White-tailed Deer Issues in NPS units: Insights from Natural Resource Managers in the Northeastern U.S.

White-tailed Deer at Morristown National Historical Park
Photo courtesy of the National Park Service

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EXECUTIVE SUMMARY

The Biological Resource Management Division of the National Park Service and the Human Dimensions Research Unit at Cornell University are collaborating to study human dimensions of white-tailed deer issues in NPS units in the northeastern U.S. By using deer as a model to examine the integration of biological and human dimensions of wildlife management, this project seeks to improve NPS ability to respond to wildlife management needs of park units in general. This report focuses on research in the first phase of the project, which consisted of a web-based questionnaire and semi-structured informal interviews with natural resource managers throughout the Northeast and National Capital Regions of the NPS. 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. In each of these areas, local communities were seen as significantly affecting management activity. Future inquiry will examine managers' approaches to decision-making, effectiveness of techniques for engaging the public, and differences between the specific values for which a park is managed and those held by stakeholders. The results are anticipated to improve NPS ability to respond to other issues that, like deer, primarily originate in local communities.

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INTRODUCTION

Wildlife management is becoming an increasingly complex task for land resource management agencies. Some locally or regionally abundant species cause marked impacts on ecosystems and introduce economic and human health and safety risks. The biological dimensions of wildlife management have been a focus of inquiry for nearly a century, and while it is acknowledged that more biological science knowledge is desirable, the greatest need in some situations is for knowledge about the social aspects, or human dimensions of wildlife management. The human dimensions of wildlife management are defined as, "…how people value wildlife, how they want wildlife to be managed, and how they affect or are affected by wildlife and wildlife management decisions" (Decker, et al. 2001:3). This definition considers both managers' and stakeholders' values. The Biological Resources Management Division (BRMD) of the National Park Service (NPS) seeks to improve its ability to respond to wildlife management needs of park units across the country by gaining human dimensions expertise and enhancing its capacity to integrate the biological and human dimensions of wildlife management issues faced by NPS.

White-tailed deer *(Odocoileus virginianus)* have been a major concern in many 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 (Underwood and Porter 1991, Warren 1991, Frost, et al. 1997, Shafer-Nolan 1997, Porter and Underwood 1999). Because of the relative wealth of biological knowledge about deer and growing resource management concerns that are perceived to involve deer in some way, deer issues in northeastern parks was identified as the "model" system for developing initial human dimensions insight and expertise in the BRMD.

The research project consists of three main phases:

Phase I: In collaboration with BRMD and northeastern NPS units, 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.

Phase II: Conduct study(ies) in collaboration with BRMD staff, NPS regional staff, specific park unit staff, and NPS partners to determine how public participation and civic engagement methods fit within NPS wildlife management, including (but not limited to) processes associated with the National Environmental Policy Act (NEPA, National Environmental Policy Act 1969).

Phase III: Conduct study(ies) in collaboration with BRMD staff, NPS regional staff, and specific park unit staff to describe and understand the differences in values and assumptions of NPS managers and stakeholders with respect to deer issues, and to suggest how NPS staff might utilize this understanding to enhance management practices.

This report focuses on results of Phase I inquiry.

METHODS: PHASE I

Discussions with NPS regional scientists and BRMD staff resulted in the development of a model representing wildlife issue-evolution in NPS units (Leong, et al. in review). According to this model, wildlife issues evolve through four main phases (Figure 1):

Identifying potential issues: Concerns are voiced and activity from concerned individuals increases, although issues are not yet fully formed.

Focusing issues: Issues are formally defined,[1] goals and objectives (specific to the issues) are set, and data are collected, laying the groundwork for effective program evaluation.

Planning action: Potential actions to address the issue are identified based on the outcome of data collection. These are evaluated with respect to variables such as efficacy, social acceptability and cost.

Taking action: Chosen management alternatives are implemented, evaluated and adapted as necessary. Activities may be refined as a result of evaluation through monitoring, as an adaptive management strategy.

Figure 1. Issue-Evolution Model in Wildlife Management (from Leong, et al. in review)

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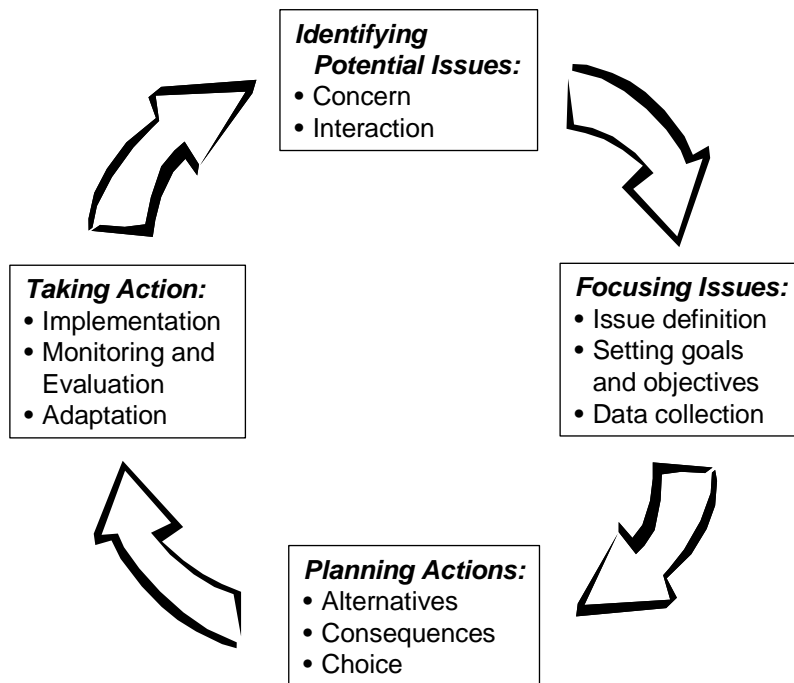
[1] An issue is a statement that can be acted upon (Kent and Preister 1999).

As a first step in understanding NPS resource managers' perspectives on deer issues throughout the northeastern U.S., a brief questionnaire was developed to determine sources and impacts of concern with respect to deer, as well as the level of action parks were taking, in terms of the issue-evolution cycle (Appendix A).[2] Representatives from 52 NPS units in the Northeast and National Capital Regions that were known to have experienced or thought to have the potential to experience impacts from deer in the near future were asked to respond to the questionnaire. Forty-four rangers, biologists, natural resource managers/specialists, superintendents, and others representing 49 NPS units responded. Respondents were not asked to provide official park position statements based on data, thus responses were considered to reflect professional judgments of the individual responding.

Most respondents (N=32, or 73%) had current deer concerns and were at various stages of taking action related to these concerns. While only four parks were planning action and two were implementing management activities, ten were collecting data and were poised for future action planning (Figure 2). Figure 3 shows level of action for each park, in map format.

Figure 2. Level of Action Related to Negative Deer Impacts, Summarized.

Categories reflect phases of the issue-evolution cycle. Parks that responded they were not sure how to rate current level of activity were categorized as "some concern."

Level of action for parks with current concerns

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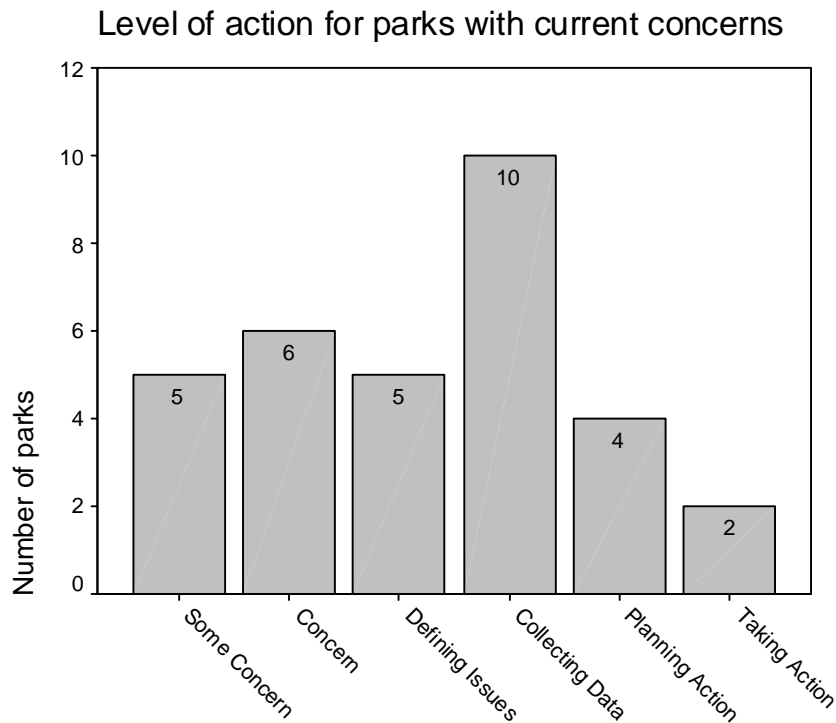
[2] In the survey instrument, we used the vernacular of most managers with whom we spoke prior to implementing the survey, which notably referred to natural resource management issues involving deer simply as "deer management" issues. As our investigations deepened, we came to learn that many deer management issues were actually focused primarily on management of another resource element in a park unit that deer were perceived to be affecting. For convenience, we refer to "deer issues," to avoid implying that the primary focus of natural resource management was fundamentally a deer objective.

Figure 3. Level of Action Related to Negative Deer Impacts, by NPS Unit.

Warm colors reflect parks that reported negative impacts. Cool colors reflect parks that reported no current deer concerns.

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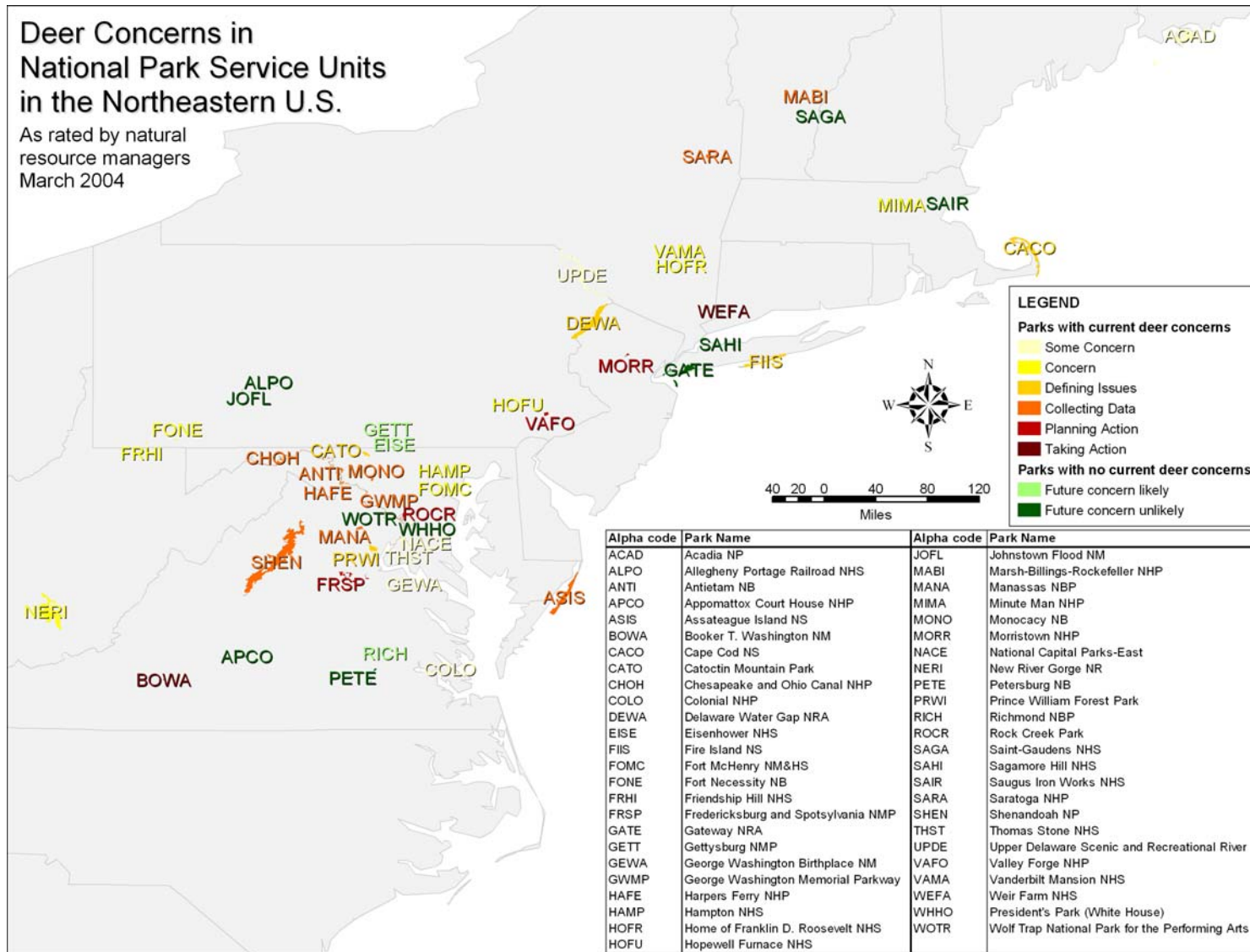
A subset of 22 parks (Table 1) was selected for follow-up site visits. Parks were chosen to represent a range of NPS designations (i.e., National Park, National Historic Site, National Recreation Area, National Battlefield, etc.), sizes, and phases in the issue-evolution cycle. Between May and October 2004, semi-structured informal discussions were conducted with 47 natural resource managers and staff at these NPS units.

Table 1. NPS units visited for follow-up discussions (in alphabetical order).

All NPS units were visited by K. Leong.
Asterisk denotes parks visited by both K. Leong and D. Decker.

Antietam National Battlefield
Cape Cod National Seashore
* Catoctin Mountain Park
* Chesapeake and Ohio Canal National Historic Park
Colonial National Historic Park
* Delaware Water Gap National Recreation Area
* Fire Island National Seashore
Fredericksburg and Spotsylvania National Military Park
* Gettysburg National Military Park
* Harpers Ferry National Historic Park
Hopewell Furnace National Historic Site
Manassas National Battlefield Park
* Marsh-Billings National Historic Park
Minute Man National Historic Park
Monocacy National Battlefield
* Morristown National Historic Park
* Prince William Forest Park
* Rock Creek Park
* Shenandoah National Park
* Saratoga National Historic Park
* Valley Forge National Historic Park
Weir Farm National Historic Site

A set of guiding discussion questions was e-mailed to managers in advance to familiarize managers with our major areas of interest: the history of deer issues at the park, perceptions of differences between manager and stakeholder concerns, the influence of the public on park management planning, and strategic natural resource communication efforts (Appendix B). This set of questions was not used as a formal interview instrument, but merely as a way to guide discussions and ensure that major topics of interest were covered.

These discussions helped to: (1) identify the extent and general nature of deer impacts in NPS units of the northeastern U.S., (2) gain an understanding of how these situations have been approached, especially with respect to the public engagement and human dimensions of wildlife management, and (3) identify common themes or experiences with respect to successes and problems related to deer issues that would be fruitful for further in-depth inquiry.

RESULTS: INSIGHTS FROM MANAGERS

For this discussion, the following definitions will be used:

Wildlife Management: "…the guidance of decision-making processes and implementation of practices to purposefully influence interactions among and between people, wildlife, and habitats to achieve [valued] impacts" (Riley, et al. 2002:586). In contrast to other approaches that focus primarily on the manipulation of wildlife populations and habitat (Caughley and Sinclair 1994, Bolen and Robinson 1995), this definition also incorporates the importance of activities directed toward people in meeting management goals. As noted by Decker et al.(2001), wildlife management exists because of the values people place on wildlife as a resource, an assertion consistent with the observation of Fazio and Gilbert (1986) that wildlife management can be 10% managing the resource and 90% managing the public.

Impacts: The socially-determined important effects of events or interactions involving wildlife, humans and wildlife, and wildlife management interventions (Riley, et al. 2002). Impacts are thus defined broadly in terms of human values with respect to wildlife, including professional values informed by science.

Stakeholder: Any person who will be affected by, or will affect, wildlife management (Decker, et al. 1996, Decker, et al. 2001). Although the National Park Service has recently begun to refer to people who meet this definition as "interested parties," we are continuing to use the term "stakeholder" as it is more widely used in the natural resource management profession. "stakeholder" should not be confused with "special-interest group" or only those people cognizant of their stake (especially in planning activities); it is possible for someone who may be affected by wildlife management decisions and actions to be unaware of the consequences, or for someone who will not be directly affected by management decisions to show a genuine interest.

Extent and Nature of Deer Impacts

Discussions with managers identified a broad range of both actors and situations that constituted the management environment. Parks are governed and influenced by political, sociological, ecological and economic considerations (Decker, et al. 2001) acting at multiple scales, ranging from within the park, to local, regional and national levels. An individual park's management environment will thus depend on the specific combination of influences experienced at each scale, resulting in a management environment unique to each park. A range of possible influences on the management environment related to deer issues was described by managers (Table 2). With one exception, managers did not identify any NPS staff whose primary role is to address local level influences on an on-going basis. Instead, NPS staff charged with managing resources within park boundaries also addressed cross-boundary influences if/when primary, intra-park responsibilities were affected. When official public scoping efforts were required, as in the development of an Environmental Impact Statement (EIS), contractors or NPS regional offices were recruited to spearhead these efforts. The one park that had permanent staff focused on local level influences was unique because it houses an institute founded on collaborative leadership and community-based conservation involving cooperation and partnerships.

Table 2. Influences on Management Decisions Related to Deer Issues in NPS Units in the Northeastern U.S.

Broad categories of management environment components were modified from Decker et al., 2001. Grey box indicates sphere of influence for focus of future research. See Appendix C for definition of acronyms.

Scale	Components of the Management Environment				
	Political: Law, Policy	Sociological: Internal, NPS/Government	Sociological: External, Stakeholders	Ecological	Economic
National	• NEPA • ESA • FACA • GPRA • NHPA • NAGPRA • NPS Policy • Director's Orders	• President and Congress • DOI • OMB • NPS Leadership • NRPC (e.g., BRMD, EQD, NRID etc.)	• National Interest Groups • Other Federal Agencies		
Regional	• State "NEPA" (e.g. NY State SEQRA) • Programmatic Planning Documents	• NPS Regional Offices • NPS National advisors (e.g. WASO, NRPC, etc.)	• State/Federal Agencies • Universities • Regional Interest Groups	• Deer meta-population structure • Habitat connectivity	
Local	• Local ordinances	• NPS Regional Planning Office/Consultants (when EIS is involved)	• State/Federal Agencies • Universities • Local Interest Groups • Congressmen • Friends Groups • Adjacent Landowners	• Deer population density • Immigration emigration • Predation (hunting/poaching) • Adjacent land matrix • Local landscaping practices • Agricultural practices	• Cash crops • Cost of landscaping • Cost of agricultural practices
Park	• Designation • Enabling Legislation • Park Planning Documents (e.g., GMP's, Resource Stewardship Plans) • Superintendent's Compendium	• Superintendent • Natural Resource Managers • Other Park resource managers • Other Park staff • Other NPS advisors	• State/Federal Agencies • Universities • Citizen Advisory Committees • Park Visitors • Inholdings	• Size of park • Contiguity of park parcels • Deer population density • Immigration/emigration • Predation (hunting/poaching) • Habitat structure of park • Agricultural practices • Landscaping practices	• Cash crops • Cost of preventing/ repairing deer damage • Cost of EIS's/ lawsuits

The management environment, in turn, appears to affect what managers interpret as negative impacts to the park. The suite of impacts experienced by a park and its stakeholders may interact and develop into broader issues. On the preliminary questionnaire, negative impacts from deer were reported most often to park natural resources (N=28), cultural resources (N=19) and relations with local communities (N=15, Figure 4).

Figure 4. Negative Impacts from Deer on Park Management.

Deer were seen to have negative impact primarily on natural and cultural resources, but relationship with local communities was also as a large concern. Other negative impacts included: relationships with farmers, living history farm experience, and park reputation as resource stewards.
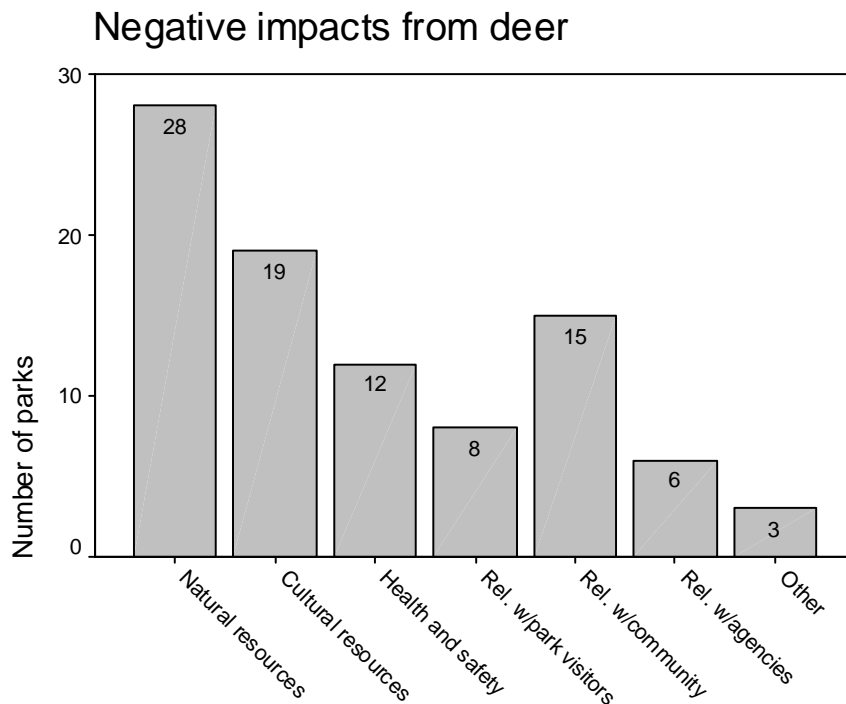
Discussions with managers corroborated these findings, and also elaborated on the specifics within each category. Table 3 presents the categories of impact on parks and stakeholders mentioned by managers at each park. The table was created by first listing all categories of impact noted by managers at Park 1. Each of these categories was then checked for impact at Park 2. If managers at Park 2 noted new categories of impact, they were then added to the table. After categories from the final park were added, each park was re-scored to assure that categories were interpreted uniformly over all parks. Managers were not asked to systematically enumerate a list of impacts, therefore, those listed in the table should not be viewed as an exhaustive list, but rather as reflecting the most prominent impacts affecting decision-making for each park.

Table 3. Deer Impact Profiles for Parks, Based on Discussions with Managers.

A park's unique set of impacts may interact to become a suite of "issues." Each number represents one of the 22 parks visited, placement in cell indicates manager's perceived areas of impact for that park.

Impact Area	Affected Parties	
	Park	**Stakeholder**
Direct Impacts		
Natural Resources		
• Forest/plant regeneration	1, 2, 3, 5, 6, 7, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22	
• Forest composition	1, 2, 5, 12, 18, 19, 20	
• T&E Plants	2, 5, 13, 15, 18, 19, 20	
• Exotic species management	3, 5, 6, 14, 18, 19, 20	8
• Forest understory	4, 5, 12, 14, 18, 20	
• Plant and animal diversity	2, 5, 18, 20	2
• Erosion	5	7
Impacts to deer		
• Feeding	16, 20, 22	22
• Behavioral	5, 22	
• Population		21
Cultural Resources		
• Cultural landscape	1, 5, 6, 7, 9, 11, 15, 18, 19, 20, 22	7
• Agricultural damage	1, 2, 9, 15, 18, 19	1, 2, 3, 9, 11, 15, 18, 19, 22
• Ornamental plantings/ landscaping	2, 5, 7, 10, 21, 22	2, 3, 5, 7, 9, 10, 13, 14, 16, 17, 21
• Other property damage	6	
Health and Safety		
• Deer-vehicle collisions	3, 5, 6, 10, 18, 19	3, 5, 6, 9, 10, 12, 13, 14, 17, 18, 19
• Lyme disease	6, 7	5, 6, 7
Other		
• Park reputation as resource stewards	5, 21	
• Communicating park significance	5	
• Hunting (poaching)		6, 8, 13, 14, 16, 17, 18, 19, 22
• Wildlife viewing		2, 5, 16, 18, 19, 20, 22
Impacts to Relationships		
• Neighboring Communities and Landowners[3]	1, 2, 3, 5, 6, 7, 8,10, 11, 13, 14, 17, 18, 19, 20, 22	
• Other State/Federal Agencies	2, 5, 6, 12, 15, 20	
• Park Visitors	5, 7, 8, 20, 22	
• National Stakeholder Groups	1, 8, 20	

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[3] In many cases, local community members also visited parks on a regular basis. They were categorized as "neighboring community" relationships when their views more accurately reflected area resident issues vs. one-time visitor issues.

Patterns emerged when managers' responses were viewed in this way. Managers perceived almost twice as many common impacts (i.e., mentioned by 3 or more managers) to parks (N=11) as to stakeholders (N=6). Given managers' primary responsibility to park resources, it is reasonable to expect they would have more detailed knowledge of impacts to park resources than do stakeholders. Also, managers' knowledge of the extent of stakeholders' recognition of impacts may be limited, for reasons discussed later.[4]

Impacts of primary concern to managers focused on aspects of the parks' natural resources and cultural landscapes. In contrast, managers believed that most stakeholder concerns related to property damage, health and safety, or recreational opportunities. Thus, managers described a management environment in which parks and stakeholders were concerned about different impacts, with parks primarily focused on impacts within park boundaries and stakeholders focused on impacts outside park boundaries. Given this perception, it is not surprising that almost every park noted negative impacts to their relationship with neighboring communities and landowners. The few parks that did not note negative impacts to these relationships generally felt their neighbors did not expect them to take a leading role in managing deer populations, either due to the small size of the park and number of staff, the purposes for which the park was established, history of inaction on the part of the NPS, or the fact that deer impacts had not yet reached a high level of concern for the local community.

Impact categories identified in Table 3 were subjected to hierarchical cluster analysis using SPSS software (version 11.5, SPSS, Inc.) to determine which impacts were most strongly related to each other. The resulting dendrogram is shown in Figure 5. The first major branch separated three variables (Group 1) from all the rest: parks experiencing impacts to forest regeneration, stakeholder impacts to ornamentals and impacts on park-neighbor relations. Again, this pattern suggests that parks believed their relationships with neighbors were affected when parks and stakeholders were primarily concerned with different kinds of impact. Other major branchings appeared to represent the following: Group 2: impacts related to agricultural and other cultural landscape damage; Group 3: impacts related to deer mortality; Group 4: more detailed areas of impact related to forest health; Group 5: impacts noted by only one or two parks.

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[4] Chase et al. (2002) indicate that agencies may broaden their understanding of stakeholder concerns by being inquisitive rather than simply receptive to stakeholder input.

Figure 5. Hierarchical Cluster Analysis of Impacts to Parks and Stakeholders.

Major branches show clusters of impacts that are related to each other. Branches that occur at larger distances are more different than branches at shorter distances. Prefix SH indicates impacts to stakeholders, prefix NPS indicates impacts to park (as described by managers). Num refers to variable number and refers to the order in which impact areas were entered into the database.

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Dendrogram using Average Linkage (Between Groups)


                                  Rescaled Distance Cluster Combine

        C A S E               0         5        10        15        20        25
     Label               Num  +---------+---------+---------+---------+---------+

     SH-Erosion           24
     SH-Cult. Landscapes  27
     NPS-Lyme Disease     15
     SH-Lyme Disease      31
     NPS-Property Damage  13
     NPS-Deer Behavior     8
     SH-Feeding           25
     NPS-Erosion           7
     NPS-Comm. Sig. Feat. 17
     NPS-Reputation       16
     SH-Population        26
     SH-Species Diversity 22             Group 5
     SH-Exotic Spp. Manag 23
     Rel-NPS-Visitor      18
     Rel-NPS-Nat'l. Grps. 21
     NPS-Feeding Deer      9
     NPS-Ornamentals      12
     NPS-Spp. Diversity    5
     SH-Wildlife Viewing  32
     NPS-Forest Comp.      1
     NPS-T&E Plants        4             Group 4
     Rel-NPS-Agencies     20
     NPS-Understory        3
     NPS-Exotic Spp. Mgmt  6             Group 3
     NPS-DVA's            14
     SH-DVA's             30
     SH-Hunting/Poaching  33
     NPS-Agric. Damage    11             Group 2
     SH-Agricult. Damage  28
     NPS-Cult. Landscape  10
     NPS-Regeneration      2             Group 1
     SH-Ornamentals       29
     Rel-NPS-Neighbor     19
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Key Elements for Successful Management of Deer Issues

While deer issues have been a concern and focus of study in northeastern NPS units for over two decades, very few parks have developed or implemented formal activities related to deer. In our discussions with managers, a number of areas emerged as barriers to taking action with respect to deer issues. Each of these barriers also represents a necessary element in developing an effective program to manage deer issues. The following discussion identifies aspects of each element that were perceived to be barriers, as well as proposed or actual solutions managers suggested for overcoming these barriers.

1) Understanding the Uniqueness of the Management Environment

Each NPS unit was created by the President or an act of Congress to preserve an area of national significance. By definition, each represents a unique natural or cultural resource. Indeed, almost all discussions with managers started with an explanation of the park's unique features. Elements of a park's management environment (Table 2) were seen to determine not only the extent and nature of wildlife issues, but also the appropriateness of various solutions. It became clear that the definition of "deer issues" varied, sometimes substantially, from park to park. While deer issues were set within a context of ecological and economic constraints, the political and sociological elements of the management environment appeared to be stronger influences on how issues were approached.

Much of the disagreement over issue definition arose from different interpretations of impairment, based on the management environment. The fundamental purpose of the NPS, as described in its Organic Act is "…to conserve the scenery and natural historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (National Park Service Organic Act 1916: § 1). Congress and the courts have consistently given priority to the conservation mandate, as resources cannot be enjoyed if they are impaired (United States National Park Service 2000). However, neither the word "unimpaired" nor the phrase "unimpaired for the enjoyment of future generations" are defined by the Organic Act; managers must determine not only what constitutes impairment in their unique context, but also how both the duration and severity of the impairment are to be evaluated or weighed against the park's public use value (Southern Utah Wilderness Alliance v. Dabney 2000). Thus, one of the main challenges facing managers is to determine the threshold at which negative impacts on resources become severe enough to threaten impairment. Because impairment is defined by the overall management environment, managers who described similar levels of deer browse, complaints from neighbors, or deer-vehicle accidents often had very different interpretations as to how soon or how important it would be to take action related to deer. Some managers indicated that focusing on "deer management" *per se* detracted from overall park goals, namely "resource health," which they considered the real focus of management planning. They believed that understanding the unique management environment of the park determined the appropriate actions and partners to include. One manager stated that the success of management activities related to deer issues depended on the engagement of all divisions of the park, as well as external stakeholders, such as cooperators, concessionaires, volunteers in trail management and backcountry hut management, and state management. If deer were moving out of park, this

manager also included adjacent landowners and believed that circumstances determine how broad a net to cast in the identification of stakeholders and partners.

A number of managers also cited the importance of individual personalities in shaping a park's unique management environment. Indeed, attitudes of the managers themselves seem to range from "risk averse" to "risk taking" with respect to implementing various forms of management. Managers often perceived barriers to effective planning when their views did not match with those of their supervisors/Superintendents. Many described situations where managers and their supervisors placed different emphasis on the NPS's public enjoyment vs. natural resource preservation mandate, or took different approaches to implementing management actions. Not surprisingly, managers who reported more success had support from influential actors, such as Superintendents, congressmen, or heads of other management divisions. Understanding the personalities responsible for management decisions seemed to be as important as understanding the political, sociological, ecological and economic forces acting on a park at various scales, since these individuals ultimately determine the trajectory of park planning.

2) Internal NPS Coordination

At the park level, many managers indicated that internal communication among park staff often was weak. Lack of coordination between different departments within a park and lack of natural resource training for non-resource management staff were reported as two major impediments to effective natural resource management. Many managers at parks with a primarily cultural focus reported that educators and interpreters were not receptive to incorporating natural resource messages into their communication efforts. Others believed that NPS staff in general did not have enough background in natural resource issues and cited a need for common goals among park staff in different divisions. Activities of different divisions were often seen as being at cross purposes; for example, salting roads in winter, or eliminating weekend trash removal exacerbated wildlife-human conflicts. Managers also suggested that increased information-sharing by supervisors and across divisions could improve management efforts.

Some parks actively fostered internal communication. Some natural resource managers and interpreters collaborated in designing messages to further natural resource objectives. One park even developed a formal partnership between natural resource managers, law enforcement officers, and educators to focus on deer issues. Many managers noted that cross-training and education of NPS staff on natural resource management issues would be helpful in furthering support for natural resource management activities. In one park, providing researchers with magnetic "NPS Researcher" signs for vehicles helped facilitate research by avoiding conflicts with law enforcement officers (i.e., parking tickets). Smaller parks with natural resource managers who also acted as interpreters, or parks that housed natural resource managers and interpreters in the same building, tended to report more success in integrating natural resource messages in interpretive materials. Many of these managers spoke of the small number of staff as an advantage in fostering information-sharing and facilitating discussion among divisions.

In general, managers attributed many difficulties with internal coordination to the traditional distinction between "cultural resource" and "natural resource" staff within NPS

culture. Parks seemed to suffer from the bureaucratic paradox that as staff grew in number, divisions became more compartmentalized for efficiency, yet each division became less informed about the others' activities, decreasing efficiency in dealing with issues that cross domains. For larger parks, the role of top management (management chiefs, superintendents, or regional officers) in encouraging and facilitating internal communication as well as providing cross-training opportunities was seen as key in establishing and maintaining good internal NPS coordination.

3) Coordination with External Stakeholders

All parks that were considering development of a formal management plan with respect to deer were concerned about external stakeholders, either because stakeholder complaints were a major impetus behind considering management or because of concerns about stakeholder reactions to management decisions. Managers identified a number of areas related to stakeholders that could assist in management: increasing public understanding of park management activities, increasing public interest in issues before they become polarized, understanding the full range of public views (vs. only the vocal extremes), and coordinating management activities with partners.

Most managers were of the opinion that neither visitors nor community members understood park management goals. In fact, many managers believed that the public generally did not recognize the difference between city parks, county parks, state parks, and national parks, but treated them all as (increasingly urban) green space. In addition, managers thought the public was unaware of park planning processes. For example, many managers stated that stakeholders were often frustrated at perceived park inaction, even though the park had been involved in the initial, albeit internal, processes of action-planning for a long time (sometimes years). Another manager mentioned that the public does not understand why national parks do not consider public hunting as an option, considering that some state parks allow hunting. The Department of the Interior has issued requirements that interested community members be trained in both community-based planning and the NEPA process (United States Office of Environmental Policy 2003). However, there currently is no one at the park level that is specifically charged with educating the public on either of these topics; natural resource managers felt that this did not fall within their area of responsibility, or that of park interpreter/educators. Notably, the managers who had strong personal ties to the local community outside of their professional roles tended to report better understanding and respect from community members toward management, even when community members disagreed with the park's final decisions.

Managers were also concerned with better understanding the public's concerns. A number of managers indicated they lacked the skills necessary to engage the public before issues became contentious, but that understanding stakeholder perspectives from an early stage would help them move toward issue resolution. In addition, almost all managers said that they only heard from the vocal extremes. As one manager stated, "People who are happy don't tell you about it." Some seemed to accept this as fact, while others desired guidance in how to determine the full range of stakeholder viewpoints. In general, managers often described action-planning scenarios that garnered little public interest until alternatives were being considered, at which point diametrically opposed groups formed and gathered support for their positions, drawing

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from both local and national interest groups. Some managers also indicated that issues changed when the dialogue expanded from a local scale to include national stakeholders.

Managers also indicated a general lack of coordination between park activities related to deer and activities occurring outside the park. All managers either stated explicitly or implied that deer overabundance is a regional issue and not solely a "park problem," however when discussing potential solutions, very few considered including regional partners. NPS management policies recognize the importance of cooperation between parks and other local and regional agencies and organizations in managing these issues (United States National Park Service 2000), yet managers often discussed managing for deer issues only in terms of NEPA requirements, which seemed to result in a park-centric perspective. One manager identified the operational environment of the NPS (its focus on national level planning requirements and increasingly narrow and topical management plans) as contributing to this effect and resulting in a public perception of the NPS as too focused on planning.

While most managers did not refer to developing collaborative management plans with other agencies or organizations, they did engage in other partnerships to address deer issues. One park began reporting farmer complaints to the local state wildlife management agency, which helped determine the number of hunting permits to issue in neighboring wildlife management areas. Another park reported that actively developing strong ties with the state agency tremendously aided management, as both agencies became more comfortable looking to each other as a resource. This park is also actively seeking to develop a long-term relationship with a local journalist so that their activities will be more accurately portrayed in the press. In addition, this park is involving local community members in gathering deer movement data. A number of parks partnered with local universities or other federal agencies to collect data on deer populations or visitor behavior. Two parks mentioned that local community groups had organized to reduce deer in areas adjacent to parks. Although these parks were not considering deer reduction on park property, managers from these parks attended the community planning sessions and gave input.

Most managers seemed to equate the term "management" with "population reduction." In contrast, when asked about feasible management alternatives, one park listed: population and impact monitoring (including engaging stakeholders in citizen-science), close coordination with the state agency, neighbors, visitors and stakeholders, education on park mandates and scale of deer issue, and finally the possibility of a program that may include a reduction of deer population. This perspective treats external stakeholders as a resource to assist in management rather than as potential adversaries. To implement effective external coordination, managers also emphasized the need for trust among the parties, public awareness/understanding of the park's mission and management processes, developing relationships with influentials in the local community, the importance of long-term relationships (especially in highly transient communities), better understanding of public expectations for park management, and better education of and communication with the public in general. One manager noted, it is instrumental to have partners, both external and internal.

4) Effective Planning Processes

Discussions of deer management planning focused mainly on understanding and implementing legal and policy requirements. Managers appeared to be concerned mainly with fulfilling requirements of the general NPS approach to NEPA outlined in the NPS Director's Order 12 and Handbook for Conservation Planning, Environmental Impact Analysis, and Decision Making (2001a), which parallels the issue-evolution cycle outlined in Figure 1. Most activities related to NEPA planning were discussed in terms of defending agency actions to the public. But public participation more broadly was also discussed with respect to new policy guidelines that require an effort to sustain partnerships and involve the public as a general way of doing business, beyond legal requirements (United States National Park Service 2000, United States National Park Service 2003). Managers were of the opinion that streamlining the process of developing planning documents and better guidance in how to effectively meet public input requirements would help wildlife planning.

Managers generally described the planning process as laborious, both in terms of the typical 3-5 years of planning prior to implementing action(s), and in terms of funding evaluation requirements, which they felt resulted in more time spent tracking funds than evaluating management action(s). Two main types of planning documents, General Management Plans (GMP's) and Environmental Impact Statements (EIS's), were typically referred to as illustrations of natural resource planning in parks. A GMP is a guidance document that specifies how a particular park will manage its resources, based on its enabling legislation and the park's mission. Many parks either did not have a GMP or were in the process of developing a new GMP (required every 10-15 years), and therefore did not have clear guidelines for overall park management, let alone specifics for deer management. While most parks were in the process of collecting data related to deer, in a number of cases, parks had not yet established specific objectives for these studies because the overall park plans had not yet been written. As noted by members of the Inter-Regional White-tailed Deer Team, without clear goals and objectives as standards, it is impossible to evaluate the degree of impact indicated by biological data (M. Coffey and J. Karish, pers. comm.).

Newer GMP's tend to be written as a combined GMP/EIS. According to the National Environmental Policy Act, an EIS is required whenever a federal agency considers any action that may significantly impact the human environment or may be highly controversial (National Environmental Policy Act 1969). The NPS Director's Order 12 and Handbook for Conservation Planning, Environmental Impact Analysis, and Decision Making (2001a) outlines the process by which NPS adheres to this statute, complementing regulations issued by the Council on Environmental Quality. Managers indicated the belief that a decade or so of data typically was necessary to support an EIS related to a controversial issue such as management actions directed toward deer. NEPA provides no specific guidance as to the amount of data necessary to make a decision, aside from the mandate to "study, develop, and describe appropriate alternatives to recommend courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources" (National Environmental Policy Act 1969: § 4332 (E)). However, if challenged in court, agencies must be able to show that they have taken a "hard look" at the action and that their decision was not arbitrary and capricious (Administrative Procedure Act 1946). Indeed, case law establishes that the purpose of NEPA is to ensure that an agency has at its disposal all relevant information about environmental impacts before embarking

on a project (Friends of Endangered Species, Inc. v. Jantzen 1985, Robertson v. Methow Valley Citizens Council 1989, Salmon River Concerned Citizens v. Robertson 1994). Also, courts have ruled against the NPS on the basis of lack of sufficient data in EIS's (Coalition for Canyon Preservation v. Slater 1999, The Fund for Animals v. Norton 2003).

Clearly, park managers are justifiably concerned about having adequate baseline data. However, in many cases, managers believed they were replicating biological studies that had already been performed repeatedly at other parks. Some thought that a programmatic EIS or a broad policy statement on NPS knowledge of deer biology would help managers move forward with action planning in a more timely fashion. Data to support such policy may already exist, as many managers from different parks indicated that they began using common techniques to estimate deer population density a few years ago. However, because discussions of management objectives and actions that involve deer will always be locally controversial, an EIS at the regional or national level would only provide an analysis of alternative methods, it would not guide individual parks in determining which methods were most appropriate to their unique management environment.

Managers referred to NEPA as a double-edged sword; while it ultimately allows parks to move forward with preferred management activities, the associated planning process was often described as a hurdle that delays action. This attitude is most obviously reflected by the fact that NPS culture has developed the term "NEPA compliance" which is taken to be synonymous with "park planning." One manager felt that the culture of "compliance" gave planning in general an unjustly negative connotation. Most managers seemed to hold three main assumptions with respect to NEPA (in relation to deer): (1) it allows parks to implement their preferred action (2) it is time consuming and costly to write an EIS (3) a lawsuit is inevitable. A number of parks cited the lawsuit regarding deer reduction at Gettysburg National Military Park as evidence (Davis v. Latschar 2000). The court ruled in favor of the park, and interestingly, managers spoke of the lawsuit in both positive and negative terms. The lawsuit was seen as further proof that parks can implement any actions they deem necessary as long as they follow the correct procedural proscriptions, yet the inevitability of a lawsuit was also used as a reason to avoid planning for deer management (where most managers again equated "management" with "population reduction"). One park felt the lawsuit illustrated a need for better communication with the public, especially local landowners, and as a result, this park focused efforts on fostering relationships with the local community members.

When asked directly about public participation in planning, most managers immediately responded in terms of public scoping efforts related to NEPA. According to NPS NEPA procedures, parks must solicit public input once they begin planning actions (United States National Park Service 2001a), which occurs halfway through the issue-evolution model (Figure 1) However, it is clear that stakeholders can have a significant role much earlier in the cycle, and even play a crucial part in defining the overall context in which the issue evolves. One manager even believed that any future management activities targeting deer issues could not be spearheaded by the park, but would have to be part of a larger community effort, precisely because of the controversial nature of the issue. Two managers suggested that early planning meetings with the public, *before* formal NEPA public scoping activities, could not only provide earlier opportunities for public involvement, but could also ensure that both management and public concerns were represented, or at least acknowledged, in the definition of the problem.

These managers also believed that alternatives presented for discussion should be informed by public input. Other managers felt the NPS already did a good job of involving the public, by providing a number of avenues to receive public input such as letters, faxes, e-mail, the new Planning, Environment and Public Comment (PEPC) website, and public meetings. They thought it was appropriate to let EIS contractors take charge of the public participation element because these contractors focus on NEPA and therefore have more capacity to engage the public than do park natural resource managers. One park that is entering into a GMP intends to assign a staff member as a community planner, to set up public outreach meetings and otherwise engage the public. This was not the norm for most parks we visited. Instead, most parks relied on ad hoc contacts with public information officers, interpreters, and natural resource managers to transmit information to local community members.

As mentioned, most managers did not believe that the public understood either park missions or the park planning process, both of which impede constructive public participation in planning. A recent NPS Director's Order (United States National Park Service 2003) calls for active on-going public participation throughout the planning process, beyond legal requirements. Some managers believed that this requirement would weaken NEPA by preventing the park from implementing *any* action. Others thought that it was superfluous, since "…once in the formal planning process, you're already doing it." Many managers were wary of public participation because of experiences with public processes that became arguments about polarized positions unrelated to park goals. They were also concerned that consensus-based management would lead to a situation in which all parties lose because there are compromises all around. They believed that "…no matter what action is chosen, someone will complain," and "…people will think they're not being heard if it doesn't go their way." Managers wanted guidance in how to fulfill public participation requirements but still maintain good relations with stakeholders. A few managers suggested that social science studies on both internal NPS and external stakeholder attitudes would help parks prepare for scoping related to NEPA.

Other managers were concerned with the level of attendance at public meetings and whether attendees were representative of the broader public. Some managers observed that public meetings typically drew only a few people, usually the same people with specific interests, and were concerned that this resulted in plans that catered to only fringe users. Other managers had the opposite problem, with such a large turnout at public meetings that it was hard for moderators to keep comments on topic. Managers stated that the public didn't understand that the volume of replies, in terms of either loudness or number, was not necessarily going to determine the action taken. Again, this points to the need to manage public expectations of the participatory process. Other managers were concerned with how to reach people in the middle ground, how to address the small percentage of people who they believe will (almost inevitably) challenge the park's decision, how to reach national advocacy groups, and how to deal with the fact that Congress can complicate local attempts to engage the public in planning by creating laws and riders, bypassing NEPA entirely. A number of managers noted that even if local communities agreed with or at least respected the park's perspective, national stakeholders often changed the tenor of issues once a Notice of Intent was posted in the Federal Register. While many managers were skeptical of public participation in planning, a few parks felt otherwise. One manager noted that, "[public engagement is] critical... Deer bring out many emotions on all ends of the spectrum. Public information, press, communications with neighbors, state and local agencies [are] a key component of all of our deer work."

Regardless of public participation activities, one manager noted the key role of planning in wildlife management, "The most important aspect of dealing with deer issues in national parks will be the thread of consistency not in how we manage the populations, but in the process of developing management goals, objectives, strategies and the planning process that gets the parks to implement 'management' programs regarding their populations."

5) Adequate Resources

Adequate resources are necessary to implement any type of management action, and managers focused on a number of key resources, including: funding, sufficient staff, regional support, access to literature, access to funding sources, and staff capacity.

Almost all managers mentioned lack of staff and funding as impediments to management of deer issues. Most of the managers who felt they lacked adequate staff indicated a need for increased support related to natural resource research, such as full-time botanists, biologists, or technicians. Some also mentioned a need for interpreters dedicated to natural resource interpretation. Only one park mentioned a need for a community outreach planner. Most managers who mentioned lack of funds spoke in terms of funds to increase staffing. Many managers described short-term grants that had increased dedicated staff for natural resource projects to illustrate this point. All managers felt they barely had enough resources to meet current management needs, let alone allocate resources for future management planning.

A number of managers expressed a need for guidance in writing proposals that would be approved for NPS funding and/or assistance. Their concern was not that past proposals had been rejected, but rather that they did not receive enough feedback to improve future proposals. Many of the managers who believed they had adequate access to small project funding sources had worked with NPS offices that oversaw those funds (either full time or through short-term details) so had better knowledge of how the funding process worked, who to contact for guidance, or even that these funding sources existed. Managers specifically mentioned funding sources such as the Natural Resource Preservation Program (NRPP) and other sources accessed through Program Management Information System (PMIS). A few parks relied on partnerships with university researchers or local community groups for funding and other resources.

With respect to internal NPS coordination, managers also reported a need to increase NPS staff capacity for integrating natural resource concerns into other areas of park management and operation. Other capacity concerns related to a need for tools to better understand, engage, and communicate with the public. Many of these concerns were outlined above in terms of both coordination with external stakeholders and effective planning processes.

Managers in the National Capital Region felt that they had an advantage of being able to interact regularly with their natural resource colleagues, which they do formally through bi-monthly meetings. Managers felt that this type of regular contact fostered a "tight natural resource group," and allowed them to give each other feedback on experiences with funding projects, what worked, who they liked to interact with, etc. While geographic proximity facilitated this type of regular interaction, managers also noted supervisors as key resources in helping identify funding sources, supporting proposals for additional staff, and facilitating information sharing between NPS employees.

DISCUSSION

While park managers are ultimately vested with decision-making power with respect to natural resource management in parks, the agency recognizes that "[the NPS] mission-both in 1916 and today-has been entrusted to us by the American public. We have a fundamental responsibility to ensure that the public understands and supports what we do on their behalf" (United States National Park Service 2001b). Fulfilling this responsibility begins with an understanding of how, why, and when publics (such as local communities) influence or are influenced by park resources and management actions performed on their behalf.

Unlike many public issues that have been studied at parks, deer issues are not primarily driven by visitor concerns, but instead involve local communities. The NPS currently has teams focusing on basic biological, geological, and cultural landscape inventories, as well as visitor surveys. However, less work has been done assessing local communities, their attitudes toward park actions, and their effect on management activities. Parks face many trans-boundary issues that may impact local communities, for example: fire management, invasive species management, ecosystem restoration and managing disease outbreaks. A technique to better understand how local communities relate to parks and management issues would be applicable in these types of situations as well. While national stakeholder groups may become involved once an issue is defined and action is being planned, local stakeholders often play a crucial role in the initial identification and development of these issues.

Future research will therefore examine: the framework managers use to approach decision-making, alternate techniques for engaging the public, and differences between the specific values for which a park is managed and those held by stakeholders. By focusing on these areas, in the context of deer issues in NPS units, it is the intent of research Phases II and III to yield insight that will help strengthen NPS ability to respond to other issues that involve local communities. This research plan assumes that a strong understanding of not only the target audience (stakeholders) but also the degree of understanding between the audience and change agent (agency) can be used to design more appropriate, and therefore more successful, communication and education initiatives related to public participation. In turn, tailoring participation strategies throughout all phases of the issue evolution cycle will ultimately result in more informed, equitable and sustainable management decisions. While these assumptions must be tested, research related to Phases II and III of this study will develop a framework and methodology with the intention that it can be applied whenever the NPS faces management issues that originate in local communities.

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Appendix A.

Questionnaire: Assessing Deer Impact in NPS Units in the Northeastern U.S.

The Biological Resource Management Division of the National Park Service (NPS) and the Human Dimensions Research Unit at Cornell University are collaborating to study human dimensions of white-tailed deer *(Odocoileus virginianus)* management in NPS units in the northeastern U.S. (for background on this effort, please read more about us). Our first step is to identify the extent and general nature of deer impacts in NPS units of the northeastern U.S.

We are requesting your help in determining whether deer issues affect your park, if at all. *(Note: even if you have not had and do not anticipate attention to deer management, we'd like your input).* Many park service units have, to varying degrees, considered or pursued actions to address impacts associated with deer. Still others are contemplating management of deer. Research and experience indicate that deer management issues, like other public issues, develop through phases, a process referred to as an issue-evolution cycle.

Eventually, we would like to examine the development of deer management strategies for a variety of NPS units in various phases of the issue-evolution cycle. We hope to gain understanding of how these situations have been approached, especially with respect to the public engagement and human dimensions of management. It is assumed that the collective experience of NPS units is a rich source of insight into deer management in parks. As our project progresses, we will seek representation of parks facing different management situations and with different management mandates (cultural, natural, etc.).

In this early stage of our project we need to determine the scope of deer management issues throughout NPS units in the northeastern U.S. We request your cooperation by sharing just a few pieces of information concerning deer management in your park. This brief questionnaire (just 7 questions) will help us gain an initial understanding of NPS management perspectives on deer management issues. It is being distributed only to natural resource managers in parks throughout the northeastern U.S.

Before we move to the 7 questions, please provide the following background information:

Your name:_____

Your e-mail address:_____

Name of your park:_____

Your current position at park:_____

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1. **Generally, which of the following statements best describes your opinion of your park's current situation with respect to deer?**
   (Check one)

   ☐ I believe that deer are having some negative impact on our park resources, visitor safety, or park relations with adjacent landowners. *(Continue with questions 2-5.)*

   ☐ I do not believe that deer are having any perceptible negative impact on our park resources, visitor safety, or park relations with adjacent landowners. *(Skip to question 6.)*

2. *How* **have you determined there is negative impact caused by deer?** *(Please check all that apply.)*

   ☐ Personal observation
   ☐ Data from deer-related research in the park
   ☐ Reading scientific literature about deer and their impacts
   ☐ Complaints from visitors
   ☐ Complaints from local community members
   ☐ Complaints from other state/federal agencies
   ☐ Other *(Please specify):* _____

3. **Please indicate which aspects of park management are being negatively affected as a result of impacts caused by deer:** *(Please check all that apply.)*

   ☐ Natural resources
   ☐ Cultural resources
   ☐ Health and safety
   ☐ Our relationship with park visitors
   ☐ Our relationship with neighboring communities and landowners
   ☐ Our relationship with other state/federal agencies
   ☐ Other *(please specify):* _____

4. **Are impacts caused by deer keeping you from meeting any park management objectives?**

   ☐ Yes
   ☐ No

   If you answered *YES*, which specific objectives are being impacted? Please identify the planning document that is the source of each listed objective.

   _____

   _____

   _____

   _____

5. **Which of the following statements *best* describes your current activity with respect to negative deer impacts and park response?** *(Please check only one response)*

☐ We have begun to notice negative impacts from deer but have not yet initiated any response.
☐ We have begun to define issues, goals and objectives related to deer impact on our park.
☐ We are collecting data to determine whether deer negatively impact management objectives.
☐ We have a planning process underway to develop a strategy for deer management in our park.
☐ We are currently implementing deer management activities at our park.
☐ We believe deer impact our park, but are not sure where we fall in the above list.

[Skip to question 7.]

6. **Do you anticipate experiencing any impacts from deer within the next 2 years?**

☐ Yes
☐ No

7. **Do you have any general observations you'd like to share regarding deer management in national parks?** *(Please enter your comments in the space provided below.)*

_____

_____

_____

_____

_____

Thank you for your input!

If you have any questions, please contact us.

Appendix B.

Guiding Questions for Discussions with Managers
About Human Dimensions of Deer Issues.

1. Please describe the history of deer issues and interest in deer management at your park as it has evolved to date.

2. Please describe your experiences with deer management with the National Park Service, at your park and elsewhere.

3. How do you believe deer affect park management at your park?

4. What do you think are the primary concerns of local community members with respect to deer at your park?

5. What types of differences do you see in community member perceptions of deer as a focus of management compared to NPS employee perceptions of deer management at your park?

6. What management alternatives do you believe would be feasible to implement at your park?

7. How do the public (e.g. local community or interest groups, national interest groups, etc.) influence deer management activities at your park? At other parks?

    a. Which groups are most/least successful and why?

8. How does public engagement in management planning affect the effectiveness of deer management at your park? in National Parks in general?

9. What types of communication/education/outreach efforts has your park designed to address deer management? What about other parks?

    a. Which of these do you consider to be the most successful and why? What are the management objectives these public engagement efforts serve to achieve?

    b. What doesn't seem to work? Why?

Appendix C.

List of acronyms used in Table 2.

BRMD: Biological Resource Management Division, NPS, NRPC

DOI: Department of the Interior

EIS: Environmental Impact Statement

ESA: Endangered Species Act

EQD: Environmental Quality Division, NPS, NRPC

FACA: Federal Advisory Committee Act

GMP: General Management Plan

GPRA: Government Performance Results Act

NAGPRA: Native America Graves Protection and Repatriation Act

NEPA: National Environmental Policy Act

NHPA: National Historic Preservation Act

NPS: National Park Service

NRID: Natural Resource Information Division, NPS, NRPC

NRPC: Natural Resource Program Center, NPS

OMB: Office of Management and Budget

SEQRA: New York State Environmental Quality Review Act

WASO: Washington Office, NPS