

tee comprised of representatives from the watershed towns. These programs expand the NEMO model to include additional GIS data layers such as parcel information, additional analyses such as forest fragmentation, and visualization techniques like three-dimensional imagery. The philosophy of these projects is that watershed management is largely about land-use management, and therefore, must encompass data and issues outside of those traditionally considered central to a "water" program. As a result, these projects also focus on cultural, historical, and land resources.

What Education Can Accomplish

The project's track record shows that effective, carefully planned educational programs conducted by professional educators can catalyze and facilitate changes in local land-use plans, programs, and policies. The programs have moved local communities to initiate watershed management plans, plan and acquire open-space, create inter-town "conservation compacts," change subdivision design, and change town road and storm drain maintenance practices. Various unanticipated "spin-off" impacts also have occurred, including award-winning school projects, research projects, implementation of town GIS systems, and grants to local communities.

At the state level, NEMO has found its way into several key documents, including the "319" nonpoint and "6217" coastal nonpoint source plans and the Connecticut Plan of Conservation and Development. More importantly, NEMO staff see a discernable shift in the stance of many local land-use officials in Connecticut, which can best be summarized as a change in the tenor of questions from an emphasis on "why" to an emphasis on "how." In other words, many communities are accepting the basic tenets of the land use-water resource-community character relationship and asking for assistance in getting on with the business of improving their planning, zoning, and site design.

How To Contact NEMO

Want to know more? You can write to the NEMO project at the University of Connecticut CES, 1066 Saybrook Rd., Box 70, Haddam, CT 06438-0070 USA, call 1-860-345-4511, or visit the Web site at <http://www.canr.uconn.edu/ces/nemo>. The site has an electronic order form for publications, updates, and maps; downloadable slide presentations; and information on GIS.

National Network

The NEMO project is working with multi-agency coalitions in 17 states to adapt the model to their area and natural resource issues. Project staff have conducted more than 20 out-of-state workshops, assisting these coalitions in assessing the issues, target audiences, opportunities, and barriers to their own natural resource solutions. Far from "cloning" a successful program, these projects are true adaptations of NEMO with only three principles in common:

- they are educational,
- they target land-use decision makers, and
- they use technology as an educational tool.

Otherwise, the coalitions can choose from a number of topics and approaches. For example, the Pacific Northwest may develop a "salmon habitat" educational model; the Southeast could forge a "wetlands" approach; and northern New England could become known for a "lake" program.

The potential of this *ad hoc* national network of NEMO-inspired projects is such that in December 1997, representatives from USDA, the U.S. Environmental Protection Agency (EPA), the National Aeronautics and Space Administration, and the National Oceanic and Atmospheric Administration formed the National NEMO Network Interagency Work Group to explore mechanisms for collaborative support. As a first step, the EPA Office of Water, Coastal Management Branch has funded NEMO to conduct four "scoping" workshops for the newest class of National Estuary Programs.

The Charge for the Future

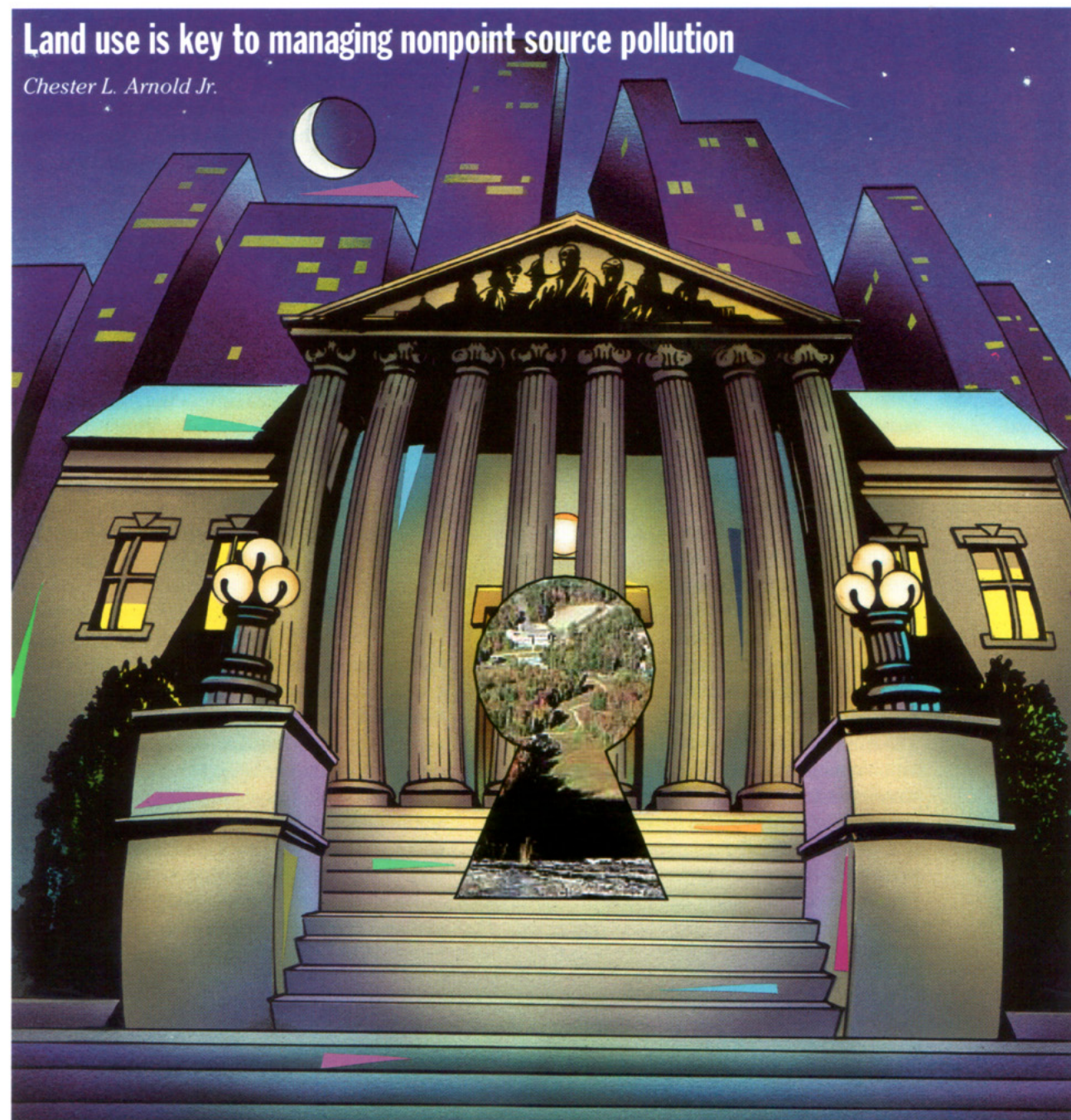
Everybody is beginning to recognize the ultimate importance of improving land-use decision making. In agencies from the EPA to The Nature Conservancy, embodied in initiatives from the Clean Water Action Plan to American Heritage Rivers, and in buzzwords including "sustainable growth," "anti-sprawl," and "watershed management," the common denominator is local land use. Water resource professionals must team with land-use planners, landscape architects, and others to confront the time-consuming, messy realities of providing meaningful assistance to the nation's communities. The key to assisting communities is education, but *on their terms and within the context of the way they do business*. NEMO, one approach to doing this, blends education and technology in a program that links natural resources, land-use planning, and long-term community health.

Chester L. Arnold Jr. is water quality educator and NEMO project director at the University of Connecticut Cooperative Extension System in Haddam.

Educating Municipalities

Land use is key to managing nonpoint source pollution

Chester L. Arnold Jr.



The first 20 years of nonpoint source pollution programs have been a mixed success because characterizing, measuring, and treating such a diffuse problem is technically difficult. But the approaches used to handle nonpoint source pollution are partly to blame as well. While many "water" professionals – researchers, engineers, regulators, environmentalists, and others – have realized nonpoint source pollution is firmly rooted in land use, they have not, as a group, fully embraced all the ramifications.



NEMO

Land-use planning, not development, will make the difference in curbing nonpoint source pollution.

Land use is local, political, nonlinear and multi-dimensional. Land use in the United States is largely decided locally by elected and appointed officials serving on county and municipal boards and commissions. These officials are not chosen for their knowledge of natural resource protection, and in many cases, they have little or no professional staff to support them. These officials must weigh a complex mix of factors as they decide the future course of their communities on a case-by-case, project-by-project basis. All of these complicating (some would say intimidating) factors make designing effective nonpoint source programs exceedingly difficult.

As a result, local land-use decision makers have been largely left out of the nonpoint source equation. The emphasis on agricultural nonpoint source pollution over the last two decades, while obviously warranted, has not served as a particularly effective springboard to confronting the complexities of land use. Farming is a land use; however, agricultural nonpoint source programs are much more about land management than land planning, with decisions made by a well-defined, easily identified group.

The Role of Technology

Best management practices (BMPs), particularly structural BMPs, came to the fore as the solution for nonpoint source pollution. As a technology-based approach, BMPs were (and are) accepted by water professionals with a much higher comfort level than the planning-based approaches needed for communities.

Technology can help, but it is not the ultimate answer to coping with the environmental impact of poorly planned development. The environmental, cultural, social, and economic impacts of suburban sprawl cannot be addressed at the site level, yet this is precisely where technology-based approaches focus the attention of local officials. National statistics indicate that nonpoint source pollution problems

in urban and suburban areas are growing, and other natural resource issues related to sprawl, such as forest fragmentation, are on the rise.

Highly touted initiatives, such as the expansion of the stormwater discharge permitting program and the increased use of total maximum daily loads (TMDLs), hold promise, but these are permitting systems, not solutions. How will communities meet these permits, and who will help them consider their options? A concerted effort is needed to provide communities with information, easily used tools, and educational programs that enable them to do a better job planning and developing their communities.

Education as a BMP

The Nonpoint Education for Municipal Officials (NEMO) project was created in 1991 by the University of Connecticut Cooperative Extension System, in partnership with two other branches of the university, the Department of Natural Resources Management and Engineering and the Connecticut Sea Grant Program. NEMO's principal funding comes from the U.S. Department of Agriculture (USDA) Cooperative Research, Education and Extension Service.

The project was originally conceived as a pilot to explore the potential of using advanced technologies, such as geographic information systems (GIS), remote sensing (RS), and the World Wide Web, as tools to educate local decision makers about the links between land use and water quality. Seven years later, NEMO encompasses a number of educational programs on the town and watershed level in Connecticut, and is at the center of a growing network of projects around the country founded on the NEMO model.

The world in which county and municipal land-use commissioners operate presents a number of thorny problems: high turnover, complex issues, a narrow focus on their regulatory responsibilities, and, most importantly, the inability to track cumulative impacts of the case-by-case land-use decisions made on a daily basis.

Reaching the Target Audience

To surmount the problems facing local decision makers, NEMO uses a combination of new and old educational tools. GIS and RS images enable NEMO staff to present information on land use in a succinct and intuitive way. Simple and colorful images of land cover, hydrography, soils, and other key environmental data go a long way toward explaining concepts like the workings of a watershed, the importance of riparian buffers, and effects of land use on water resource health.

The project is not solely focused on the present, however. One objective is to enable local officials to visualize future impacts of their current land-use policies and plans. For instance, a zoning-based "build-out" analysis contrasts current levels of impervious surface (known to be a reliable indicator of the potential for water quality degradation) with future levels estimated from zoning regulations.

Increasingly, the project is using the World Wide Web to disseminate information. Last year, the NEMO Web site had about 5000 visitors, and generated about 200 publication requests, including requests from nine foreign countries. Of particular interest to the project team is the fusion of the Web and GIS technologies that will soon allow people to access and manipulate GIS maps knowing only how to use an Internet browser. As a precursor to this goal, in 1997 the project created a series of six watershed and land-cover maps for each of the 169 municipalities in Connecticut; a sample series, with explanations and suggestions for their use, is posted on the project Web site.

The map series was accompanied by an intensive series of regional educational workshops — part of the "old" educational techniques. Because information is not education, NEMO conducts workshops that provide the give-and-take necessary for real learning to take place. NEMO staff give approximately 150 workshops annually to municipal audiences, including both the "basic" land use-water quality program and a number of follow-up programs ranging from impervious surface reduction to open-space planning.

The emphasis of all these programs is on comprehensive, natural resource-based planning as the most effective (and cost-effective) way to protect water resources. Planning recommendations are then followed by site design considerations, focusing primarily on reducing

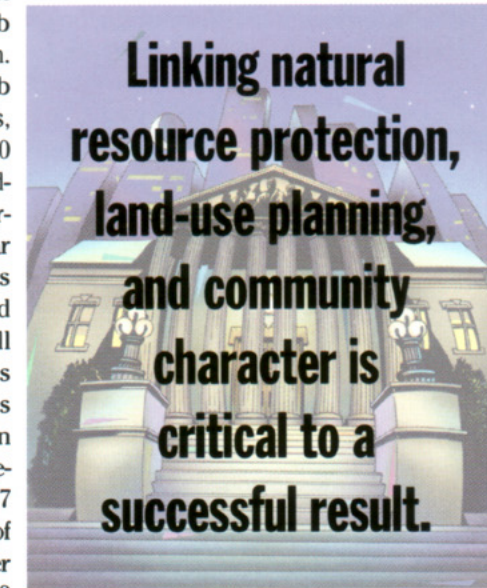
impervious surfaces, promoting infiltration, and using vegetated areas. Only then are more structural BMPs reviewed, again, with an emphasis on infiltration and vegetated structures.

Interrelated Issues

One successful and unintended facet of the basic NEMO presentation is that by addressing water quality as a land-use issue with planning and design solutions, the links to other issues in the community emerge. For instance, a meaningful discussion on reducing road widths cannot occur without getting into issues of traffic safety, neighborhood character, and public works budgets. While this consequence may seem to complicate matters, it helps to ensure that water resource protection is integrated into the real-life local land-use process. Without that integration, local officials are likely to view nonpoint source pollution issues

as the environmental "flavor of month," soon to be forgotten. Linking natural resource protection, land-use planning, and community character is critical to a successful result.

NEMO also is involved in a number of multitown watershed projects, particularly in the lower Connecticut River valley. The watershed programs are based on a partnership between a team of natural resource experts from cooperative extension and other organizations and a watershed commit-



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Nemo staff conduct about 150 workshops annually to municipal audiences.