



GIS Analysis of Consequences of Land-Use Change within the River Observatory and Monitoring Applications (ROMA) Project

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Principle Investigator(s):

Robert G. Clark (Task Lead)
USGS National Center
12201 Sunrise Valley Drive
Reston, VA 20192
703-648-7123

bclark@usgs.gov

Milan J. Pavich (ROMA Project Lead)
USGS National Center
12201 Sunrise Valley Drive
Reston, VA 20192
703-648-6963

mpavich@usgs.gov

Allen C. Gellis (Co-investigator)
USGS
8987 Yellow Brick Road
Baltimore, MD 21237
410-238-4281

agellis@usgs.gov

Collaborators: Chesapeake Bay Program (over 25 Federal Agencies, 6 States, the District of Columbia, and numerous local customers and partners)

Statement of Problem: The uplands of the Susquehanna watershed has been changed by human-induced and natural processes, some of which have significant impact on ecosystem health and sustainability. The need to integrate and apply information to help understand the consequences the dynamics of the land surface has on sediment erosion and deposition caused by agricultural production, urbanization, forest logging, climate change, and other factors operating at local and broad regional scales is critical to managing the natural resources of the watershed and Chesapeake Bay. Improved information and understanding about the state of the land

surface and the rates and patterns, causes/drivers, and consequences of landscape change are needed to help scientists and decision-makers in land-use planning, land management, and natural resource utilization/conservation. For example, accurate studies of sediment mobilization (a critical area of investigation to the Bay program) require high resolution land cover and elevation data linked to detailed slope, aspect, and accumulated flow calculations in order to model the sediment carrying ability of local sub-watersheds. Current studies (Langland and others) have quantified sediment accumulation behind four dams on the lower Susquehanna using less than satisfactory base cartographic data. Current available elevation data is not consistent or detailed enough in resolution in the area of needed coverage to factor in local topography and land cover effects to satisfactorily predict sediment movement.

Objectives: Data will be acquired to define the topographic characteristics of several sub-watersheds within the Susquehanna; LiDAR, SPOT and Landsat imagery; NHD, EDNA, and land-use/cover data. The data will be quality checked, where necessary, and integrated for analysis. Geographic analysis will be conducted to help understand the impact these topographic characteristics have on sedimentation within the watershed. These objectives are in direct support of the River Observatory for Management Applications (ROMA) project. Data assembly techniques, analysis, and applications will be documented.

Approach: Geographic analysis will be used to improve understanding of how the topographic states and changes in the Susquehanna uplands shape the Susquehanna watershed over time. Base topographic, socio-economic, land remote sensing, and other natural science data will be used to quantify landscape characteristics, identify rates and key driving forces, and hindcast and forecast past and future trends of landscape change, respectively. Studies will be place specific and at a range of spatial and temporal scales so that investigations provide comprehensive information needed to understand the environmental, resource, and economic consequences of landscape change. Analysis will seek to correlate the rates and consequences of land use/cover change and other topographic characteristics on sedimentation in the Susquehanna watershed.

Selected Reports and Other Products:

The ROMA Geographic database consisting of data from Lancaster County, PASDA, Department of Agriculture, and USGS has been vertical integrated. An Open-File Report describing the ROMA database and several uses of the data has been published and available at <http://erg.usgs.gov/rit/ROMAof04052004.pdf>

Webpage content describing the ROMA studies has been published at <http://erg.usgs.gov/rit> and <http://chesapeake.usgs.gov/ROMA/> with the Open-file report, a Poster, a PowerPoint presentation and a video detailing project makeup, available for download.

Land cover change study for the West Branch of the Little Conestoga is being completed and a peer-reviewed article detailing land surface charge will be offered as a contribution to the FY05 Geographic Analysis and Monitoring Status and Trends Report.

Modeling of sediment mobilization and topographic analysis for the West Branch and Manor soils is scheduled to be completed in FY04. Modeling of the mobilization for additional West Branch soils will continue in FY05. A peer reviewed article describing the sediment mobilization modeling due to the consequences land cover/land-use change is planned for FY05.

Relevance and Benefits: This project task relates to USGS Chesapeake Bay Science Program Goal 2—Understand the sources and impact of sediment on water and biota.