

University of Connecticut Center for Land use Education and Research

Summary: Land use is an issue of global and national importance that is decided primarily at the local level, with little guidance or support from state and federal governments. The University of Connecticut, a national leader in land use education and research, requests \$3 million over a three-year period to create an integrated state-of-the-art land use analysis, information, and education resource for the citizens and towns of Connecticut. This effort would provide critically needed information on urbanization, forest fragmentation, farmland loss, and water resource impairment for local officials struggling to accommodate growth while protecting natural and cultural/historical resources. The result will be widespread positive impacts on the economic, social, and environmental health of Connecticut communities. Further, through UConn's national programs, the Connecticut effort will serve as a prototype for efforts in other states across the nation.



Need: Land use is the central issue underlying many of the most pressing concerns of communities across the nation. Air and water quality, economic development, transportation, open space protection, community character, and farmland preservation are all closely connected to land use patterns and trends. In fact, land use change is not only of national, but also of global importance. A series of recent NASA-funded studies suggests that human-induced land surface changes, such as deforestation and urbanization, are a major factor in global climate change. Just in the past six months, major studies have been released detailing the impacts of urbanization on coastal resource health and on drinking water supplies. The environmental, social and economic impacts of "urban sprawl" are a major concern of financial institutions and environmental agencies alike. Nonpoint source pollution, or polluted runoff, is the number one water quality problem in the United States. The Nature Conservancy reports that up to one-third of the country's animal and plant species are at risk of extinction due mainly to habitat loss and degradation, and the American Farmland Trust estimates that farmland is being lost to development at a rate of one million acres per year. Finally, there is a growing body of work documenting the costly public health impacts of the sedentary lifestyle and additional vehicular activity associated with poorly planned urban growth.

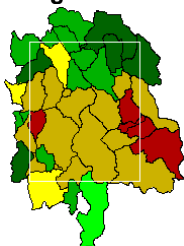
Despite its universal impact, land use remains a local issue that is decided primarily by individual landowners and land use boards at the town, township, and county levels. Local land use decision makers have few resources with which to track, analyze and understand the changes to their landscape, or to gauge the impacts that these changes may have on the economic and environmental health of their towns. Nowhere is this more true than in Connecticut, where each of the state's 169 municipalities determines land use through zoning, planning, economic development and other volunteer commissions, with little assistance from the state or federal agencies. Sprawl is also no stranger to Connecticut -- a study by the Metropolitan Area Research Corporation shows that from 1970 to 2000, the state's population increased only about 10% while the amount of developed land more than doubled. This trend is likely to worsen, as new estimates from the U.S. Census Bureau show that in the past decade, the state's national ranking for percentage population growth has jumped from 47th to 25th.

Precisely because land use is local, federal and state regulations can only go so far to dictate or even foster better local land use decisions. As concluded in an October 2001 report by the General Accounting Office, non-regulatory education, information and technical tools are among the most effective, and cost effective, means by which to promote better local land use policies.

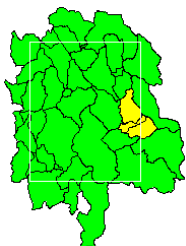
Requested Action: The University of Connecticut *Center for Land use Education and Research* (CLEAR) is one of very few organizations dedicated to providing land use information and educational assistance to community decision makers, both in Connecticut and, through a national network of projects, across the country. UConn requests \$3 million over a three-year period from

NASA, to enable CLEAR to provide a statewide integrated package of up-to-date land use information, education and tools to the citizens and municipalities of Connecticut, building on a strong existing foundation to provide a new and critically needed resource for land use decision makers across the state.

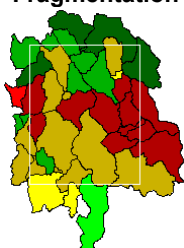
1985 State of Forest Fragmentation



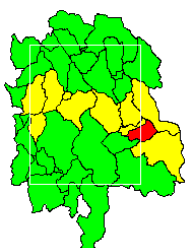
1985 Impervious Surface Density



1999 State of Forest Fragmentation



1999 Impervious Surface Density



Examples of CLEAR landscape analyses for a portion of the Salmon River watershed, CT, showing changes from 1985 (top) to 1999 (bottom) in the degree of forest fragmentation and the amount of impervious surfaces (pavement), an indicator of the impacts of development on water quality. Darker areas depict more severe impacts. Such analyses can give local officials an understanding of the impacts of their current land use policies on natural resources, and help them plan for the future.

CLEAR currently exists as a group of affiliated, grant-funded projects that share the goal of bringing “rocket science” to town hall (next section). Federal funding would be used to ensure core CLEAR capabilities in remote sensing research, GIS and web tools development, and outreach education, and to invest in new technology for the Center. This enhancement will enable expanded, more uniform and more powerful dissemination of CLEAR products and programs than is possible under existing conditions. CLEAR’s remote sensing research and applications projects rely on NASA ESE and other satellite and airborne image data. For example, using Landsat ETM+ data, CLEAR researchers have developed nationally cutting-edge remote sensing-based techniques to track and analyze urban growth, farmland loss, and forest fragmentation over time (left). These techniques currently exist only for a pilot area. Federal funding would allow CLEAR to extend these techniques to the entire state of Connecticut. In addition to serving as a national model, through CLEAR’s national network this effort will have direct nationwide impact on NASA’s “Community Growth” Strategic Application Area.

Information products and decision support tools for Connecticut’s land use decision makers to be created by this project include:

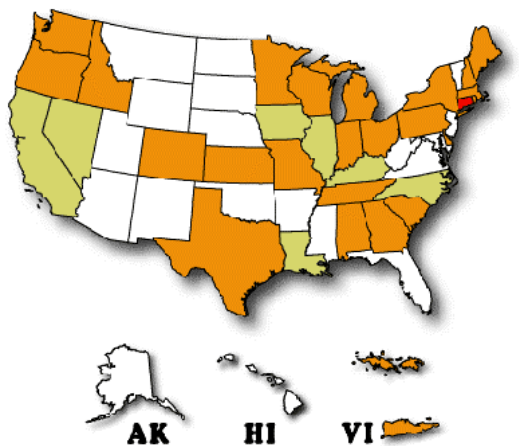
- (1) statewide land cover change for approximately five year intervals from 1985 to the present;
- (2) urban growth, forest fragmentation, and change in impervious cover over this period;
- (3) landscape change animations and 3D visualization models, based on the above analyses;
- (4) tools that translate this information into robust, standardized GIS software suitable for use by professional engineers, planners, and others.

Education and training products for Connecticut’s land use decision makers to be created by this project include:

- (1) a new state-of-the-art web site with interactive technology that will make the above tools and information easily accessible for Connecticut citizens and municipalities;
- (2) new educational modules for CLEAR’s award-winning educational programs for municipal officials and private land owners;
- (3) GIS and remote sensing training for town officials and employees by CLEAR’s GeoSpatial Technology Program.

Real changes to local plans, regulations, policies, and on-the-ground development designs are occurring in Connecticut communities as a result of UConn’s work, and will accelerate greatly under the proposed program. Requested federal funds will be leveraged by other federal and state funds going into CLEAR programs, and by UConn’s support of CLEAR principals. Support for CLEAR will benefit not only Connecticut, but through CLEAR’s national projects, much of the work will be disseminated, as models, to other states.

Institutional Uniqueness: The *Center for Land use Education and Research (CLEAR)*, located in the College of Agriculture and Natural Resources, exists to provide information and education to Connecticut's land use decision makers. CLEAR, created in April 2002, is founded on a series of highly successful UConn projects that integrate cutting-edge remote sensing research on land use change with innovative outreach programs for municipal decision makers and private land managers. CLEAR outreach programs, such as the national award-winning NEMO Project, the Geospatial Technology Program, and the Green Valley Institute have worked with a majority of Connecticut's 169 municipalities, catalyzing a growing list of positive changes in local plans, regulations, policies, and development design. These projects have ongoing partnerships with USDA, EPA, NASA, NOAA, USGS, and the National Park Service, among others.



The *National NEMO Network*, coordinated by UConn CLEAR. Funded projects are in orange, and projects expected to begin in 2003 are in green, totaling 31 states. These state projects are trained by CLEAR and often adapt CLEAR products for use in their state.

CLEAR principals have national reputations, and have won national awards, in the fields of land use planning, natural resource protection, and remote sensing/GIS technology. This unique combination enables the Center to integrate the capabilities of the USDA Land Grant, NOAA Sea Grant, and NASA Space Grant College systems – one of the only, if not the only, effort in the country to do so. CLEAR programs include national efforts as well as those focused on Connecticut. The National NEMO Network, which includes 26 affiliated projects in 24 states and territories patterned after the Connecticut NEMO Project (figure), is a unique and effective national vehicle for disseminating new information, tools, and educational products and methods developed by UConn. The principals of CLEAR have co-directed the Northeast NASA-funded Regional Earth Science Applications Center (RESAC), which received a competitive grant for about \$1.1 million for

a three-year period ending February 2002. The NASA Code FE and YO-sponsored *Earth Grant* GeoSpatial Technology Program in CLEAR will have received \$150,000 over the period September 1, 2001 to August 31, 2004.

Conclusion: As a recognized national innovator in land use research and education located in an urbanizing state, the University of Connecticut has the ability, the opportunity, and the responsibility to provide national leadership in the development and dissemination of practical land use change information and tools to help local land use decision makers cope with an urbanizing landscape. Because land use is a local issue and one that cuts across agency missions, federal recognition of the critical need to assist land use decision makers has been slow in coming. However, CLEAR's decade-long track record of success, and its existing national contacts and reputation, will ensure that a modest federal investment in UConn will result in a real difference in the economic, environmental, and cultural health of our communities, both throughout Connecticut and across the nation.