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Date: 2002-06-19
Writer: Jack King

Using a $284,000 grant from NASA's Faculty Award for Research program, researchers from New Mexico State University plan to test a theory about the significance of geographic formations in the process that turns grazing land into desert, said Michael DeMers, head of New Mexico State's geography department.

The researchers will collect information about an area including the Jornada Basin and from Mount Summerford, northeast of Las Cruces, to the eastern foothills of the San Andres Mountains, which run north and south along the eastern edge of Dona Ana County, into Sierra and Socorro counties. They will collect satellite imagery, data from studies on the ground and conventional maps. The data will be loaded into a computerized geographic information system (GIS) that will allow researchers to sort and analyze it.

From the data and its analysis, they hope to be able to make predictions about the role in desertification of geographic formations, such as alluvial fans, arroyos, hill slopes, "playas" or dry lakes and sand dunes, DeMers said.

The researchers are DeMers; Dan Dugas, an assistant professor of geography; Janet Greenlee, a remote sensing GIS specialist; and Walt Whitford, a retired biology professor from New Mexico State and nationally known desert ecologist.

Geographers define "desertification" as the process through which land changes from continuous grassland to patches of grass interspersed with desert shrubs, such as mesquite, creosote bush or tar bush, with greater and greater degrees of "patchiness" as the process continues, Dugas said.

Current geographic theory says that the primary control on the distribution of grass and shrubs is the availability of water and nutrients, which is controlled by the presence of different land formations. For example, an "alluvial fan" is caused when sediments wash off a mountain side onto the adjacent desert floor. The size and distribution of those sediments controls where run-off water stays and soaks down in the desert floor, he said.

But recent studies aimed at proving that theory have relied on point and transect sampling techniques, where a fixed number of soil and vegetation samples are taken at certain points or along a line on a land form.

"The problem is those are fairly small samples from a particular place. Researchers have had only limited success taking their analysis of that data and applying it to the same land forms at other locations," DeMers said.

Using a GIS, with satellite data supported by land-based data, will allow researchers to get a much larger overall view of a landscape -- roughly "smaller than a continent, but larger than an ecosystem," DeMers said.

The results of the study should help prove or disprove the prevailing theory about desertification and should show whether it's possible to develop a model of desertification using a GIS, he said.

"It's the predictive property of the GIS that we're interested in here, whether we can observe a range of vegetation on one alluvial fan and apply that to an alluvial fan at another location. GIS technology has very rarely been used this way, to form and test a scientific hypothesis. Usually it's used as a management tool, to observe a specific phenomenon," he said.

If a model of desertification can be derived from the GIS, that model could be used to help make decisions about the management of arid lands, he added.

DeMers said each member of the team will play a specific role in the project. Dugas will interpret the satellite imagery and ground data to create maps of land forms in the area. Greenlee will process the satellite imagery and load it into the GIS. Whitford will analyze the ground data, identifying vegetation in the area and interpreting what ecological processes are suggested by its presence. DeMers, the project's principle investigator, will create a model from the data and its analysis, that he hopes will be able to be applied to other locations, he said.

Jack King
June 19, 2002
