

Policy Related Decisions Regarding the Management of White-tailed
Deer on Fire Island National Seashore

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Introduction

The management of white-tailed deer populations on National Park Service (NPS) lands throughout the eastern United States has become the focus of much attention (Underwood and Porter 1991, Warren 1991). During the 1980's, deer populations up and down the Eastern Seaboard increased dramatically (Cypher and Cypher 1988). Much to the consternation of biologists, land managers and the public at large, deer populations have now achieved levels uncommon to our previous experience.

In 1983, Fire Island National Seashore (FIIS) initiated a research project to study various aspects of white-tailed deer ecology. In a final report (O'Connell and Sayre 1988; hereafter referred to as the *O'Connell and Sayre report*) to the NPS, results of this five year investigation disclosed island-wide estimates of abundance, deer movement patterns, the prevalence of Lyme disease in deer, some effects of deer browsing on island vegetation, deer food habits and physiological condition. The O'Connell and Sayre study was the first, and most important source of data about the biology of white-tailed deer on FIIS, and it will be referred to frequently throughout this report.

Since the completion of the deer study, the natural resources management staff at FIIS, in conjunction with the North Atlantic Regional office of Scientific Studies, have undertaken the development of a deer and vegetation management plan. In the summer of 1990, FIIS went public with its intentions to draft such a plan and attempted to solicit opinions and review. Three interim documents were produced. The first document (Appendix I) outlined the general natural resources management objectives of the Seashore and those specifically relating to deer and vegetation. The second (Appendix II) encapsulated the various issues surrounding deer management at FIIS including the effects of deer on the island's natural vegetation, possible health risks associated with Lyme disease, safety concerns resulting from increase deer and human interactions, and the potential impacts of supplemental feeding on the deer population's abundance and distribution. Finally, the third document (Appendix III) brought the current state-of-knowledge to bear on the issues presented previously, and provided tentative recommendations until such time as the deer and vegetation management plan is completed.

There have been several supporting studies conducted at FIIS which are germane to this report. The first was an ecological analysis of the Sunken Forest area initiated in 1967 (Art 1976), which has provided some useful baseline vegetation characteristics prior to the eruption of deer on FIIS. The second is a series of vegetation studies initiated in 1985 which continue to document the biotic effects of deer browsing and grazing on vegetation in certain areas of the Seashore (Art 1987, 1990, Appendix IV). Third, a multi-year investigation of the ecology and management of ticks was recently completed (Ginsberg 1990), and has shed great light on the issues surrounding the role of deer in the transmission of Lyme disease. Finally, attached to this

report is a paper which documents the changes in deer population abundance and rate of increase island-wide over the last eight years (Appendix V).

The objectives of this report are to analyze the decision record regarding the management of deer on FIIS, examine the data from which these decisions were made, identify areas where actions and policy were not necessarily consistent, and provide recommendations for a more effective utilization of scientific findings to issues of deer management.

Background

The NPS has explicitly recognized change as a fundamental characteristic of naturally evolving biological systems (Houston 1971), and has strived to embrace change in the development of natural resource management policies (USDI 1988; 4:2). Servicewide, the interpretation of NPS management policy has changed subtly over time with reference to populations of large herbivorous mammals like deer (Leopold et al. 1963, Houston 1971, 1982, Despain et al. 1986, Boyce 1989, National Parks and Conservation Association 1989). These changes have paralleled the evolution of our general understanding of the population dynamics of these animals, in my opinion.

In 1962, a five member advisory board of distinguished wildlife professionals recommended changes in the way wildlife populations in National Parks were to be managed (Leopold et al. 1963). The gist of the board's recommendations was one of protection and maintenance of wildlife populations *without harvest*. Many of the board's recommendations were promulgated into policy, and remain relatively intact today. With respect to native deer species in parks, however, the panel's recommendations were less clear. Leopold et al. (1963) wrote:

*"Where animal populations get out of **balance** with their habitat and threaten the continued existence of a **desired** environment, population control becomes essential. This principle applies, for example, in situations where ungulate populations have exceeded the **carrying capacity** of their habitat through **loss of predators**, immigration from surrounding areas, or compression of normal migratory patterns... [emphasis mine]"*

In the 30 years since that report was written, a veritable war has been waged over the appropriate definition of several key constructs in wildlife management; primary among them is the construct of carrying capacity and the issue of overabundance in ungulate populations (Caughley 1976, 1980). While the battle is far from over, some conflict has been resolved with the passage of time. Specifically, among ecologists and some biologists:

- 1) *balance* is no longer perceived to be an appropriate description of the dynamic interaction between large herbivorous mammals and their habitats (Caughley 1976). This term has been refined to include two different concepts. The first is stability, which has to do with the amount of change (or lack thereof) which a population or system exhibits over time (Walker and Goodman 1983). The second is resiliency, which refers to the speed at which a system returns to its initial state after being displaced from it (Walker and Goodman 1983).

2) reference to the existence of a *desired* environment is irrelevant to a scientific discussion of the ecology of deer population growth. Desiring a particular environment denies that which is, in favor of something that is somehow more appealing than what nature is capable of producing. This represents a judgement of value, not a characterization of how nature functions (Underwood and Porter 1991).

3) *carrying capacity* refers to two definitions, which are rarely distinguished in the scientific literature, even though they implicate different population levels. The first is ecological carrying capacity (Caughley 1979), which is the long-term abundance of deer when left to their own accord. The second is economic carrying capacity (Caughley 1979), a definition handed down from the wildlife profession's animal husbandry ancestry. It is tacitly used by most state game agencies and refers to population sizes of deer approximately one-half those witnessed at ecological carrying capacity. The only way to maintain a population at economic carrying capacity (or any other population size except ecological carrying capacity) is through repeated culling.

4.) alleged overabundance has largely been a result of the misidentification of ecological carrying capacity for economic carrying capacity. Other definitions of carrying capacity exist (Dhondt 1988). Most are goal-driven, replete with value statements and have little to do with the ecology of deer population growth. By any of these other definitions, a population at ecological carrying capacity could be labeled as overabundant. *Loss of predators* and disruption of normal movement patterns have been implicated in the inability of deer to "control" their own numbers. However, the ability of animal populations to "regulate" their own numbers is confined mostly to small bodied herbivorous mammals (Caughley and Krebs 1983); this ability is encoded on their genes and expressed as changes in spacing behavior. I know of no such mechanism for white-tailed deer, nor any other large herbivore for that matter.

The characteristic growth trajectory or the so-called ungulate eruption from low to high abundance in deer is pervasive for all large herbivorous mammals, and occurs in the presence and absence of predators (Caughley 1970). The usage of the "loss of predators" paradigm (Leopold et al. 1947) is convenient, but founded on scant circumstantial evidence. Many of the paradigms (Kuhn 1970) from which these constructs emerged remain among the most controversial in deer population management today (Warren 1991).

Analysis

With respect to management of deer on FIIS, current NPS policy is very clear regarding actions that can be undertaken to control animal populations. Individual passages have been excerpted here for clarity.

"The National Park Service will seek to perpetuate the native animal life (mammals, birds, reptiles, fish, insects, worms, crustaceans, etc.) as part of the natural ecosystems of parks. Management emphasis will be on minimizing human impacts on natural animal population dynamics."

There is no question that white-tailed deer are native to the Atlantic Barrier island system. However, precisely when deer colonized Fire Island is uncertain. O'Connell and Sayre state that reliable reports of deer on the island date back to the turn of the century. Leopold et al. (1947) documented Suffolk County, Long Island as an area with chronic deer management problems. This area of mainland, immediately adjacent to Fire Island, was an important vegetable trucking region during the post-Depression years. Conner (1971) observed deer on FIIS including in the area of the Sunken Forest. However, no deer were observed during three years of field research in the Sunken Forest in the mid- to late-1960's (H. Art, personal communication). During a field reconnaissance of FIIS, J. McCormick (USDI 1972) wrote:

"Browse sign, particularly on sawbrier and catbrier was observed in the Sunken Forest and throughout most of the National Seashore during the present study. It was reported that forty-six deer were sighted between Smith Point and Captree in an aerial census conducted by the National Park Service personnel during Spring, 1971."

No additional evidence can be found to confirm whether or not such a count was conducted by the NPS, nor can the validity of the number of deer observed be assessed. The most convincing account of a relatively dense population somewhere on FIIS was from a paragraph found in a draft management plan written by FIIS staff in 1970. The authors wrote:

"A small scattered number of white-tailed deer live over the entire length of Fire Island. Although they frequent the various zones of the Island, including forays out into the open beach at night, they are primarily dwellers of the brush thickets where edge cover browse is abundant. Although the herd is small their density is quite high...with winter die-offs from malnutrition common..."

The statement suggesting common winter die-offs should not be taken lightly because at low density, this phenomena would not be expected. Taken together, these observations support the notion that deer were present on Fire Island at the time it was acquired by the NPS, and that in some areas their numbers were sufficiently high to incur chronic winter mortality. Changes in the enforcement of game laws, in light of NPS presence, provided the kind of protection from poaching necessary to produce the full-scale deer eruption observed in some areas of FIIS (i.e., primarily the western end) during the last two decades.

As a native species of FIIS, deer are protected against harvest, removal, destruction, harassment, or harm through human action (USDI 4:6). Further, individual animals within a population may be removed only when...

"hunting and trapping are permitted by law

control of specific animal populations is required for park ecosystem maintenance

removal or control of animals is necessary for human safety and health or to protect property or landscaped areas

removal is part of an NPS research project described in an approved resource management plan or is part of research being conducted by others who have been issued an appropriate collection permit"

With respect to the management of populations, the NPS management policies are very clear...

"Natural processes will be relied on to control populations of native species to the greatest extent possible. Unnatural concentrations of native species caused by human activities may be controlled if the activities causing the concentrations cannot be controlled."

An analysis of statements made in the O'Connell and Sayre report reveals little indication that a direct reduction of deer in the eastern portions of the Seashore (i.e., the Wilderness area) was warranted. In fact, only *one* statement was found indicating that anything at all be done:

"Based on the information presented in this report, human influence and the precarious, finite character of island living have had considerable impact on FI (Fire Island) deer. In turn, deer have now measurably affected FI. The scope of these interactions would appear to warrant active management on or related to this deer population."

It appears that a misinterpretation of statements made subsequent to the release of the O'Connell and Sayre report led to an action that, in my judgement, was not supported by existing data or management policy. A reanalysis of the population survey data (Appendix V) shows clearly that deer abundance in the eastern end of FIIS has not changed significantly in the last eight years. The issues of grazing effects on native vegetation notwithstanding (Appendix IV), the deer population in the Wilderness area appears to be at ecological carrying capacity. Deer numbers there are being determined by the natural forces acting on individual birth and death rates. This does not imply that this population is static, however. Annual fluctuations on the order of $\pm 30\text{-}40\%$ are indicated in the census data. Fluctuations of greater magnitude might be expected after a significant hurricane, for example. Current management within this area of FIIS, which represents approximately 70% of all natural-zoned areas within the Seashore, is consistent with NPS natural resources policy regarding animal populations.

A similar conclusion cannot be as easily reached for the remaining natural areas (approximately 30%) restricted to the western end of FIIS. These areas are comprised of the interstitial green-space between the 17 communities, the Sunken Forest and the Lighthouse Tract. Deer abundance in these areas has increased at an average annual rate of 22% since 1983 (Appendix V). While absolute densities are not available, there is evidence to suggest that overall, deer numbers in these areas may be substantially higher than those of the Wilderness area. This fact alone is not alarming. The knowledge that there is a probable human influence involved is, however. Further, the magnitude of this human factor is confounded by differences in the natural vegetation between the east and west ends of FIIS (e.g., the Sunken Forest is a maritime forest, which does not occur in similar extent elsewhere on FIIS).

The application of NPS natural resources management policy in these areas is clouded by several factors:

- 1) The remaining naturally zoned areas of FIIS occur among developed private property,
- 2) The extent and magnitude of human influence on private property is presumed substantial but unknown at this time,
- 3) The relative capacity of the natural vegetation to support deer in these areas is also unknown at this time.

Vegetation studies in the Sunken Forest, for example, have demonstrated significant biotic effects of deer browsing and grazing on certain plant species (see Art 1987, 1990, Appendix IV). This alone is insufficient to warrant action, however. That is, changes in vegetation structure and composition are to be expected as a deer population grows from low to high abundance. Some species might decline in abundance and distribution (sometimes drastically) while others might prosper. Some plants might even be eliminated from the vegetation community altogether. Whether or not these changes are "good" or "bad" depends upon several factors. Primary among them are:

- 1) the objectives for management of that particular area, and
- 2) the status (i.e., threatened or endangered) of affected species.

To date, the interpretation of legislation for the Sunken Forest has been inconsistent. The vacillation stems from the fact that the Sunken Forest is designated as a natural zone within FIIS, subject to NPS management policies for natural zones in parks. The legislation, however, seems to indicate a different approach to management of the Sunken Forest than that for park natural zones. Consequently, no clear management direction is indicated.

There are no known threatened or endangered plant species within the natural zones of FIIS. Nevertheless, there is a valid scientific concern for many of the endemic, herbaceous perennial plants affected by the foraging habits of deer, especially in the Sunken Forest. This concern revolves around the degree to which changes in the density and distribution of certain species have been wrought at the hands of humans. How much of the observed changes in the Sunken Forest, for example, can be attributed to the natural interaction between deer and the vegetation upon which it feeds, and how much to the effects of supplemental feeding of deer in the nearby residential community? Deer do not forage solely on handouts, but instead may supplement up to 60% of their diet with available natural forage even when fed an *ad libitum* ration (Ozoga and Verme 1982). Artificial food supplements have the potential to sustain higher deer numbers than the surrounding natural forage can support. This may subject some plant species to a novel browsing and grazing regime not at all like that for a more natural system and may jeopardize the existence of plants ordinarily capable of sustaining a deer population eruption.

Some herbaceous perennial plants, once common throughout the Sunken Forest, are now found only in fugitive sites. Vegetation enclosures have demonstrated that many species preferred by deer are capable of re-colonizing suitable sites if protected from grazing and browsing (Appendix IV). This ability is not shared by all affected species, however (Dr. Henry Art, personal communication). Additional studies are needed to ascertain the relative abilities of severely browsed species to re-colonize suitable sites under differing grazing and browsing regimes. The dynamics of woody seedlings of overstory species in the Sunken Forest appear to be more influenced by disturbances to the canopy (e.g., hurricane Gloria) that allow for episodic germination events to occur than by the foraging preferences of deer (Appendix IV). The prognosis for recruiting seedlings into the overstory layer is still grim in the face of current levels of grazing and browsing by deer.

Recommendations

FIIS is unique in that entire residential communities exist within its administrative boundaries. NPS management policies and regulations may not apply in many of these areas (except for those covered in the Federal Code of Regulations; see 36 CFR). Consequently, decision-making power regarding deer management issues on private property may not be entirely within the domain of NPS managers. It is in the park's best interest to play a key role in assisting the various local governments in their efforts to address deer management concerns. Apprehensions by residents over the intentions of FIIS managers regarding future deer management begs for an aggressive public relations campaign that would inform residents and visitors of NPS policies and regulations as they apply to natural resources of the Seashore.

The successful resolution of deer management issues island-wide will depend on a creative, sensitive approach that will elevate the awareness of all parties to the nature of each issue and the best course of action to take given articulated goals and objectives. Logical and defensible positions regarding the management of white-tailed deer on FIIS require a thorough documentation of NPS natural resources management policy and regulations. This will ensure a consistent application of scientific research to specific deer management issues. Specifically, it is recommended that FIIS:

- 1) establish a liaison between the Seashore and the island communities. This person, working closely with the Resources Management staff at FIIS and the regional office of Scientific Studies, would provide direct assistance to each of the 17 Fire Island communities in the areas of policy interpretation, planning, and coordination of deer management activities;
- 2) implement an aggressive campaign covering the entire gamut of public relations between FIIS and island residents and visitors. Subjects should include NPS policy interpretation, awareness of Federal regulations applicable to the feeding of deer, dissemination of factual information about the biology of FIIS deer, and all issues surrounding Lyme disease. The goal of such a program would be to put an end the dissemination of false or inaccurate information about issues of deer management by being the first to write it;

- 3) finalization the deer and vegetation management plan. The plan should clearly and thoroughly describes the Seashore's intentions, aspirations, and authority (including a careful analysis of policy, especially in relation to areas like the Sunken Forest) to implement deer and vegetation management.

The North Atlantic Regional office of Scientific Studies is committed to further advancing our knowledge of this unique island and its natural resources through research, and supporting FIIS in its management endeavors.

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