

Survey of White-tailed Deer Impacts

By Scott J. Miller, Susan P. Bratton, and John Hadidian

When many of the first NPS areas were designated, problems with ungulate browsing were rare. In the first decades of this century, ungulate populations, from overhunting and habitat loss, often were near their historic lows. In the case of white-tailed deer, hunting regulation, restocking, habitat improvement and protection, and succession on former agricultural lands, all have encouraged population increases. As a result, more and more NPS areas now are reporting concerns with deer impacts on park resources.

As part of a literature review project sponsored by the NPS National Capitol Region, researchers from the NPS/CPSU at U/GA, Athens, investigated the existing literature on white-tailed deer impacts on native vegetation. This project produced little data on such impacts on endangered plant species, so an attempt was made to gather more information. The investigators surveyed by telephone 173 scientists and natural resource managers, asking information such as field observations of deer disturbing endangered or threatened plant populations.

Included were resource managers from 76 NPS areas in the Southeast, Southwest, Midwest, National Capital, Middle Atlantic, North Atlantic and Rocky Mountain Regions, who had responsibilities for parks that might have significant white-tailed deer populations. Areas with limited acreage of forest or of native plant communities were excluded from the survey. The managers were asked if deer were known to disturb endangered flora, if they were influencing forest regeneration, causing a browse line, or depredating crop plants or ornamental species.

Survey Results

In comparison to informants from the Natural Heritage Inventory, NPS staff reported far fewer

observations of deer grazing or damaging endangered species. Of the information received concerning rare plants, 60 percent was from the various state Natural Heritage programs, 6 percent from The Nature Conservancy land stewards, 6 percent from NPS resource managers, and 28 percent from experts affiliated with the USFS, USFWS, universities and other institutions.

The informants and literature search produced a list of 98 nationally or state listed or candidate endangered or threatened plant species disturbed by deer. Interestingly, 38.7 percent of these species belonged to either the lily or orchid families (*Liliaceae* or *Orchidaceae*). Sources of impact included not only grazing and browsing, but antler rubbing and trampling. A full report and species list from this part of the survey has been submitted to *Natural Areas Journal* and preliminary copies also are available from the authors (listed at the end of this article.)

Of the parks surveyed, 26 (34.2%) reported high deer populations having potentially adverse impacts on park resources (Table 1), whereas 50 parks (65.8%) reported no problems at the current time. Only 3 of the 26 parks (11.5%) had records of deer impacts on endangered or threatened flora, although some parks, such as Catoctin Mountain, expressed concerns for more than one species.

Of the parks with known impacts, 84.6 percent reported browse lines, 19.2 percent reported crop damage, 7.7 percent reported destruction of ornamentals, and 34.6 percent reported suppression of forest regeneration or seedling production (Table 1). Among

reported problems were bark stripping from deciduous (*Ulmus* spp) trees at Catoctin Mountain Park, and a concern for grazing of *Platanthera* spp. populations. Apostle Islands National Lakeshore is experiencing a change in forest community structure and function due to intensive browsing. At Lincoln Boyhood National Memorial there are extreme problems of browse on red-stemmed dogwood (*Cornus stolonifera*) as well as newly planted seedlings of deciduous trees.

When Fort Necessity National Battlefield attempted to reestablish trees on part of the site, deer ate many of the newly planted seedlings. Cumberland Island National Seashore is experiencing suppression of live oak (*Quercus virginiana*) regeneration along with reduction of many native forest floor forb populations. Several historic parks, such as Gettysburg National Military Park, George Washington Birth Place, and Hopewell Furnace National Historic Site, are experiencing repeated damage to agricultural crops planted to maintain the historic scene.

The survey produced other patterns of interest in determining an overall NPS strategy for managing white-tailed deer. First, the 26 parks reporting impacts had a smaller average size (34,200 acres) than the 50 parks reporting no impacts (averaging 50,000 acres). Very large parks and, of course, very small parks, are less likely than "middle-sized" parks to have problems.

Second, of the 26 parks reporting deer impacts, 17 were national historic parks, battlefields, or monuments with an average size of 3,600 acres. Third, many of the parks reporting impacts have a high ratio of

(Continued on page 10)

Professionalism

(Continued from page 8)

edge beyond their education specialty, we need to maintain their professional expertise at the highest level possible. Resource managers should be encouraged to participate in activities such as short courses, scientific conferences, and graduate level continuing education opportunities. The NPS should regularly sponsor workshops specifically targeted toward resource managers, focusing on state of the art themes.

Natural and cultural resources, which form the foundation on which the National Park System is built, are facing threats as never before. Natural resource programs, including research and resource management, made up only 6 percent of the NPS budget in FY 1991. Whether or not the NPS considers its own resource managers to be professionals is projected to others by how the NPS is organized. Resource management must surface as a keystone responsibility, considered a part of "line management," with sufficient personnel and support to deal with the issues faced by the parks in today's world.

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Literature Cited

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- Davis, Gary E. 1988. *Inventory and monitoring of natural resources in Channel Islands NP, Ventura, CA.*

Table 1. U.S. national parks reporting impacts by white-tailed deer.

Park	State	Type of Vegetation Affected				
		E&T Plants	Ornamentals	Agricultural Crops	Seedling Reproduction	Browse Line
Antietam Natl Battlefield	MD			*		*
Apostle Island Natl Lakeshore	WI				*	*
Blue Ridge Parkway	NC					*
Catoctin Mountain Park	MD	*			*	*
Chesapeake and Ohio Canal Natl Hist Park	MD				*	*
Chickamauga & Chattanooga Natl Milt Park	GA					*
Colonial Natl Hist Park	VA					*
Cumberland Island Natl Seashore	GA	?			*	*
Cuyahoga Valley Natl Recreation Area	OH					*
Eleanor Roosevelt Natl Hist Site	NY		*			
Fire Island Natl Seashore	NY					*
Fort Necessity Natl Battlefield	PA				*	*
George Washington Birth Place	VA			*		*
Gettysburg Natl Military Park	PA			*		*
Great Smoky Mountains Natl Park	TN	*			*	*
Hopewell Furnace Natl Hist Site	PA			*	*	*
Horseshoe Bend Natl Military Park	AL				*	*
Lincoln Boyhood Natl Memorial	IN				*	*
Lower St. Croix Natl Scenic Riverway	WI					*
Lyndon B. Johnson Natl Hist Park	TX		*			*
Mammoth Cave Natl Park	KY					*
Morristown Natl Hist Park	NJ				*	*
Pea Ridge Natl Military Park	AR					*
Saratoga Natl Hist Park	NY					*
Valley Forge Natl Hist Park	PA			*		*
Wilson's Creek Natl Battlefield	MO	*				

Native Seed Bank Brooklyn Reclamation Project

By Carol A. Pollio and Walter H. Davidson

The 1977 Surface Mining Reclamation and Recovery Act (SMRCA) requires the reclamation of land disturbed by surface mining. This law also addresses the issue of areas mined prior to 1977, by establishing a fund to begin emergency reclamation of the most hazardous sites. Within New River Gorge National River, there are hundreds of such mine hazards eligible for abandoned mine land (AML) reclamation funding, and many others that, although not hazardous, need reclamation work. The site used for this study, the Brooklyn Mine Refuse Area, (BMRA), was considered a low priority for emergency funding because it was not a serious threat to health and safety or to the environment. The Brooklyn site created an aesthetic problem, however, because of its visibility from the river and the air.

The BMRA consists of a large, almost completely unvegetated mound of unstable refuse. The NPS has developed resource management guidelines that encourage the use of native species for revegetation projects within natural zones. This project was developed in order to determine if the native seed bank technique would encourage natural succession to reclaim disturbed sites, allowing for increased stabilization, increased adaptation of plants to local climatic conditions, and at the same time, produce a source of food and shelter for wildlife.

Another consideration was the cost associated with assembling a native seed mixture from commercial sources. The native seed bank method uses local topsoil that already contains seeds of existing native plant communities. These seed banks are excellent sources of both primary and secondary succession species thought necessary to the development of natural ecosystems (Wade 1986).

Native seed banking is not a new technique. It has been used by a number of researchers since the mid 70s, at first in the arid western regions of the country, and more recently in the Appalachian Mountains of the eastern United States. Farmer, et. al. (1982) experimented with spreading Appalachian forest topsoils for reclamation, producing 134 taxa on two mine sites and



Biological Technician Judy Weese in 1st replication plot (June 1989). Photo by Carol A. Pollio

one nursery site (Farmer et al 1982). This study, conducted in Tennessee, also concluded that a large amount of nitrogen and phosphorous was taken up by the plants growing in the native seed banks. These essential nutrients, they suggested, might be important in the development of later plant communities, possibly enhancing the diversity of species.

Objectives of this project were twofold. One was to encourage the emergence of native plant species in order to reclaim disturbed sites, such as minespoils. The second was to determine if seasonal variations would change the composition of plant species that emerged. Other considerations, though not specific objectives, were cost effectiveness and personnel time necessary for implementation of native seed banking for future reclamation projects.

Methods

In June of 1989, three 20' x 20' experimental plots were delineated on the refuse pile at the Brooklyn site.

During each phase of implementation, 3 additional plots were installed, creating a total of 12 experimental plots. Phases, or replications (Reps), were installed in June and October, 1989, and April and June, 1990.

Prior to installation of the plots, soil samples were taken from the project site and analyzed by the USDA Laboratory in Berea, KY. Soil analysis data were collected for six plots, two samples from the top and four samples from the slope of the spoil pile. Samples were tested for the following parameters: pH, Aluminum, PO_4 , Sulphur, Total Carbon, Calcium, Magnesium, Potassium, Sodium, Barium, Silicon, Zinc, Phosphorous, Iron, Copper, Manganese, Cobalt, Nitrogen, Titanium, Chromium and Lead. This information was then compared to baseline soil composition data to determine the application rates of lime and fertilizer.

Each of the plots had a pH in the range of 3.5 to 4.8, or relatively acidic. Below a pH of 5.0, aluminum, iron and manganese often are soluble in sufficient quantities to be toxic to some plants (Brady 1971). Soil sample results showed high levels of aluminum and iron were present. Treatment with agricultural lime rated at 105 lbs/acre, equivalent to 600 lbs/acre, was performed as a site preparation to reduce the concentration of iron, aluminum and manganese in the experimental plots.

Plots also were pretreated with fertilizer, 100 lbs rated 10-20-20, equivalent to 40 lbs N, 80 lbs P and 80 lbs K per acre. The "native seed bank" material, the top 2 to 3 inches of forest floor and litter, was removed from preselected sites manually and distributed on the plots at approximately the same thickness. The availability of suitable borrow material in the area presented a problem and caused a difference in the soil used for each installation. The highest quality soil was used for the initial plots in June 1989, and suitable material of a lesser quality was used for all subsequent plots. The latter contained a higher percentage of coal refuse material and less organic material (visual observation). In spite of these limitations, all plots exhibited comparable growth of both woody and herbaceous species.

Measurements

Once the plots were installed, the emergence of

White-tailed Deer Impacts Surveyed (Continued from page 9)

boundary to interior area, with a majority of these also situated next to suburban, developed, or agricultural areas. And fourth, several of the natural areas reporting problems are either islands or have isolated deer populations without large predators (i.e. Apostle Islands and Cumberland Island).

Discussion

Surprisingly few NPS areas reported white-tailed deer impacts on endangered plant species. This may be due to one of several factors or a combination of them. First, very few moderately sized parks have formal endangered species monitoring programs, hence some deer impacts may not be noticed or documented. Second, the Heritage programs have far more field professionals with training in plant taxonomy and plant ecology than the NPS does. Thus, one might expect the Natural Heritage programs to have more sightings and information.

Third, since many of the parks with white-tailed deer concerns are historic, they may not support many rare plant populations within their boundaries. Although some historic areas, such as Chicamauga-

Chattanooga National Military Park, contain regionally important rare plant habitat, NPS historic areas probably have fewer rare plants than the small, but botanically unique, Natural Heritage Conservation areas. The data do suggest, however, that all NPS areas with a potential for "overgrazing" by deer should have completed rare plant inventories and should have field monitoring established, especially for susceptible genera such as *Cypripedium* (lady slippers), *Trillium*, and *Platanthera* (habernarias or fringe-leaf orchids).

The survey results indicate a trend for smaller, historic parks and parks with a high boundary to interior ratio to have greater concerns for deer impacts. This suggests that the NPS tradition of concentrating major wildlife research efforts in the larger natural areas will fail to address properly the issues raised by white-tailed deer.

Further, many of the areas affected have no wildlife biologists or science staff of their own. Environmental conditions and management practices in areas outside the parks may have a major influence on deer impacts inside the parks. This makes NPS deer management extremely "political" because of the large number of sites involved, the influence of other agencies, and the

visibility of the issues to the public. Some of the problems are specific to historic parks and districts (e.g. Gettysburg and Cades Cove), and may require management models not normally applied in natural areas.

To deal properly with the issues and problems generated by an increase in white-tailed deer populations in and around parks, it would be most effective to break with the NPS tradition of research and management programs localized in larger parks, and to deal with problems *interregionally*. Communication and cooperation, particularly among the four easternmost Regions, already are moving in this direction. However, the question remains as to how the NPS might best approach such a disperse resource management problem and objectively evaluate deer impacts on both native and cultivated flora.

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