INVESTIGATOR'S ANNUAL REPORT

National Park Service

All or some of the information provided may be available to the public

Reporting Year: 2005	**Park:** Shenandoah NP
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Permit#:
SHEN-2005-SCI-0001

Park-assigned Study Id. #:
SHEN-00308

Project Title:
3-D Laser Scanning of Rock Outcrop Areas

Permit Start Date: Jan 06, 2005	**Permit Expiration Date** Jan 16, 2005
Study Start Date: Jan 06, 2005	**Study End Date** Jan 16, 2005

Study Status:
Completed

Activity Type:
Research

Subject/Discipline:
Geography

Objectives:
The project will test the use of 3-D laser scanning technology to assess natural resources on rock outcrop areas within the park.

Findings and Status:
The pilot study indicated terrestrial laser scanning techniques present an improved means of quantifying growth, biotic and abiotic interactions, and population dynamics of lichens on rock outcrops and boulder surfaces in Shenandoah National Park. The success of this exploratory research is reflected in the satisfactory completion of the three major objectives of this project (A more detailed report has been submitted in the Spring 2005 to Shenandoah National Park Natural Resources Division and should exist on file within SNP):

Objective #1 â to determine the extent to which terrestrial laser scanning can be used to record lichen species

We were able to record individual and coalesced lichens on rock surfaces and differentiate them from other features (e.g. moss, grass, and bare rock). The virtual recording of lichen species and basic parameters can be done relatively effectively in a GIS and with a high-degree of accuracy. Further refinement of the techniques and the use of different classification techniques will produce a clearer differentiation of numerous lichen species and other biotic and abiotic parameters on the rock surfaces. The laser scanning technique also offers the opportunity for repeat surveys, which with further collaboration with the lichen ecologists should permit us to refine our measures of lichens to assist in assessing the extent and locations of lichen declines. This would lead to quantitative information upon which future SNP management decisions can be based.

Objective #2 â to illustrate how micro-terrain can be extracted along with the biotic information and used to analyze abiotic/biotic interactions

The micro-terrain data can be collected simultaneously with the lichen data at a resolution of millimeters within all of the 3D Cartesian coordinates. We have shown how the DEM and curvature data can be tied directly to the lichen data. Our precursory assessment of the micro-terrain has shown statistically significant relations between the lichen species and the rock topography. The results are for a relatively small sample plot and further understanding of the spatial variability of lichen species would be enhanced by examining relations at various spatial scales. There is a variety of other terrain parameters that we can calculate, but given the limited scope of this study we have only highlighted some commonly used parameters. Many of the micro-terrain parameters can also be used as surrogates for micro-climatic parameters. Micro-terrain data may also prove important in helping define the physical locations where particular lichen grow, which may help in defining critical areas for protections of particular lichen species.

Objective #3 â to show the potential contribution of laser scanning techniques to the broader goals of interpreting lichen population dynamics in SNP

The laser scanning technique has merit for interpreting lichen population dynamics in SNP. The findings clearly show both abiotic and biotic parameters can be collected, virtually recorded, and analyzed in a timely manner. Although not used specifically in this exploratory analysis, replicates can be developed easily from these data. This is of critical concern in conducting scientific research in any field. The ability to conduct repeat surveys permits continual monitoring of study sites and should provide an unprecedented analysis of lichen change detection throughout sites in SNP. The resolution of the laser scanned spatial and ecological data can be stored in near archive quality for future assessments and accessed by a variety of researchers concerned with lichens.

For this study, were one or more specimens collected and removed from the park but not destroyed during analyses?

No

Funding provided this reporting year by NPS:	**Funding provided this reporting year by other sources:**
0	0

Fill out the following ONLY IF the National Park Service supported this project in this reporting year by providing money to a university or college

Full name of college or university:	**Annual funding provided by NPS to university or college this reporting year:**
n/a	0