
# THE USE OF GIS AS AN EDUCATIONAL TOOL TO SUPPORT BETTER LAND USE DECISIONS AT THE LOCAL LEVEL

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## GIS AND WATER RESOURCES PROTECTION

The use of geographic information system (GIS) and remote sensing (RS) technologies for natural resource protection applications has been increasing rapidly at the federal and state levels. The prevalent use has been for research and analysis; resource mapping, landscape analysis, and land cover-driven estimates of nonpoint source pollutant loadings are just some examples with relevance to coastal zone management.

The use of GIS at the local level has not yet caught up with this surge of applications. Many communities still have no access to GIS; others are reluctant to revisit its use after bad experiences during the first flush of enthusiasm for GIS in the mid-1980's. Nevertheless, GIS use is growing at the local level -- whether you define "local" as municipal, township, or county. However, the overwhelming use of the technology is for administrative applications such as property tax tracking or school bus routing. Natural resource-related applications are still relatively rare.

Such applications are sorely needed. According to the latest Environmental Protection Agency statistics, nonpoint source water pollution is the number one water quality problem in the United States, and suburban/urban runoff is the number one source of pollutants to our coastal water bodies. Nonpoint pollution, and other threats to coastal resources such as habitat destruction and fragmentation, are rooted in land use policies and practices that are, with few exceptions, determined at the local level. GIS and RS technologies need to be added to the list of tools that local governments and land owners can access as they develop and implement these policies and practices.

## THE NEMO PROJECT

The University of Connecticut Cooperative Extension, with the help of many partners, is involved in a series of educational projects that try to bridge the gap between natural resource protection and GIS technology at the local level. Collectively entitled NEMO, for *Nonpoint Education for Municipal Officials*, these projects make use of GIS and RS technologies to educate local decision makers on the connections between land use and water quality.

NEMO projects are nonregulatory, educational efforts targeted at local land use decision makers -- primarily volunteer members of land use boards and commissions (e.g., zoning, planning, wetlands, conservation). Easily-obtained GIS coverages like watershed boundaries and simple hydrography are used to illustrate watershed principles. Then, RS-derived land cover data is

displayed in GIS maps, and used in conjunction with local photographs to relate various types of land use with the nonpoint source pollutants and problems with which they are commonly associated. Finally, a zoning-based "build-out" analysis is performed, contrasting current and future levels of impervious surface, which is recognized as a good indicator of urbanization and the impacts of urbanization on
water resource health.

GIS maps are never used "as is" in NEMO presentations. To increase their effectiveness as educational tools, NEMO GIS images are imported into computer graphics programs, allowing the project team to simplify and label images, and combine them with photos, text, and other graphics.

## Beyond NEMO: The Tidelands Watershed Projects

Since 1993, the NEMO project has collaborated with The Nature Conservancy, the Environmental Protection Agency and the U.S. Fish and Wildlife Service on two watershed projects in the lower Connecticut River valley. These projects go well beyond the basic NEMO program, in the level of involvement with the communities, the acquisition of GIS information, and the analyses performed with that data.

Perhaps the most interesting and useful of these data are the individual parcels (property lines) within the watershed boundaries. The parcel layer is being linked to town tax assessors' databases, so that lists of property owners meeting a certain requirement -- say, those living along a stream, or those owning over 10 acres of forested land -- can be identified for educational presentations or mailings.

In addition, the parcel information is being combined with protected open space (parks, preserves, easements), various soil attributes, and other data to create several key maps in support of watershed planning. One such map is *priority conservation areas*, which include aquatic, terrestrial and community (e.g., historic) resource areas; another is *land most suitable for development*, based on soil type, slope, and proximity to existing roads. A comparison of these maps shows where potential conflicts may arise between economic growth and natural resource protection, and where no such conflicts exist. Lastly, the watershed team is working on a zoning-based *forest fragmentation build-out analyses* for the priority conservation areas, which will contrast current and future levels of large unfragmented forest land; we see this as the habitat equivalent of the NEMO impervious surface (water quality) build-out analyses.

## Future Uses of GIS and RS for Water Resource Protection

In the future, we will continue to develop new uses for parcel information, which is proving an invaluable resource. More refined build-out analyses are also a goal, for instance, one that contrasts future levels of impervious cover and/or open space between traditional and cluster subdivision scenarios.

Although NEMO has always avoided the promotion of GIS technology per se, new trends in the industry make it more feasible to assist local interests to directly connect with GIS information. Of particular note is the increasing interaction between World Wide Web and GIS systems; for instance, the University of Connecticut *MAGIC* Web site contains extensive downloadable GIS coverages that are available at no cost and can be used in a variety of PC and work station applications. This evolution in the industry has led to our first effort to train local officials in the use of GIS software. After familiarizing the class with the basics and explaining the use of the *MAGIC* site, natural resource management applications will be emphasized with examples drawn from NEMO and other projects. We also envision World Wide Web-driven information kiosks in high-profile town locations (town hall, library, schools) that would enable a wider cross-section of citizens in our watershed communities to review project maps and information.

Our watershed projects have convinced us of the practically unlimited potential for *carefully thought-out, prepared and presented* GIS information. Making maps for their own sake can do as much harm as good, and the inherent danger of GIS technology is the confusing overloading of maps with multiple coverages. However, maps created with sound logic and a definite purpose can be powerful unifying tools to enable local officials to take a broader, watershed/ecosystem approach as they guide land use. The presentation of information to this critical audience demands as much care, planning and professionalism as any research or analytical application.