

Natural Resource Management At Colonial National Historical Park

By Chuck Rafkind

Colonial National Historical Park (NHP), established in 1930 to preserve the historic resources of Jamestown Island and Yorktown Battlefield, also possesses significant natural resources – worthy of an active natural resource management program. These include extensive tidal and non-tidal wetlands (about 2,000 acres), forest (nearly 8,000 acres), and open fields (about 1,000 acres); 40 miles of streams and James and York River shorelines, and rare, threatened and endangered (RT&E) flora and fauna. Two sizeable units comprise the park: Jamestown Island (1,500 acres) and Yorktown Battlefield (4,300). The units are connected by a 23-mile parkway (3,600), and there are four small, noncontiguous areas: the Cape Henry Memorial, Swann's Point, Green Spring Plantation, and Tindall's Point. Most of the park lies adjacent to the James or York rivers.

In addition, various cultural resource activities involve natural resource processes and techniques. In the light of all this, the park has joined with several outside organizations to conduct in-park research aimed at insuring protection and proper management. These include Virginia's Water Quality Board, Department of Game and Inland Fisheries, Natural Heritage Program, and Department of Forestry; the US Geological Survey, the US Soil and Conservation Service, the USFWS, Virginia Institute of Marine Science, the College of William and Mary, and Hampton University.

With NPS Regional science and Air Quality Division assistance, we are developing a management plan that describes the park's air quality related values and recommends proposals for monitoring of ozone, sulfur dioxide and visibility; acid deposition and its impacts of park structures, vegetation and aquatic environment; and air pollution impact on vegetation. An air quality bio-monitoring program will begin in 1991.

Erosion Control

Personnel from all park divisions have helped design and implement management actions to control erosion on numerous informal trails along the Yorktown bluffs. These bluffs contain the remains of the British (1781) and Civil War earthworks. Trails connecting the bluff and the river have developed serious erosion problems from social usage, combined with the natural sloughing action of the bluffs. Management actions emphasize the use of natural vegetation barriers, including the planting of native bushes, no-cut zones for adjoining open fields, repairing and expanding present fencing and signing. Interpretive actions will include on-site messages, new exhibits, public service announcements to local TV and radio stations, press releases to local and regional newspapers, and orientation for park employees. Also planned is social science research to determine who the trail users are and what are their needs.

A fire management plan emphasizes suppression of fires on park lands and stresses improved coordination with adjoining fire fighting organizations.

The park is working with the State Forester, the Agricultural Extension Agent, and the new Regional Soil Conservationist on a plan for environmentally and economically sound management of the extensive open fields in the park. Erosion control, weed control, forestry practices, alternate mowing regimes, farming,



This distinctive art was created by Yorktown District Interpreter Doug Thompson, to be used as the cover for the park's Resource Management Plan. The design integrates the significant cultural and natural resources of Jamestown Island and Yorktown Battlefield.

water quality management, all are being examined.

A change in the mowing regimes of open fields around Yorktown Battlefield and Colonial Parkway has meant that a number of intensively mowed fields now will be maintained as tall grass fields. It is expected that this will help reduce the number of illegal paths along the Yorktown Bluffs and earthworks. Some fields will be mowed only once a year. Across one field, a path will be mowed to permit easy visitor access from the Yorktown Visitor Center to British Redoubt #9. The mowed path can be changed periodically to limit impact to any one area of the field. Another expected bonus from curtailed mowing will be the abundance of wildflowers it will allow. This selected mowing regime, subject to adjustment, may be extended along the 23-mile Colonial Parkway, providing improved erosion control along the James and York rivers, which flow into Chesapeake Bay.

RT&E Flora and Fauna Survey

The State of Virginia's Natural Heritage Program is conducting an RT&E flora, fauna, and critical natural community survey of all NPS areas in the state. The data thus gathered will aid park planning and management efforts to preserve biological diversity. Also the

study will recommend guidelines for management of the RT&E species and critical habitats of the park. Next to Shenandoah NP, Colonial has the highest number of RT&E species of any NPS site in Virginia.

The Cartographic Computation Lab at NC/State/U is assisting the park in developing a Geographic Information System. Aerial (winter, true color) photographs taken in 1989 are being interpreted and digitized in developing the following themes at a scale of 1:12,000: Current vegetation, wetlands, streams, ponds, earthworks, roads and trails, and adjoining land ownership use types (residential, military, commercial).

These data bases are being used to (1) identify fire management units and prepare fire fuel and National Fire Danger Rating System models, (2) compare historic and current vegetation patterns, (3) prepare park boundary maps delineating adjoining lands that could be developed under the Chesapeake Bay regulations and their impact on the park viewshed, and (4) develop environmental assessments and aid in the review of adjoining land use proposals.

Water Resources Management Plan

We are working with the Regional Chief Scientist,

Vegetation Management in Great Basin NP

By Raymond Jandl, Lee Eddleman, William Brock and Boyd Byelich

The Great Basin province is a mixture of high desert basins alternating with a series of nearly 200 isolated, long, narrow, north-south oriented mountain ranges created by major block faulting. Great Basin NP (GRBA), in the South Snake Range of east-central Nevada, rises nearly 8,000 feet from the valley floor to the top of 13,063 foot Wheeler Peak. It contains a diverse flora, ranging from desert to arctic alpine above tree line.

Many of the potential natural communities found in the Great Basin Province were a complex of plant community types, the result of disturbances such as fire and drought. These events were cyclical, with natural successions occurring during interims that varied from 40 to more than 100 years, depending on the community. By the early 1880s, livestock grazing was being introduced to the Province on a first-come, first-served basis, with no restrictions to prevent overgrazing. Fire, believed to be a natural component of many of the potential natural communities in the Great Basin Province, was greatly reduced during this period because the fine fuels (grass) needed to carry fire were removed by grazing. Consequently, plants susceptible to fire but not used as livestock forage established and expanded their ranges.

Livestock numbers in Nevada have declined from a high of 1.2 million sheep and 500,000 cattle in 1918 to 93,000 sheep and 383,000 cattle today. The fire-carrying fuels have increased with the decline in livestock numbers and with improved rangeland management. However, a continuing policy of fire suppression has essentially eliminated fire.

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the NPS Water Resources Division, Virginia Polytechnic Institute, and State University Water Resources Research Center to develop a parkwide water resources management plan. The plan will (1) complete the delineation of park non-tidal wetlands and prepare computerized maps, (2) prepare a hydrological overview of the park, (3) conduct a literature review of research, monitoring, and mitigation actions that cover or impact park lands, (4) review and recommend approaches for the park to interact with present and proposed research, monitoring, and mitigation projects in and adjacent to the park, and (5) review existing baseline data on park water quality, preparing recommendations for additional baseline inventory and monitoring needs for research.

Some of the water quality issues of concern include (1) water quality – groundwater and surface waters, wells, and public water supply systems; (2) erosion and sedimentation problems – involving shorelines, rivers, streams, farming practices, trails, roadway drainages, and urban development; (3) underground storage tanks, septic tanks, and wells, both active and inactive; (4) recreational use and impacts – nature and severity; and (5) determination of actions the park should take under mandates to protect and prevent degradation of park wetlands.

The park faces complex environmental, visitor use, and cultural resource management challenges and we are working to develop an active management program that takes into consideration all the interrelated natural and cultural resources of which we are the stewards.

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GRBA was established to illustrate and preserve a portion of the Great Basin physiographic province. GRBA also is charged to provide for continued livestock grazing. Integrating livestock grazing into a preservation management strategy demanded a research study to evaluate the rangeland resources of the South Snake Range, from which a comprehensive range management program will be developed.

In 1988, in cooperation with the Department of Rangeland Resources at Oregon State University, GRBA began a 2-year range resource analysis. This study is also being used to verify, refine, and improve the vegetation classification and mapping effort of the NPS from LANDSAT imagery. Evaluation of rangeland resources includes a survey and description of the present plant communities in the park, analysis of the past status of these communities, and a prediction of future development under various management strategies. Following is a preliminary look at the resource evaluation after the first summer's field season.

Methods

The study area, in the South Snake Range, covers roughly 250,000 acres. Of this, approximately 4,000 acres is private land, 70,000 acres is managed by BLM, 99,000 acres by USFS, and 77,000 acres by NPS.

Reflectance values in four bands from a June 1986 LANDSAT image were used to generate spectrally unique landcover categories for each 30m x 30m area of land (pixel). These landcover categories were the result of an unsupervised classification within the GRASS GIS program. Based on preliminary surveys and observed cover types, a classification by the NPS GIS Division in Denver identified 20 cover types.

From this initial stratification, polygons were identified as potential sampling sites to describe the associated plant communities. A minimum polygon area of 2 ha was the initial criterion established. This was done to minimize the influence of errors either inherent in imagery, induced operationally through data manipulation, or associated with accurately locating uniform areas in the field (Warren et al. 1989). Sampling sites were concentrated on NPS and USFS lands. Within these lands the sites were so distributed that cover types were sampled in each of the major drainages and were proportional to the area occupied by each cover type.

Vegetation descriptions were determined from a 50m x 20m macroplot located within a representative portion of the identified polygon. Each site description included environmental characteristics, species lists and cover, ground cover characteristics, grass and forb production, relative deer and livestock use based on feces occurrences, and tree density, size and age. A total of 104 cores taken from dominant tree species established stand age distribution. Trees were divided into size classes similar to those defined by Blackburn and Tueller (1970) for pinyon and juniper, and by the USFS Ecosystem Classification Handbook (Jensen and Keane, 1987) for conifers and aspen.

Results and Discussion

During the 1989 field season, 50 macroplot sites were visited. Of these, 8 were mountain big sagebrush (*Artemisia tridentata* var. *vaseyana*) with no tree species present, 15 were various densities of pinyon (*Pinus monophylla*) and juniper (*Juniperus osteosperma*), 10 were aspen (*Populus tremuloides*), 6 were other coniferous forest types, and the remainder were meadow and low sage (*Artemisia arbuscula*).

The pinyon juniper cover type occupies 86,540 acres of the project area. Prior to arrival of European man, pinyon and juniper are believed to have been confined to rock outcrops and other areas protected from fire. There, trees were relatively long-lived, but in low densities. Of the 15 pinyon juniper sites evaluated to date, only one was found to be an old mature stand. This was on a steep, south facing limestone slope. Total tree cover was 19 percent. Cores taken from an old mature pinyon and a juniper were estimated at 400 and 470 years, respectively.

The remaining sites are in areas with less adverse conditions. Of the pinyons aged in these sites, no tree was older than 160 years and most averaged less than 100. Thus, pinyon is a relatively recent arrival. The effect of pinyon on site dynamics can be estimated by comparing site conditions among various densities of pinyon cover in these stands. (Table 1). As the density of trees increases toward a closed canopy condition, the species diversity and the percent cover of shrubs, forbs, and grasses declines. By the time pinyon cover reaches 60 percent, total forb, grass and shrub cover has shrunk from 60 percent to less than 3 percent.

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Table 1. Mean tree cover, cover and number of species of shrubs, forbs, and grasses, and deer pellet groups per macroplot for several plant cover types at Great Basin NP. (T = trace).

Cover Type	Percent cover				Number species				deer pellet groups 100 m ²
	tree	shrub	forb	grass	shrub	forb	grass		
Sagebrush	0	33	13	17	6	19	7	69	
Pinyon (old stand)	19	18	T	0	3	1	0	0	
Sagebrush with scattered pinyon	4	21	9	21	6	20	9	15	
Pinyon (young stands)									
Low density	20	23	5	7	6	13	6	48	
Moderate density	41	6	2	2	4	10	4	6	
High density	60	1	T	1	5	8	5	7	
Aspen	81	5	10	3	3	11	4	25	
Conifer									
Engelmann spruce	46	2	T	T	1	3	1	1	
Limber pine	25	23	7	2	4	1	3	5	
Douglas-fir	58	7	T	T	3	3	3	8	