

# Effects Of Urbanization On Ecological Services In A Semi-Arid Region Of The United States

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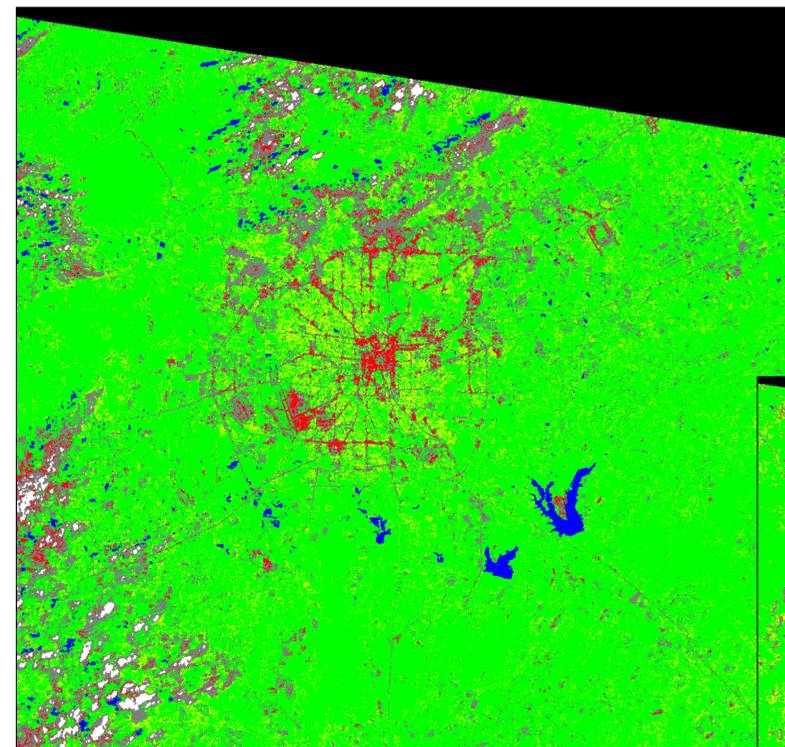
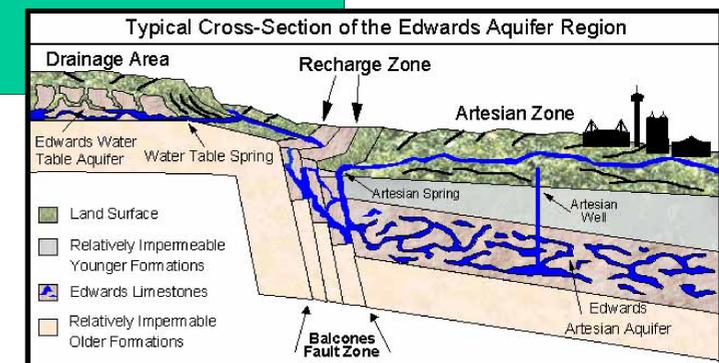
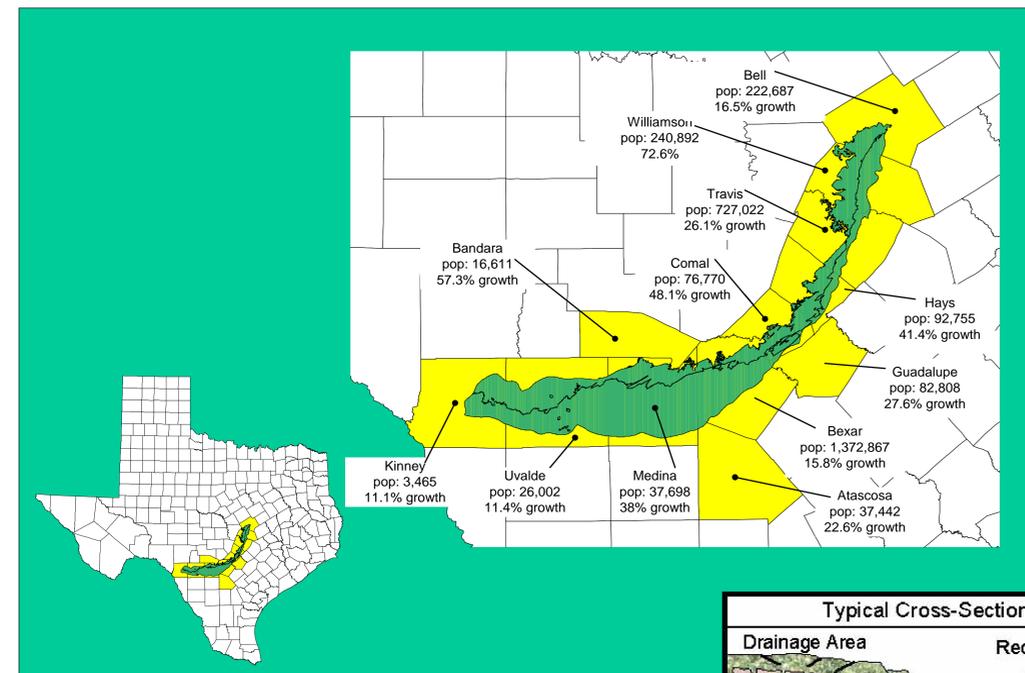
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## Abstract

Changes with land cover and land use are closely integrated with water processes at the land surface. Nowhere is that more apparent than in the Edwards aquifer region of south-central Texas. The Edwards aquifer covers approximately 4,350 square miles in parts of 12 counties in Texas and includes San Antonio and Austin, the nation's eighth and nineteenth largest cities, respectively. Water is discharged at several natural points and through hundreds of pumping wells, particularly municipal supply wells in the San Antonio region and irrigation wells in the western extent. Because of its highly permeable nature in the fresh water zone, the Edwards aquifer responds quickly to changes and extremes of stress placed on the system. The semi-arid climate and highly variable rainfall in the region create large differences in recharge and discharge rates from year to year.

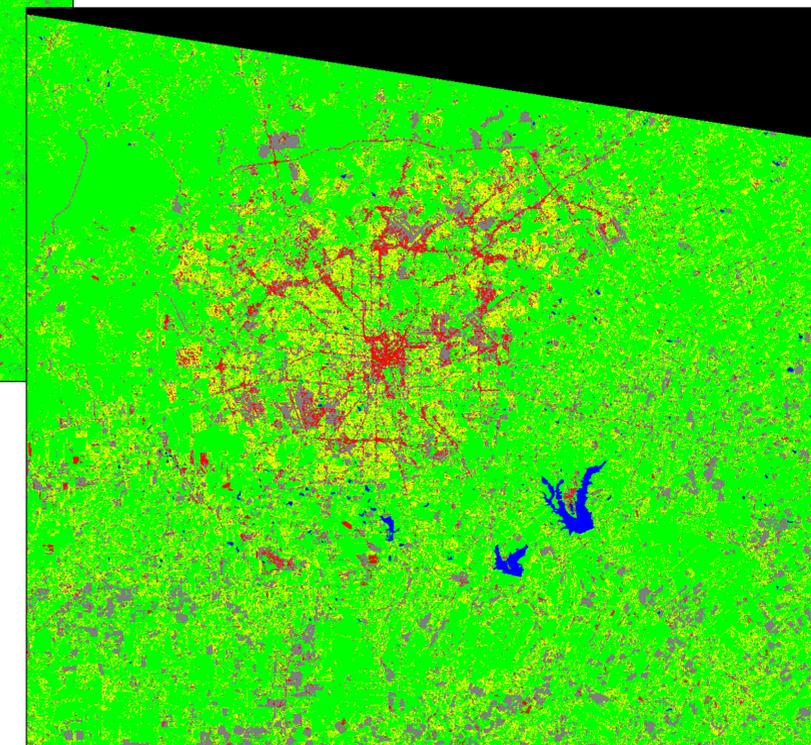
Population growth in this region has been high with county population increases (1990 – 1999) ranging from 11.1% in Kinney County to 72.6% in Williamson County. While this growth has directly increased the demand on the aquifer, of greater significance has been the impact on the region's ecological services. Of particular interest is the dynamic between water resources, carbon sequestration, and wildlife habitat. For example, reduction of brush and other woody plants in the Edwards aquifer recharge zone has been shown to increase water resources in the artesian zone, where the water is discharged for public use. However, the elimination of woody plants reduces wildlife habitat. Additionally, the increased biomass of woody plants sequester more carbon than the grasslands that would replace them, so brush removal reduces sequestration of carbon. Clearly the goals of increasing water availability, increasing carbon sequestration, and increasing wildlife habitat are in conflict. Policy instruments have addressed these conflicting goals individually and as a result have failed to achieve a sustainable balance between them.

The overall goal of the research will be to determine the impact of past land cover and land use change (LCLUC) on regional ecological services and to apply that knowledge to evaluate public policy instruments to enhance these services in the future. Specific ecological services targeted are water resources, vegetation for carbon sequestration, and refugia for wildlife habitat. A strong multi-disciplinary research team has been assembled to accomplish this goal through evaluation of LCLUC in the region from Landsat satellite images, determination of the changes in ecological services arising from LCLUC, utilization of spatial information from these analyses to establish and evaluate different policy instruments to control LCLUC, and optimization of policies to maximize ecological services through management of LCLUC. The outcome of this research will be an understanding of LCLUC and the effects on ecological services in a semi-arid region, a determination of the effectiveness of policies to enhance ecological services, and an optimization of ecological services through policies that appropriately manage LCLUC.



San Antonio, Texas –Classification of 1976 Landsat MSS image

- Agricultural, Bare Soil, or Forested
- Commercial
- Residential
- Transportation
- Water



San Antonio, Texas – Classification of 1991 Landsat MSS image