Project Summary

Society envisions metropolitan areas that supply ecosystem services sustainably, and mechanisms to pay for and distribute those services equitably to ensure well-being and a high quality of life for all. Attaining this vision requires a richer understanding of the production of ecosystem services as a function of spatially integrated built and natural environments. A more equitable consumption of these services must reconcile the discordance between the spatial boundaries and time scales of human institutions as compared to ecological systems. This proposal addresses these challenges in the Triangle Region of North Carolina, an ideal location for an Urban Long Term Research Area (ULTRA). One of the fastest-growing regions of the country, the Triangle contains urban, suburban, and rural lands. The region contains 45 municipal and seven county governments and, although there is some coordination through the Triangle J Council of Governments, each government has its own land-use and growth policies. The region has three major research universities and a strong USDA Forest Service research presence.

Researchers involved with this proposal will use a three-part framework that addresses: (1) the production of ecosystem services by ecological systems; (2) their valuation and monetization by people; and (3) the design, implementation, and evaluation of policies to pay for and allocate these benefits equitably. During the ULTRA-Exploratory project, researchers will: (a) apply this framework in a case study of the ecosystem service of clean water production, in collaboration with state and local government agencies; (b) further develop a network of collaborators through a series of four community workshops focused on ecological, economic, policy, and synthesis topics; and (c) develop an integrated data platform that will serve researchers, government agencies, and, ultimately, the public at large. In the longer term, the program will expand to include other ecosystem services (open space, habitat and biodiversity support, carbon sequestration). The overall goals are: (1) to become leaders in establishing a multi-disciplinary and policy-relevant program focused on managing coupled human and natural systems and (2) to develop the Triangle ULTRA as the hub of a regional network engaging scientists, managers, and community stakeholders in applied research.

Intellectual Merit. The initial case study on land use and water quality embraces many of the central challenges in ecology today: issues of scale, spatial processes, and system-level feedbacks. These define ecohydrology, and the proposed combination of field data and simulation modeling will lead to substantial progress toward synthesizing a deeper understanding of these issues. Over the longer term, the effort to map the flow of ecosystem services from where they are produced to where they are consumed will set a new standard for spatially explicit valuation. More generally, the project will help resolve questions about feedbacks between human behavior and institutions, and ecosystem processes in the spatially structured environment of urban systems. Collectively, results of this project will help provide the scientific basis for emerging policy instruments and markets for ecosystem services.

Broader Impacts. This project will result in increased collaboration among university, government and non-government agencies, and the general public, ensuring that the research is policy-relevant and addresses topics important to the local community. Researchers will begin developing a data platform that integrates scattered ecological, hydrological, and socioeconomic data for the region and makes them available publicly. Results will help guide land-use planning decisions in a seven-county (45 municipalities) region with an unprecedented level of coordination. Through an emphasis on the equitable distribution of the costs and benefits of ecosystem services, the project will specifically target underserved populations in the region. Funding for this project will support the training of graduate students at three universities; engage graduate and undergraduate students in service-learning and collaborative research; engage K-12 science teachers through a fellows program; and contribute to outreach through the NC [High] School of Science and Math, education programs in partnership with a local museum, and interaction with stakeholder groups and municipal officials.