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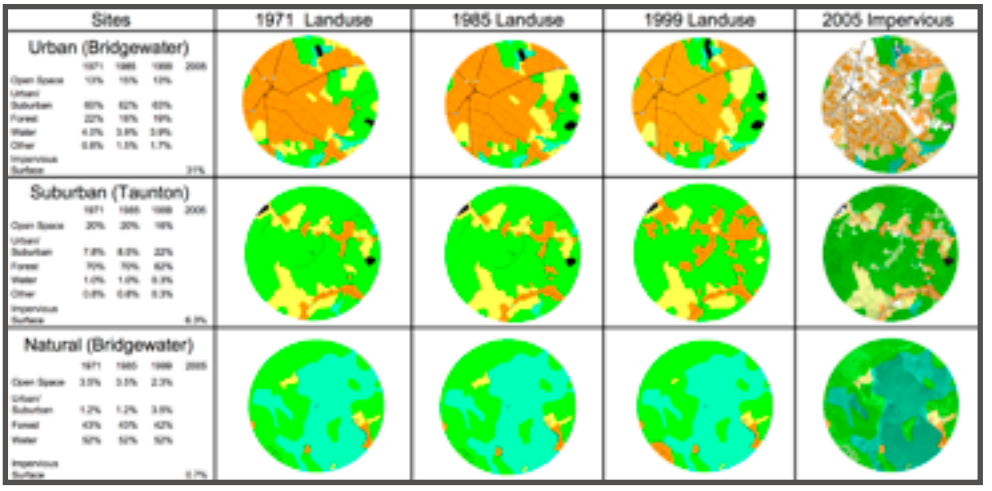
# Inside Front & Back Covers: Changes and Variability of Urban Sprawl - Implications for Local Climate Change

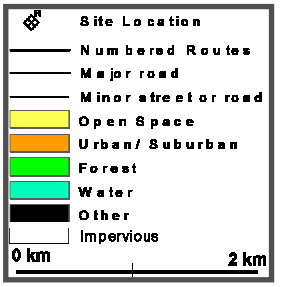
Robert Hellström
*Bridgewater State College*, rhellstrom@bridgew.edu

# Changes and Variability of Urban Sprawl

## Implications for Local Climate Change

Scott Damron and Patrick McDonough (Dr. Rob Hellström)





## Abstract

Southeastern Massachusetts is experiencing dramatic rates of landscape change, largely due to human activity. Urbanization dramatically reduces the earth's natural cooling processes. We present methods and results from one of the three sub-projects that contribute to the ETnet local climate change study. This project incorporates Geographic Information Systems to explore landuse change and variability in S.E. Massachusetts between 1971 and 2005. Landscape modification affects local climate and evapotranspiration rates. The rapid growth of urban and suburban landuse at the expense of open space significantly alters the energy and water budget. We selected seven sites of various natural and urban landscapes. We incorporated data sources from the MassGIS web site to analyze color infrared orthophotos, vector layers of landuse, and impervious surfaces using the computer program ArcGIS 9.1. We found striking increases in anthropogenic land area for all sites. We found large differences in the percentage of impervious surface between all sites.

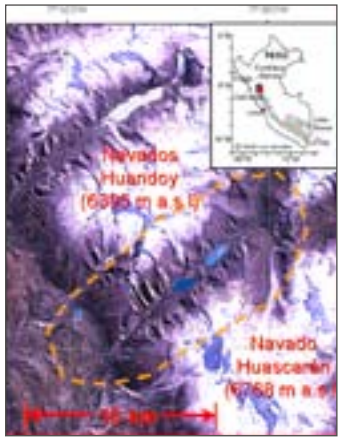

The illustrations on the inside front and back covers of this edition of Bridgewater Review feature the work of Dr. Robert Hellström of the Geography Department. Professional presentation of data from research is becoming increasingly graphic, in large part due to recent advances in the technology for their production. As computer capacity and speed improve, and the software used to produce complex graphics is written for specialized purposes, graphics like these will increasingly present masses of information in compact and easy to understand forms. On this page is a presentation of data about changes in land use in the Bridgewater area over a period of 35 years from a study conducted by Bridgewater State College students Scott Damron and Patrick McDonough under Dr. Hellström's supervision. It takes no special training to understand the trends in urbanization visible in these graphics.

*—Robert Hellström is Assistant Professor of Geography.*

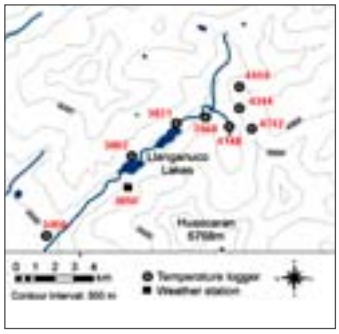
# Annual Hydrometeorological Variability within a Tropical Alpine Valley

## Implications for Evapotranspiration

Rob Hellström, Bridgewater State College
and Bryan G. Mark, Geography Department,
The Ohio State University

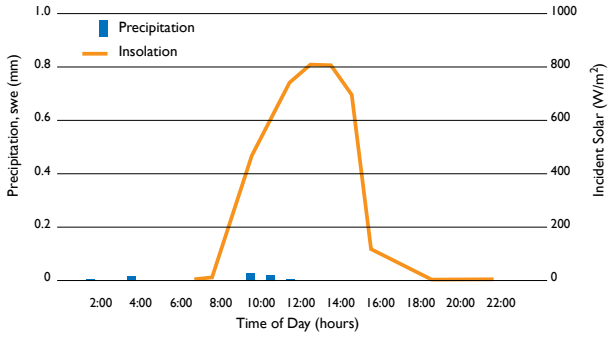



Study Area (Llanganuco Valley)

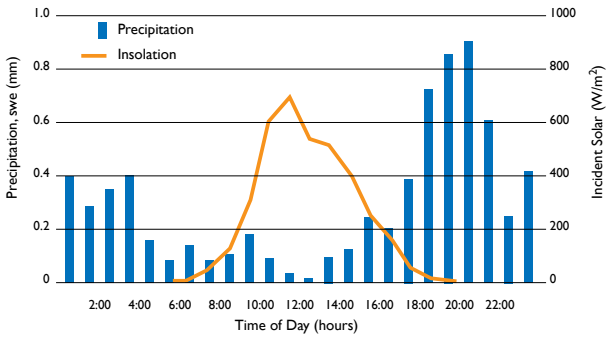



## Diurnal Variation of Dry and Wet Period Insolation and Precipitation

Dry Period Diurnal Variation of Average Precipitation and Insolation




Wet Period Diurnal Variation of Average Precipitation and Insolation




- Very little precipitation with ITCZ located north of valley
- Afternoon shading by steep valley wall
- Most precipitation occurs at night
- Insolation is not significantly reduced by cloud cover

In this graphic we see a number of techniques used to present information about Dr. Hellström's research project on climate in the Peruvian Andes. On the left are two maps, one showing the position of the research site within the country of Peru, the other locating the site more precisely on a larger scale relief map as set in a mountain valley. At the upper right is an illustration of the location of the data collection stations on a topographic elevation map. And at the bottom right of the page are two graphic presentations of data indicating precipitation and solar input that were generated from data collected at these sites. The dry and wet seasons are clearly evident by differences in the vertical bars showing precipitation. The relatively smooth bell shape of solar vertical bars showing precipitation. The relatively smooth bell shape of solar input indicates a lack of cloud cover during daylight hours for the wet season, and this promotes high rates of evaporation. Evaporation is a critical component of the water balance in thispart of the Peruvian Andes.