

# A clear approach to land use

In this revealing interview, **Chester Arnold** reviews the importance of instilling knowledge in land use decision makers and outlines the contributions his centre is making in this area



**The Center for Land Use Education and Research (CLEAR) helps to inform decision makers about land use. Could you provide an insight into the land use decision-making process in your region?**

New England is a home rule region – land use is determined almost exclusively at the municipal (town) level. These decisions are not made by professionals, but by appointed or elected local citizens who often have little

knowledge of natural resource management or land use planning. This means it is difficult to make consistently well-informed decisions, engender any continuity in approach over time, or tackle larger issues at the watershed or ecosystem scales. These local decision makers need a tremendous amount of support to understand all of the ramifications of the choices they must make. Unfortunately, there are few resources available to provide that support. CLEAR exists to help fill that gap.

**What resources are afforded to you by the University of Connecticut (UConn)'s College of Agriculture and Natural Resources (CANR)?**

CLEAR is a partnership of two departments at CANR – the Department of Extension and the Department of Natural Resources and the Environment. We benefit greatly from the outreach perspective of the former and the research perspective of the latter.

UConn is also a member of the longstanding US Department of Agriculture (USDA)-related Land Grant University system, as well

as the National Oceanic and Atmospheric Administration (NOAA)-related Sea Grant University system. We carry out a fair amount of national work and these networks are therefore invaluable to us.

CLEAR has some interaction with students but most of the Center's staff are extension faculty who educate in the community rather than teach classes. However, for the past three years, we've become increasingly involved with the Natural Resources Conservation Academy, a CANR summer programme for high school students that is aimed at getting kids excited about the environment and interested in pursuing environmental studies in college.

**Could you outline the function of the Climate Adaptation Academy (CAA) and how it feeds into the wider goals of the Connecticut Institute for Resiliency and Climate Adaptation (CIRCA)?**

CLEAR and Connecticut Sea Grant are rolling out the CAA as a way to educate local citizens and land use officials about the impacts of climate change on their

**Top Left:** The green roof on the Laurel Hall classroom building, looking from the second story atrium over the roof to the heart of the UConn campus. The campus now has three green roofs, which serve as stormwater management practices but also have energy conservation and aesthetic benefits.

**Bottom Left:** CLEAR group shot. Front row (left to right): Tom Worthley, Bruce Hyde, Emily Wilson, Juliana Barrett and Cary Chadwick. Back row (left to right): Joel Stocker, Dave Dickson, Chet Arnold, Kara Bonsack. Missing: Mike Dietz, Dan Civco, Bob Ricard and James Hurd.

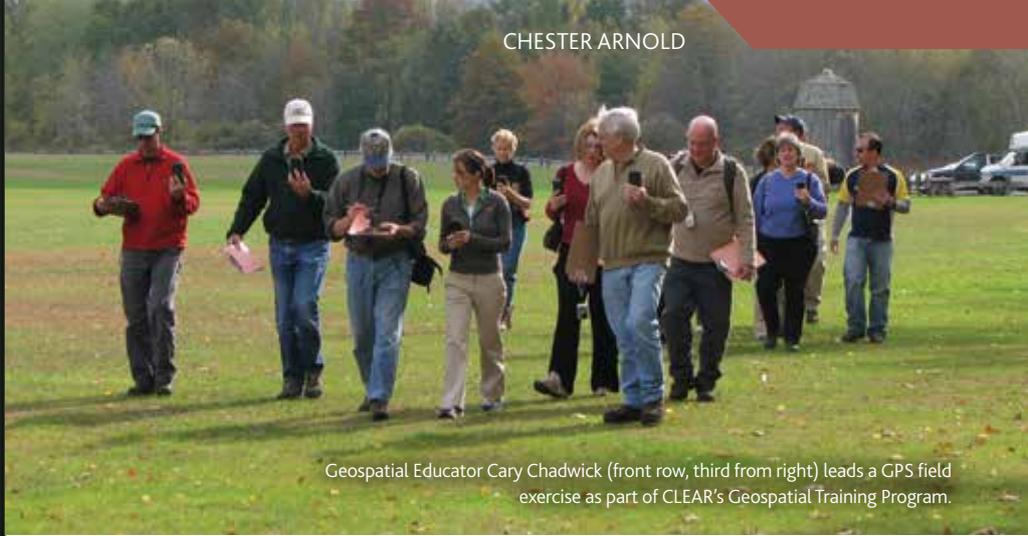
communities, and to communicate possible strategies for them to become more resilient in the face of these impacts. Like most CLEAR-related programmes, the CAA is unique in that it is based on the philosophy of targeting local decision makers directly, rather than focusing on professionals and agencies. The CAA is at the very heart of CIRCA's mission, which is to harness the power of UConn research and outreach to assist communities struggling with these issues. For CLEAR, the addition of a focus on climate resilience dovetails seamlessly with our other focal areas of land use, water and geospatial technology.

### 23 per cent of CLEAR users are private citizens. Why might this be the case?

In the case of our geospatial tools and training, it's because many people are inherently interested in maps and mapping, and in discovering more about their town, watershed or state. With our land use and water resource work, many of the approaches that we teach to towns are transferable to private citizens. The biggest example of this has been the tremendous interest in building the small stormwater practices known as 'rain gardens'. Building a rain garden is something simple that a homeowner can do, and collectively these individual practices can have a significant impact at the town or watershed level. We have a grant from USDA to expand our Rain Garden smartphone app to at least 15 states, so these impacts will really add up.

### Which direction do you think land use planning will take as the world tries to develop sustainably?

Hopefully upward, since making good land use decisions is critical to sustainability. We need to better integrate the natural resource and economic development aspects of our plans, and integrate local planning with regional or even larger-scale planning. We also need to better project future demands and trends. Harnessing the potential of geospatial technology to characterise, analyse and model landscapes will help with this although, in the end, you need to take those inputs and fold them into the basic planning process, which includes tough choices that cannot be relegated to a computer program.



Geospatial Educator Cary Chadwick (front row, third from right) leads a GPS field exercise as part of CLEAR's Geospatial Training Program.

## Turning knowledge into policy

A centre at the **University of Connecticut**, USA, is filling the gap in resources currently available to decision makers who are responsible for managing land use in order to improve the state of the natural world

**THERE ARE MANY** competing demands placed on land, such as industrialisation, urbanisation and farming. Striking a balance between growth promotion and natural resource protection can be difficult, but is achievable with reliable and relevant data. Land use planning is the term for the sector of public policies that encompass a range of disciplines in an attempt to regulate land use in an efficient and ethical way.

It is important for decision makers to be well-informed when taking action regarding land use. Land management practices have major consequences for natural resources including water, soil, plants and animals. For instance, a decision to carry out deforestation in an area can result in erosion if it is not carefully planned, which in turn can significantly impact local water quality – with numerous other implications for society.

Seeking to improve the information available about land use and to directly integrate knowledge into policy decisions is the Center for Land Use Education and Research (CLEAR). Chester Arnold, CLEAR Director for Outreach, explains the importance of enhancing research and knowledge in this area: "Land research is a good example of the importance of studying a topic at a number of different scales, from global to very local. Each scale has its own issues, research questions, practical applications and audience, which have to be integrated. This is not an easy task".

### BUILDING BLOCKS

CLEAR is based at the University of Connecticut's College of Agriculture and Natural Resources and is a partnership of the Department of Extension and the Department of Natural Resources and the Environment.

The Center evolved from a water quality outreach programme called Nonpoint Education for Municipal Officials (NEMO), which was established in 1991 and is still ongoing today. NEMO uses remote sensing data and geographic information systems (GIS) for educational purposes, targeting local land use decision makers. The mission of CLEAR is similar to that of NEMO: to provide information, education and assistance to land use decision makers in order to better manage growth and natural resource protection. With this goal in mind, CLEAR carries out a number of activities, including remote sensing research, developing landscape analysis tools and training tools, and conducting outreach education programmes.

### REACHING A LARGE AUDIENCE

Although the Center is relatively small and funded predominately – almost 75 per cent – by soft money grants that make its work plan somewhat uncertain year-to-year, its resources reach a large audience, including town planners, land use commissioners, private citizens and agency staff. "All of our faculty have good relationships with a number of individuals in state and federal agencies, who have often looked to us to help them evaluate or devise tools and outreach that will work at the local level," Arnold elaborates. Part of the reason CLEAR can reach such a large and diverse audience is that all of its tools and resources are freely available for all to use.

The Center's range of resources includes online mapping tools and applications – one particularly popular example is its Rain Garden smartphone application, which trains landscapers and homeowners to create and construct small stormwater treatment practices. CLEAR has also had success using web-geospatial technology, for example through Connecticut Environmental

## INTELLIGENCE

# CLEAR

CENTER FOR LAND USE  
EDUCATION AND RESEARCH

### OBJECTIVES

To provide information, education and assistance to land use decision makers, in support of balancing growth and natural resource protection. To achieve this goal, CLEAR conducts remote sensing research, develops landscape analysis tools and training and conducts outreach education programmes.

### KEY COLLABORATORS

**Dan Civco**, CLEAR Director for Research • **Michael Dietz**, Connecticut Nonpoint Education for Municipal Officials (CT NEMO) Program Director • **Juliana Barrett**, Coastal Ecologist, CT Sea Grant • **Dave Dickson**, National Programs Coordinator • **Kara Bonsack**, Communications & Design • **Cary Chadwick**, Geospatial Training Program Coordinator • **Emily Wilson**, Geospatial Educator • **Bruce Hyde**, Land Use Academy Director • **Tom Worthley**, Forestry Program, Forest Sustainability • **Robert Ricard**, Human Dimensions of Natural Resources and Phytotechnology • **Joel Stocker**, Geospatial Educator • **James Hurd**, Research Associate, Laboratory for Earth Resources Information Systems (LERIS)

### PARTNERS

Department of Extension • Department of Natural Resources and the Environment at the College of Agriculture and Natural Resources • The Connecticut Sea Grant College Program

### FUNDING

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**CHESTER (CHET) ARNOLD** has been with the University of Connecticut since 1987. During this time he has helped to create the Long Island Sound Study Public Outreach Program, the NEMO Program, National NEMO Network and CLEAR. He has authored several national award-winning papers and been Principal Investigator (PI) or co-PI on over US \$14 million of external grants. Arnold focuses on the integration of CLEAR research, geospatial tools and outreach programmes.

Conditions Online (CT ECO – [www.cteco.uconn.edu](http://www.cteco.uconn.edu)), a website that was set up in collaboration with the Connecticut Department of Energy and Environmental Protection. The site was established in 2010 to share environmental and natural resource information with the general public. In 2013, about 25,000 unique visitors used CT ECO roughly 44,000 times to access information and maps on Connecticut's natural resources. "The implications are powerful and the possibilities nearly endless, and we like to think that CLEAR has been a leading proponent of this type of technology-enabled outreach," notes Arnold.

### KNOWLEDGE IS POWER

One of the major initiatives that CLEAR has worked on in the past has been the Changing Landscape project, which charted changes in Connecticut's landscape from 1985 to 2010. The project serves as a rich source of information and has been used for local planning, state regulation and planning, environmental assessment, research and education. Arnold reveals the impact this information has on decision makers: "When you talk to municipal decision makers about their town, most of them will tune out when looking at models. However, an animated map of how their town's land use has changed since 1985 really gets their attention".

CLEAR also grabs the attention of decision makers and the general public by educating them on remote sensing and GIS techniques through outreach programmes. Research results and other data gathered by CLEAR are used in workshops and training sessions covering topics such as basic roles and responsibilities of land use officials, open space planning, stormwater management and climate resiliency. The Center also offers technical training in the use of geospatial technologies. "We train people on several different levels, from traditional desktop GIS technologies and global positioning systems (GPS) to new online mapping techniques, as well as the connections between all three. At all of these levels, the basic concepts and an



Depiction of Rain Garden App. Shown is the Plant Catalog Search screen (left) and home screen (right). The app guides the user through siting, sizing, designing, planting and maintaining a 'rain garden' stormwater practice.

understanding of what data are available is critical," explains Arnold.

### SPREADING SUCCESS

The strength of the Center can best be measured in the impact it has on land use practices, both in New England and nationally. For example, land use at the University of Connecticut campus and region has been changing in response to CLEAR's efforts. A number of low impact development and green infrastructure practices have been built in recent years, such as green roofs, rain gardens and pervious pavements.

Indeed, starting with the NEMO programme, the researchers have been working alongside decision makers statewide for nearly 25 years to influence land use practices and regulations, which has proven fruitful to date. "Many towns have made significant changes that are starting to pay off in terms of on-the-ground results," Arnold compliments. "Through the creation of the National NEMO Network, and the great work of our colleagues in NEMO programmes in other states, we feel that we've had a national impact on land use policies and practices."



CLEAR's Mike Dietz (red sweatshirt) supervises students in the construction of a rain garden.

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