LCLUC Abstract

Causes and Consequences of Land Cover in a Greater Ecosystem: Trend Assessment, Monitoring and Outreach
<http://www.homepage.montana.edu/~ubiah/hansen/nasa.html>

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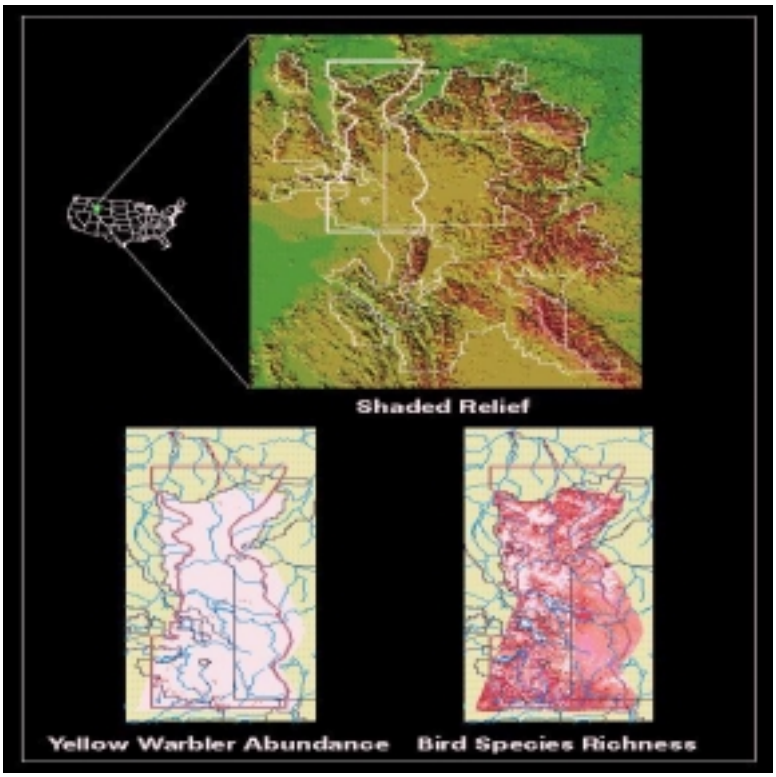

"Greater ecosystems" are areas where nature reserves are surrounded by gradients in land use. Thought of as refugia for biodiversity, greater ecosystems around the world now have rapid human population growth. Thus, the ecological characteristics that attract human emigrants to greater ecosystems may be at risk from increased human land use. Therefore, we propose to study interactions between the ecological and human community of the Greater Yellowstone Ecosystem.

Objectives are:

1. Quantify changes in natural and human forcing functions, ecological processes, land cover and use, and ecological responses across the GYE from 1972-1996.

2. Test hypotheses on forcing functions, ecological processes, land cover, and ecological responses:

   H1: High elevation and patchy distributions of topography, climate, and soil cause net primary productivity (NPP) to be low and variable over most of the GYE.

   H2: Species abundances and richness are correlated with abiotic gradients and NPP and are high only in localized hot spots across the landscape.

   H3: Human population growth is most rapid in counties with high opportunities for economic diversification, due in part to ecosystem-based businesses.

   H4: Human land use is correlated with environmental gradients such that land use is most intense at hot spots for ecological productivity and biodiversity.

   H5: Intense land use reduces NPP and native bird abundance, diversity and nest success.

3. Assess current and future risk to ecological hot spots and potential for restoration.

4. Develop and implement an approach to monitor ecological and human interactions.

5. Communicate results to stakeholders via workshops, publications, and decision-support tools.

Land cover/use and other key human and ecological variables will be quantified for 1995 using satellite, field, and in situ data. An innovative change-detection approach will be tested and used to create land cover/use maps at five previous time periods back to 1972 (date of earliest available satellite data). Accuracy assessments will be done on all resulting maps using aerial photos and field data. Hypotheses will be tested primarily by multivariate correlation analyses across space and time. Some hypotheses are also being tested with field experiments under other funding. The results will be used to determine the places in the landscape most important to biodiversity and under the greatest risk from changing land use. Places with high potential for restoration will be identified. Feedbacks from the ecosystem to the human community will also be examined. Continued monitoring is essential for ecosystem management, and we will develop and demonstrate an approach for taking the ecological and human "pulse" of the GYE in the future. Finally, outreach projects will be designed to quickly communicate results of the study to stakeholders and policy makers.

This study is unique in testing important new ecological theory concerning abiotic controls on biodiversity. It also will directly examine the notion that human communities are closely tied to the surrounding ecosystem. The apparent mismatch between ecological and administrative boundaries may underlie many of the resource conflicts in the GYE. The results will provide a basis for managing the GYE to sustain both ecological and human communities. Our methods will be exportable to other greater ecosystems and, hopefully, will facilitate sustainable management strategies before these refugia for biodiversity are jeopardized by unplanned human-population growth.