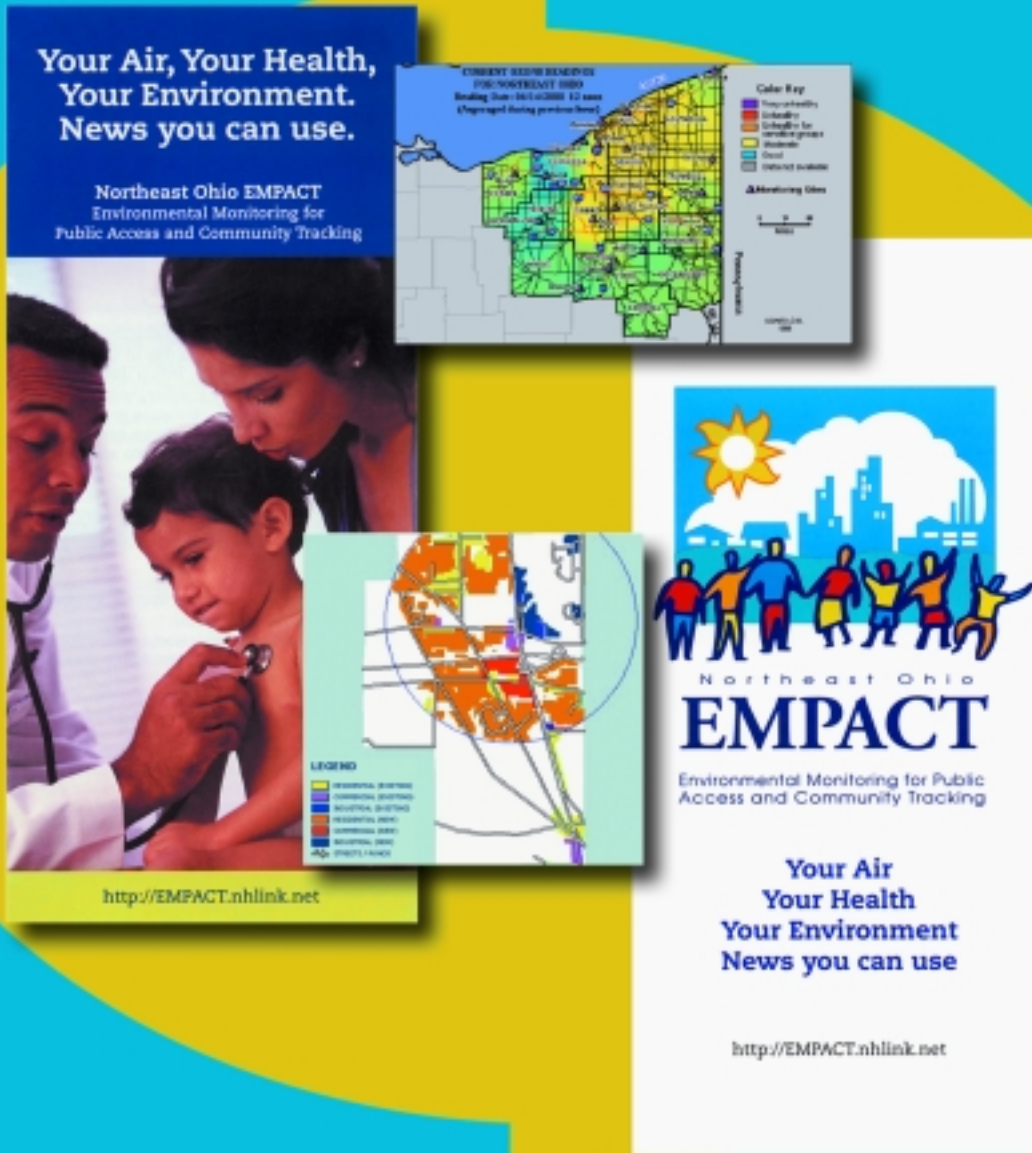


# Urban Sprawl Modeling, Air Quality Monitoring, and Risk Communication: The Northeast Ohio Project



E M P A C T

Environmental Monitoring for Public Access  
& Community Tracking

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# Urban Sprawl Modeling, Air Quality Monitoring, And Risk Communication: The Northeast Ohio Project

United States Environmental Protection Agency  
Office of Research and Development  
National Risk Management Research Laboratory  
Cincinnati, OH 45268



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## LIST OF ABBREVIATIONS

CNA	critical natural areas
CO	carbon monoxide
EDC	Earth Day Coalition
EMPACT	Environmental Monitoring for Public Access and Community Tracking
EPA	U.S. Environmental Protection Agency
GIS	geographic information system
IIS	Microsoft Internet Information Services
NAAQS	National Ambient Air Quality Standards
NAMS	national air monitoring stations
NEOAIR	Northeast Ohio Air Quality Online
NEOEDEN	Northeast Ohio Environmental Data Exchange Networks
NO <sub>2</sub>	nitrogen dioxide
PAMS	photochemical assessment monitoring stations
PM	particulate matter
PSA	public service announcement
SLAMS	state and local air monitoring stations
SO <sub>2</sub>	sulfur dioxide
VOC	volatile organic compound



# 1

## URBAN SPRAWL MODELING, AIR QUALITY MONITORING, AND RISK COMMUNICATION: THE NORTHEAST OHIO PROJECT

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### 1.1 INTRODUCTION

Communicating environmental and health risks to the public has increasingly become a responsibility of local and state officials and private groups involved in environmental monitoring. People have come to expect access to more information about local air quality, for example, and advances in environmental monitoring and computer technology (such as the Internet) have made timely—sometimes daily—communication of environmental conditions possible.

One program that addresses these new expectations and options is the Northeast Ohio Urban Sprawl Modeling, Air Quality Monitoring, and Communications Project (hereafter called the Northeast Ohio Project). The Project provides local environmental and health information useful to residents, local officials, community planners, and others in a 15-county region in northeast Ohio that includes the greater Cleveland metropolitan area. Focus groups consisting of staff from state and local government agencies and representatives of neighborhood, civic, religious, academic, development, banking, business, and environmental groups had previously identified urban sprawl and environmental quality as the top regional problems. The Northeast Ohio Project addresses the environmental impacts posed by urban sprawl (the haphazard spreading of low-density development beyond a city's boundaries), provides near-real-time data on air quality as it affects individual and public health, and conducts an extensive community outreach program on sprawl and air quality issues.

The Northeast Ohio Project was part of EPA's 1996 to 2002 Environmental Monitoring for Public Access and Community Tracking (EMPACT) Program, which helped communities provide the public with time-relevant environmental and associated health risk information. Local governments involved in the program identify and use effective methods to collect, manage, and distribute environmental health information in a timely manner to the public. Handbooks such as this one then describe the experiences of municipalities that have successfully accomplished these data collection and communication objectives so that other communities can learn from these projects.

### 1.2 HOW TO USE THIS HANDBOOK

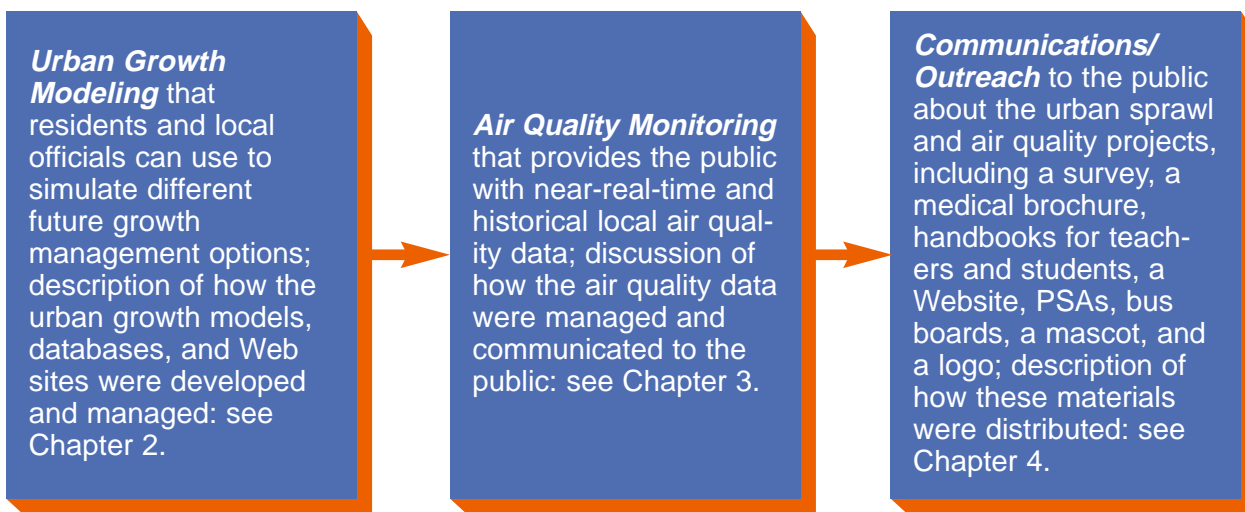
This handbook highlights the key components of the Northeast Ohio Project. Local officials and community groups from other municipalities can use this information as guidance for establishing or expanding their own environmental programs; residents of northeast Ohio can use this handbook to learn about and access the Project's materials on urban sprawl and air quality in their area. The handbook is organized as described below.

This handbook covers the three areas addressed by the Northeast Ohio Project:

- *Urban sprawl modeling (Chapter 2)*. Urban sprawl has been associated with a number of negative community impacts, including reduced air and water quality, traffic congestion, loss of productive agricultural areas and natural habitat, and increased costs for new services such as schools and water treatment systems. The Northeast Ohio Project developed case studies and models, available through the Internet, so that residents and local officials can simulate potential future development and better understand the implications of different growth management policies and programs. The modeling results can be used for more comprehensive land-use planning efforts. In addition to describing the case studies and models, Chapter 2 explains how the Project developed and managed the models and its ecological and urban sprawl database and Web site.

- **Air quality monitoring (Chapter 3).** Through a Web site, the Project provides the public with regional near-real-time and historical data on levels of ozone and other pollutants. This information helps people take appropriate actions to protect their health and the environment when air quality is poor. This chapter describes the general process of air quality monitoring and explains how the Northeast Ohio Project manages and reports its air quality data.
- **Communications/outreach (Chapter 4).** In addition to posting information on Web sites, the Northeast Ohio Project has conducted communications and outreach efforts through the media, including a survey, medical and promotional brochures, handbooks for teachers and students, public service announcements (PSAs) and news releases, bus boards, a mascot, and a logo. The Project has distributed these materials to the general public through community events and medical offices, TV and radio stations, newspapers, schools, transit authorities, libraries, recreation centers, and camps.

### 1.2.1 ROAD MAP



### 1.2.2 FREQUENTLY ASKED QUESTIONS

Whether you are just beginning to think about a program to address urban sprawl or air quality issues or are in the process of expanding your program, the following frequently asked questions may be useful.

**Q:** *What is urban sprawl?*

**A:** Urban sprawl is the extension of low-density residential, commercial, and/or industrial development into rural areas beyond a city's boundaries that occurs with little or no prior planning on the community or regional level. Several local and/or regional problems often occur as a result of sprawl, including degradation of air and water quality, increased traffic congestion, the decline of inner cities, higher costs for new services (e.g., roads, schools, water systems), and loss of community character. See Chapter 2, Section 2.2, for more information about urban sprawl.

**Q:** *What is urban growth modeling?*

**A:** Urban growth modeling simulates potential future development scenarios and growth management options. Such simulation can help you evaluate the impacts of growth on land and other resource use. The growth management options that a model generates can show, for example, how much environmentally sensitive area or farmland can be saved by managing growth rather than allowing sprawl to occur. See Chapter 2, Section 2.3, for more on urban growth modeling.

*Q: What factors should be considered when using or developing an urban growth model?*

*A:* The Northeast Ohio Project found five factors to be particularly important when developing its urban growth models: cost, ability to work with available data, accessibility by the public or other audience, understandability, and model validity. See Chapter 2, Section 2.4, for more information on these factors.

*Q: Why is GIS useful for environmental modeling?*

*A:* GIS (geographic information system) technology lets users overlay maps with several different kinds of information on one another, creating new, more comprehensive maps. GIS provides a way to produce visual displays of potential future land uses, population growth, and related environmental and other impacts. The Northeast Ohio Project has used GIS to compare different future development scenarios and growth management strategies and their effects. See Chapter 2, Section 2.4.1, for more on using GIS.

*Q: What types of data might be useful for developing an urban growth model?*

*A:* The Northeast Ohio Project based its urban growth models on several types of environmental and geospatial information, including: aquatic and terrestrial species/habitats, brownfields (i.e., abandoned or underused commercial or industrial sites), demographics, flood plains, geology/soils, hydrology/surface water, land use/cover, planning/zoning, pollution hazard, TIGER/Census, water quality, and wetlands data. See Chapter 2, Section 2.5.4, for more information on types of useful data.

*Q: What are some of the ways that an urban growth model can demonstrate the effects of different development patterns?*

*A:* Urban growth models often use build-out scenarios (e.g., projections of population growth) for an area as one key set of data to help determine how much growth could occur (e.g., in terms of population density) and where it could occur (e.g., in terms of land areas used). Urban growth models can also help users identify—and determine the acreage of—the most environmentally sensitive lands and farmland that will be lost to development or saved through certain growth management practices. As is the case with the Northeast Ohio Project model, these models can then show different ways of managing growth, such as (1) minimizing the amount of development allowed on environmentally sensitive lands and/or farmlands or (2) designating urban growth boundaries beyond which development can be restricted in various ways (e.g., requiring cluster development, providing state funds only for development within the boundary). See Chapter 2, Section 2.5, for more information on how the Northeast Ohio Project developed its growth models.

*Q: What is time-relevant air quality monitoring?*

*A:* It has become possible to report certain air quality information in near real time (e.g., hourly from 10 a.m. to 7 p.m.) and show trends, such as changes over a 24-hour period. EPA's AirNow program and the Northeast Ohio Air Quality Monitoring Project provide such information. Having such time-relevant information allows people to know when air quality in their area may be harmful and to take actions to protect their health during that time. See Chapter 3, Section 3.1, for more information on time-relevant air quality monitoring.

*Q: How can a time-relevant air quality monitoring project be developed and air monitoring data managed?*

*A:* Often, air quality monitoring stations with data management systems already in place to meet existing regulations (e.g., for the Clean Air Act) can provide time-relevant data as well. Some municipalities that decide to provide time-relevant data use this opportunity to update some of their systems (e.g., computer hardware and software). Air pollutants typically monitored and reported (e.g., in the Northeast Ohio Air Quality Monitoring Project) include ozone, sulfur dioxide, carbon monoxide, particulate matter, and others. See Chapter 3, Sections 3.2 and 3.3, for further details regarding the development and management of air quality monitoring programs.

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*Q: How can urban growth models and air quality monitoring data be communicated to the public?*

*A:* Web sites have become popular tools for reporting and communicating environmental information to the public and other audiences. The Northeast Ohio Project has developed several Web sites, including one that features the Project’s “Urban Growth Simulator,” which lets users develop and compare different development scenarios. Another Project Web site provides air quality information and allows users to view graphs, maps, and text data.

In addition to Web sites, it is often useful to develop other avenues of communication, since not everyone has a computer and ready access to the Internet. The Northeast Ohio Project’s Communications Workgroup has developed a number of outreach materials, including handbooks on urban sprawl and air quality for teachers and students, a brochure on the health effects of air quality (available to patients in doctors’ offices), bus boards, PSAs for both TV and radio, a promotional brochure, a logo, and a mascot. Consider developing similar outreach materials in more than one language if doing so would be appropriate for your audience. See Chapter 4 for detailed information on the Northeast Ohio Project’s communication and outreach efforts for urban sprawl and air quality monitoring.



## 2.1 INTRODUCTION

A key goal of the Northeast Ohio Urban Sprawl Modeling Project was to create a tool accessible to and usable by the general public so that any citizen could simulate alternative future growth patterns in his or her community. Achieving this goal involved developing a model that could be applied to a study area within a 15-county region in northeast Ohio (the 15 counties are Cuyahoga, Geauga, Lake, Lorain, Medina, Ashtabula, Portage, Stark, Summit, Wayne, Mahoning, Trumbull, Columbiana, Carroll, and Holmes Counties), as well as to sub-regions of that area.

Northeast Ohio has undergone significant urban development in recent years. The potential negative effects of this growth made clear the need for better planning. Seeking an appropriate growth management tool for northeast Ohio, researchers used an EPA EMPACT grant to examine urbanization as an environmental issue. The researchers reviewed existing environmental analysis and urban growth models and made a recommendation for a growth modeling program for the region.

## 2.2 WHAT IS URBAN SPRAWL AND HOW DOES IT AFFECT COMMUNITIES?

Urban sprawl is the haphazard spreading of low-density residential, commercial, and/or industrial development into rural areas near cities. Sprawling development often results in several potential community and regional problems, including:

- Increased and insufficient land use and energy consumption
- Increased traffic congestion.
- Negative environmental effects, such as reduced air and water quality and loss of open space and other natural gases
- Higher public costs for new facilities and services for the newly developed areas (e.g., road construction, sewer/water systems).
- Loss of community character.
- The decline of inner cities as people leave them for sprawled areas.

See <http://www.smartgrowth.org> for more information on these issues. In recent years, urban sprawl has been the focus of many geographic, economic, and sociological analyses. For example, a 1998 report entitled *Paying the Costs of Sprawl: Using Fair-Share Costing To Control Sprawl* describes the fiscal and ecological costs of sprawl (<http://www.sustainable.doe.gov/articles/sprawl.shtml>, 2002). Another study, *Living on the Edge*, by researchers from Northern Illinois University and the American Farmland Trust, found that “scatter” development leads to increased emergency response times for police, ambulances, and firefighters that may exceed national standards (<http://farmlandinfo.org/cae/scatter/e-loetoc.html>, 1999).

Americans now rank concerns over sprawl and growth as high as traditional issues such as crime, according to a study by the Pew Center for Civic Journalism. Survey participants in four cities (Denver, Tampa, San Francisco, and Philadelphia) listed sprawl and traffic congestion as major community concerns. Sixty percent of the participants in Denver cited sprawl as a top concern in an open-ended question, as did 47 percent in San Francisco and 33 percent in Tampa ([http://www.pewcenter.org/about/pr\\_ST2000.html](http://www.pewcenter.org/about/pr_ST2000.html), 2000).

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Around Cleveland, Ohio, land occupied by residential, commercial, and industrial uses increased by 33 percent while population decreased by 11 percent from 1970 to 2001 (*Urban Sprawl in Northeast Ohio: A Handbook for Educators and Their Students in Grades 4–8*, produced by the Northeast Ohio Project).

To prevent or control urban sprawl, planners, public administrators, public officials, environmentalists, and others have begun to monitor and seek to improve land-use decisions and regulations. For example, comprehensive (or master) planning is increasingly being used to help communities grow in ways that they choose rather than undergoing random and undesirable development. Also, zoning changes have been recommended for many communities to discourage sprawl and instead encourage smart growth. Simply defined, smart growth involves better planning of economic and community growth in balance with local natural and historical resources. Achieving better community growth might involve concentrating development where infrastructure (schools, roads, sewer lines, transit systems) is already in place; reinvesting in older communities instead of abandoning them to create new ones (through efforts such as EPA's brownfields program); and preserving open space and community character, thus creating more liveable communities with a higher quality of life (<http://www.nrdc.org/cities/smartGrowth/nsolve.asp>, 2001). Assessing the effectiveness of smart growth planning tools, however, often requires relatively long-term evaluation. Therefore, some decision-makers and citizens have turned to urban growth modeling to improve and quicken the process of evaluating planning efforts and smart growth strategies.

## **2.3 WHAT IS URBAN GROWTH MODELING AND HOW CAN IT BE USED?**

Urban growth modeling uses actual data (when available) and theoretical assumptions about land uses and environmental effects to produce growth-related scenarios (e.g., build-out analyses) for a given area. Using a computer program carefully designed to simulate as closely as possible the actual process of past, current, and potential future development, urban growth modeling can produce alternative development possibilities, displaying the results in various tabular, map, or other formats.

For some time, the ability to apply theoretical growth models to actual land-use forecasting was limited by the expense of assembling, managing, and manipulating the large quantities of data required for such projects. However, the recent development of and improvements to computerized digital geospatial databases and the ability to manage and manipulate these databases using tools such as GIS has made it easier for citizens and local officials to use land-use forecasting, including urban growth modeling.

By allowing current and future land uses to be examined, urban growth modeling can play an important role in evaluating the impacts of growth on land and water resources. Additionally, modeling can provide communities with a better understanding of the implications of different growth management policies and programs and contribute to more comprehensive land use and resource planning efforts.

## **2.4 HOW CAN AN URBAN GROWTH MODEL BE DEVELOPED?**

Clearly identifying the goals that you want a growth management program to achieve is one of the first and most important steps in choosing an appropriate urban growth model. For the Northeast Ohio Urban Sprawl Modeling Project, a major goal was to limit negative environmental impacts associated with urban development. Thus researchers reviewed various environmental analysis computer models and approaches as they relate to urban growth issues in northeast Ohio.

A literature review can be found on the EMPACT: Urban Sprawl in Northeast Ohio Web site ([http://gis.kent.edu/gis/empact/lit\\_home.htm](http://gis.kent.edu/gis/empact/lit_home.htm)).

There are many factors to consider when developing a new urban growth model or using an existing one. For the Northeast Ohio Project, the following five factors (roughly in order of importance) were used to evaluate 10 fully operational noncommercial (academic) and commercial models:

- Cost.
- Ability to work with available data.
- Ability to reach a large audience (accessibility).
- Understandability.
- Theoretical soundness (validity).

These five factors are discussed below.

*Costs* associated with an urban growth modeling program include initial purchase (or development), installation, and maintenance. Cost is often the initial consideration in developing a new model or adapting an existing modeling program. For example, although several of the commercial modeling packages fit the criteria of the Northeast Ohio Urban Sprawl Modeling Project, they fell outside the budget. Additionally, while some commercial packages the Project considered could be custom-made, the source code would still have been owned by the manufacturing company: the user would have needed to work with the company each time a change needed to be made. This would have increased cost and made it more difficult to make the program fully accessible to the public.

*Ability of the model to work with available data.* The type of data a model uses must match the data available for the study area and the types of information that the community wants to evaluate. For the Northeast Ohio Project, it was important to have a model that worked with the existing GIS data set and was adaptable to a specific study area within the 15-county northeast Ohio region so that the growth scenarios could be modified to meet different local conditions or requirements.

*Accessibility and understandability* facilitate the key goal of making the model fully available to the public, allowing citizens and public officials to view the impacts of various development policy choices. Therefore the Project's modeling program was to be made accessible via the Internet, which meant that the model had to be written in a programming language that was easily or directly adaptable for use on the Web. This requirement excluded all packages that used copyrighted code. The model, including its assumptions and operations, also needed to be easily understood by non-technical users.

The *theoretical soundness* of a model determines its usefulness in providing accurate, valid alternative growth scenarios. Theoretical soundness, however, is almost inevitably inversely related to understandability. That is, the more sound a system is, the more complex (and thus more difficult to understand) it usually is. When choosing a model, one must weigh the degree of accuracy with the need for simplicity.

## 2.4.1 USING GIS IN URBAN GROWTH MODELING

GIS is an innovative tool that can demonstrate current and future development conditions and simulate possible growth scenarios, based on defined criteria and assumptions for development. By visually displaying land and resource use alternatives, including potential environmental and cultural resource impacts, economic implications, and potential use conflicts, GIS can help planners, public officials, and citizens better manage growth.

GIS can combine layers of diverse information as geospatial data themes. It also lets users examine a broad range of alternatives. An increasing number of municipalities, counties, state and federal government agencies, and private groups are using GIS to help them make rational, ecologically sound decisions about resource development, impact mitigation, and other environmental management issues.

When using GIS, be aware that creating a comprehensive GIS-based environmental database can often involve a significant amount of time and money unless you can obtain already-existing data that are current, easily interpreted, and cost-effective. Even when needed data do exist, they may be difficult to retrieve because they are fragmented in different systems and databases managed by several public, nonprofit, and private agencies.

## 2.5 HOW THE NORTHEAST OHIO URBAN GROWTH MODEL WAS DEVELOPED

After selecting an urban growth modeling program, the Northeast Ohio Urban Sprawl Modeling Project developed two case studies to demonstrate the program's applicability on a regional and sub-regional level. These studies show the usefulness of relatively simple simulation modeling and illustrate ways to identify or develop a model that is suitable for different levels of detail (i.e., both the regional and sub-regional levels). The Project also developed a more detailed Urban Growth Simulator. Both the case studies and the Urban Growth Simulator are described below.

### 2.5.1 THE REGIONAL CASE STUDY

The *regional case study* of the Northeast Ohio Urban Sprawl Modeling Project was developed by EcoCity Cleveland with assistance from researchers at Cleveland State University. It presents one possible land-use development pattern for a seven-county region, based on various build-out scenarios. The regional case study model is essentially a simplified sustainability study for the area. Its purpose is to show what residential urban expansion in the region could look like based on a simple set of assumptions about where growth will occur. (See Figure 2-1, a map that shows one possible scenario for projected population density and land use based on a set of assumptions.) The program should not be used as a general guide to urban growth planning.

Users can download the program used for this case study from the Urban Sprawl in Northeast Ohio Web site ([http://gis.kent.edu/gis/empact/dwl\\_home.htm](http://gis.kent.edu/gis/empact/dwl_home.htm)). They can also order it on CD-ROM from one of the study's developers.

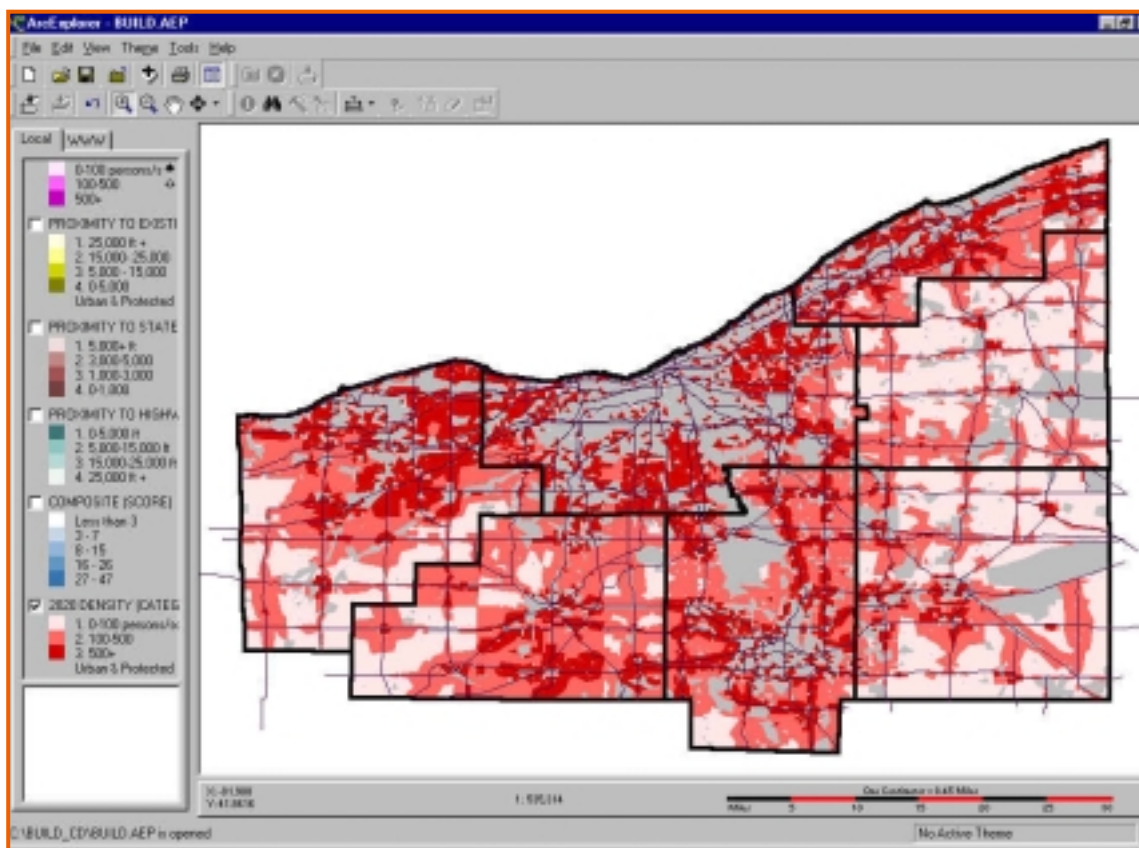


Figure 2-1. Regional case study simulation. Using the ArcExplorer program, researchers estimated northeast Ohio's population densities for 2020. A comparison of the 1990 population density map to this 2020 map indicates that urban sprawl will continue in the region if additional growth management strategies are not implemented.



## 2.5.2 THE SUB-REGIONAL CASE STUDY

The *sub-regional case study*, like the regional study, is meant to give local citizens and officials a better understanding of the implications of different growth policies. However the sub-regional case study examines the impacts of urban sprawl on farmlands and environmentally critical areas at a more local level—a single county in northeast Ohio (Portage County). The case study is built on a model, called the Portage Model, that uses GIS data layers along with various growth management tools and policies to simulate future residential development patterns in Portage County. The model uses data sets that were readily available for the study area, including data on:

- Generalized land use (e.g., residential, commercial, industrial, landfill) for a sample year in three different decades.
- Farmlands.
- Zoning districts.
- Water and sanitary sewer-service areas.
- Roads and highways.
- Steep slopes.
- Surface waters.
- Critical natural areas. (The modelers created this data set by combining information on flood plains, wetlands, natural heritage areas, and ground-water pollution potential).
- Population projections.

The sub-regional case study allows the user to view three possible future development patterns for Portage County as a whole and for the individual townships within the county. Each pattern uses one of these three growth management models:

- *Continued growth model*. This model assumes that growth and land development patterns continue to follow current trends, policies, and zoning regulations. This is often used as the baseline model.
- *Managed growth (or environmental protection) model*. This model assumes that growth management tools and incentives for altering land development patterns are adopted by all local governments within a given county. For example, all communities would adopt zoning policies that prohibit residential development in areas deemed environmentally sensitive. This model also assumes the same rate of population growth as the continuous growth model.
- *Controlled growth model*. This is the most aggressive of the three models. It assumes a lower population growth and stricter growth management tools to promote reduced, more compact development.

These models were developed through complex mathematical equations and computer computations, summarized in Figure 2-2 and described in the steps below.

The steps involved in developing the three growth management models for the sub-regional case study included:

- The computer model first overlays the various GIS data layers being used (land-use changes, wetlands, etc.) to identify lands that are not yet developed but are zoned for development (“developable lands”).
- The model then applies population forecasts and the criteria associated with the growth scenario being modeled.

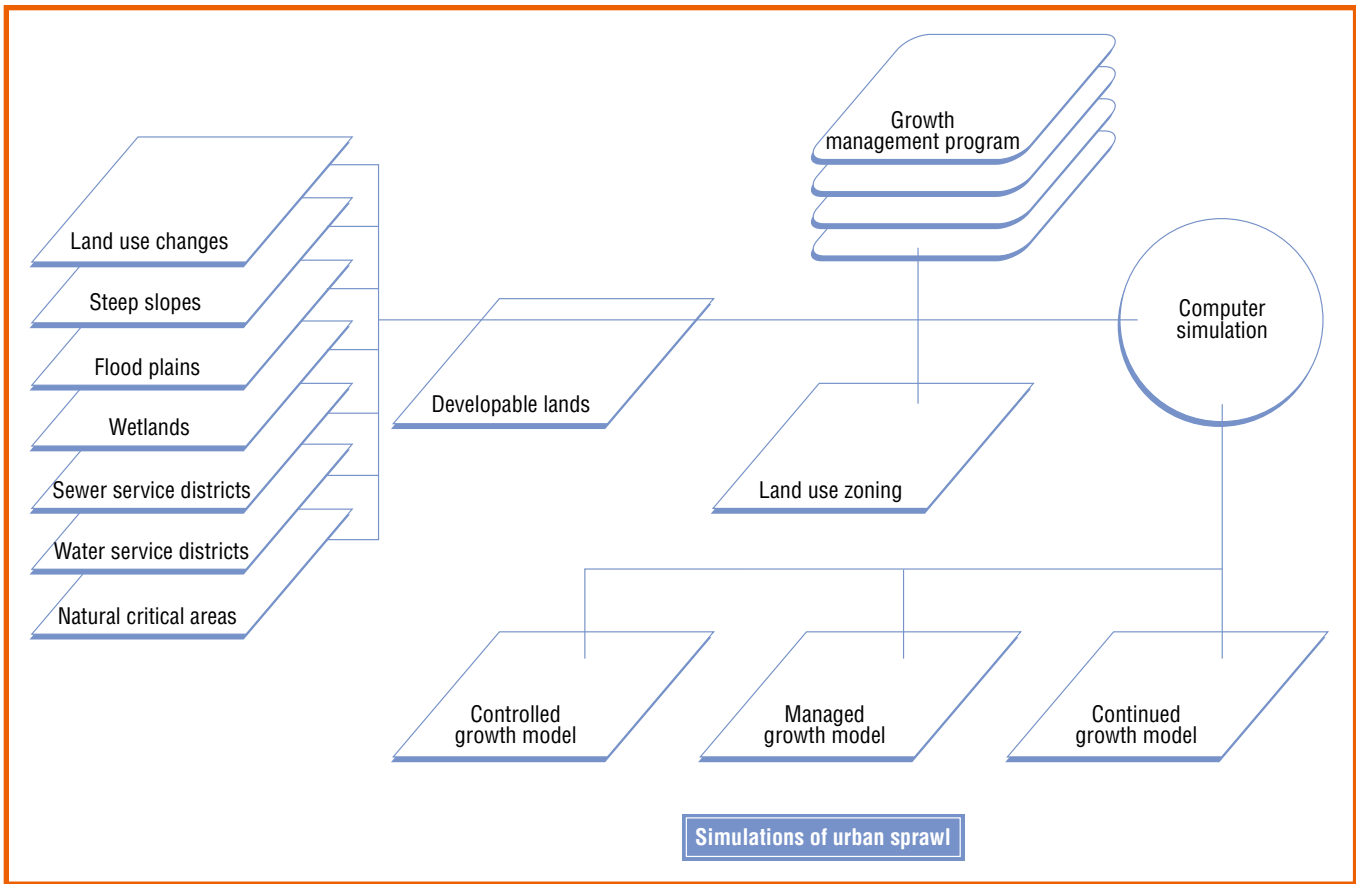


Figure 2-2. Procedures and algorithms.

- The simulation continues until all potential development sites available are identified under the particular growth model being simulated (i.e., controlled, managed growth/environmental protection, or continued growth model).

The results of the model are presented in maps displaying development patterns and summary tables of the amount of farmland and critical natural areas lost to development (see Figures 2-3, 2-4, and 2-5).

The sub-regional case study program can be downloaded from the Urban Sprawl in Northeast Ohio Web site ([http://gis.kent.edu/gis/empact/dwl\\_home.htm](http://gis.kent.edu/gis/empact/dwl_home.htm)) and can also be run online. (The regional study cannot be run online because it relies on ArcExplorer, a map-browsing program that must be installed on the user's computer; the sub-regional study does not use this software.)

The following maps (Figures 2-3, 2-4, and 2-5) show three possible development scenarios for the sub-regional case study simulation for Aurora Township, Portage County, Ohio, for the year 2015. The Portage Model was used to simulate three alternative growth build-out scenarios for all of Portage County and for the individual townships within the county.

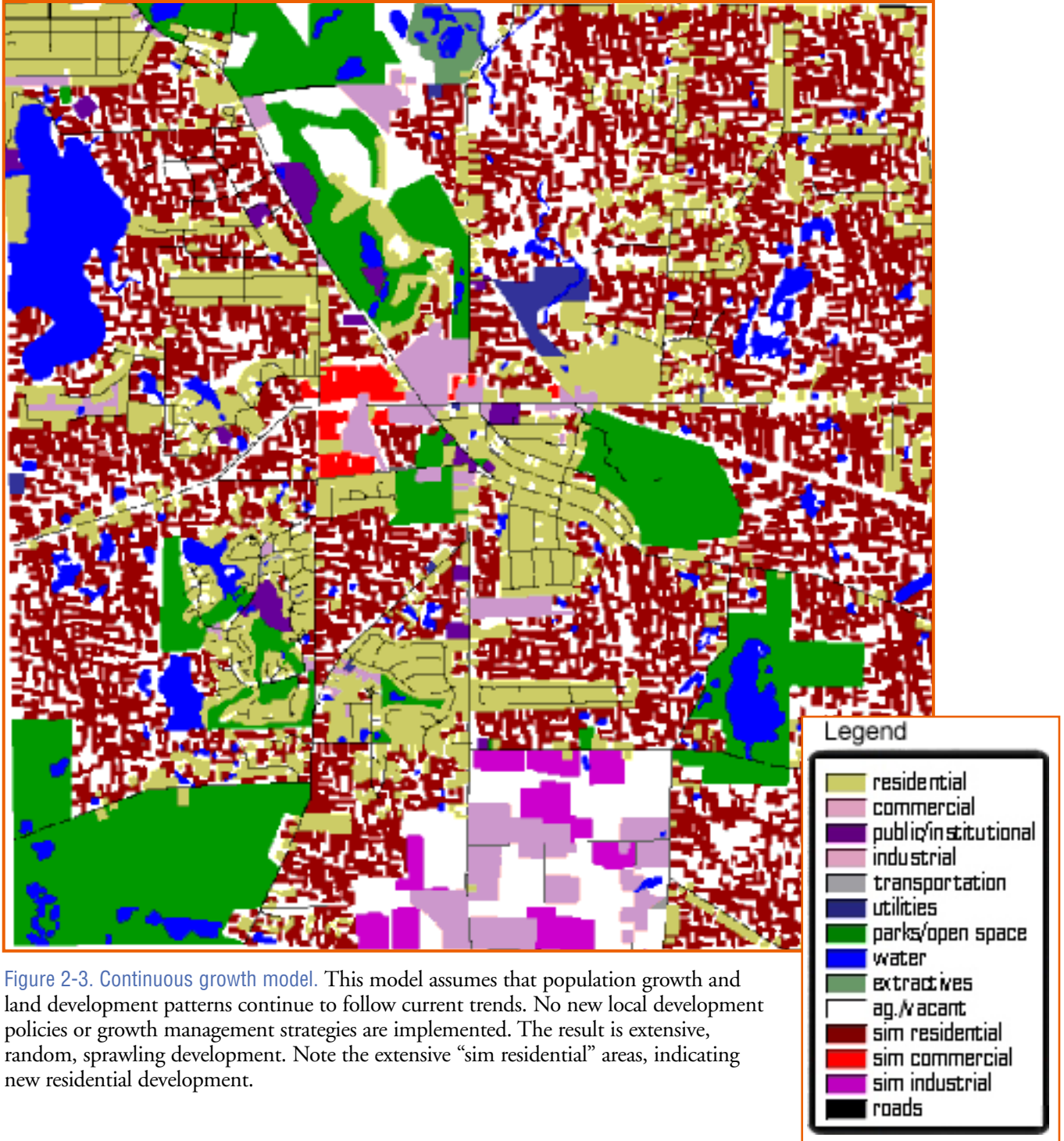


Figure 2-3. Continuous growth model. This model assumes that population growth and land development patterns continue to follow current trends. No new local development policies or growth management strategies are implemented. The result is extensive, random, sprawling development. Note the extensive “sim residential” areas, indicating new residential development.

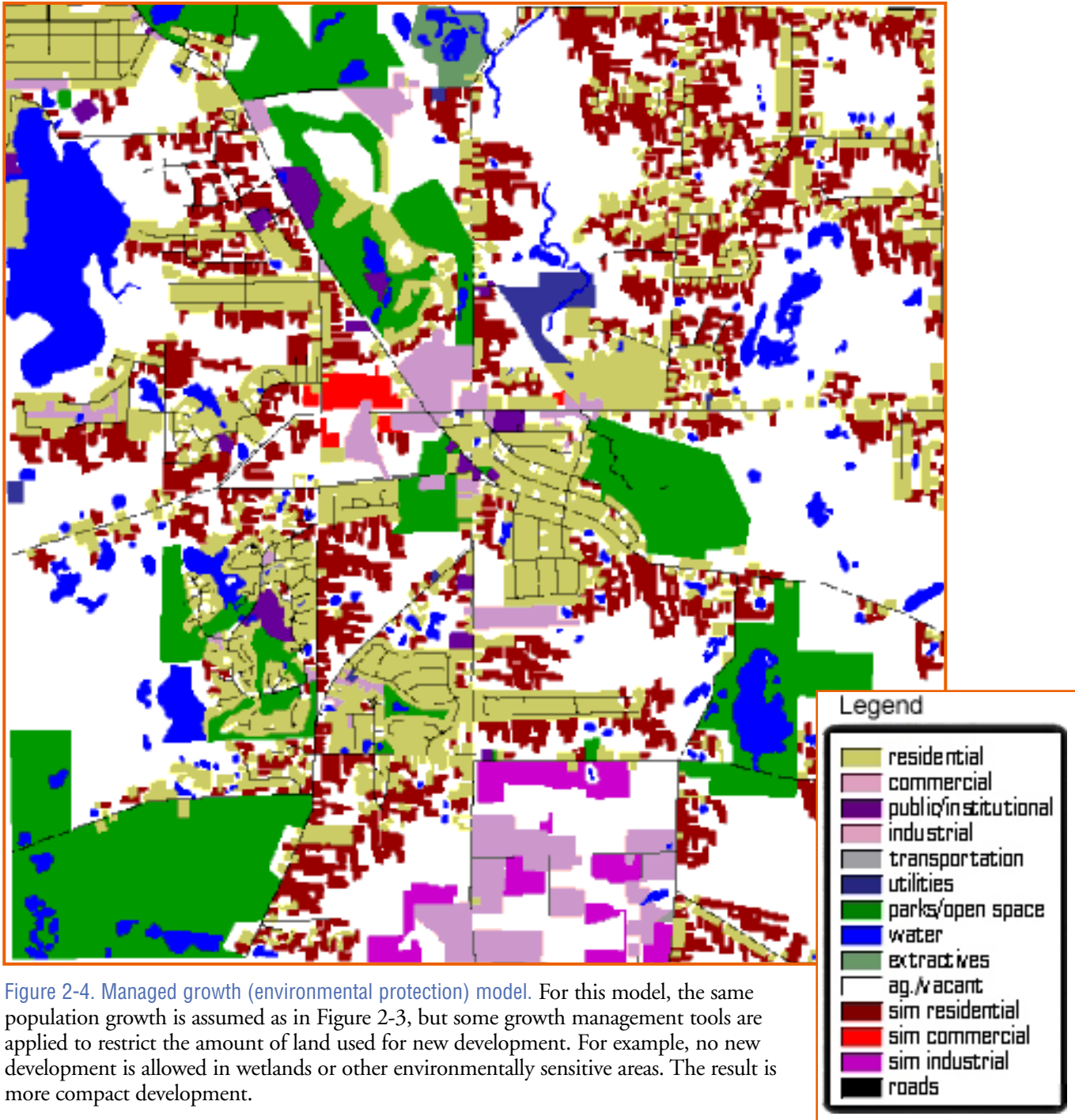


Figure 2-4. Managed growth (environmental protection) model. For this model, the same population growth is assumed as in Figure 2-3, but some growth management tools are applied to restrict the amount of land used for new development. For example, no new development is allowed in wetlands or other environmentally sensitive areas. The result is more compact development.

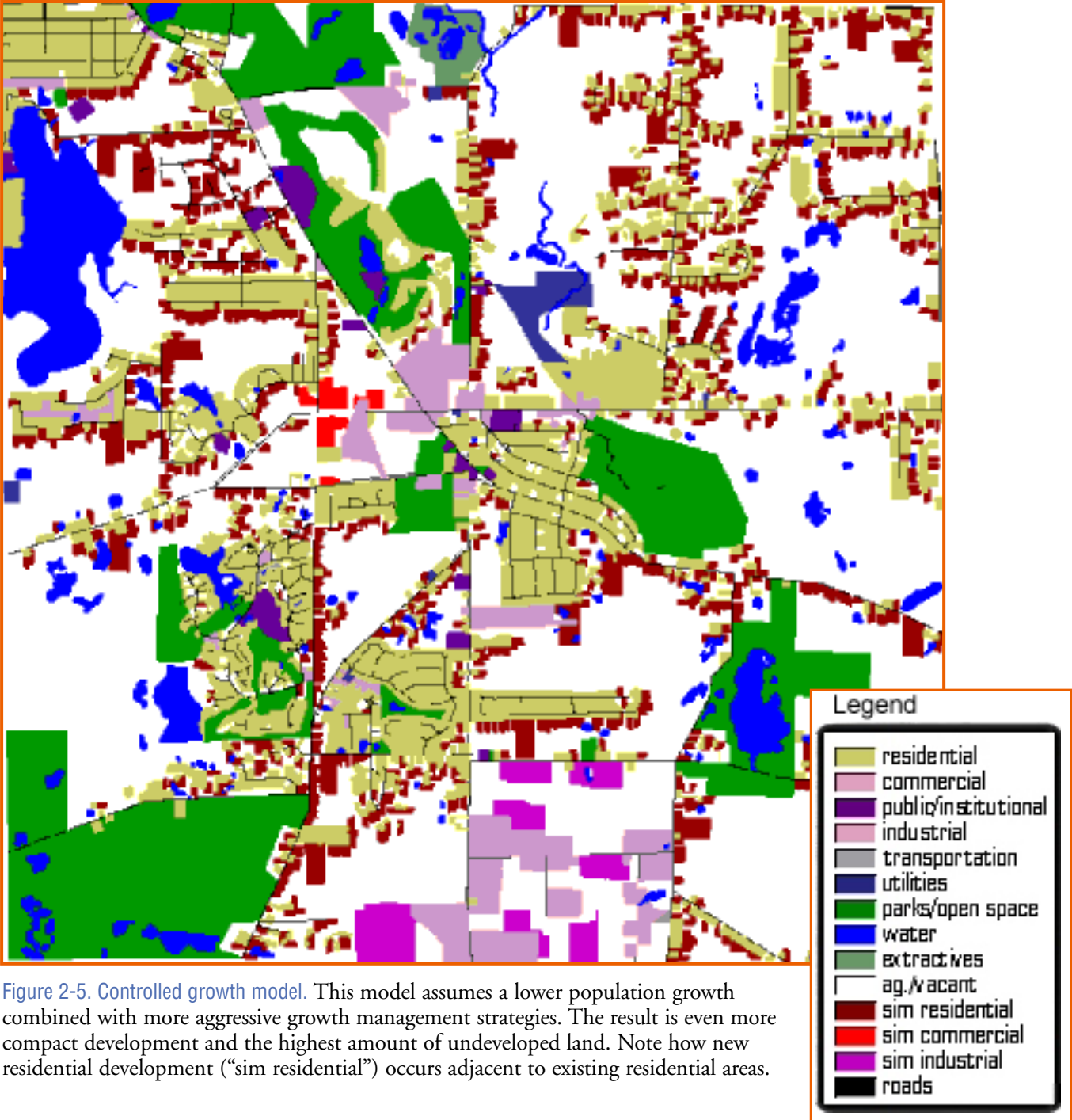


Figure 2-5. *Controlled growth model*. This model assumes a lower population growth combined with more aggressive growth management strategies. The result is even more compact development and the highest amount of undeveloped land. Note how new residential development (“sim residential”) occurs adjacent to existing residential areas.

### 2.5.3 THE URBAN GROWTH SIMULATOR

The Northeast Ohio Urban Sprawl Modeling Project also developed an Urban Growth Simulator model, which the Project used to provide more information and flexibility to users than the models used in the case studies. The Urban Growth Simulator allows users (e.g., citizens, interest groups, government agencies, planners) to project future changes in their communities and observe the implications of various strategies for managing residential growth. A user can generate individual build-out scenarios and change available data to view alternative future growth scenarios in map or table formats.

The Simulator is unique among available growth modeling programs in that it allows efficient simulations of urban growth with minimal requirements of data from users. Its newest version can take simulated build-out scenarios and calculate estimated nonpoint-source pollution as well as the amount of land used by simulated growth in categorized soil types. This new version will be used in projects for Geauga County and the Grand River Watershed in Ohio.

The Urban Growth Simulator was based on the Portage Model, described in Section 2.5.2. Like the sub-regional case study, it uses extensive data sets so users do not have to compile their own data. However, the Urban Growth Simulator is more robust than the Portage Model, allowing users to evaluate the effects of implementing the following three growth management strategies:

- *Avoid critical natural areas (CNA)*. CNA include wetlands, steep slopes, flood plains, areas surrounding endangered or threatened animal or plant species, and other areas considered environmentally sensitive. Under this strategy, permits would not be granted for new development in these areas, and thus CNA would be protected.
- *Establish a growth boundary*. Users can place a boundary on new development, making development more compact by limiting it to a given area and reducing the impacts of sprawl.
- *Maximize open space*. Requiring new developments to preserve more lands for open space might involve reducing the lot sizes of new developments, cluster zoning, etc.

In addition to choosing a growth management strategy, Simulator users can modify two other variables that affect the amount and form of development:

- *Lot size*. By defining lot sizes, users can choose the land area (in acres) that each new unit would need in order to be built.
- *Frontage or cluster development*. Users can also choose to base their modeled development on either:
  - Frontage, in which new developments of 5 to 15 units are built along streets, or
  - Cluster development, in which new developments are built in subdivisions of 5 to 30 units grouped together.

Figure 2-6 shows results from the Urban Growth Simulator in map and tabular form (see also <http://empact.geog.kent.edu>). Acreage of CNA and farmlands affected by simulated development is also shown as an indication of how the environment is being affected.

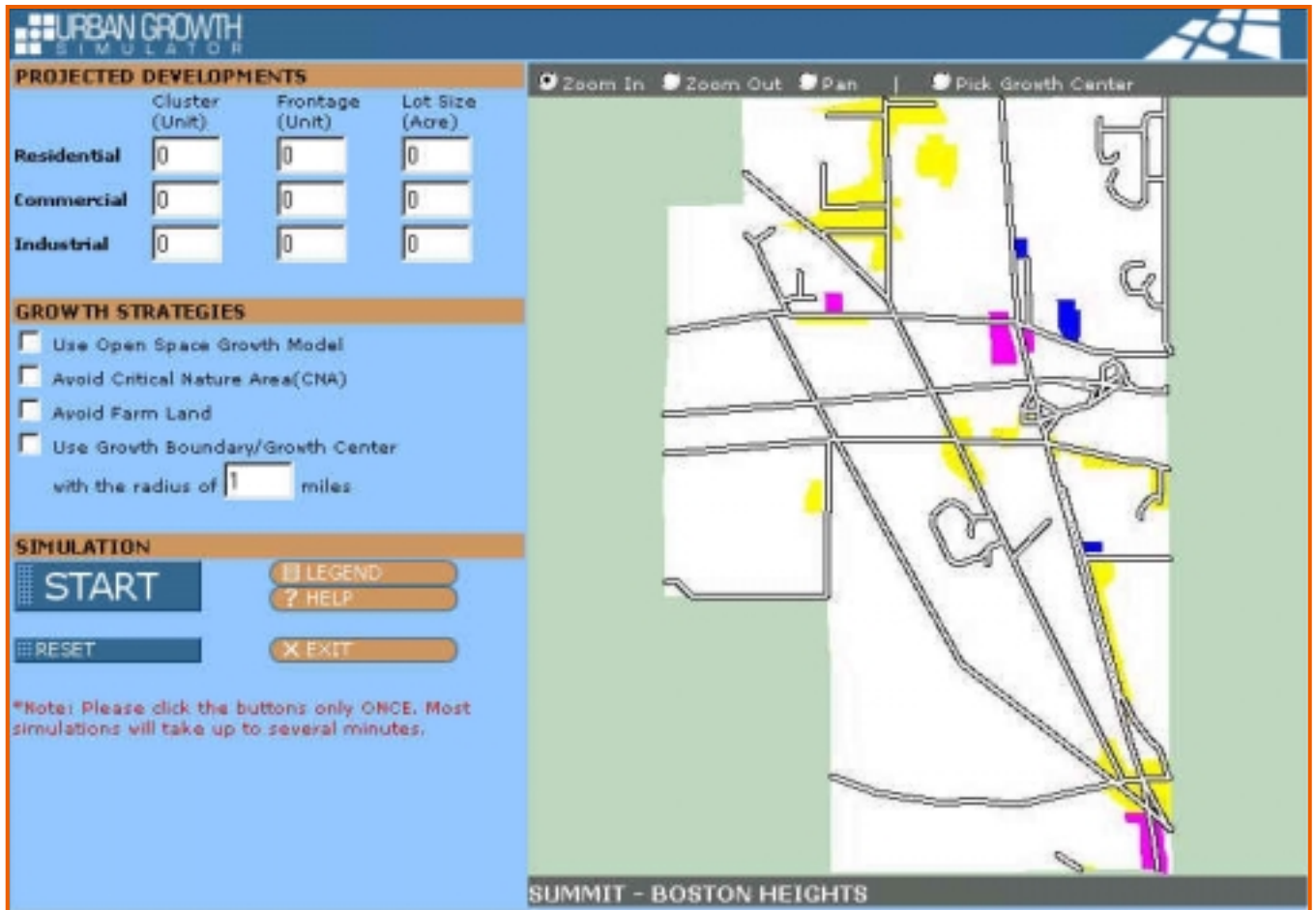


Figure 2-6a. Northeast Ohio Urban Growth Simulator workspace. This figure shows the Web page of the Urban Growth Simulator (<http://empact.geog.kent.edu>), from which users can input various levels of development and growth management strategies. The map on the right shows current development in the chosen township, in this case Boston Heights Township in Summit County.

Type of Land Use	
Residential	
Commercial	250
Industrial	100
Total (acres)	1,350

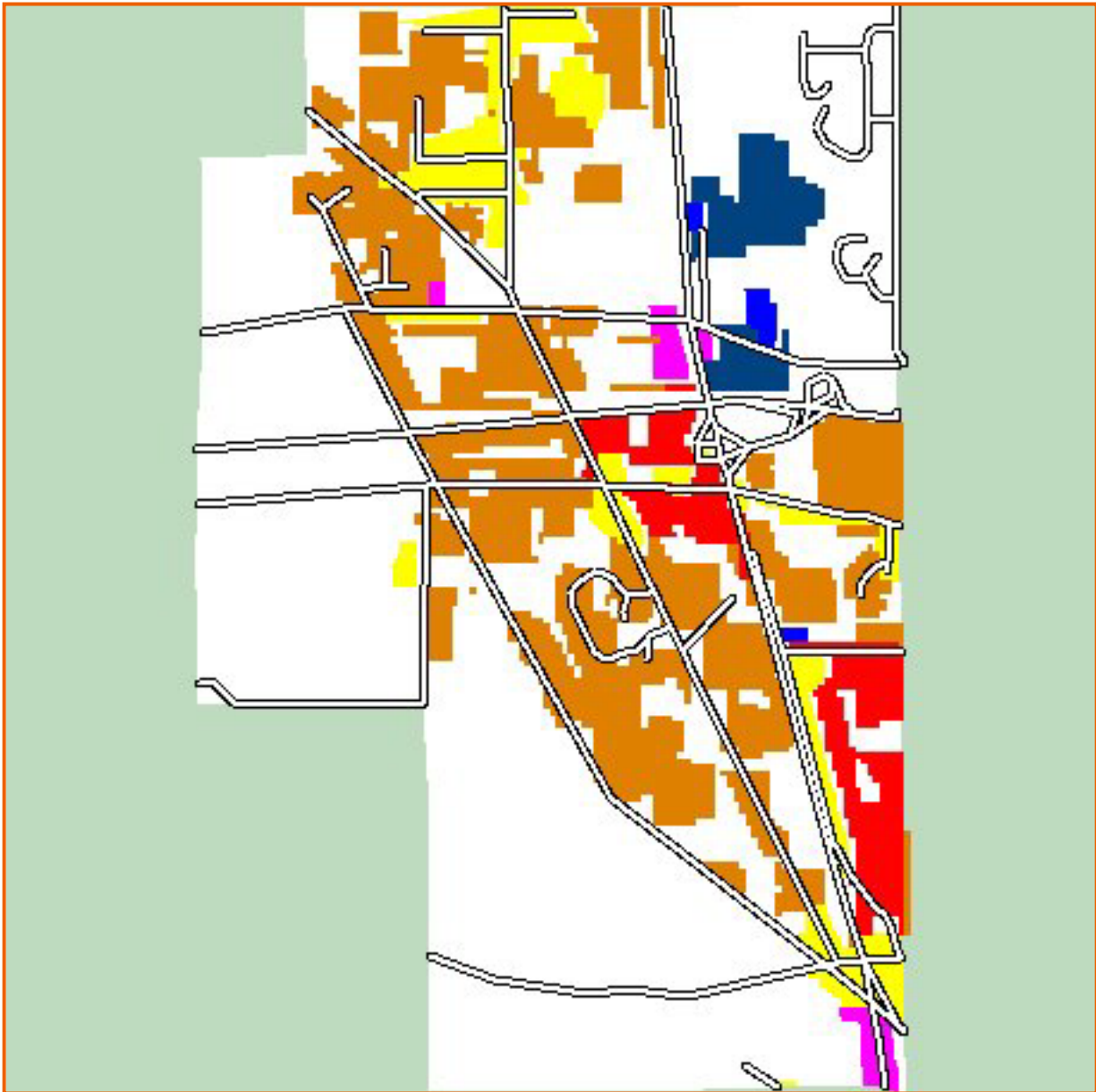


Figure 2-6b. Sample simulation with no growth management strategies applied (for Boston Heights, Summit County, Ohio). No growth management strategies were applied in this scenario, resulting in 1,350 acres developed, including the loss of 53.5 acres of agricultural land and 57.75 acres of CNA.



Type of Land Use	
Residential	
Commercial	110
Industrial	100
Total (acres)	1,210

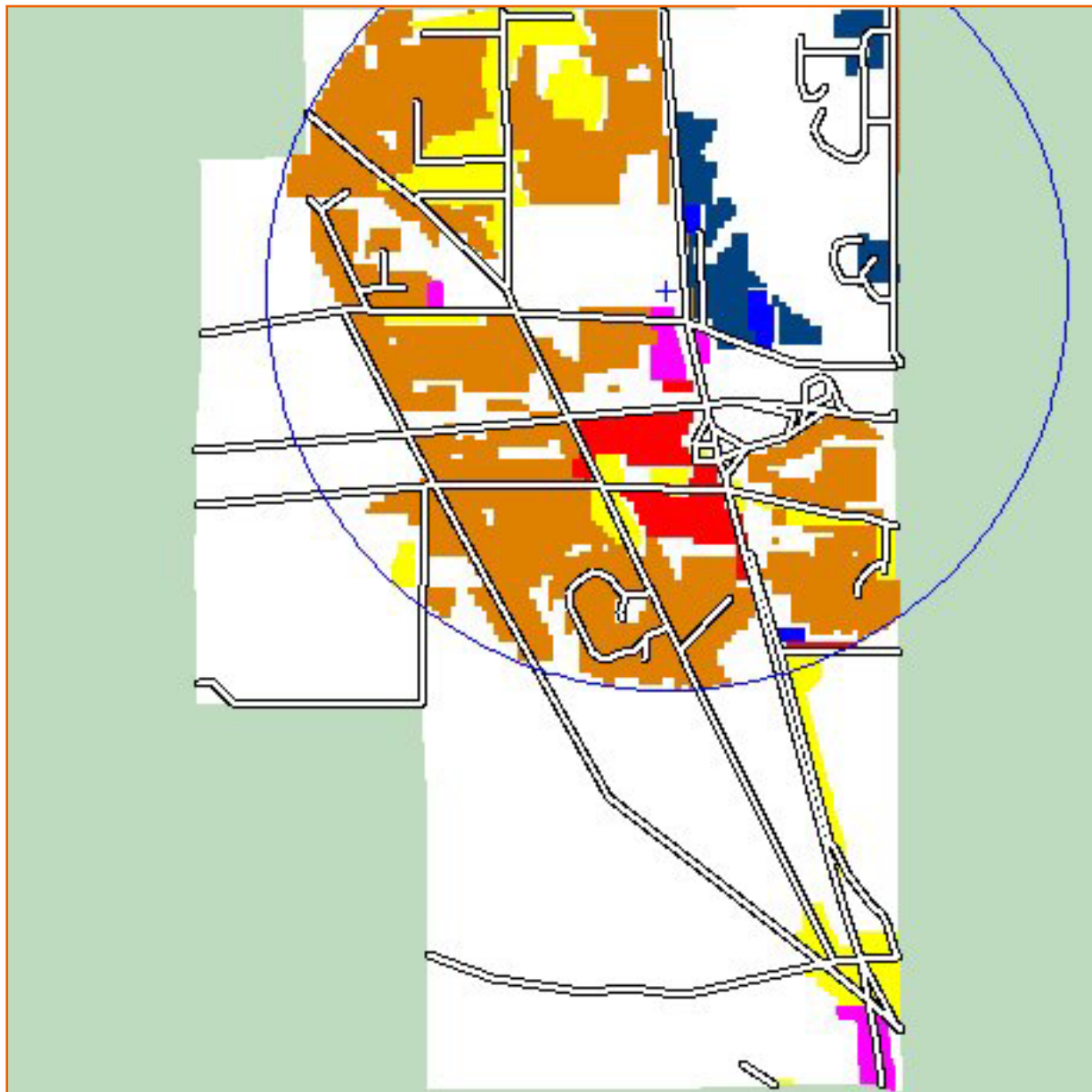


Figure 2-6c. Sample simulation with “Use Growth Boundary/Growth Center” and “Avoid Critical Natural Areas (CNA)” applied (for Boston Heights, Summit County, Ohio). In this case, the combination of two growth management strategies led to less land being developed than in Figures 2-6a and b. A total of 1,210 acres were developed, and no CNA were lost. To accommodate growth, however, 76 acres of agricultural land were lost to development.

#### 2.5.4 HOW WERE DATA FOR THE URBAN SPRAWL MODELING PROJECT GATHERED AND MANAGED?

A large amount of data is needed to create a valid urban growth model. The Northeast Ohio Project based its urban growth models on many types of environmental and geospatial data: aquatic and terrestrial species/habitats, brownfields, demographics, flood plains, geology/soils, hydrology/surface water, land use/cover, planning/zoning, pollution hazard, TIGER/Census, water quality, and wetlands data, for example.

These data came from a variety of sources, including the Ohio Department of Natural Resources, EPA's Better Assessment Science Integrating Point and Nonpoint Sources (BASINS) project, the Northeast Ohio Data Information Service (NODIS), Magic 2000 CD-ROM data, and the Northeast Ohio Environmental Data Exchange Networks (NEOEDEN).

NEOEDEN was a project undertaken by four universities (Cleveland State University, Kent State University, the University of Akron, and Youngstown State University) before the EPA EMPACT grant began for the Northeast Ohio Project. The goal of NEOEDEN was "to create and maintain a data exchange network for northeast Ohio, focusing on environmental and geospatial information" by collecting, processing, and making available on the Internet a broad range of environmental and land-use data in a 14-county northeast Ohio region (<http://urban.csuohio.edu/~ucweb/neoeden/neoeden.htm>, 2002). NEOEDEN sought to inventory all relevant publicly available data for northeast Ohio by:

- Identifying programs or organizations that produce, manage, or disseminate geo-referenced environmental data that could be incorporated into NEOEDEN.
- Determining what data each organization had, as well as the suitability of those data for inclusion in the NEOEDEN database.
- Establishing priorities for collecting and documenting these data based on demand, geographic extent, uniqueness, and other criteria to be determined by the NEOEDEN organizations and users.
- Identifying other data, currently unavailable in digital form, that might be suitable for the NEOEDEN database.

In the course of the Northeast Ohio Project, NEOEDEN was expanded to incorporate additional GIS data sets, database search software, and an Internet mapping server as part of the redesign of the Web site, allowing users to view selected data sets in mapped format or as tables. Currently there are 364 geospatial data sets on the NEOEDEN Web site. Of these, 32 are downloadable.

Data completeness and timeliness varies across the 15 Ohio counties included in the Northeast Ohio Urban Sprawl Modeling Project. For some data sets, necessary information was based on assumptions, estimates, and U.S. Geological Survey records on historical data. The researchers decided to include such data sets because they felt that some users would still find the information helpful, even if it was incomplete. It is hoped that the data inventory will continue to be completed and expanded.

#### 2.5.5 HOW ARE URBAN GROWTH MODELING DATA COMMUNICATED TO THE PUBLIC?

*County planning commissions* are one key mechanism for using and communicating information for the Northeast Ohio Urban Sprawl Modeling Project. For example, Geauga and Portage Counties have used the Northeast Ohio Project Web site to generate build-out scenarios that are used at various public meetings by county residents.

*Web site.* Kent State University's Department of Geography hosts the *EMPACT: Urban Sprawl in Northeast Ohio* Web site, a good resource for the public and local officials (<http://gis.kent.edu/gis/empact/>; see Figure 2-7). The site describes the problems of urban sprawl and the usefulness of models and simulators.

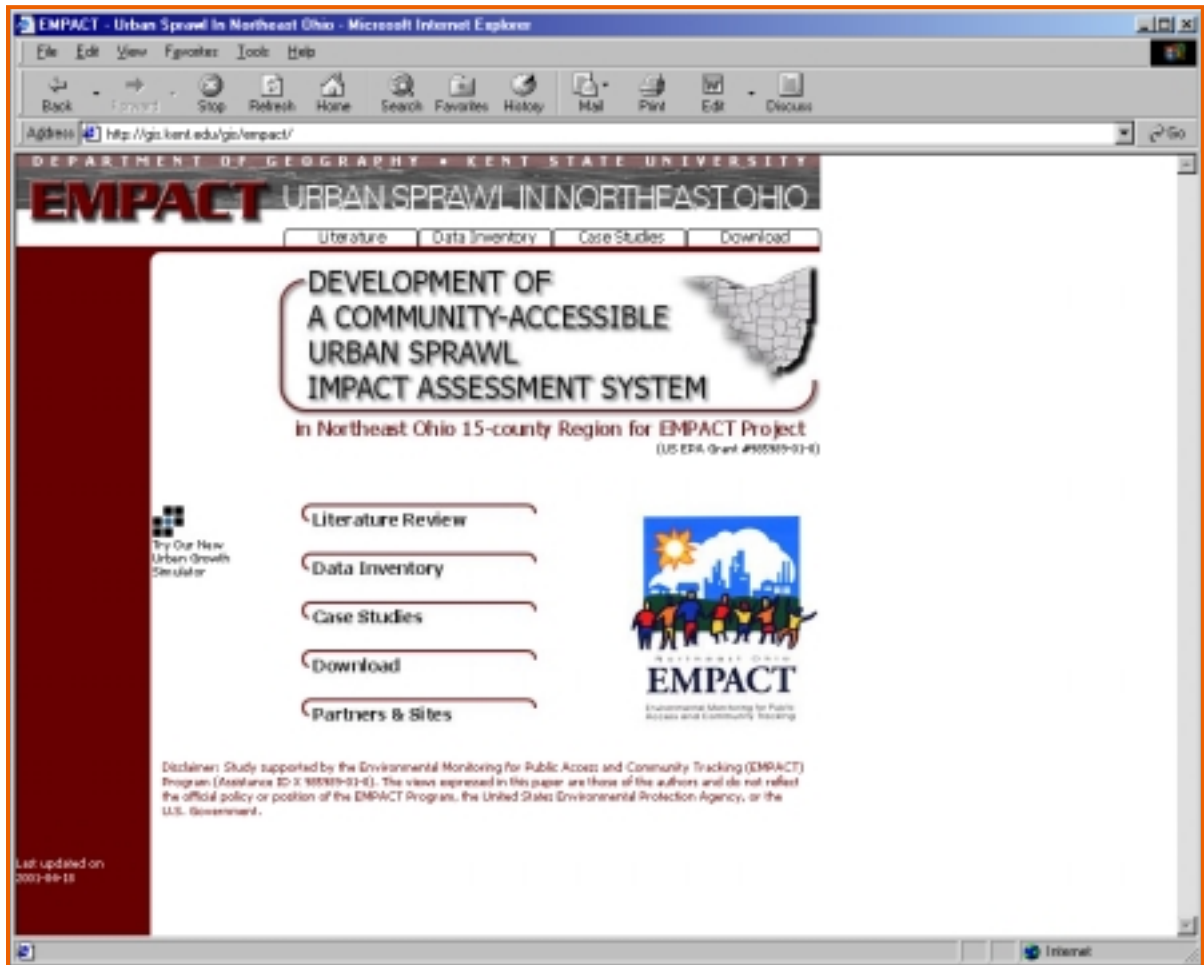


Figure 2-7. EMPACT: Urban Sprawl in Northeast Ohio Web Site. (Source: <http://gis.kent.edu/gis/empact/>)

Users can also download the regional and sub-regional case study simulations from this site, as well as order the regional study on CD-ROM. They can also run the sub-regional study as well as the Urban Growth Simulator online at the site. (See Sections 2.5.1 and 2.5.2 for discussions of the case studies and Section 2.5.3 for a description of the Urban Growth Simulator). For quick reference, the Web site also provides screen capture samples from the case studies.

*Documentation for the Urban Growth Simulator.* The Project, as part of its communications and outreach effort, developed an *Urban Growth Simulator Self-Guided Workbook* that provides step-by-step guidance through four simulations. The Workbook explains what each menu item is used for and how to use the Simulator to achieve particular results. The Workbook can be downloaded from the Kent State University Web site (<http://empact.geog.kent.edu/workbook.html>) or requested from the Kent State University geography department.

*Educational handbook.* A workbook on urban sprawl, titled *Urban Sprawl in Northeast Ohio: A Handbook for Educators and Their Students in Grades 4–8*, was created. It provides teachers with activities, information, and resources to help them introduce the concept of urban sprawl into their classrooms. It also shows readers how to use the Urban Growth Simulator, using sections from the *Urban Growth Simulator Self-Guided Workbook*.

*Seminars and training sessions.* The Northeast Ohio Project offered seminars and training sessions to local organizations from which Project researchers hoped to gather data sets.

Chapter 4 discusses a variety of additional communications/outreach efforts conducted by the Northeast Ohio Project.

### 2.5.6 WHAT LESSONS WERE LEARNED IN THE NORTHEAST OHIO URBAN SPRAWL MODELING PROJECT?

Some of the lessons learned in developing the northeast Ohio urban growth models included:

- *Set realistic goals for data collection.* Collecting comprehensive data from a variety of sources into one data clearinghouse is a good concept, but can be difficult to achieve for a variety of reasons (discussed below). It is important early in a growth modeling project to clearly define a realistic scope of data collection and limit modeling efforts accordingly.

Collecting and maintaining data for a growth management project can be expensive, in terms of both time and money. To reduce this cost, the Northeast Ohio Project attempted to use readily available, existing data sets to create a centralized database and avoid duplication of research. This effort, however, was itself challenging. The NEOEDEN team sent out questionnaires to various organizations and agencies that had data sets useful to the project. The response rate was quite low, and much of the information ended up coming from state agencies. Also, some organizations were unwilling to donate their data or did not feel that they had the time to participate.

- *Establish a good organizational structure at the start of the project.* A good structure might include having a single, lead entity, such as a state agency, oversee the project and set clear guidelines and expectations from the beginning, rather than having different organizations responsible for various aspects of a project. For example, a government agency could take on the responsibility of managing the project and owning the resulting product, which would then have a place in the agency's annual budget and possible continued funding and support; this system would help to ensure that the frequent updates involved in data collection and maintenance are performed. If universities are involved, their role could be to research and develop the product and then turn it over to a regional planning committee or other government entity to sustain it. The product's creators could train government employees in the use of the modeling programs and data maintenance. Community nonprofit organizations are often good partners for conducting outreach.
- *Obtain project involvement by high-level officials,* such as mayors or county engineers, to help support an urban growth modeling project. Several counties in northeast Ohio (e.g., Summit County) were successful in promoting a collaborative effort on data collection, in part because they had such high-level support.
- *Consider developing case studies* to showcase completed simulation models, for example for different scales, such as at the regional (e.g., seven-county) and sub-regional (e.g., one-county) levels. The case studies for the Northeast Ohio Urban Sprawl Modeling Project exemplified successful development and growth management projections and illustrated a simplified method for performing modeling and simulations.
- *Possibly develop more than one product to fully serve various audiences.* While a Web-based system is a good avenue for those with ready Internet access, you may also want to create a stand-alone system (such as a CD-ROM) that allows quicker data transfer than the Internet does. CD-ROMs have another advantage: you can use them to meet the needs of advanced users (e.g., planners). A CD can be created that contains more detailed or specific data than your Web system does. You can also supply sophisticated users with CDs containing modeling software (the "back end" of your online model) to which they can add their own data. In addition, printed materials may be important to develop to reach people without Internet or computer access.

The air quality monitoring component of the Northeast Ohio Project is discussed in Chapter 3. Additional outreach and communications efforts conducted by the Northeast Ohio Project are discussed in Chapter 4.



## 3.1 INTRODUCTION

The Northeast Ohio Air Quality Monitoring Project is one of the three key components of the Northeast Ohio Project. The purpose of the Air Quality Monitoring Project is to provide public access to monitored air quality data in 15 counties of northeast Ohio. This information is disseminated through the Project's Northeast Ohio Air Quality Online, or NEOAIR, Web site (<http://neoair.noaca.ohiou.edu/>), which presents near-real-time and historical air quality data. A dynamic interface allows users to select the type of data they wish to view.

### 3.1.1 WHAT IS TIME-RELEVANT AIR QUALITY MONITORING?

Information on air quality can be provided to the public in near real time, depending on the frequency of sampling and the speed of data retrieval and processing. Access to real-time data allows people to take appropriate actions to protect their health and the environment. For example, when certain air pollutant levels are high, normally healthy people may decide to limit outdoor activities and more sensitive populations (children, the elderly, people with breathing problems) may choose to stay indoors. Additionally, a public that is aware of current pollution levels may be encouraged to take steps to reduce air emissions through measures such as efficient electricity use, carpooling, and use of public transportation. Already existing air monitoring stations (as described in Section 3.1.3) can often be used to conduct time-relevant air quality monitoring and reporting programs.

### 3.1.2 THE EPA AIRNOW PROGRAM

The Northeast Ohio Air Quality Monitoring Project was derived from EPA's AirNow Program (see <http://www.epa.gov/airnow>), which provides the public with easy access to national and regional air quality information. The AirNow Web site offers daily air quality forecasts as well as real-time air quality information for over 100 cities across the United States, and provides links to more detailed state and local air quality Web sites. The site also includes information on the health and environmental effects of air pollution, ways that people can protect their health and actions they can take to reduce pollution, and links to EPA publications that highlight the environmental and health effects of air quality and explain the basic science of ozone.

Currently, real-time AirNow air quality maps provide ozone levels for 38 states and parts of Canada. During the ozone season (May through September in most areas, April through October in Ohio), these maps are updated every hour. Users can view still-frame maps of 1-hour peak values, 8-hour peak values, and forecasts. Animated maps of hourly averages are also available. Future plans for the AirNow site include ozone mapping for the contiguous 48 states and real-time mapping of particulate matter. Ways in which the Northeast Ohio Air Quality Monitoring Project has used and supplemented AirNow data for the northeast Ohio region are discussed in Section 3.2.

### 3.1.3 OVERVIEW OF AIR QUALITY MONITORING

Under the Clean Air Act, states are required to establish air quality monitoring networks to measure ambient concentrations of pollutants for which National Ambient Air Quality Standards (NAAQS) have been established. These pollutants, known as criteria pollutants, are particulate matter (PM), nitrogen dioxide (NO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), volatile organic compounds (VOCs), and lead. Ambient Air Quality Surveillance requirements (40 CFR Part 58) specify how often monitoring must occur and where monitoring stations are to be sited.

The monitoring networks consist of strategically located air monitoring stations and data collection, transfer, and storage systems. The types of stations include state and local air monitoring stations (SLAMS), national air monitoring stations (NAMS), and photochemical assessment monitoring stations (PAMS). Information on pollutant concentrations is used to:

- Determine if an area is in compliance with the NAAQS.
- Develop strategies for controlling pollutant levels.
- Provide information to the public about local air quality.

Guidance for establishing a monitoring network can be found at the website <http://www.epa.gov/ttn/amt/cpreldoc.html> and in the following EPA documents:

*PAMS Implementation Manual*, EPA/454/B-93/051 (<http://www.epa.gov/ttnamti1/pams.html>)

*Ozone Monitoring, Mapping, and Public Outreach, Delivering Real-Time Ozone Information to Your Community*, EPA/625/R-99/007

## 3.2 AIR QUALITY INFORMATION AVAILABLE FROM THE NORTHEAST OHIO PROJECT

The following information on ozone is available at the Northeast Ohio Project's NEOAIR Web site:

- Near-real-time data, including hourly average levels depicted on a stationary map and levels for the previous 24 hours on an animated map. A map of northeast Ohio with ozone levels is shown in Figure 3-1. (See Section 3.4.2 for further discussion of these maps.)
- Tabular presentations of current data at each of 18 air monitoring stations, as shown in Figure 3-2.
- Historical data, shown on maps, tables, and reports. Examples of historical data are shown in Figures 3-3 and 3-4.

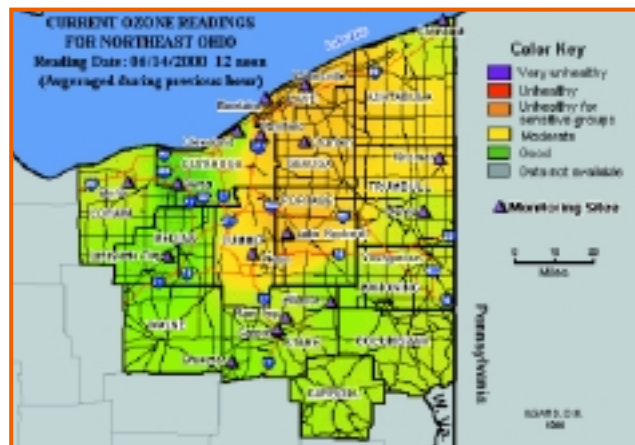


Figure 3-1. Northeast Ohio ozone levels, hourly average, stationary map.

The NEOAIR Web site differs from the AirNow Web site in that it lets users view northeast Ohio in greater detail and thus obtain information on air quality at more specific locations. Real-time levels for non-ozone pollutants are also included on the NEOAIR Web site.

## 3.3 HOW ARE AIR QUALITY DATA MANAGED?

The same monitoring and data management systems used to meet the requirements of the Clean Air Act can often be used as the basis for other air monitoring programs. The NEOAIR Web site, for example, relies on existing monitors to provide data, with PM<sub>2.5</sub> monitors added as part of the Air Quality Monitoring Project.

### 3.3.1 DATA COLLECTION

Air monitoring infrastructure that is already in place for data transmission to meet regulatory requirements (e.g., 40 CFR Part 58) can often be used for other data collection and reporting purposes, such as a local near-real-time air quality monitoring and reporting program and Web site. For example, the Ohio Environmental Protection Agency collects data from the air monitoring stations in northeast Ohio for transmission to the U.S. EPA. The same data are automatically transferred to NEOAIR every 2 hours during ozone season.

northeast ohio  
**air quality** ONLINE

what pollutes our air? • today's air quality • ozone action days • your comments • contact

• Air Monitors

Air Monitor	Yesterday's Peak Level (1-hr)(ppb)	Yesterday's Peak Level (8-hr)(ppb)	Ozone Level at 1:53:23PM, 2 pm (ppb)	Health Index (for today)
Vienna (Trumbull County)	30 at 4 pm	35	-999	no data
Wilkes (Stark County)	40 at 12 pm	34	-999	no data
Wespa (Crawford County)	26 at 1 am	23	-999	no data
Wesport (Stark County)	40 at 5 pm	32	-999	no data
Wesport (Mettisale County)	46 at 5 pm	40	-999	no data
Wesport (Crawford County)	26 at 4 pm	24	-999	no data
Wesport (Stark County)	47 at 5 pm	39	-999	no data
Wesport (Stark County)	45 at 4 pm	37	-999	no data
Wesport (Trumbull County)	40 at 11 am	32	-999	no data

Figure 3-2. Example of data available in table format from the Northeast Ohio Project Web site.



Figure 3-3. Historical ozone data (graph format) for the Northeast Ohio Project.

**Ozone Air Quality Data at Vienna**

**Information Available:**  
 Ozone data for the air monitor located at Vienna, Trumbull County is provided. Annual information will provide the first, second, third and fourth highest one-hour and eight-hour averaged ozone values observed at this location for the selected year. The date maximum one-hour and eight-hour averaged ozone values observed at this monitor for the period of 1991-2009 can be obtained by using the pull down menus given below.

Annual Information: 1999

Daily Ozone Values: From: 10 June 1999 To: 14 June 1999 HTML

[Note: For single day data select the same date values in the "From" and "To" date fields]

There are "no" daily maximum 1-hr averaged ozone values exceeding 125ppb.  
 There are "2" daily maximum 8-hr averaged ozone values exceeding 85ppb.

Daily maximum 1-hr and 8-hr averaged ozone values  
 From: 06/10/99 To: 06/14/99

Date	1-hour max (ppb)	8-hour max (ppb)
6/10/1999	186	87.5
6/11/1999	187	98.375
6/12/1999	91	84
6/13/1999	75	71.75
6/14/1999	52	46.25

Figure 3-4. Historical ozone data (table format) for the Northeast Ohio Project.

As a preliminary step in developing the Northeast Ohio Project’s air monitoring system, Project staff reviewed the existing air quality monitoring network to identify any deficiencies. As a result, data loggers and modems at the monitoring sites were upgraded.

Data received from the Ohio Environmental Protection Agency are automatically reformatted, evaluated, prepared for presentation, and stored in a database. The database is then accessed to supply data in response to Web site user queries. The general flow of data is shown in Figure 3-5.

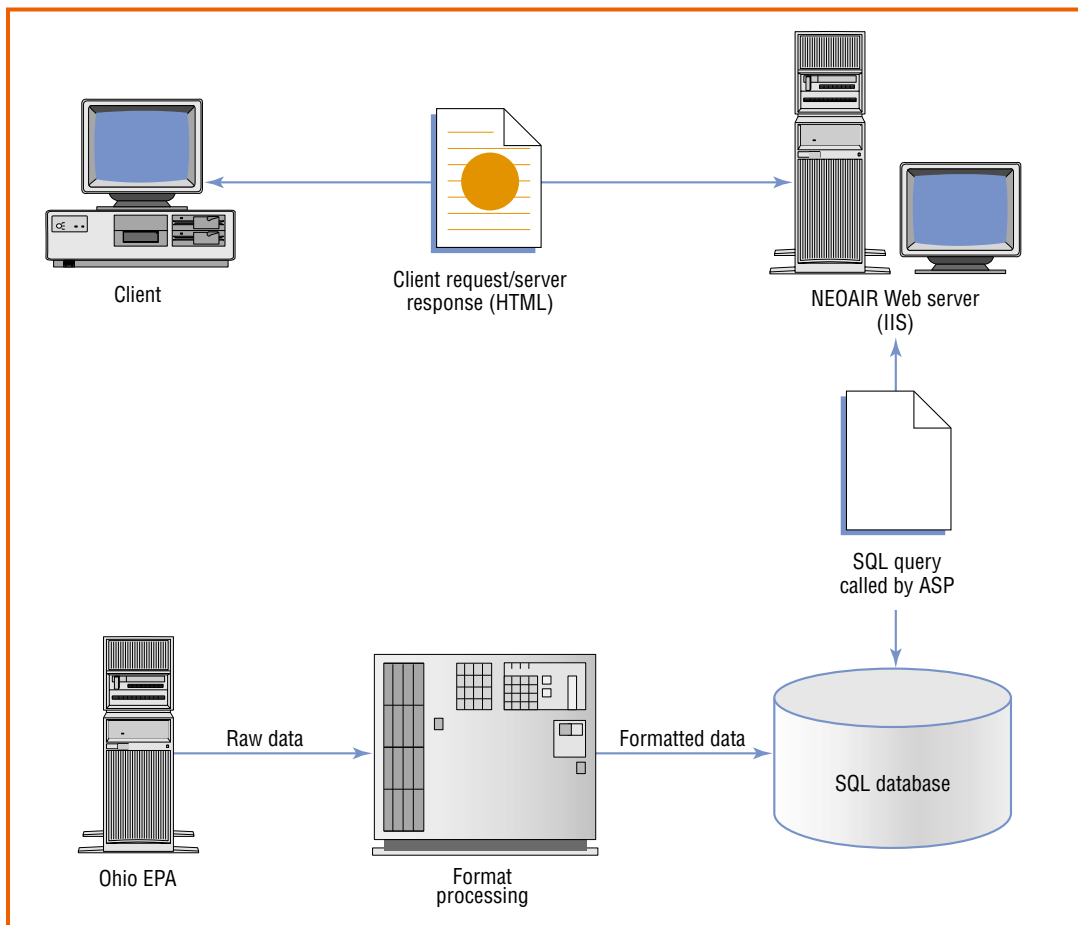


Figure 3-5. Data flow for the data retrieval module.

### 3.3.2 DATA QUALITY

It is important to ensure the quality of data collected before it is reported to the public. Data entry errors can produce erroneous data, as can malfunctioning or inoperable monitors.

Data received by NEOAIR are checked automatically. Data are identified as erroneous if reported values are outside expected ranges or have changed at greater-than-expected rates. The Web site does not report data identified as erroneous. Instead, it shows the data as not available, indicated by “-999” in the text or by a gray area on maps.

### 3.3.3 DATA STORAGE

The data for the NEOAIR Web site are stored in a database using a Microsoft SQL server. There are seven different kinds of information in the database, as shown in Table 3-1.



**TABLE 3-1. TYPES OF INFORMATION INCLUDED IN THE NEOAIR DATABASE**

Category	Information Included
Monitors	Monitor name, monitor ID, EPA region, county, latitude, longitude, land use, location type, available information, and time period.
Ozone peak values	Daily 1-hour and 8-hour peak values, monitor ID, and date for each of the 18 ozone monitors.
Ozone exceedances	Produced from the peak value data to save data retrieval time. Contains 1-hour and 8-hour exceedances, monitor ID, and date for each of the 18 ozone monitors.
SO <sub>2</sub> peak values	Daily 1-hour peak values, monitor ID, date, 1-hour max, and 24-hour max for each of the 10 SO <sub>2</sub> monitors.
SO <sub>2</sub> exceedances	Produced from the peak value table to save data retrieval time. Contains 24-hour exceedances, monitor ID, and date for each of the 10 SO <sub>2</sub> monitors.
CO peak values	Daily 1-hour and 8-hour peak values, monitor ID, and date for each of the two CO monitors.
CO exceedances	Produced from peak value table to save data retrieval time. Contains 8-hour exceedances, monitor ID, and date for each of the two CO monitors.

**3.3.4 HARDWARE AND SOFTWARE USED BY NEOAIR TO OPERATE ITS AIR QUALITY MONITORING WEB SITE**

The NEOAIR Web site uses a workgroup server/workstation with the following attributes:

- CPU: Intel Pentium III.
- Memory: 128 MB.
- Hard disk: 10 GB.

Software used for the NEOAIR Web site is shown in Table 3-2

**TABLE 3-2. NEOAIR WEB SITE SOFTWARE**

Software Type	Near-Real-Time Data		Historical Data
	Ozone	Non-Ozone	
Operating system	Microsoft Windows NT 4.0 Server or Windows 2000 Server		
Web server	Microsoft Internet Information Services (IIS) 4.0 or 2000 (a component of Windows NT or 2000)		
Database server	Microsoft SQL Server 7.0		
Web developing tool	Microsoft Visual Interdev 6.0		
	Macromedia Dreamweaver UltraDev 4.0		
Graphic tool	Mapinfo Adobe Photoshop 6.0 Adobe Image Ready 3.0 Macromedia Fireworks 4.0		
Java developing and executing tool		Java Development Kit 1.1 or higher version	

### 3.3.4.1 WHAT ARE THE LABOR REQUIREMENTS FOR OPERATING THE NEOAIR WEB SITE ONCE IT IS RUNNING?

Most functions of the NEOAIR Web site can be automated. Non-automated functions that require personnel include creating the 24-hour automated maps; creating or replacing maps and tables due to missing data or errors; troubleshooting the server's HTTP and FTP service, as well as its overall performance; updating and maintaining the Web server; updating Web pages; writing and updating programs; and testing new programs, software, and procedures. It is estimated that these activities could require 10 hours or more per week of a programmer's time and 3 hours per week or more of a system administrator's time.

## 3.4 HOW ARE THE NORTHEAST OHIO PROJECT'S AIR QUALITY DATA COMMUNICATED TO THE PUBLIC?

### 3.4.1 HOW DOES THE PUBLIC ACCESS INFORMATION ON THE NEOAIR WEB SITE?

The NEOAIR Web site provides information on ozone, PM, CO, SO<sub>2</sub>, NO<sub>2</sub>, and ozone action days. (The organization of the NEOAIR Web site is shown in Figure 3-6.) The public can access information in two ways. "Static" pages provide general information on air pollution. Static pages are mainly textual and do not require any input from the user, except the kind of information in which the user is interested. An example of a static page is shown in Figure 3-7. "Dynamic" pages allow users to query the Web site for specific time-relevant and historic data.

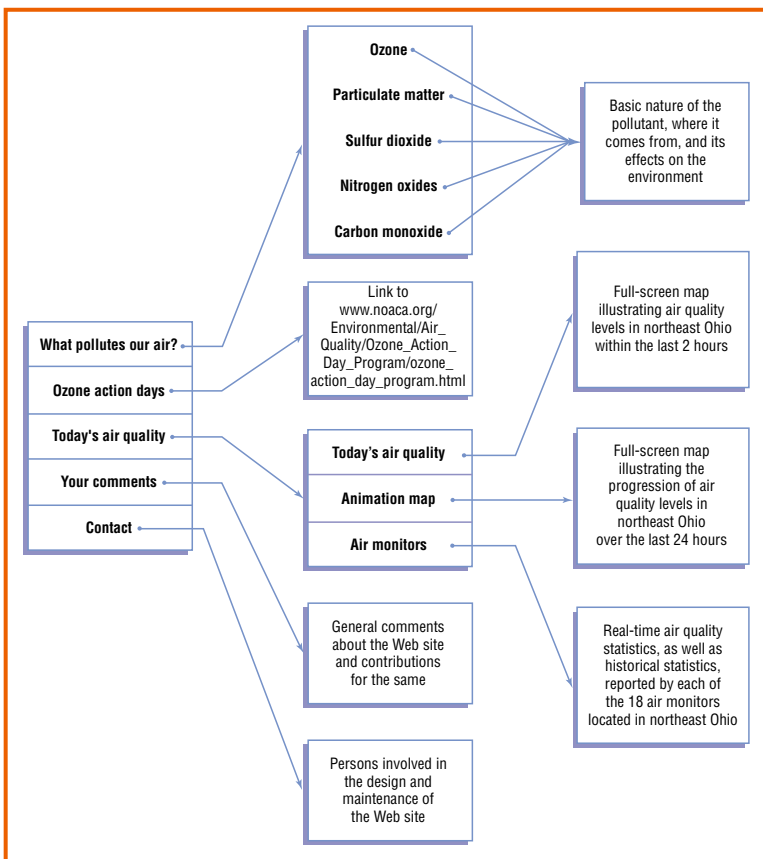


Figure 3-6. Web page flow chart for NEOAIR.



Figure 3-7. Example of NEOAIR Web site "static" page for general air pollution information.

### 3.4.2 HOW DOES THE NEOAIR WEB SITE DISPLAY TIME-RELEVANT DATA?

The NEOAIR Web site uses maps to display near-real-time concentrations of ozone across northeast Ohio. Colors on the map represent ranges of ozone concentrations. The ranges are the same as those used by EPA to define air quality (good, moderate, unhealthy for sensitive groups, unhealthy, very unhealthy) and the colors are the same as those used on EPA's AirNow Web site. The NEOAIR maps differ from the AirNow maps in that they show a smaller geographical area, providing greater detail. As mentioned previously, two types of maps are available for ozone: a map showing hourly average levels across northeast Ohio (see Figure 3-1) and an animated map showing levels for the previous 24 hours. Time-relevant data are also presented in a table summarizing monitoring station data, as shown in Figure 3-2.

Non-ozone pollutant concentrations are sampled once per day, since they do not change as significantly over the course of a day as ozone. Data for non-ozone pollutants are presented in a tabular format only: the monitors are relatively sparsely located and do not necessarily represent overall regional conditions, since these pollutants are not atmospherically generated.

### 3.4.3 HOW DOES THE NEOAIR WEB SITE DISPLAY HISTORICAL DATA?

Historical data are displayed in formats similar to those for time-relevant data. Maps of the average ozone level for 1-hour periods are available as well as animated maps showing the change in ozone levels over 24-hour periods going back to 2000. Historical data are also available for each monitor, as shown in Figures 3-3 and 3-4. The user can request reports on peak ozone values and ozone exceedances at each monitor going back as far as 1985. Historical non-ozone data from continuous monitors are currently being added, and data from non-continuous PM<sub>2.5</sub> monitors may be added in the future.

### 3.4.4 IS AIR QUALITY INFORMATION COMMUNICATED IN WAYS OTHER THAN THE NEOAIR WEB SITE?

The Northeast Ohio Project has used a variety of additional means to communicate the availability of air quality monitoring data to the public, including:

- A medical brochure.
- An air quality handbook.
- Bus boards.
- Radio and TV PSAs.
- News releases.

These other forms of public outreach and health risk communication are discussed in Chapter 4.

## 3.5 LESSONS LEARNED IN THE NORTHEAST OHIO AIR QUALITY MONITORING PROJECT

The Project's experience in conducting and expanding its air quality monitoring program resulted in some key lessons learned, including:

- *Schedule sufficient time frames* for tasks when multiple agencies and organizations are involved, particularly when multiple groups are involved in developing Web site information.
- *Maintain good working relationships* with agency and group partners. Good working relations and communication are especially important to an organization that is involved in only certain aspects of the data flow, rather than being in control of the data it needs. Without good communication, timely access to the data to be reported to the public (e.g., to be posted on the Web site) could be problematic.

# 4 THE NORTHEAST OHIO COMMUNICATIONS PROJECT

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## 4.1 THE NORTHEAST OHIO COMMUNICATIONS WORKGROUP

The Northeast Ohio Communications Workgroup consists of a diverse group of representatives of federal and local government agencies, local environmental organizations, health agencies, and local universities. The Workgroup was organized into a coordination committee and an advisory committee; the Earth Day Coalition (EDC) was designated the lead organization for outreach. EDC was chosen as the lead because of its experience with the target audience—inner-city, racially diverse communities of the Cleveland-Akron region in Ohio.

The Workgroup seeks to publicize the availability of the Northeast Ohio Project's air quality and urban sprawl data and products to the greater Cleveland-Akron community, enabling citizens to make informed decisions on day-to-day environmental and health concerns that can affect their quality of life.

## 4.2 WHAT DOES THE TARGET AUDIENCE NEED TO KNOW?

To create a successful outreach campaign, the Communications Workgroup conducted a survey of northeast Ohio residents to determine their information needs, knowledge level, and means of gathering information. This questionnaire was used, for example, to assess the public's computer knowledge and patterns of computer use and determine how to best present information to the target audience of low-income and minority communities. It was important to learn which communication outlets (other than computers) the target audience used, so that key information could be conveyed to community members who were not computer literate. The survey questions are in Appendix A.

The survey was administered to a random sampling (100+ respondents with a +/-6.5% margin of error) of the potential audiences that might use the Project's data. The Communications Workgroup followed up with respondents and other participants at six in-depth community meetings. Survey results were compiled and analyzed, and a report distributed to the Project steering committee.

Survey results included:

- The average inner-city resident was unaware of the environment-to-health link (less than 15 percent cited awareness). The level of awareness of ozone issues, including Ozone Action Days, was quite low (with less than 40 percent of the population aware), and knowledge of the health impacts of ozone was very low (less than 8 percent).
- Over 20 percent of all households have one or more members diagnosed with a respiratory health condition that could be exacerbated by high ozone or particulate levels.
- The number of households with respiratory concerns exceeded 35 percent.
- TV and radio are the major channels of daily information entering the household, with over 85 percent of participants using these media.
- Printed materials from or by the medical community are highly valued and preferred by the survey respondents and meeting participants.
- Information needs to be relevant and immediate to have an impact on households' decision-making.

## 4.3 COMPONENTS OF THE NORTHEAST OHIO PROJECT'S OUTREACH PLAN

Outreach conducted by the Northeast Ohio Project's Communications Workgroup was quite extensive, as shown in Table 4-1 and discussed throughout this chapter.

**TABLE 4-1. OUTREACH MATERIALS DEVELOPED BY THE NORTHEAST OHIO PROJECT'S COMMUNICATIONS WORKGROUP**

Item/Product		
Initial communications survey		
Promotional brochure	<ul style="list-style-type: none"> <li>• Northeast Ohio Project</li> </ul>	<ul style="list-style-type: none"> <li>• General public</li> </ul>
Medical brochure, <i>Your Air, Your Health, Your Environment: News You Can Use</i>	<ul style="list-style-type: none"> <li>• Air quality and related health effects</li> </ul>	<ul style="list-style-type: none"> <li>• General public of northeast Ohio (specifically inner-city residents)</li> </ul>
Educational handbook, <i>Air Quality in Northeast Ohio: A Handbook for Educators and Their Students in Grades 4-8</i>	<ul style="list-style-type: none"> <li>• Air quality/air pollution</li> <li>• Northeast Ohio Project</li> </ul>	<ul style="list-style-type: none"> <li>• Educators (teachers, camp counselors)</li> <li>• 9- to 13-year-olds in school and camps</li> </ul>
Educational handbook, <i>Urban Sprawl in Northeast Ohio: A Handbook for Educators and Their Students in Grades 4-8</i>	<ul style="list-style-type: none"> <li>• Urban sprawl and its effect on the environment</li> <li>• Northeast Ohio Project</li> </ul>	<ul style="list-style-type: none"> <li>• Educators (teachers, camp counselors)</li> <li>• 9- to 13-year-olds in school and camps</li> </ul>
Web site, <i>Northeast Ohio EMPACT Project</i> (hosted by the Neighborhood Link)	<ul style="list-style-type: none"> <li>• Northeast Ohio Project:               <ul style="list-style-type: none"> <li>– Air quality</li> <li>– Urban sprawl</li> <li>– Community outreach</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• General public</li> </ul>
Web site, <i>EMPACT: Urban Sprawl in Northeast Ohio</i> (hosted by Kent State University)	<ul style="list-style-type: none"> <li>• Urban sprawl and its effects on the local environment and communities</li> </ul>	<ul style="list-style-type: none"> <li>• General public</li> <li>• Local officials</li> <li>• City/regional planners</li> </ul>
Urban Growth Simulator	<ul style="list-style-type: none"> <li>• Urban sprawl</li> </ul>	<ul style="list-style-type: none"> <li>• General public</li> <li>• Students</li> <li>• Local officials</li> <li>• City/regional planners</li> </ul>
Bus boards	<ul style="list-style-type: none"> <li>• Air quality</li> <li>• Northeast Ohio Project</li> </ul>	<ul style="list-style-type: none"> <li>• General public of northeast Ohio, specifically residents in areas identified as high-risk or environmental justice neighborhoods</li> </ul>
Radio PSAs	<ul style="list-style-type: none"> <li>• Air quality and its health effects</li> <li>• Northeast Ohio Project</li> </ul>	<ul style="list-style-type: none"> <li>• General public</li> </ul>
Television PSAs	<ul style="list-style-type: none"> <li>• Air quality and its health effects</li> <li>• Northeast Ohio Project</li> </ul>	<ul style="list-style-type: none"> <li>• General public</li> <li>• Children</li> </ul>
Mascot, Abee (Always Breathe EasiEr)	<ul style="list-style-type: none"> <li>• Air quality</li> <li>• Urban sprawl</li> <li>• Northeast Ohio Project</li> </ul>	<ul style="list-style-type: none"> <li>• General public</li> <li>• Children</li> <li>• Local officials</li> </ul>
Logo	<ul style="list-style-type: none"> <li>• Northeast Ohio Project</li> </ul>	<ul style="list-style-type: none"> <li>• General public</li> <li>• Local officials and decision-makers</li> </ul>

<sup>1</sup>Unless otherwise noted, "general public" refers to residents of the 15-county area covered by the Northeast Ohio Project.

### 4.3.1 HOW DOES THE NORTHEAST OHIO PROJECT COMMUNICATE AIR QUALITY INFORMATION AND ISSUES TO THE PUBLIC?

The community survey described in Section 4.2 represents one of the first forms of community outreach used by the Northeast Ohio Project. The survey results gave the project important information on how best to educate the public on air quality issues and also introduced the concept of air quality to this audience. Outreach efforts that followed the survey are discussed below.

#### 4.3.1.1 MEDICAL BROCHURE ON HEALTH RISKS ASSOCIATED WITH AIR QUALITY

The survey distributed to community residents (see Section 4.2) indicated that many citizens of inner-city northeast Ohio trust information from the medical community. Therefore, a medical brochure entitled *Your Air, Your Health, Your Environment: News You Can Use* was produced to provide the general public with information on air pollution and its effects in northeast Ohio.

The brochure, featuring a picture of a doctor and child on the cover (Figure 4-1), discusses the six criteria air pollutants (lead, PM, ground-level ozone, CO, SO<sub>2</sub>, and NO<sub>2</sub>), who is most at risk from air pollution, and how to find out about daily air quality levels. Resources for more information, including the Northeast Ohio Project's Web site, are listed in the brochure. A total of 25,000 brochures were produced for at-risk individuals and distributed to the medical community throughout northeast Ohio—registered nurses, county health departments, county hospitals, children's hospitals, asthma clinics, elementary and middle schools, participating universities, and nonprofit organizations.

#### 4.3.1.2 AIR QUALITY HANDBOOK

Outreach to educators and students on air quality was accomplished through *Air Quality in Northeast Ohio: A Handbook for Educators and Their Students in Grades 4–8*. The handbook (Figure 4-2) includes approximately 85 pages of background information, activities, experiments, lesson plans, and resources on air pollution, air quality, and the Northeast Ohio Project. Teachers reviewed drafts of the handbook during its development. EDC members used the handbooks to conduct training at camps and recreation centers.

Example handbook activities include an air quality flashcard game with cut-out vocabulary cards provided, experiments incorporating observation and math skills through data collection and analysis, and activities related directly to the NEOAIR Web site. The handbook indicates appropriate grade levels for each activity or experiment, along with educator notes that refer to background information. EDC produced and distributed about 100 copies of the air quality handbook.

The air quality handbook was very well received in the education community. School principals were enthusiastic about bringing the air quality educational program to their schools because air pollution–related health problems (e.g., absences due to asthma) affect so many of their students. Teachers were enthusiastic about free classroom presentations and educational materials. Many schools requested additional copies.

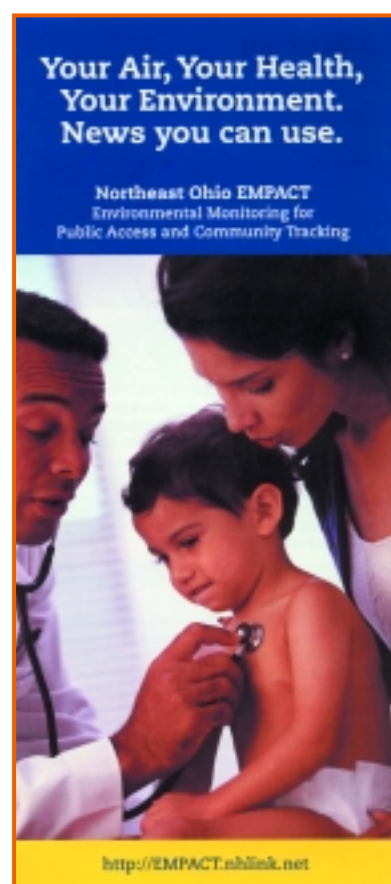


Figure 4-1. Medical brochure developed by the Northeast Ohio Project.

Highlights of the educational campaign related to the handbook included explanations of ozone formation, which were very successful with students. Also popular among children were activities involving the Internet. Environmental games worked well as a communications tool for camp children.

#### 4.3.2 HOW DOES THE NORTHEAST OHIO PROJECT COMMUNICATE URBAN GROWTH MODELING TO THE PUBLIC?

A handbook and a Web site are two key communication tools used by the Northeast Ohio Project to communicate urban sprawl issues, as discussed below.

##### 4.3.2.1 URBAN SPRAWL IN NORTHEAST OHIO HANDBOOK

Applying the framework of the air quality handbook, EDC created a second teaching tool, *Urban Sprawl in Northeast Ohio: A Handbook for Educators and Their Students in Grades 4–8*. The design of this handbook is similar to that of the air quality handbook. Teachers reviewed and commented on drafts of the urban sprawl handbook before EDC finalized it.

The sprawl outreach and education efforts focused on Cuyahoga County. This is because Cuyahoga contains Cleveland, the biggest city in northeast Ohio and the one for which the most local, relevant information (e.g., historical growth data) was available. Using this information, EDC was able to include examples and activities directly related to the city in the handbook. A sample activity from the urban sprawl handbook is a role-playing activity in which a fictional growth scenario (“You live in a small community where a developer would like to put a shopping mall”) is presented and students are assigned various roles within a community. One role might be that of a local shop owner who does not want additional commercial competition; another might be that of a town official who would like to bring additional money and tourists to the area. The students play out the scenario, learning that there is not necessarily a right or wrong solution to the situation and that sprawl is a complicated issue.

A section of the handbook covers the Urban Growth Simulator developed by Kent State University and includes sections from the *Urban Growth Simulator Self-Guided Workbook*. (See Chapter 2 for a discussion of the Simulator.)

As with the air quality handbook, 100 copies of the sprawl handbook were produced. Due to limited funds for outreach, EDC will not be going into schools to conduct educational programs on sprawl, but is still planning teacher meetings to introduce educators to both handbooks. For example, EDC met with teachers from “gifted and talented” programs in 15 to 20 schools in Cuyahoga County in February 2002.

##### 4.3.2.2 URBAN SPRAWL IN NORTHEAST OHIO WEB SITE

Another means of communicating the issues of urban sprawl to the public is the *EMPACT: Urban Sprawl in Northeast Ohio* Web site, hosted by Kent State University (<http://gis.kent.edu/gisempact/>). This Web site provides an overview of issues related to sprawl and includes background on the usefulness and creation of urban growth models. It also links to the Urban Growth Simulator, through which users can view different potential growth scenarios for their community. (See Chapter 2 for more information on urban growth modeling and this Web site.)

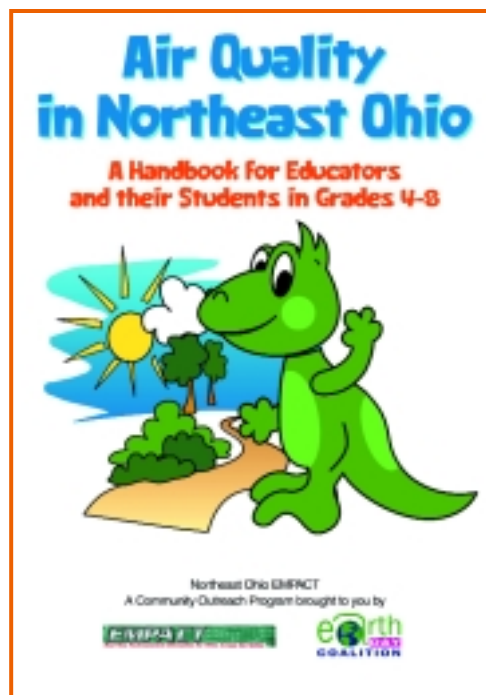


Figure 4-2. The Northeast Ohio Project's air quality handbook.

### 4.3.3 THE NORTHEAST OHIO PROJECT'S MEDIA CAMPAIGN

In addition to outreach specific to the Project's air quality monitoring and urban growth modeling efforts, a general media campaign was undertaken to inform people of the existence of the program. The media campaign included bus boards, PSAs, news releases, development of a logo and mascot, a promotional brochure, and a Web site, as described below.

#### 4.3.3.1 BUS BOARD CAMPAIGN

Thanks to the cooperation of transit authorities in the Cleveland-Akron area, over 270 buses were outfitted with boards carrying the message, "News You Can Use: Your Air, Your Health, Your Environment." (See Figure 4-3.) As part of the bus board design, a mascot named Abee pointed to the Web site address (<http://EMPACT.nhlink.net>). (Abee is described in Section 4.3.4.2.) While ultimately successful, bus board development took longer than expected. The Communications Workgroup learned that it is important to give transit authorities enough time (4 to 6 weeks) to develop bus board programs.

#### 4.3.3.2 PUBLIC SERVICE ANNOUNCEMENTS

Radio PSAs were developed by EDC and broadcast on 28 radio stations. The PSAs were 10-, 15-, 20-, and 30-second versions of the same basic announcement, each describing the Project in a different degree of detail. Most of the stations carrying the PSAs were FM stations, but Cleveland's most popular station, an AM station that covers sports, also aired the announcements.

A PSA for television, written and produced by EDC, was also part of the outreach campaign. EDC originally planned to produce this television announcement using a private vendor. After learning it would cost between \$5,000 and \$6,000 to create this one piece, EDC went to the four major networks in the greater Cleveland area (NBC, FOX, ABC, and WUAB) to see if any would be willing to sponsor the PSA. All four networks offered to produce the commercial for free, but each wanted sole use of the commercial. The Coalition chose NBC because they offered the most extensive package—two interviews and a Web link as well as the announcement itself.

The PSA aired on the local NBC affiliate throughout the summer, mostly in the afternoons and on weekends. It took about 1 day to film the PSA's segments and 1 day to edit them into a single announcement. The two interviews were held on NBC's "Noon News" program, which airs between 12:00 and 12:30 p.m. on weekdays. The interviews lasted about 5 to 6 minutes and were also shown throughout the summer. The second interview included Abee, the mascot. NBC added a link from its Web site to the Northeast Ohio Project's Web page.

#### 4.3.3.3 NEWS RELEASES

A series of news releases was developed and distributed to over 100 media outlets (including television, radio, and print publications) in the greater Cleveland area via an in-house electronic fax system. An additional 20 major print publications and TV stations received copies via postal mail. The releases announced the Northeast Ohio Project's Web site and information provided by the project; the Regional Transit Authority bus board campaign; the school outreach programs; and Abee, the Northeast Ohio Project mascot.



Figure 4-3. Bus board displayed on Cleveland-Akron transit authority buses.



#### 4.3.3.4 OUTCOME OF THE MEDIA CAMPAIGN

Overall, the media campaign was successful, but not as widespread as originally planned due to the limited availability of personnel. The Northeast Ohio Project's educational outreach programs run by EDC staff were in higher demand than expected (see Section 4.4), leaving less staff time to focus on media outreach.

#### 4.3.4 WHAT PROMOTIONAL MATERIALS WERE CREATED, AND HOW WERE THEY DISTRIBUTED?

##### 4.3.4.1 PROJECT LOGO

To increase visual recognition of the program, the Northeast Ohio Project created a logo (Figure 4-4), which was featured on all of the Project's handbooks, brochures, Web sites, and promotional items.

##### 4.3.4.2 MASCOT NAMED ABEЕ

A mascot was also produced as part of outreach efforts to younger audiences. Named Abee (Always Breathe EasiEr), this friendly green dinosaurian character (Figure 4-5) often wears the Northeast Ohio Project's logo on her chest. Abee appeared on local television stations, at schools, and at EarthFest 2000, where she greeted dignitaries such as the Secretary of Health and Human Services and a congressman. The mascot was also prominently featured in each of the educational handbooks. She also appeared (often along with the logo) on magnets, t-shirts, and a hand stamp, which were handed out at events such as EarthFest. Abee helped create project recognition: people recognized her and associated the promotional materials with the Project after meeting her at community events.

##### 4.3.4.3 PROMOTIONAL BROCHURE

The Northeast Ohio Project also developed a promotional brochure that describes the Project's three components: real-time air quality monitoring, urban sprawl modeling, and community outreach activities. This color, glossy brochure describes various ways for people to obtain the information available on the Project's Web site. Approximately 25,000 brochures were produced and distributed to county libraries, Northeast Ohio Project partners, universities, the Ohio Department of Recreation, camps, schools, and transit authorities participating in the bus board program.

##### 4.3.4.4 PROJECT WEB SITE

The Northeast Ohio Project's Web site (<http://EMPACT.nhlink.net>) summarizes the Project's initiatives and links to all three project components (air, communications, sprawl), as well as the EPA home page and the Web pages of partner organizations. The Project's Web site is hosted on a local server, the Neighborhood Link. (The Neighborhood Link is a partnership between the City of Cleveland, Cleveland State University, Ameritech, and the Neighborhood Centers Association. It was designed pro bono by the firm Luttner and Yachannin Advertising.) Note that the Web site is available at all Cleveland public libraries, recreation centers, and neighborhood computer centers.

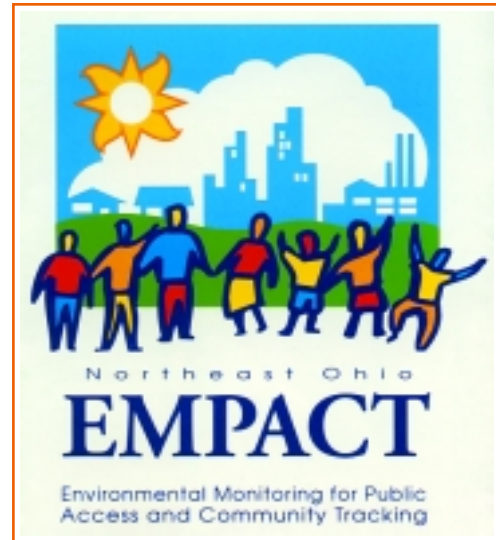


Figure 4-4. Logo developed for the Northeast Ohio Project.



Figure 4-5. The Northeast Ohio Project's Abee mascot.

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## **4.4 MEASURING THE SUCCESS OF THE OUTREACH CAMPAIGN**

One of the best ways to measure success is to establish goals at the outset of a project and then determine whether they were reached. The Northeast Ohio Project's Communications Workgroup did just this.

The Workgroup used the community survey (see Section 4.2) to identify the needs of the community and the methods by which the target audience receives its information. As a direct result of those findings, bus boards were placed on the routes identified as hotspots or environmental justice neighborhoods likely to include the target audience.

Results from the survey also showed that target populations are very trusting of the medical community and get most of their health information from hospitals, doctors, and health organizations. Therefore, the Communications Health Workgroup developed a medical brochure (see Section 4.3.1.1) that was placed in hospitals and doctor's offices to maximize its availability to the target audience. Thus the initial survey helped the Project increase its credibility for community members.

The success of the educational programs was fairly easy to determine by the enthusiastic response from both schools and camps. The original plan was to conduct the program in four schools. Due to the program's popularity, however, EDC ended up running it in eight schools, plus recreation centers and camps, reaching more than 1,500 children aged 9 to 13. Teachers and camp counselors are still requesting the return of the program and speakers. Unfortunately, funding is currently unavailable to run the program. The handbooks are available, however, and teachers continue to use them.

Teachers commented that they would like to see more programs like the air quality program. It was this response that encouraged EDC to create the urban sprawl handbook. When EDC approached educators about reviewing that handbook, the teachers were eager to participate and provide comments.

The Northeast Ohio Project's Web site received its maximum number of "hits" (visits to the site) when the media and Regional Transit Authority bus board outreach were being conducted, indicating that these campaigns were successful. Since that time, hits have declined somewhat.

## **4.5 LESSONS LEARNED IN THE NORTHEAST OHIO COMMUNICATIONS PROJECT**

### **4.5.1 DIVERSE MEMBERSHIP HELPS CREATE AN EFFECTIVE ORGANIZATIONAL STRUCTURE**

The diversity of members in the Communications Workgroup helped to ensure that a range of viewpoints from the community and other stakeholders was heard and included in decision-making. The Workgroup's diversity produced some differences of opinion about what specifically should be communicated. The group therefore spent time, before launching the outreach campaign, coming to a common decision on a clear message. The fact that they reached this early consensus—that air pollution, particularly ozone and its health effects, is a priority concern—was helpful throughout the outreach project. Designating a lead organization to develop ideas and present them to the group also helped create consistency and stability.

### **4.5.2 DEVELOPING EDUCATIONAL MATERIALS ON INNOVATIVE TOPICS LIKE URBAN SPRAWL IS CHALLENGING BUT WORTHWHILE**

Gathering information and developing educational activities on urban sprawl for children in grades 4 through 8 can be challenging because little information is available about this topic for this age group. The topic of urban sprawl may be more appropriate for older students, but EDC was mandated to develop a single handbook targeted to the same grade levels as those covered by the air quality handbook. Furthermore, teachers felt that while sprawl is a difficult concept for children, it is a worthwhile topic to explore.

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EDC therefore spent time finding relevant educational activities, resulting in the project taking longer than expected. Ultimately, EDC chose activities on related topics—e.g., associated environmental issues such as air pollution and water quality—and added urban sprawl components to these activities.

When communicating innovative topics, emphasizing key concepts that may not be intuitive can be important. For example, for the topic of urban sprawl, it was important to convey that sprawl can and often does occur in areas of no or low population growth (e.g., Cuyahoga County). The concept that land use for development is outpacing population growth may be a difficult but important one for many people (including children) to grasp.

#### **4.5.3 DEVELOP LONG-TERM RELATIONSHIPS WITH PARTNER ORGANIZATIONS**

If possible, rather than simply dropping off literature at various organizations, try to develop longer term relationships with partner groups and others using your materials. For instance, EDC found that developing relationships with schools and camps was an effective outreach strategy.

#### **4.5.4 CONSIDER DEVELOPING OUTREACH MATERIALS IN MULTIPLE LANGUAGES**

EDC received numerous requests for their materials to be translated into Spanish and Chinese. When planning your project, consider developing materials in more than one language, especially if your audience is multiethnic.

# 5 CONCLUSION

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In summary, the Northeast Ohio Project focuses on three areas: urban sprawl, air quality, and public outreach related to the environmental risks associated with sprawl and poor air quality. The Project's urban growth model provides a tool for examining the environmental impacts of sprawl (such as increased traffic, which contributes to unhealthy air pollutant levels) and identifies possible growth scenarios that communities can implement to reduce such impacts. Urban sprawl and its ecological and human health effects make up a rapidly growing and changing field of study. A Web search on "urban sprawl" will reveal numerous articles and sites about this topic on local and national scales.

The Northeast Ohio Project's near-real-time measurements of regional air quality let residents know when air quality is poor; people can then choose to avoid or minimize certain activities that may increase their health risk on days with poor air quality. Finally, the numerous communications and outreach materials developed by the Project, such as Web sites, brochures, and logos, successfully inform area residents of the urban growth modeling tools and air quality information available through the Northeast Ohio Project. Communities in other areas of the country may want to consider developing similar regional programs.

For more information about the Northeast Ohio Project, email Dan Petersen at [Petersen.Dan@epamail.epa.gov](mailto:Petersen.Dan@epamail.epa.gov) or Stephen Goranson at [Goranson.Stephen@epamail.epa.gov](mailto:Goranson.Stephen@epamail.epa.gov).



# **APPENDIX A**

## **Project Survey of Northeast Ohio Residents**

## SURVEY OF NORTHEAST OHIO RESIDENTS

### I. Open-ended questions

1. What issues are you concerned about ( e.g., household/maintenance, economy, natural resources)?

2. Does your child or someone in your family have a persistent cough?

### II. Health questions

3. Is your health:  Excellent  Good  Fair  Poor

4. Does anyone in your family have asthma? Who:  Sex: male  female  Age:

How long?

What are the symptoms?

Do symptoms change with: a) time of day:  Yes  No If yes, then when is it worse?

b) where you are:  indoors  outdoors

If yes to asthma: have you seen a doctor about this?  Yes  No

Are you currently getting medical help?  Yes  No

5. Does anyone in your family have other breathing problems?

Who:  Sex: male  female  Age:

How long?

What are the symptoms?

Do symptoms change with: a) time of day:  Yes  No If yes, then when is it worse?

b) where you are:  indoors  outdoors

If yes to other breathing problems: have you seen a doctor about this?  Yes  No

Are you currently getting medical help?  Yes  No

6. Does anyone in your family get colds, have a cough? Who:  Sex:  male  female  
Age:  How long?

What are the symptoms?

Do symptoms change with: a) time of day:  Yes  No If yes, then when is it worse?   
b) where you are:  indoors  or outdoors

If yes to colds, cough: have you seen a doctor about this?  Yes  No  
Are you currently getting medical help?  Yes  No

### III. How aware are you?

7. How good is the air in your neighborhood? (check one):

Excellent  Good  Fair  Poor  Bad

8. Over the past 5 years has the air quality in your neighborhood been improving or getting worse? Is it:

Much better  Better  About the same  A little worse  Worse

9. What are the things that contribute to how clean or dirty the air is in your neighborhood? Such as:

- business and industry
- traffic congestion
- availability of parks and open space
- illegal trash dumping
- hospital/other incinerators
- powerlessness due to low or medium income level
- ethnicity/race
- political commitment to environmental issues
- other (what?)

10. In your opinion, is there a link between air pollution and your family's health?

Yes  No Specific comments:

11. In your opinion, is there a link between *indoor* air pollution and your family's health?

Yes  No Specific comments:

IV. How informed are you?

12. Where do you get information about community issues?

13. How often do you talk to your doctor, clinic, or health professional?

14. What are your sources of general information?

*Ask about each type:*

*Ask specific outlet/name:*

*How often?*

(#1 = primary; #2 = used daily, #3 = used 3x/week)

#1 #2 #3

<input type="checkbox"/> TV	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> radio	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> newspapers	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Internet	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> community meetings	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> word of mouth	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> 800 number	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> other	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. Do you have computer Internet access?  Yes  No Where?

16. Do you use the Internet for medical or other information?  Yes  No

17. Would you like to get day-to-day information on outdoor air quality?  Yes  No

18. In what form should we give it to you (e.g., TV, print-brochure, radio, etc.)?

19. If we brought outdoor air quality information to you to help you better predict your asthma attacks, would your activities and quality of life change?  Yes  No

How?



V. Personal information

Name  Age  Sex:  male  female

Family figure: mother/father  grandparent  other

Which neighborhood  Residence in the last 5 years:  Yes  No

Are you interested in attending a small group meeting in your neighborhood?  Yes  No

If yes: Address  City  Zip

Phone: (h)  (w)

Would you be willing to name your general income level:

above \$10,000  above \$20,000  above \$40,000  above \$60,000



United States  
Environmental Protection  
Agency

Office of Research and  
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National Risk Management  
Research Laboratory  
Cincinnati, OH 45268

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November, 2002

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