



## ECOLOGICAL RESEARCH PROGRAM

### LANDSCAPE INDICATORS ASSIST GROWTH MANAGEMENT DECISIONS

**Issue:**

The landscape changes to our forests, grasslands, and plants can indicate how humans and natural conditions are impacting the environment. Over the last century, vegetation changes have been recorded anecdotally by comparing historical records or photographs, but these methods have provided only a snapshot. New tools and methods are needed to provide a comprehensive analysis of landscape changes over a wide region and how the changes are impacting natural resources such as the supply of water.

**Science Objective:**

Scientists at the U.S. Environmental Protection Agency’s Office of Research and Development are using earth-observing satellites and process models to quantitatively measure comprehensive changes in landscape and forecast how

specific land management actions will impact the environment. Landscape indicators have been developed for the San Pedro River, a moderate-sized watershed in southeast Arizona and northern Sonora, Mexico, to estimate the status of watershed conditions, the sustainability of water supply, and the condition of habitats.

Scientists developed a spatial analysis tool known as Automated Geospatial Watershed Assessment (AGWA) to understand how the changes in vegetation are impacting the overall San Pedro watershed. AGWA has been used to evaluate future conditions associated with changes in land cover and land use.

**Application and Impact:**

The forecasting tools and methods developed are providing a landscape approach to environmental planning and protection for communities.

Researchers are able to compare and display how potential growth scenarios will impact the environment, water supply, and quality of life. Local planners are using the science to evaluate alternative growth management strategies.

**References:**

Kepner, W.G.; Semmens, D.J.; Bassett, S.D.; Mouat, D.A. and Goodrich, D.C. Scenario Analysis for the San Pedro River, Analyzing Hydrological Consequences of a Future Environment. *Journal of Environmental Monitoring and Assessment*. 2004 94: 115-127. Kluwer Academic Publishers. <http://dx.doi.org/10.1023/B:EMAS.0000016883.10110.15>

Kepner, W.G.; Edmonds, C.M. and Watts, C.J. Remote Sensing and Geographic Information Systems for Decision Analysis in Public Resource Administration: A Case Study of 25 Years of Landscape Change in a Southwestern Watershed. U.S. Environmental Protection Agency, EPA/600/R-02/039, 2002.

**For more information, visit:**

[www.epa.gov/nerlesd1/land-sci/san-pedro.htm](http://www.epa.gov/nerlesd1/land-sci/san-pedro.htm)  
[www.epa.gov/nerlesd1/land-sci/agwa/index.htm](http://www.epa.gov/nerlesd1/land-sci/agwa/index.htm)

**Contact:**

William G. Kepner, research ecologist, EPA’s Office of Research and Development, 702-798-2193, or [kepner.william@epa.gov](mailto:kepner.william@epa.gov).

June 2007