

White Sands
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NATURAL PROCESSES ASSOCIATED WITH THE FORMATION
OF THE ARCHEOLOGICAL RECORD IN A DUNE ENVIRONMENT

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WHITE SANDS, N.M.

A Planning Report on an Experimental Remote Sensing Project
To be Conducted at White Sands National Monument

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Introduction

Two basic types of processes combine in the formation of the archaeological record: cultural processes, which are those processes which result in the alteration of natural materials or settings by man; and natural processes, the result of which alters the previously-deposited cultural record. These two types of process have been abbreviated "C" and "N" processes by Schiffer (1976), who points out that the relationship between C- and N-induced change in archaeological materials is not simple or one-way. Much of what we see in the archaeological record is, in addition, the result of N-Processes rather than simply what was left behind by prehistoric peoples. The purpose of the planned study is the investigation of the nature of N-Processes on cultural materials in relation to a dune environment.

Cultural Processes in the Dune Environment

To study the effect of N-Processes on the archaeological record, of course, one must be able to factor out cultural processes which result in the non-homogeneous distribution of archaeological sites and materials. Remote sensing methods recently developed by the Remote Sensing Division will be of use in this study. Previous cultural resources assessment work within White Sands National Monument and adjacent areas can be related to the total study area through sample stratification methods as described by Ebert (1978) and Brown and Ebert (1978). One outstanding feature of dune environments which bears directly on the subsistence activities of hunter-gatherers is extremely high vegetative diversity over space in

these areas. Initial studies in the measurement and consequences (in behavioral terms) of this high-diversity situation were made by Ebert and Hitchcock (1977) in a dune area in northwestern New Mexico; current plans at the Remote Sensing Division include the continuation of diversity measurement studies, using remote sensor data, as part of the San Juan Basin Project during 1978-79. The results of these experiments will be directly applicable to defining the nature of the cultural resources of White Sands National Monument and the C-processes from which they result.

Natural Processes in the Dune Environment

Once some idea is gained of the ^{types} ~~nature~~ of cultural resources, their nature and distribution, in the White Sands area, the natural processes which would work upon the original cultural record and alter its appearance today will be concentrated upon. Geological studies will initiate this phase of the project, beginning with a bibliographic/literature survey on formation and change in aeolian features, the classification of dunes, the application of remote sensing to dune studies, and the specifics of past studies at White Sands.

The second phase of the study of natural processes at White Sands will involve the location of all available aerial and space imagery of the area. Aeolian features will be mapped from imagery through the derivation of a recognition pattern set and visual interpretation. In addition, the application of electronic image enhancement equipment will be investigated, and the relative advantages of black-and-white, true color, and false color IR imagery weighed using actual data. Periodic imagery will be employed in an attempt to measure movement of features and change in their nature.

Ground-base field checking and low-level inspection flights and photography will be used to bridge the gap between the cultural record and geological studies undertaken with aerial and space imagery. Archaeological sites and features will be located on the ground and inspected using aerial imagery; the effects of changes in the dune environment deduced during the activities above (geological interpretation) on archaeological materials will be analyzed. This phase of the study will involve climatic investigations, since climate is an important controlling factor in dune movement and change.

Benefits of Planned Study

The White Sands study outlined briefly above will be of benefit in a number of ways. First, results can aid in assessing the nature of, assessing potential impacts on, and monitoring change in cultural resources at White Sands in specific, and in dune environments in general. Second, the experiments proposed in this study will help test the applicability of remote sensing techniques to the detection, study and measurement of both cultural and natural phenomena in sand-covered or dune areas; this should be of benefit not only to cultural resource managers, but to biologists and other resource management personnel as well.

During the last decade, which has brought drought conditions to many parts of the world -- particularly those already marginally arid -- there has been increased awareness on the part of scientists that cultural and natural forces are closely interrelated in the expansion of deserts. It has not always been clear, however, just what these relationships may be and what factors, if any, are causal. The study of prehistoric culture and its relationship to dune environments at White Sands may

help solve some of the problems of "desertification" -- particularly the role of grazing animals in the expansion of sand areas.

Cooperation with Other Offices and Organizations

During the course of the planned project, the Remote Sensing Division will cooperate with a number of other offices and agencies. These include White Sands National Monument; the United States Air Force (Holloman AFB); and Dr. William H. Reid of the Laboratory for Environmental Biology at the University of Texas at El Paso, who is currently studying successional vegetation processes and dune migration at White Sands.

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