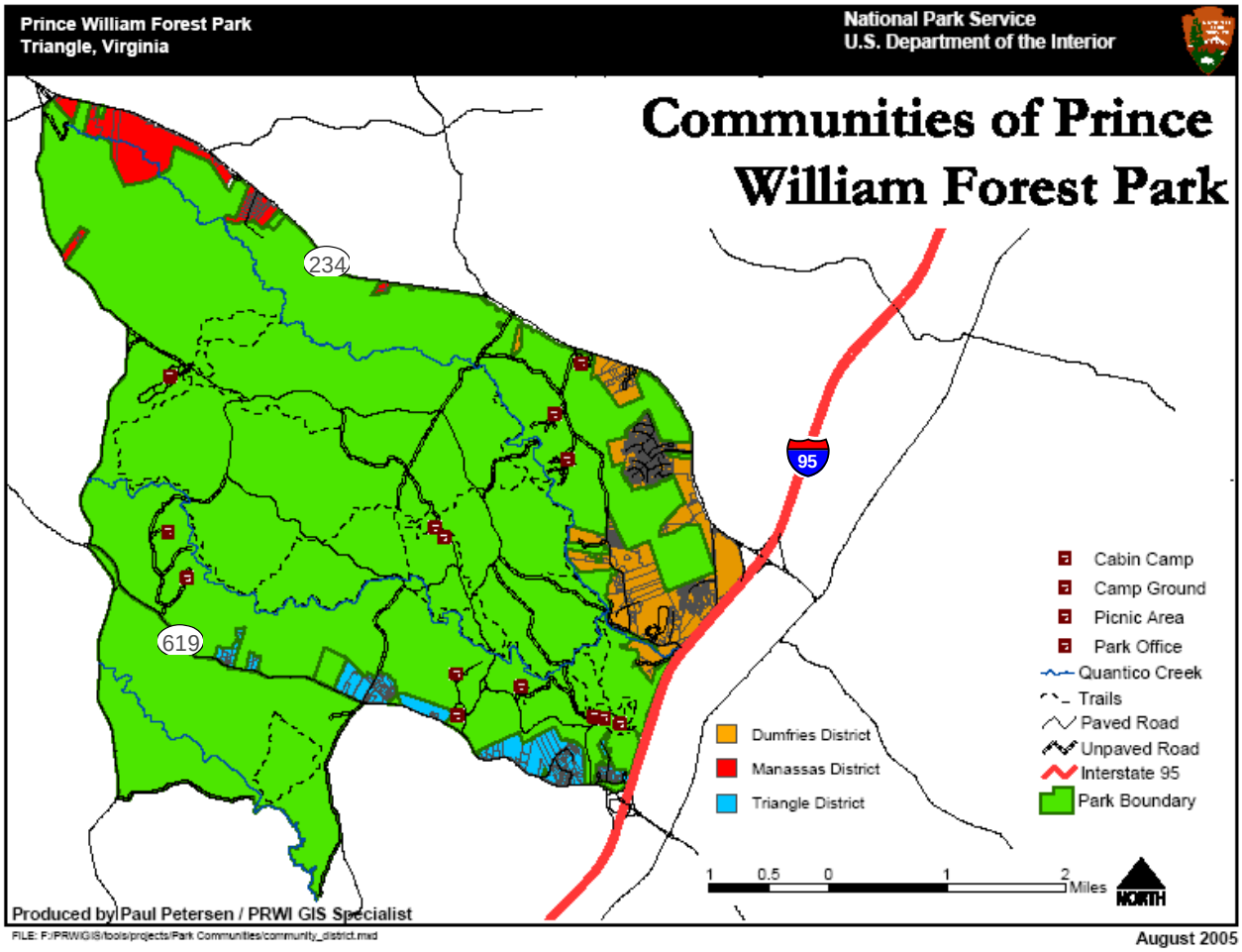
For Type B interviews, participant-observation (i.e., observation in which the researcher both observes and participates in the setting, Emerson 2001) and information from Type A interviews were used to identify informal gathering places in the area (e.g., recreation sites, community events, cafes and quick-service restaurants, retail sites). Local residents encountered at these locations were approached randomly to participate in face-to-face interviews, which typically lasted 15-20 minutes. Only two of these interviews were audio recorded due to environmental conditions. Hand-written notes were taken during the interviews and detailed descriptions were written up as soon as possible following the interview (again, usually within one day).

Unlike quantitative research that emphasizes numerical data, qualitative research examines "…things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them" (Denzin and Lincoln 2000:3). Thus, interview transcripts and notes are the "data" (Miles and Huberman 1994). Interview transcripts and notes were coded for themes using ATLAS.ti (version 5.0, Scientific Software Development GmbH, Berlin). An iterative process was used to generate codes based on themes that emerged in the interviews. That is, segments of text in the first interview were assigned thematic codes as they emerged. Each of these codes was then applied to text from the second interview. If the second interview introduced new themes, they were then added to the coding scheme. When new themes were added, previous interviews were re-scored to assure that codes were applied uniformly. Themes and topic areas were linked and quotes were sorted to reveal key concepts and to capture emergent relationships between themes.

FINDINGS

A total of 81 subjects were interviewed individually or in groups (N=66 interviews). Only three individuals refused to be interviewed. Interviewees' average age was mid 40's, with the average tenure of residency approximately 25 years. Type A interviewees included: members of the Friends of Prince William Forest Park and other park volunteers, park neighbors who regularly contacted PRWI, representatives of other local governmental entities, and board members of Homeowner Associations. Type B interviewees included: adjacent park neighbors (within the authorized boundary of the park, Figure 2), residents of surrounding communities, local businesses, and local teachers. Interviewees were predominantly white; 14 were black, four were Hispanic, and two Asian.

Figure 2. Communities within the authorized boundary of Prince William Forest Park. Any future land acquisition by PRWI must be within the authorized boundary, which is defined by I-95 on the east, Route 234 (Dumfries Rd.) to the north, and Route 619 (Joplin Rd.) to the south, with a portion that is surrounded by Quantico Marine Corps Base to the south of Joplin Rd. Communities within the authorized boundary are privately owned land.



Deer-related impacts to PRWI and to local communities

Unlike at parks with a long history of deer issues (see Leong and Decker 2007a, b for full reports), interviewees near PRWI identified fewer types of deer-related impacts, had less concern about those impacts, and reported equally strong positive impacts. The most pervasive negative impacts were deer-vehicle collisions (DVC's) and damage to landscaping and gardens. Positive impacts from viewing deer were mentioned almost as frequently. Other impacts, such as: concerns about Lyme disease and ticks, deer health, deer interaction with pets, or negative reactions to droppings, each were reported by five or fewer individuals.

A number of interviewees had never seen deer, except as a result of DVC's. DVC's were mentioned by over half of interviewees, many of whom also commuted up to 3 hours per day

between their places of residence and employment. Possibly because of the distance of people's commutes, DVC's often were discussed as a regional problem, more than a local problem. A number of interviewees mentioned a billboard on Quantico Marine Corps base that kept a running tally of deer-vehicle collisions on the base throughout the year as evidence that DVC's were a problem locally. While DVC's were viewed as potentially dangerous for both people and deer, few mentioned a need to reduce the number of DVC's.

Almost half of interviewees mentioned deer impacts to landscaping and gardens, but many indicated that the level of browse they experienced was tolerable:

> "They don't bother me. They ate my winter pansies this year, but that's no big deal. Other than that they aren't really a nuisance. They come and go because we don't threaten them" (PB28).[3]

> "They don't bother me. Some ate my flowers this past summer, I'll get over it" (PB35).

Interviewees who lived within the authorized boundary of the park spoke about higher levels of browse impact. They did not necessarily consider this to be a problem, but many mentioned neighbors who did not think as favorably of deer:

> "…you can see where they've been eating everywhere up to the height of …where the deer can reach…It doesn't bother me that much but there are other people in the community that are just incensed by the damage that is done by deer" (PA4).

Many also had changed their landscaping practices, which they found to be adequate:

> "…we lost probably $1000 worth of landscaping from the first couple of years that we were here…we were giving them juicier stuff to eat, [now we plant different things]…We just plan to lose stuff. If they're hungry, they're not that dumb. But, as you can see the plants look in fairly good shape…the other stuff that's really deer lettuce, we have kept away from [planting] them, like day lilies and stuff like that" (PA11).

> "I had a mass plan of attack after that first invasion and I tried to make it noninvasive to [the deer], but I wanted to protect my landscaping. And the cool thing was that I found out that they may eat it but it all comes back. It is almost like a natural shearing. Whatever they eat comes back almost in a more hearty fashion so it really doesn't bother me any more. I guess I have learned to live with them" (PA19).

Only six interviewees mentioned negative effects of deer browsing on native vegetation, ecosystem health, and/or biodiversity, which typically are the focus of concern to NPS managers (Leong and Decker 2005). Damage was not believed to be severe, and half of the assessments were tentative:

[3] Numbers and letters in parentheses denote interview identification codes. The first letter indicates the study site (P=PRWI), the second letter indicates Type A or Type B interview, and the number indicates interview number. For group interviews, individual respondent is indicated following the id code (R1=respondent 1, R2=respondent 2, etc.).

"Some of the fruiting trees and shrubs, I have concern that some of the native ones may have a tough time reproducing. But I don't have good, hard scientific data that can really say what would be out there and what it would look like if you took deer off the landscape" (PA2).

"I've heard that [deer] take out a lot of the low growth that provides, at least in the wintertime, food for other animals as well as the deer, so I suppose they do have an impact, but I'm no expert in that" (PA4).

"I don't recall a discussion other than the damage the deer cause, the degree of overbrowse. I don't know the degree here. In other parks, it's browsed shoulder high" (PB39).

Almost half of interviewees spoke about positive impacts from viewing deer and other wildlife, including adding value to their property and providing a "natural" component:

"…personally I think they're positive for us, because we like to see them…it just adds a dimension of enjoyment to our [property] for us" (PA16, R1).

"It's got to be positive. They're pretty, people like to look at them and see them. They're natural to the area, it has to be good" (PB8).

"I see them in my backyard all the time. Just regular deer families, early in the morning or at night. They're in my neighborhood because there are trees. I really like seeing them because it's more like nature" (PB11).

"It makes the park closer to nature. They're part of nature" (PB14, R1).

"We're known for a heavy deer population. At every time of day, there are 6-8 deer on our property. We definitely see wildlife here, foxes, all kinds of wildlife filter over from the park…I definitely don't think it's negative. People enjoy that it's part of the property. We're cautious with the building to protect those things, we've incorporated tree-saving areas, a walking trail by the park, so that what we do in developing keeps the disturbance to the wildlife to a minimum" (PB18).

Some noted trade-offs between experiencing negative and positive impacts related to deer:

"I have a friend up at Occoquan who gripes that the deer ate her plants. It's usually at the end of the season. They ate her hostas. It's worth it to watch them" (PB6).

"It's wonderful to see them. Yes, they like to eat trees and stuff, but that's what they do. I love to see the deer" (PB13).

"From a positive standpoint, seeing nature is an educational piece for the community, for kids. I don't know if 'healing' is the right term. I think seeing nature is a very peaceful

thing. The other side is that there are hazards associated with deer, deer running in front of cars. We need to be cohabitating" (PA10).

"R2: Well, we like to see them. We pull in at night, and if there are deer in this pasture over here towards the way we park, we back up the car so we can see them…
R1: and we don't mind that they're eating our horse mash, you know, no big deal" (PA16)

Others implied that they might feel differently about deer if preventative measures were not as effective:

"They are beautiful and we do enjoy them but I think as a whole I can speak for my nearest neighbors: we do enjoy seeing the deer and we don't mind sharing with them but we all spray [our vegetation with repellents]. All of my neighbors spray" (PA19).

While some negative impacts from deer were noted, deer sightings often were described as rare and special events:

"Everybody just loves them. They drive through the park hoping to see them…I haven't heard of anyone having any problems. So many people go walking hoping to see them. It's positive" (PB6).

"Last Saturday night my son was at a party. I went to pick him up, my son and his friend, and I ended up with a car full of kids. As soon as I turned into the development, guess what was in the middle of the road? Two deer. The kids started yelling and screaming. [The deer] politely took their time to cross the road. That was the talk for the rest of the evening. Some of them had never seen one in the wild" (PB31).

Some interviewees indicated that people's overall tolerance of deer might vary based on perceived novelty and intensity of positive vs. negative impacts related to deer:

"…my experience has been that most of the people enjoyed it, liked to see [deer]. Now if there had been big populations of them that, you know, cropped their flowers every night, or every morning, it may have been different. You know, it was so occasional that people I think enjoyed it more than anything" (PA8).

"[I would think there were too many if there were more] accidents; a car with kids turns the corner, there are three deer in the road—on a regular basis. Once in a while, it's cool for kids to see" (PB34).

Many contrasted the situation near PRWI with other areas where deer impacts were more severe, or where management was being undertaken, to illustrate the lack of a perceived local problem:

"The Shenandoah deer are really skinny, you can see their bones. They're not like that here…I've never heard of them causing deforestation, destroying saplings. I've never

seen issues with trees that were damaged. In Shenandoah, there's not a moment that you don't see a deer" (PB2).

"I occasionally see a deer in Dale City and they get a thing in the newspaper that there was a deer in the front lawn and what not, but it is [so minimal] that I don't think it causes a problem. I mean, you seldom hear of anyone hitting a deer with a car like where I come from in central Pennsylvania. It happens all the time. You see deer lying along the road. I just don't notice any problem with it in Virginia" (PB3).

"You don't get them like in Georgetown[4]" (PB8).

Some interviewees noticed a change in behavior of deer, apparently through habituation. In wildlife management, habituation is defined as a reduction of response to a repeated, inconsequential stimulus, usually resulting in loss of fear response, whereas food conditioning is when an animal learns to associate food with the presence of people, due to positive experiences of acquiring food easily (McCullough 1982, McNay 1998):

"…we'll literally walk within 100 feet of deer and just kind of hang out, they won't run or anything. So it's kind of bizarre in a way" (PA1).

"Deer are becoming more and more of a nuisance in the last couple of years. A lot more are eating shrubs. They're becoming too familiar. They're out at all times of day, not just dusk and dawn. It's not the park's fault, it's becoming a sanctuary" (PA12).

"the deer out here are out of this world…they'll stand in the middle of the road and look at you, you've got to actually push them out of the way (laughs)" (PA15, R1).

"…they eat all of [our flowers]. They come right up to the house. The light kicks on, but it doesn't bother them. There's a mom and a daughter or son. They were born right over there in the woods" (PB22, R2).

A few recognized that people were habituating to deer as well:

"As human beings become immune, we don't pay attention until we hear about an incident. It's incumbent on us to keep it in the forefront that we live in an area with deer" (PA10).

For the most part, interviewees appeared to experience an acceptable mix of positive and negative impacts from deer. Negative impacts had not reached a level of serious concern, and most interviewees did not describe their experiences with deer as warranting any actions beyond increased vigilance while driving and routine use of repellents to protect plantings. As one interviewee summarized, "It's not salient or well-formed. It's a non-issue, 'that's the way it goes'" (PB16).

[4] Earlier that week, a deer had entered the retail shops in Georgetown. It was captured in Ralph Lauren and released in Rock Creek Park.

Impacts to deer

While impacts of deer on humans may not be "salient" generally, many interviewees were very concerned about people's impacts on deer. Anthropogenic factors, especially population growth and associated development and traffic, often were seen to impact deer more negatively than deer impacted people:

> "Roads are not the problem. It's because there are more drivers on the roads…They miss the point that development is bulldozing the environment. Deer in the neighborhood tripled because they knocked down every tree around us. Animals have nowhere to go" (PA3).

> "I think they're beautiful. They're beautiful things. They come into our yard. It's because of all this house building. Everything is growing, there's nowhere for them to go" (PB21).

> "We're more of an impact on them than they are on us…It's the things we have done and are continuing to do" (PB31).

> "They're here all the time, every night, she has to cover the flowers or they get them. Sometimes they're here in the day. We're not overly concerned with that. It was worse. They don't have anywhere for them to go. There were woods up in back. Development has taken all of the area they've been using" (PB45, R1).

A few interviewees recognized that suburban landscaping creates habitat that may be more desirable for deer than more "natural" habitat:

> "They're not dumb, they go where the food is, the vegetation in the garden is better than the woods" (PB9).

> "I would think the deer probably have most everything they need [in the park], but of course deer are like most wild animals. They are opportunistic feeders and if they know there is a garden and it's got good carrots or whatever they are going to go for it" (PA17).

Many believed that the goal should be coexistence with deer and other wildlife:

> "As long as man keeps developing and developing, it will run them out. One summer I saw 25 snakes. We build and build and build and run the animals away. People think it's negative impact from animals. It's not. We're invading them. It's coexistence. There's so much development. I wish this would be addressed. The animals are becoming a problem because they're being pushed out. When they become a problem to us, we're creating that problem" (PB26).

> "…they're supposed to be there and we aren't. They say they're overpopulated with deer, that's nonsense. We're downsizing their habitat. They're running out of fertile ground, they're forced to cohabitate" (PB31).

> "I think it's great to see deer. We should coexist with nature. They were here before us. We're beginning to come in and populate their living space" (PA10).

> "We're losing the war on development. Deer live here too. If we think we're going to be the only animal left, we're kidding ourselves. We have to plan our development to be in harmony with the rest that are here" (PA3).

Others believed that anthropogenic landscape change resulted in humans having responsibilities for stewardship of wildlife:

> "We came along and developed, took away their habitat, so I feel like we owe them something" (PB43).

> "…a big part of it is our problem. This used to be all woods before there was an I-95 and before there was an Arlington, VA or Fredericksberg, VA or any of that, and as we encroach more and more on their area, they have to go somewhere to eat or there is not enough to keep them alive. So I would say that we have a big responsibility for that" (PA17).

One interviewee took a longer-term perspective, similar to that expressed by PRWI managers:

> "I don't think it's been perceived as a problem yet…It will get there as the park is surrounded by suburbia. Deer are pushed in and it becomes a sanctuary…In the long-term there will be more conflict" (PA12).

Other local community concerns

To place the relative importance of deer issues in perspective, interviewees were asked to identify other local community concerns involving PRWI. The most common concerns were the intensity of new development and traffic congestion. In addition, interviewees identified concerns about: a need for open space and recreation opportunities (both active recreation, e.g. recreation that requires developed areas such as baseball and soccer fields, and passive recreation, e.g. hiking and mountain biking); affordable housing; crime; and activities for children, especially after-school activities. One interviewee concluded that with "More people, more homes, [we're beginning to] model the problems of big cities" (PB14, R1).

The same anthropogenic activities that were cited as impacting deer (primarily new development and traffic) also had negative impacts on many interviewees:

> "Growing up here, there was a lot more land with trees. Every time you turn around, a whole section of the forest is cut down. Homes and roads are going in. Personally, I have an issue with that. We need more green space. Even if it's not natural. Even if we had to cut it down and replant it for planned green space. We don't have that anymore. We have 12 acres, we're planning to build on it but we want to keep green space. Everything here is concrete and asphalt" (PA10).

> "The big problem in the area is traffic. It's created by developers. It's horrendous. My wife volunteers for the hospital. It used to be a 20 minute drive. Now sometimes it's 2 hours to come home. There's development all over. They're opening up new places everywhere" (PB9).
>
> "…there's going to be a tremendous, tremendous amount of traffic. It's just increased probably about 10-fold. There's going to be a lot of stuff going somewhere. Oil and sludge and stuff" (PA11).

This appeared to result in a general negative sentiment about human activities, with a focus on developers:

> "Mankind is kind of destructive. Everything's development, traffic, urban sprawl. We're running everything down…Man is bringing nature down to her knees" (PB26).
>
> "Development is getting a free ticket. The gestation period for townhouses here is very quick. They break ground and people are living in it 2-3 months later" (PB39).

Community affiliation with and image of PRWI

Perhaps because of the prominence of population growth and associated negative impacts, many interviewees positively contrasted PRWI as a sanctuary for deer:

> "When you see deer in the park, you're glad to see there's enough area left for them that there's somewhere for them to go. There's so much encroachment. It's a safe place for them. I think, 'Thank God.' And they don't seem to run away, it's like they feel safe" (PA5).
>
> "…when I see them I am glad to see them because it is like, "Oh good, they are here, they are still here!" (PA17).
>
> "That's the only place deer have to go anymore. There's so much cutting of trees, development. The poor things have no place to go. If we didn't have the park, I don't know what they would do. The squirrels, rabbits get pushed out too, but they're more adaptable" (PB23).
>
> "With all the development, the poor things, there's nowhere for them to go. If there weren't places like the park, where would they live?" (PB37).
>
> "What a privilege, especially in the midst of development, if they could have a safe haven. I thought in this area they were all gone from overdevelopment" (PA9).
>
> "To me, the idea of a park is to enjoy it but not leave an imprint. I don't see how deer would have an impact. It should be a natural place for them to go in and out of. After

living here my whole life and seeing all this development, it's nice to see areas left for wildlife" (PB2).

Interviewees also spoke of PRWI more generally as a protector of green space:

> "I like the park there because it can't get built up. I feel terrible about all the trees getting cut. It's terrible that they're cutting everything down. I'm glad we have a park where they can't do that" (PB25).

> "There's too much development and too much traffic. I get upset when they tear down trees for houses and churches. They just tore down trees for a church [near my house]. Not that I mind churches, I just don't think they need to take down trees. I wish they would stop cutting trees to put in new things. That's why I love parks, because they can't cut the trees there, the trees have to stay there" (PB13).

> "I'm glad the park is there. If it wasn't, it would be filled with houses and people" (PB45, R1).

In general, interviewees who were familiar with PRWI associated it with family activities, children, camping, Boy and Girl Scouts, and school projects. Many valued their emotional and symbolic associations with the park:

> "It reminds me of home…I'm not saying I'm a nature freak, but I like hanging out in the outdoors, taking walks. Life has changed. There are not the opportunities to do those things like there used to be…It reminds me of when I was a kid. We used to frolic, go to fishing holes. When I'm on Joplin Road it comes back to me" (PB31).

> "…the park is just a value to the metropolitan area which is so congested…It is just a kind of a meditative place for a peaceful getaway" (PB3).

> "I love the park. I usually go and walk up there. It's very peaceful. I meditate, commune with nature. It's peaceful, calm. Every spring I walk the trails, look at the animals" (PB26).

> "[I see it as a] sea of tranquility in a land of chaos. When you're sitting in traffic that's bumper to bumper everyday" (PB46, R1).

Whether or not they currently used the park, many interviewees believed it was an important community resource, although underused:

> "When my husband was alive, we walked there all the time. We used to go to the nature center and events 4 or 5 times a year. It is a wonderful resource, like the Liberty Bell" (PB44).

> "[A colleague who donates to the park] doesn't come to the park but he realizes how significant it is. If you lose it, you lose something significant" (PB46, R1).

> "I think it's great that it's over there. It's one of the few remaining places that will retain wildness. Our kids enjoyed it tremendously. When they were growing up, they were in the park frequently" (PB45).
>
> "…the reason I bought a house here is because I always loved being by the park. That was a value to me both by being able to access it and obviously for financial reasons" (PA1).
>
> "I use it primarily to run and occasionally for hiking and biking with kids. It's a great amenity. It's so accessible. We're very lucky to have it. I'm shocked people don't take advantage of it" (PA12).

A number of interviewees believed that the reason for the lack of use was that only a fraction of local residents were even aware of the park's existence:

> "The park is kind of a stealth resource in the sense that the county is counting on its existence to justify all kinds of development and yet the people don't realize that this is intended for their use and they could get a lot more personal happiness if they knew it was there" (PA11).
>
> "This is a unique park. It's too close to DC…the park is almost too close. I detect antipathy with most of the people I talk to. Most don't realize they have a National Park so close. I would say a fair percent are not aware of the existence of the park, a larger percent are not aware it's a National Park" (PB39).
>
> "In the last few years, we took a trip with a Senior Citizen group to New York State that was billed as a Fall Foliage trip. But it was so warm that when we got there the leaves hadn't changed yet. I said we could go to Prince William Forest Park and it would be prettier. It's such an asset to the area. And so many people don't know it's there. Or they know the name but don't know it's a National Park" (PB23).
>
> "The people are totally ignorant about it. You know, they don't have a big battle like the battle at Manassas up there...The things they have here are more subtle" (PA8).
>
> "It's a well-kept secret. People get confused that it's a federal park. They see 'Prince William' so they think it's a county park. Educating is the biggest job. Even county employees say 'Yeah, it's one of our parks'" (PA5).
>
> "This is a real resource for not only Prince William but Stafford and the entire region. I bet you can go up like into Fairfax and Arlington and Alexandria and I bet you most of them probably don't even know this place is here. I bet you" (PA13).

This perception was corroborated by a number of other interviewees who either were not aware of the park or had never visited (a few had tried but not been able to find the entrance). These

interviewees expressed an interest in the types of activities and facilities offered, especially whether there were ball fields, facilities for picnics or family retreats, and children's programs.

Others believed that people were aware of the park but didn't visit for other reasons:

> "It's just there. Poor Prince William Park. This area has so much to offer for leisure time, Old Town Alexandria, Washington DC, George Washington's Birthplace, Fredericksburg, it's tough competition…The area is so saturated with things to do. People are apathetic about things like [the park] because there are so many things. It's an uphill battle" (PB17)

> "People that live close by don't visit, it's often people coming from far away. It's like the Smithsonian, if it's right there, people take it for granted" (PA5).

> "They might be their own worst enemy, because they're doing stuff all the time, so people don't pay attention. Others only do things once a year, so it's a big deal when they do" (PB34, R1).

Still others described a change in the atmosphere at PRWI, which many attributed to the institution of an entrance fee. They described the park as having a different function in the community before they began charging a fee; it was more an integral "part of" than "apart from" the community:

> "There used to be Easter Egg Hunts. In the summertime there were 200 people in the park. We would go in there every day. We would be grilling, we would bring hot dogs, people would play on the ball fields. They had events, with famous people, what's her name from Good Times, Esther Rolle. There were all kinds of things…The park is not like how it was before. Now you have to pay to get in. There's a gate by Williams Ball Field. Nobody can play on the fields. There used to be people there all the time. They don't play anymore, they can't get in. There's nothing to do, they need things for kids…They need to open up the softball fields, trails, roads. There are picnic tables and grills that have never been used in 20 years" (PB22, R3).

> "Back when we had all the things going on, people depended on [the park]. Now that there's a fee, not everyone can afford it" (PB21).

> "There was a different dynamic here when the park was free. People would be in here waxing their cars, playing Frisbee. Montclair changed the dynamics of eastern Prince William County" (PB46, R1).

> "[The park staff] don't want to interact. There's nothing in there, they started charging, they let the place go down. They don't want people in there…The way they're running things is one-sided" (PB22, R2).

These differences in perception may be related to the different demographics of the communities on the Dumfries Rd. vs. Joplin Rd. sides of PRWI. Much of the growth is occurring along the

Dumfries Rd. corridor, which is bringing in new residents who often described assets of the park in relation to open space recreation needs. Communities on the Joplin Rd. side of the park (e.g., Triangle and the town of Dumfries) include residents with longer tenure, self-described "local locals" (PB27), many of whose ancestors owned land that was either sold to the park or confiscated by the military. These communities are adjacent to the park entrance and had a longer history of interaction with the park.

Regardless of general knowledge and attitudes about the park, few interviewees knew about the resources in the park or what the park did for natural resource management. When asked "Do you believe the park makes good decisions about resource management?" many believed they did not know enough about the park (or resource management) to comment:

> "I don't feel like I'm really in a position to comment. I'm not really involved or knowledgeable of their mission or what they're trying to do" (PA2).
>
> "I don't know a lot about the decisions that are being made" (PA4).
>
> "I'm just too ignorant on what resource management really is, you know?…I like to believe they do a good job with the big things, water quality, there's some historic sites in there that I'd like them to keep actively protecting, and I know I've heard that they are (PA1).

Others assumed the park was well-managed because they were not aware of any problems:

> "…the lack of problems is a good indication that things are being run well. Sort of like with maintenance in the park, if they are doing a good job, almost nobody notices. But when you go in and the doors are falling off the hinges in the visitor center or things are messed up and there are rips in the carpet and things like that, you notice when there is a problem but you don't notice when things are run well, and I have never noticed a wildlife management problem here" (PA17).
>
> "The park is a beautiful facility. When you go through the park, it is a beautiful facility, so I have to think that they're doing it right" (PA16, R1).
>
> "I guess so, sure. I haven't heard anything to the contrary" (PB35).

A few interviewees noted the tension between protection and use, both for threatened and endangered species protection and regulations of certain forms of recreation, such as mountain biking and horseback riding. They thought an over-emphasis on protection of resources was resulting in the under-use of the park, again creating distance between the park and local community residents. While they appreciated the underlying principles for restricting/regulating use, they believed that visitation could be managed to be more inclusive and still protect resources.

Most interviewees had few, if any, interactions with staff at PRWI. For the most part, the interviewees who had interacted with staff described very positive experiences. They

emphasized staff responsiveness and professionalism, but also talked about relationships they had developed with staff members, as well as willingness of park staff to help, openness to new ideas, and general enthusiasm.

> "The Town Council could always count on the park rangers to help out on issues that impact the park and town. Like Quantico Creek, they helped out by getting trees, things to plant, providing manpower. I look at them as a good group to work with" (PB24, R1).

> "Without a doubt one of the best parks in the area. Most of the parks will almost defend a stand if an issue comes up. Prince William Forest Park listens, says 'we'll make a note of it and see if we can get it done.' They're receptive to the public's perception of what's happening to them" (PB44).

> "I've been impressed with [the staff] from the park. They were very attentive and knowledgeable. I guess I assumed because it's an urban, or suburban park, that's not utilized as heavily, because it's not like Yellowstone, I thought they wouldn't be as good" (PA1).

Perceptions of public participation

Most Type B interviewees had little experience with public input and PRWI, although some had attended public meetings. Type A interviewees were in more regular contact with PRWI because of their standing as community and stakeholder group leaders. They believed they had good access to PRWI staff, and were comfortable calling, writing, or e-mailing when they had questions. They also were more aware of public meetings and were invited to participate in more formal decision-making processes. Interviewees spoke positively of one-to-one interactions with staff members; however, many had low expectations for formal public processes as a means to provide meaningful input, an opinion that often was colored by experiences with other agencies or local governments where decisions were believed to be made a priori. Most interviewees did not distinguish between public meetings held by NPS vs. other local government entities, such as the Prince William County Planning Commission which is responsible for zoning and special use permits.

Those who had attended meetings held by PRWI or local government entities described poor attendance. In fact, many interviewees were not aware of opportunities to provide input or believed that most other residents were unaware of such opportunities:

> "Most of these public meetings, they put up notices but you have to know where to look. Like in the town, they post them at the police station for one day (makes a face)" (PB38).

> "I thought the meeting itself was conducted very well, just getting the word out, I think a lot more people would have come had they known about it. Because the park does affect, I mean it really does affect so many more people than were there, I mean it was probably a tenth of the people that it directly affects, it's all around here, people are concerned about it" (PA1).

For some, low attendance led to concerns that attendees were not representative of the larger public:

> "Meetings with small turnout—it's not the majority, it's the voice of the few that have changed the life of many. It's not accurate, not very representative of the masses. Four people vote" (PB31).

> "…people around here tend to be either super-involved or not at all. And the ones that are super-involved can be pretty vocal" (PA1).

> "You only hear from people if they have something to complain about, or if it directly impacts them…People come out when they see how it immediately impacts them. In my experience, they only show up if they think it will be negative" (PA12).

Others believed that low attendance simply indicated that most people were unaffected:

> "I don't think it's bad that we didn't have a lot of people. You have few people when it's a noncontroversial issue. It's a mom and apple pie issue. If it does not affect your quality of life, you get a very small group of people" (PB47).

In general, interviewees described the region as a commuting area where people's time was at a premium and their focus was on their family; although the park often was associated with family activities, providing public input to PRWI or other local entities was not believed to be a priority for time:

> "My general impression of the area is that people work. They're dual income families. Other than their kids, they don't care. They worry about traffic. I've been to a number of community meetings. The participation is horrible" (PB39).

> "They usually have signs up so people can go, notify them of meetings. Not many attend. I'd say it's pretty poorly attended. People work, when they get home it's already started. They have kids" (PB6).

> "…people only have 24 hours in a day. They have to dedicate it to the most important things. The park doesn't rate that high until you see them selling off Prince William Forest Park and bulldozing it over. In day to day operation, people don't pay attention" (PB46, R1).

> "In this area, people are on the road and stuck in traffic so much, when they get home, they get home and they don't want to go back out" (PA5).

They believed that attendance was directly linked to perceptions of relevance of the topic:

> "A citizen has to have a vested interest to keep them involved, dedicated" (PB43).

> "People tend to spend their time on the things that are important to them and so you have to make that connection. Like I said people tell me, 'Oh yeah, I used to camp there in the summers when I was in Girl Scouts or Boy Scouts,' or whatever, and once people have a connection then it matters to them. People are only going to spend their time on things that they care about" (PA17).

> "It's hard to motivate people to do anything, especially if it's in the evening on their time. You don't get a very large turnout unless it's very controversial. [They don't] go if it's not going to impact them directly" (PB31).

This assessment was corroborated by numerous interviewees who were not interested in providing input to the park, or said they didn't have the time or were too busy. For many, the degree to which they were likely to become involved depended on trade-offs with other priorities:

> "For a meeting, it would have to be really, really important on something that I felt strongly about and I would have to not be doing something with my children" (PB13).

> "[I would like to provide input] If I used it, yes, but not until then. I don't want to be on the mailing list until I start using it. I have a 4 year old girl [maybe when she's older]" (PB36).

Interviewees displayed a wide range of individual preferences for providing input to the park. Many emphasized e-mail and websites, but others preferred telephone, mail surveys, one-to-one conversations, and various forms of public meetings. Some interviewees believed that it was important for people to hear the views of others and offered alternatives to improve effectiveness of public meetings. These suggestions included more informal venues (such as gatherings at people's homes over coffee or other refreshments, or events with activities for children so people could attend with their families) as well as piggy-backing off of other local events or meetings held by other organizations. Some believed that a greater effort to be involved with the larger community would pay off in the long-run:

> "They have to turn things around. That would increase their support in the county, which would then maintain their level of funding, because if they needed it, they could go to the citizenry and say, 'man, we've done all this for you so you need to help us.' And, you know, and I assure you, if they came to me and said, "hey, we need somebody to write a letter to get us some funding," I'd do it, I like them" (PA16, R1).

DISCUSSION

PRWI was chosen as a research site with emerging deer issues, in contrast to Fire Island National Seashore and Valley Forge National Historical Park, which have a longer history of high densities of deer, high levels of negative impacts from deer, and controversial interactions between the parks and local communities about deer and deer management. As expected, while the same types of negative impacts were reported at PRWI, the intensity and frequency of those

impacts were relatively low in comparison to the other study sites. In addition, negative impacts were generally described as tolerable and not yet considered a "problem." Deer sightings were still rare enough to be highly valued and, for the most part, appeared to compensate for the negative impacts that were experienced. With low levels of negative interactions between humans and deer, and highly valued positive interactions, much of the dialogue at PRWI focused on anthropogenic influences that were seen to negatively impact both deer and humans.

The rapid rate of land conversion for new development resulted in a belief among interviewees that deer were being pushed into PRWI and that the park soon would become a sanctuary. There was an equally pervasive belief that development was responsible for deer seeking refuge in communities. The relative strength of these beliefs (as well as the geographic location of the community in question) may determine whether PRWI is primarily seen as a source of deer problems for local communities or as a recipient of deer problems from development. Distance sampling showed that deer density in PRWI decreased slightly from 2004 to 2005, although it is estimated that five more years of population data will be necessary to detect an actual trend (Bates 2006). Since PRWI was established, many of the old farmsteads within its boundaries have been restored to mixed hardwood forest through natural succession. As the forest continues to mature and less light penetrates the canopy, the habitat in the park may become less suitable for deer. Simultaneously, as development of surrounding communities is completed and landscaping matures, these areas outside the park may become more attractive to deer. Thus, the extent to which the park contributes to supporting the local deer herd in the future will depend on: (1) PRWI natural resource management regimes that maintain edge habitats, such as fire management and meadow management, and (2) landscaping and open space choices made by communities outside the park. Other studies have shown that deer tagged in established suburban landscapes surrounding a park often stay within those communities (Lovallo and Tzilkowski 2003). Continued efforts to monitor deer population trends and associated impacts, within PRWI and in surrounding communities if possible, coupled with clear communication of results, can assist local community members in developing accurate expectations for where "deer problems" are likely to be encountered.

For most interviewees, deer were an important symbol of nature that provided a welcome contrast to the ever-present evidence of human activities in the surrounding area. White-tailed deer are a highly adaptable species, and as the area surrounding PRWI continues to be converted to suburban landscape it is likely that residents will begin to encounter deer in unexpected settings with greater frequency and intensity. Thompson and Henderson (1998) demonstrated that cervid habituation in urbanizing environments is a naturally occurring adaptive behavioral strategy to maximize reproductive fitness. Yet studies reveal that as deer adapt to human-altered landscapes and become habituated to humans, people may begin to see them less as symbols of nature and more as pests (Leong and Decker 2007a, b). The low level of habituation and food conditioning currently experienced in areas surrounding PRWI provide opportunities to affect people's expectations for future interactions with deer. First, increasing people's awareness of habituation as a natural process may diminish the intensity of people's negative reactions to habituated deer. Researchers have found that people tend to associate higher risks with events caused by human vs. natural origins (Covello and Sandman 2001). If education and outreach efforts emphasize habituation as a natural process vs. man-made phenomenon, people may assess risks from interactions with habituated deer less negatively, although this hypothesis remains to

be tested. Second, people can be encouraged to alter their own behavior around deer to discourage habituation and food conditioning. Ethical implications of attempting to influence human behavior must be considered if this course is pursued.

Like deer, PRWI overall was important as a symbolic representation of nature. Detailed knowledge about ecological processes or natural resources preserved by the park appeared to be less important to interviewees than the psychological qualities it offered as a peaceful meditative retreat or as recreational open space; public-use objectives of citizens may not correlate well with natural resource management objectives of PRWI managers. In addition, many interviewees believed that public participation in decision-making in general was a low priority in the region, and a large proportion of interviewees were unaware of opportunities to provide input in PRWI management planning. Together, these observations suggest that future efforts to engage the public in natural resource management planning would likely need a significant amount of effort to draw a representative group of the public able to provide meaningful input. Public engagement in planning related to deer would require additional efforts to demonstrate relevance to residents who do not yet perceive a regional problem. Interviewees also indicated a wide range of preferences for ways to engage with the park. Other studies have reported similar findings and recommend strategies for public engagement that include multiple methods for stakeholder input and involvement to reach a broader base of stakeholders (Chase et al. 2002). While the majority of interviewees had not interacted directly with staff at PRWI, those who did had extremely positive interactions. Proactive efforts to extend these positive relationships and make the park more broadly visible as a natural resource asset throughout the local area may improve future public participation efforts. In this process, it will be important to consider whether the approach taken might be perceived as inclusive or exclusive towards certain geographic or user group communities.

It is generally recognized that suburban development is creating an ecological niche to which some wildlife are better able to adapt than others (DeStefano and DeGraaf 2003). Some believe the ultimate result is “manmade subspecies” that behave differently than their “wild” counterparts (Leong and Decker 2007b). As the area surrounding PRWI reaches build-out, the length of time and extent to which deer retain their “natural” status will likely depend on: how people in the area collectively behave towards deer, and consequently the response of deer to people; and whether people’s symbolic associations with deer are based on expectations for encounters with deer in “the wild” or in suburbia. Either scenario can be influenced by proactive communication with residents to establish realistic expectations for future human-deer interactions.

LITERATURE CITED

Babbie, E. 2003. The Practice of Social Research. 10th edition. Wadsworth, Belmont, CA.

Bates, S. 2006. Deer Survey Report: Fall 2005. National Park Service, National Capital Region, Washington, D.C.

Beierle, T. C., and J. Cayford. 2002. Democracy in Practice : Public Participation in Environmental Decisions. Resources for the future, Washington, D.C.

Chase, L. C., W. F. Siemer, and D. J. Decker. 2002. Designing stakeholder involvement strategies to resolve wildlife management controversies. Wildlife Society Bulletin 30: 937-950.

Covello, V. T., and P. M. Sandman. 2001. Risk communication: Evolution and revolution. Pages 164-178 *in* Wolbarst, A.,editor. Solutions to an Environment in Peril. Johns Hopkins University Press, Baltimore, MD.

Decker, D. J., M. A. Wild, S. J. Riley, M. M. Miller, K. M. Leong, J. G. Powers, and J. C. Rhyan. 2006. Wildlife disease management: A manager's model. Human Dimensions of Wildlife 11: 151-158.

Denzin, N. K., and Y. S. Lincoln. 2000. Handbook of Qualitative Research. 2nd edition. Sage Publications, Thousand Oaks, CA.

DeStefano, S., and R. M. DeGraaf. 2003. Exploring the ecology of suburban wildlife. Frontiers in Ecology and the Environment 1: 95-101.

Emerson, R. M. 2001. Fieldwork practice: Issues in participant observation. Pages 113-151 *in* Emerson, R. M.,editor. Contemporary Field Research. Waveland Press, Prospect Heights, IL.

Frost, H. C., G. L. Storm, M. J. Batcheller, and M. J. Lovallo. 1997. White-tailed deer management at Gettysburg National Military Park and Eisenhower National Historic Site. Wildlife Society Bulletin 25: 462-469.

Halvorsen, K. E. 2003. Assessing the effects of public participation. Public Administration Review 63: 535-543.

Leong, K. M., and D. J. Decker. 2005. White-tailed deer issues in NPS units: Insights from natural resource managers in the Northeastern U.S. Human Dimensions Research Unit Publication Series Number 05-5. New York State College of Agriculture and Life Sciences, Department of Natural Resources, Cornell University, Ithaca, NY.

Leong, K. M., and D. J. Decker. 2007a. Identifying capacity for local community participation in wildlife management planning. Case 1: White-tailed deer issues at Fire Island National Seashore. Human Dimensions Research Unit Publication Series Number 07-1. New York

State College of Agriculture and Life Sciences, Department of Natural Resources, Cornell University, Ithaca, NY.

Leong, K. M., and D. J. Decker. 2007b. Identifying capacity for local community participation in wildlife management planning. Case 2: White-tailed deer issues at Valley Forge National Historical Park. Human Dimensions Research Unit Publication Series Number 07-3. New York State College of Agriculture and Life Sciences, Department of Natural Resources, Cornell University, Ithaca, NY.

Lovallo, M. J., and W. M. Tzilkowski. 2003. Abundance of white-tailed deer *(Odocoileus virginianus)* within Valley Forge National Historical Park and movements related to surrounding private lands. Technical Report NPS/NERCHAL/NRTR-03/091. National Park Service, Philadelphia, PA.

McCullough, D. R. 1982. Behavior, bears, and humans. Wildlife Society Bulletin 10: 27-33.

McNay, M. E. 1998. Wolf-human interactions in Alaska and Canada: A review of the case history. Wildlife Society Bulletin 30: 831-843.

Miles, M. B., and A. M. Huberman. 1994. Qualitative Data Analysis: An Expanded Sourcebook. 2nd edition. Sage Publications, Thousand Oaks, CA.

National Environmental Policy Act. 1969. 42 U.S.C. § 4321 *et seq.*

National Park Service. 1999. General Management Plan, Prince William Forest Park. U.S. Department of the Interior, National Park Service, Washington, DC.

National Park Service. 2000. Management Policies 2001. National Park Service, Washington, DC.

National Park Service. 2003. Director's Order #75 A: Civic Engagement and Public Involvement. National Park Service, Washington, DC.

Porter, W. F., and H. B. Underwood. 1999. Of elephants and blind men: Deer management in the U. S. National Parks. Ecological Applications 9: 3-9.

Riley, S. J., D. J. Decker, L. H. Carpenter, J. F. Organ, W. F. Siemer, G. F. Mattfeld, and G. Parsons. 2002. The essence of wildlife management. Wildlife Society Bulletin 30: 585-593.

Shafer-Nolan, A. L. 1997. The science and politics of deer overabundance at Cuyahoga Valley National Recreation Area. Wildlife Society Bulletin 25: 457-461.

Thompson, M. J., and R. E. Henderson. 1998. Elk habituation as a credibility challenge for wildlife professionals. Wildlife Society Bulletin 26: 477-483.

U.S. Census Bureau Population Division. Table CO-EST2005-09 - Population Estimates for the 100 Fastest Growing U.S. Counties in 2005: April 1, 2000 to July 1, 2005. 2006 [cited

March 28 2007]. Available from http://www.census.gov/popest/counties/CO-EST2005-09.html.

Underwood, H. B. 2005. White-tailed deer ecology and management on Fire Island National Seashore. Fire Island National Seashore Science Synthesis Paper. Technical Report NPS/NER/NRTR--2005/022. National Park Service, Boston, MA.

Underwood, H. B., and W. F. Porter. 1991. Values and science: White-tailed deer management in eastern National Parks. Transactions of the 56th North American Wildlife and Natural Resources Conference: 67-73.

Warren, R. J. 1991. Ecological justification for controlling deer populations in eastern National Parks. Transactions of the 56th North American Wildlife and Natural Resources Conference: 56-66.

Wondolleck, J. M., and S. L. Yaffee. 2000. Making Collaboration Work: Lessons from Innovation in Natural Resource Management. Island Press, Washington, DC.

APPENDIX A. INTERVIEW GUIDING QUESTIONS

1. How long have you lived near this park?
2. Are you a year-round or seasonal resident?
3. Which community do you live in?
4. Please describe and draw the boundaries to this community and other communities you interact with on the map.
5. Have you visited this park before?

   If yes:

   a. How often have you visited in the last two years?

   b. What are the main reasons you visit the park? List all that apply.

6. Please describe your observations on deer and deer management at the park and in the surrounding community.
7. Have you learned about deer from park staff, exhibits or other materials, either within the park or in other contexts?

   If yes:

   a. What did you learn?

   b. How did you learn it?

8. Do you believe deer impact the park, either positively or negatively? How?
9. Do you believe deer from the park impact the local community, either positively or negatively? How?

   a. How responsive is the park to these local concerns about deer?

   b. How do you feel about the park's responsiveness to these concerns?

10. In comparison to deer impact, how responsive is the park to other types of local concerns?

    a. How do you feel about the park's responsiveness to these concerns?

11. Please describe the types of interactions you typically have with park staff.
12. Do you believe the park makes good decisions about resource management? Why or why not?

13. Have you acted to influence decision-making at this park? Why or why not?

    If yes:

    a. Please describe your activities and the topics or issues.

    b. Which activities were most effective?

14. Have you ever given input or participated in public meetings or other scoping processes related to park decision-making?

    If yes:

    a. Please describe your participation/input.

    b. Why did you participate?

    c. Do you believe that your input made a difference in park decisions? Why or why not?

    d. What was the best/most effective part of the process?

    e. What could be improved?

    If no:

    a. Did you ever have the opportunity to participate/give input?

    b. Would you like to participate/give input?

    If yes:

    i. How would you like to be notified?

    ii. How would you like to participate?

    c. What could be done to encourage you to participate?

15. Do you have any additional comments that you would like to add?

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