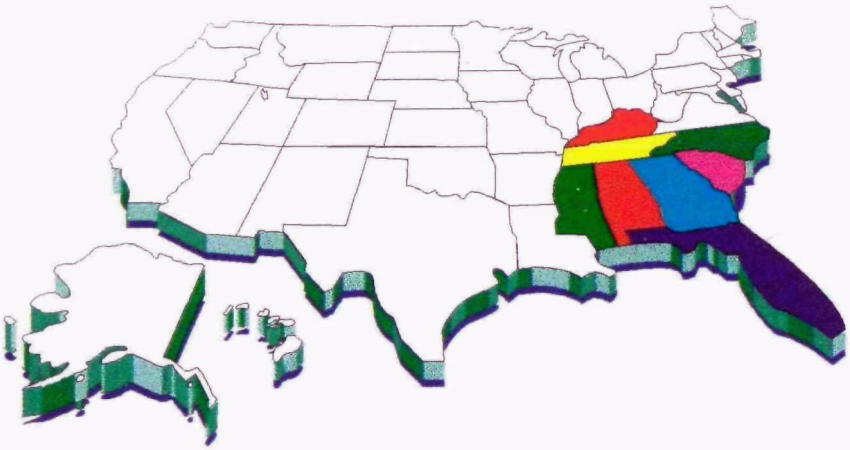
A Regional Environmental Strategic Plan (RESP) for U.S. EPA and the States of Region 4



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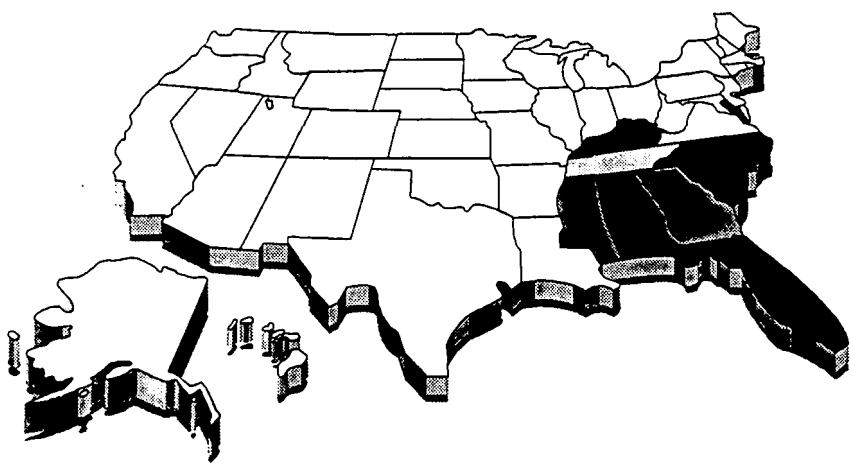

May 1996

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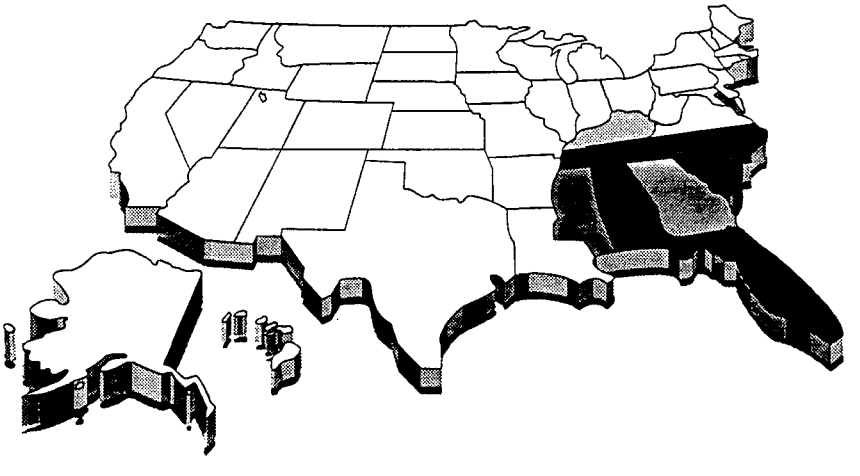
Section A

Overview of the Region



The Context for the
Regional Environmental Strategic Plan

Overview

Region 4 of the U.S. Environmental Protection Agency (EPA) and its member states are presently in the initial stages of developing a multi-level planning process to guide themselves in dealing with the important environmental issues facing the Region over the next twenty years. Specifically, the collective intent of this process is to accomplish a number of objectives to include:

- identifying the strategic issues with which the EPA and the states of the Region must collectively deal,
- preparing long-term goals and strategies for jointly dealing with those issues,
- organizing the actions of the EPA and the states to carry out those strategies,
- creating a relationship of genuine partnership between the EPA and the states,
- changing the focus for guiding environmental policy and decision making from a focus on program performance to one of environmental performance,
- beginning to change the culture of both EPA and the states to accommodate these new orientations, and
- changing the historic relationship between the EPA program offices (and their tradition of detailed prescriptive guidance) and the regional offices to provide a more flexible, environmentally-based relationship that provides for regional differences and for regional participation in funding decisions.

The RESP reflects the collective efforts of Region 4 of the U. S. Environmental Protection Agency and the eight state that comprise the Region. Over the past 10 months the management and staff of Region 4 EPA and the management and staff of the environmental agencies of Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina and Tennessee have been working to develop this cornerstone planning product.

The RESP is a strategic plan and as such it is qualitatively different than other management tools developed by EPA and the states. Most previous planning activities were for relatively short periods (1 or 2 years) and focused on prescriptive program activities and achievements. This RESP is very different in a number of important ways. The RESP:

- **takes a long-term perspective, projecting environmental results, strategies and activities over a 20 year period.** The RESP recognizes that significant environmental improvement is often the product of concerted activities over long periods of time. The RESP attempts to focus attention, energy and resources on the achievement of important environmental results measured by dynamic quantitative goals. The focus on the long-tern achievement provides the direction for our short-term activities.
- **focuses on issues that reflect the most important environmental concerns the Region will face over the next 20 years.** The major issues of the RESP reflect the most important priorities for the environmental future of the Region. As such the issues are quire different from most EPA-state planning efforts. Those differences are:
  - the issues are more broadly defined,
  - they reflect environmental outcomes more clearly,
  - they include environmental concerns not presently a part of the statutory missions of either EPA or the states,
  - they include environmental concerns that are the responsibility of other agencies -- federal, state, or local.

  The intent of the RESP is not to plan for current problems with current programs and current resources, but to identify all important environmental problems requiring treatment in the Region

over the next 20 years and begin the process of setting priorities, assigning responsibilities and allocating resources so that those problems can be successfully addressed. Only by taking such a broad view can we coordinate all of the relevant stakeholders, allocate and coordinate resources, integrate strategies and acquire the authorities we need in order to achieve the environmental result we want to achieve.

- **is a cooperative and collaborative process.** Most previous planning processes involving EPA and the states were vehicles for specifying requirements for states in carrying out EPA program direction. The RESP is a very different process. Instead of mandates and requirements, the RESP presents a set of negotiated and consensual goals and strategies that EPA Region 4 and the states will work toward. The RESP creates a framework for cooperative action in which EPA and the states can voluntarily work together to address the major environmental issues facing the region. The RESP is not a mandate: it should serve as the foundation for other planning activities and as a springboard for discussion of future joint EPA-state activities.
- **has a regional focus.** Most other EPA-state planning activities have been restricted to EPA's relationship with individual states. The RESP is regional in scope and focuses on the environmental results that can be obtained for the region through the joint, collaborative efforts of EPA and the eight states.

Finally, like all effective planning, the RESP must be an evolving; dynamic process. This present RESP is an beginning effort and, as such; reflects some limitations that can be expanded in future years. By design, this present RESP was developed by the EPA and the eight state environmental agencies corresponding to EPA in the Region. Since the relationship between EPA and the states is the fundamental element of the plan, the decision was made to focus the initial plan on the roles and relationships of these two participants. Missing from the planning process is the participation of other state and federal environmental agencies, the private sector, the environmental community and the public. The development of a fully effective process must certainly include these stakeholders. Future versions of the process will include their participation.

Next Steps

The RESP is just the first step in a process to ensure an effective planning process for the region. Three additional planning activities are being considered to extend this process:

- Development of a ***Regional Strategic Implementation Plan*** that — at the regional level — takes the direction provided by the strategies of the RESP and develops a series of specific actions that EPA and the states will take to carry out those strategies and **make them work.** This step would involve the creation of working groups or other coordination mechanisms to implement the RESP strategies.

- Development of individually negotiated ***EPA-State Environmental Plans.*** EPA and each of the states should use the same goal-driven, indicator-supported, and issue-based planning process used in the RESP to develop a joint plan that is supported both by regional goals and indicators as well as state goals and indicators. Each state plan should reflect the particular character and distribution of environmental concerns for that state by identifying the key issues and developing a strategic approach to implementing and measuring environmental performance. This plan would then serve as the basis for a negotiation in the mix of resources received from EPA. State performance would be judged, not by strictly program criteria, but also by environmental performance.

- Development of an ***Internal Operating Plan*** that outlines how EPA will internally organize and manage itself to accommodate these fundamental changes in operation.

Policy Context

The context for this plan is in part being set by the desire of EPA Region 4 and its states to develop a stronger and more effective means of cooperating and collaborating their activities to achieve the best possible environmental protection for the southeastern United States. Also heavily influencing the development of this process is a number of trends that reflect national thinking about the direction of environmental policy and management.

Environmental policy in this country is presently undergoing a rather dynamic re-evaluation. At the national level, there are concerns about loss of focus and clear sense of direction in regard to attempted achievements in dealing with environmental issues, and that the management tools being used need increased emphasis and evaluation. In general, there are several major, fundamental concerns driving this re-evaluation:

Focus on the Environment

The historic roles of EPA and the states have centered around the requirements of large national programs and the reporting of specific *program results*. Most of the new environmental initiatives are changing this focus to direct attention to the achievement of *environmental results*. To promote this emphasis on results-oriented measurement, EPA is sponsoring a variety of activities designed to increase its own use of measurement tools to drive its own decisional process, and it is working dynamically with states to improve their capabilities of developing environmental indicator systems as integral parts of their environmental management systems.

The current emphasis on environmental indicator systems is some of the clearest evidence of this trend. EPA investment of funds in state indicator technical assistance programs through the *State Environmental Goals and Indicators Project* and through the pivotal role assigned to indicators in the *Performance Partnership Agreements* demonstrates this trend.

Further, EPA's funding and technical support of comparative risk assessment studies for states demonstrate a commitment to identifying and prioritizing environmental issues as the core of environmental planning processes. These projects provide the technical information required to restructure policy — and, ultimately, redefine programs and re-allocate resources — based on a comprehensive assessment of relative risk of all significant environmental issues.

At the national level the *Governmental Performance and Results Act* will require all federal agencies, including EPA, to set goals regarding their missions and to measure their achievement. Both environmental and program performance indicators will be used.

Direction

The current structure of environmental policy in this country is primarily the result of the passage of a variety of pieces of federal legislation that have set direction for federal and state governments in dealing with specific media or problem-based issues. However, the maturing of the regulatory programs and the emergence of a variety of new environmental problems have raised issues concerning whether the overall direction of environmental policy requires an integrated reassessment to ensure a clear concept of sought-for achievements in the environment. The EPA is responding to this concern through its implementation of the National Goals Project, an ambitious attempt to open national discussion on the development of a series of unified, integrated national environmental goals that can serve as the foundation for the structuring of national environmental policy.

Partnerships

Achievement of environmental progress in the coming decades will require the resources of governmental organizations, the private sector, and the public to be fully and effectively used and

coordinated. A series of new partnerships and working arrangements will be required. The proposed *Performance Partnership Agreements* that structure a new relationship between EPA and the states are one form of a new partnership. *Project XL* is another strong new initiative that would offer new working relationships with individual facilities, economic sectors, community groups, and governmental agencies.

Environmental Context

In 1986 EPA began a process to reexamine its program and budgetary priorities by comprehensively assessing all important environmental issues within the context of the relative risk each poses. This effort resulted in the publication of ***Unfinished Business: A Comparative Assessment of Environmental Problems***, an attempt to assess the environmental risks that still remained after twenty years. A principal finding of this document was that EPA's program structure reflected the public's perception of risk more closely than it did a scientifically based assessment of risk. The process used to conduct this analysis — *comparative risk assessment* — was then utilized to conduct studies in each of its ten regional offices. Region 4 completed one of the more thorough comparative risk studies. This study established the policy and scientific infrastructure required to accomplish quality strategic planning.

These activities represent a collective effort on the part of states and the federal government to fundamentally reexamine environmental policy in this country. By using this approach they are recognizing that our present process of dealing with environmental needs is incomplete and requires a comprehensive reassessment. By emphasizing a scientific assessment of risk, a new and more objective basis for designing and implementing environmental policy and programs is established

By definition, comparative risk assessment is a planning, management, and public policy tool specifically designed to assist environmental agencies at the national, state, regional, and local levels. The comparative risk assessment process:

- identifies the critical environmental issues with which an organization must deal,
- rigorously assembles and consolidates the best available scientific information concerning that issue,
- applies a process that considers this scientific information in combination with the judgments of the best available technical experts to produce the best possible assessment of the risk that each issue poses to the ecology, human health, and quality of life,
- establishes, based on these assessments of risk, relative rankings of the issues with regard to their separate risk impacts on the ecology, human health, and quality of life, and
- confirms these rankings with the interested and general public by conducting a participative public process that culminates in the development of a single integrated ranking of environmental risks.

The results of a comparative risk assessment project can be used in at least two major ways. First, the rankings can become the basis for educating the public with regard to where the real environmental risks lie. Comparative risk assessment — by focusing on scientific evidence — has the potential to correct public perception of the relative risks of important environmental issues. Second, it provides an excellent policy tool that elected officials and environmental agency managers can use to restructure the priorities of environmental programs. By reviewing existing programs that may deal with issues of relatively low risk and by identifying issues of relatively high risk that are receiving little or no attention, programs and budgets can be restructured to meet our environmental needs.

Comparative risk assessment is not a perfect policy tool for environmental issues, but it does provide some substantial improvements over our current practices. Some of the more important improvements include:

- the current unsystematic means of defining environmental policy is replaced by a means of making decisions that is based on the best available science and the judgments of the best available scientists,
- the current practice of dealing with environmental problems one at a time is replaced by a process that comprehensively assesses all environ-mental issues, allowing decisions about environmental programs and budgets to be made in a much more complete context,
- comparative risk assessment actively involves the public in defining the environmental risks that will drive environmental policy, a level of access not commonly found in the current system.

Region 4 EPA has conducted a comparative risk assessment specifically for the eight states in the Region. Twenty-five environmental problem areas were listed relative to one another based on residual risk, the risk that remains after the consideration of present controls and regulations. For each environmental problem area, staff estimated human health, ecological, and welfare risks. Human health risk considered cancer and/or non-cancer health effects; ecological risk examined the severity and extent of adverse effects on species, communities, and ecosystem structure and function; and welfare risk estimated the dollar value of impacts including direct health care costs, lost resource values, and diminished quality of life. The twenty-five issues are:

- Accidental Chemical Releases
- Acid Deposition
- Airborne Lead
- Degradation of Terrestrial Habitats
- Degradation of Wetlands
- Drinking Water
- Global Warming
- Ground Water
- Hazardous Waste
- Indoor Air Pollution
- Industrial Solid Waste Sites
- Industrial Wastewater
- Municipal Solid Waste Sites
- Municipal Wastewater
- Nonpoint Source Pollution
- Odor/Noise Pollution
- Ozone/Carbon Monoxide
- Particulate Matter
- Pesticides
- Radiation (Other Than Radon)
- Radon
- Storage Tanks
- Stratospheric Ozone Depletion
- Superfund Sites
- Toxic Air Pollutants

In addition to the regional comparative risk assessment, several states have undertaken their own state comparative risk projects. Three states have developed issue lists for their projects: Florida, Kentucky and Mississippi. The overall approach of each project was to determine which environmental problems posed the greatest risk to each state. The initial step in each project was to develop issue lists of the areas of greatest environmental concern. Each project looked at the risks to human health, the ecology, and quality of life associated with environmental problem areas specific to their state. Each project has produced a list of environmental issue areas that were determined to be of greatest concern. The issues developed for each state are listed on the following page. (These lists do not imply any order of significance or priority.)

Florida

- Alteration and Loss of Ecosystems
- Water Quantity
- Surface Water Quality
- Patterns of Development
- Use and Management of Public Lands
- Soil Quality
- Ground Water Quality
- Transportation and Storage of Hazardous Materials
- Ambient Air Quality
- Degradation of Indoor Air Environment
- Loss of Scenic, Historic and Cultural Resources
- Environmentally Contaminated Food

Kentucky

- Protecting/Maintaining Biodiversity
- Water Quality/Quantity
  - Groundwater
  - Surface Water
  - Drinking Water
- Waste
- Land Quality
- Air Quality
- Food Safety
- Indoor Environmental Quality and Safety

Mississippi

- Industrial Wastewater Discharges to Oceans, Lakes and Rivers
- Municipal Wastewater Discharges to Oceans, Lakes and Rivers
- Aggregated Public and Private Drinking Water Supplies
- Non-point Discharges to Oceans, Lakes and Rivers
- Physical Degradation of Water and Wetland Habitats
- Aggregated Groundwater Contamination
- Storage Tanks
- RCRA Hazardous Waste
- Hazardous Waste Sites - Abandoned Superfund Sites
- Municipal Solid Waste Sites
- Industrial Solid Waste Sites
- Accidental Releases to the Environment
- Pesticides
- Sulfur Oxides and Nitrogen Oxides (Including Acidic Deposition)
- Ozone and Carbon Monoxide
- Lead (From all Sources)
- Particulate Matter
- Hazardous/Toxic Air Pollutants
- Indoor Pollutants Other Than Radon
- Physical Degradation of Terrestrial Ecosystems/Habitats
- Odor and Noise Pollution
- Stratospheric Ozone Pollution
- CO_2 and Global Warming
- Water Quantity

Human Health

Problem areas with high rankings in the area of human health risk are primarily driven by large populations of individuals exposed to chemical and physical contaminants. For example, Indoor Air Pollution is ranked very high in terms of human health risk because the exposed population potentially equals residents of the entire southeastern U.S. Similarly, radon in homes, pesticides on foodstuffs, workplace/home exposure, lead in drinking water, ozone, carbon monoxide, sulfur oxides and nitrogen oxides, other toxic air pollutants, and ultraviolet radiation also place large segments of the population at risk. For example, ozone non-attainment areas generally correspond to densely populated counties and, as a result, large numbers of people Region-wide are at risk. The ranked human health issues are:

Ranking of Human Health Issues
(High to Low)

Indoor Air Pollution Radon	Airborne Lead Ground Water Hazardous Waste Industrial Solid Waste Sites Industrial Wastewater Municipal Solid Waste Sites Municipal Wastewater Nonpoint Source Pollution Particulate Matter Superfund Sites	Accidental Chemical Releases Odor/Noise Pollution Storage Tanks Radiation (Other Than Radon)
Acid Deposition Drinking Water Ozone/Carbon Monoxide Pesticides Stratospheric Ozone Depletion Toxic Air Pollutants		Degradation of Terrestrial Habitats** Degradation of Wetlands** Global Warming**

***Not Ranked*

Ecological

Similar to the findings of the human health risk assessment, many of the problem areas that pose "very high" risk to ecological systems are linked to population growth or to areas with high population density. Past development has physically degraded formerly healthy terrestrial and wetland ecosystems; urban areas continue as the source of pollutants that stress natural ecosystems. The environmental damage that results from Acid Deposition, Industrial and Municipal Wastewater, and Ozone/Carbon Monoxide are all derived from activities of our industrialized society. Some of the same processes that contribute to acid rain and tropospheric ozone formation (such as electric power generation and automobile transportation) also contribute to Stratospheric Ozone Depletion and climate change, which were also ranked very high in the ecological risk assessment.

Ecological risk, moreover, is not limited to densely populated areas. Much nonpoint source pollution is associated with agribusiness and is only indirectly related to population density or rapid population growth. The primary factor remains the same — a large population using limited natural resources. The ranked ecological issues are:

Ranking of Ecological Issues (High to Low)

- Degradation of Terrestrial Habitats
- Degradation of Wetlands
- Global Warming
- Stratospheric Ozone Depletion

- Acid Deposition
- Industrial Wastewater
- Municipal Wastewater
- Nonpoint Source Pollution
- Ozone/Carbon Monoxide
- Pesticides

- Accidental Chemical Releases
- Ground Water
- Hazardous Waste
- Industrial Solid Waste Sites
- Municipal Solid Waste Sites
- Storage Tanks
- Superfund Sites
- Toxic Air Pollutants
- Airborne Lead
- Particulate Matter
- Radiation (Other Than Radon)

- Drinking Water**
- Indoor Air Pollution**
- Odor/Noise Pollution*
- Radon**

***Not Ranked*
**Not ranked within box*

Welfare

In terms of welfare risk, the problem areas identified as producing the highest economic damage typically result because of their high health and ecological impacts. Reductions in ecological and human health risks will produce concurrent reductions in welfare risk. The ranked welfare issues are:

Ranking of Welfare Issues (High to Low)

- Acid Deposition
- Drinking Water
- Global Warming
- Nonpoint Source Pollution
- Ozone/Carbon Monoxide
- Particulate Matter
- Stratospheric Ozone Depletion

- Accidental Chemical Releases
- Degradation of Terrestrial Habitat
- Ground Water
- Indoor Air Pollution
- Industrial Solid Waste
- Industrial Wastewater
- Municipal Solid Waste
- Municipal Wastewater
- Odor/Noise Pollution
- Pesticides
- Radon
- Toxic Air Pollutants

- Airborne Lead
- Degradation of Wetlands
- Hazardous Waste
- Storage Tanks
- Superfund Sites
- Radiation (Other Than Radon)

Demographic and Economic Context

The distribution and character of these environmental issues within the Region reflect demographic and economic trends and conditions. Analysis shows that densely populated areas correspond closely to areas where existing health and ecological risks are high. These are likely caused by unwise patterns of land use, water use, or waste disposal — all of which must be addressed. Existing risks require clean-up/restoration type activities to correct old problems and source reduction efforts to eliminate or reduce continuing sources of pollution.

Because the Region's population is showing significant growth, only offering a snapshot of present risks to the public and the environment — without a discussion of future trends — is simply planning for the past. Demographic analysis connected to risk evaluations will allow the Region to reduce present and future environmental risk and plan for sustainable development. For example, air quality problems have a strong correlation with areas of high population density and rapidly increasing population growth. EPA's air emission trends data for 1988 show NAAQS exceedances for ozone in virtually every urban area with a population density greater than 500 persons per square mile. In the four coastal states, virtually all of these nonattainment areas are surrounded by counties with high growth rates. Thus, an effective strategy must focus on both existing and future activities. In rapid growth areas, regional strategies should focus on preventing new nonattainment areas.

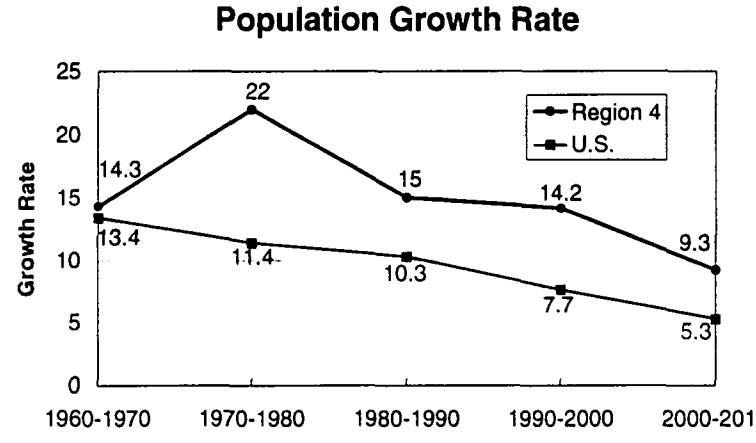
Future environmental degradation will occur in those geographic locations which are environmentally sensitive and where development pressures are the greatest. The degradation of natural environments in the Southeast may be especially severe in coming years due to predicted rapid population growth. Region 4 is an especially diverse biological area and many of the natural areas are environmentally sensitive. Areas of critical concern in the Southeast include ground water recharge areas, tidal wetlands, the Gulf of Mexico drainage basin, the Everglades, and many fragmented terrestrial ecosystems. Fragmented habitats are especially prone to localized species extinctions due to development pressure. Since prevention activities are especially useful in averting likely future problems, this plan relies heavily on them to manage areas where significant growth is likely.

Taken together, the eight states of the southeastern United States are growing faster than any other Region of the country, except the desert southwest. The Region 4 states are projected to grow to a population of 52 million by 2000, reflecting a growth of 34 percent from 1980 levels, while the nation as a whole is projected to grow only 18 percent. With a high rate of growth will come increasing pressure on the natural environment.

EPA Regional Population Comparison

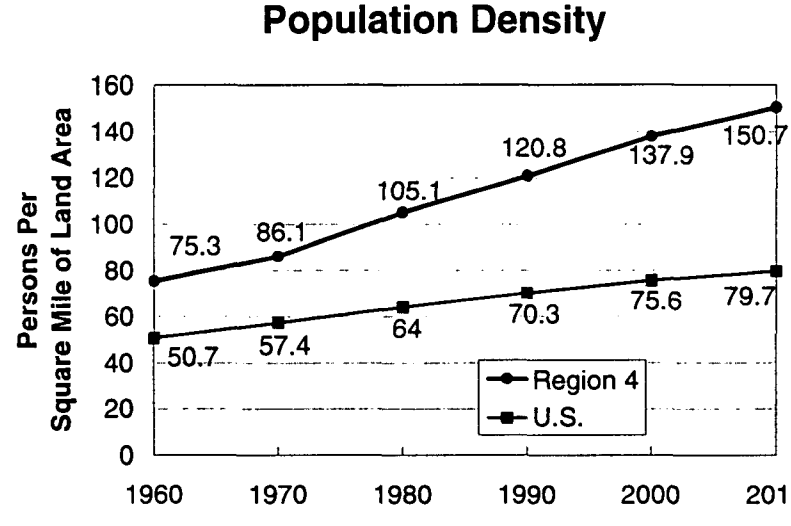
	1980 (Thousands)	1990 (Thousands)	1980 - 1990 % Change	% of 1990 U.S. Population	2000 (Projected) (Thousands)
Region 1	12,348	13,208	6.9	5.3	14,002
Region 2	24,923	25,720	3.2	10.3	26,348
Region 3	24,610	25,916	5.3	10.4	28,000
Region 4	38,880	44,708	15.0	18.0	52,241
Region 5	45,758	46,384	1.4	18.6	47,123
Region 6	25,050	28,218	12.6	11.3	29,137
Region 7	11,765	11,950	1.6	4.8	12,095
Region 8	6,952	7,605	9.4	3.1	7,733
Region 9	28,151	35,735	26.9	14.4	41,367
Region 10	8,111	9,266	14.2	3.7	9,701
U.S. Totals	226,546	248,710	9.8		267,747

There are dramatic differences in the rate and nature of growth among the eight states of Region 4. Thus, the population patterns and changes in Region 4 can best be discussed by bisecting the Region into two geographic areas which we have called: 1) Coastal states, comprising the states of North Carolina, South Carolina, Georgia, and Florida; Alabama, and Mississippi (although the latter two states have short Gulf coastlines and 2) Inland states, composed of Kentucky and Tennessee. The split dramatically documents where growth will likely occur in the Southeast.



Source: U.S. Census Bureau

The patterns of growth, immigration, and land use differ in character between the Coastal and Inland sub-regions. In agriculture, the Mississippi Valley is more intensely cultivated than anywhere else in the Southeast and is subjected to a pesticide load that is among the highest in the U.S. In the Inland states, mining and heavy manufacturing have been key components of the industrial base for over one hundred years, building the Region's major metropolitan centers. For example, more chemical emissions from the Industrial Toxics Project are released from Inland states than from Coastal states.



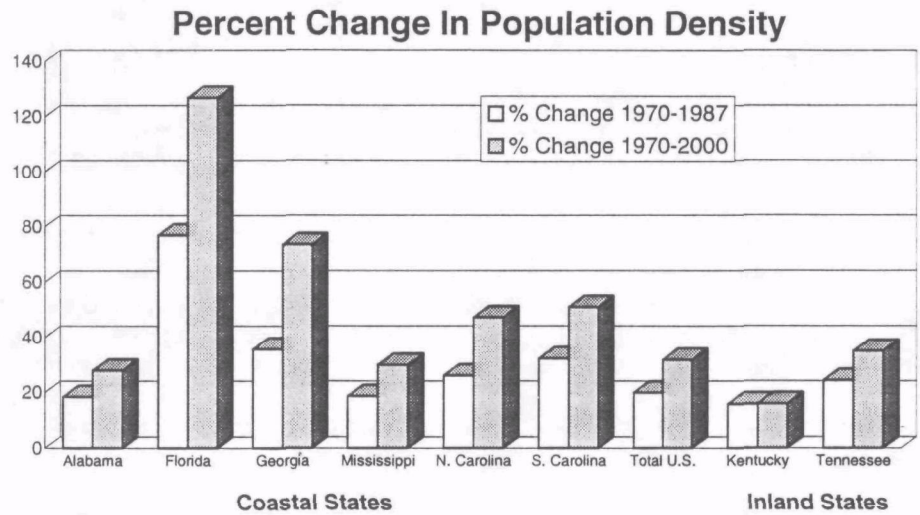
Source: U.S. Census Bureau

In contrast, much of the future pressure from population growth and development is likely to occur in the Coastal states. In general, while the Coastal states have exceeded the rate of population growth in the U.S. during the past two decades, the Inland states have lagged behind.

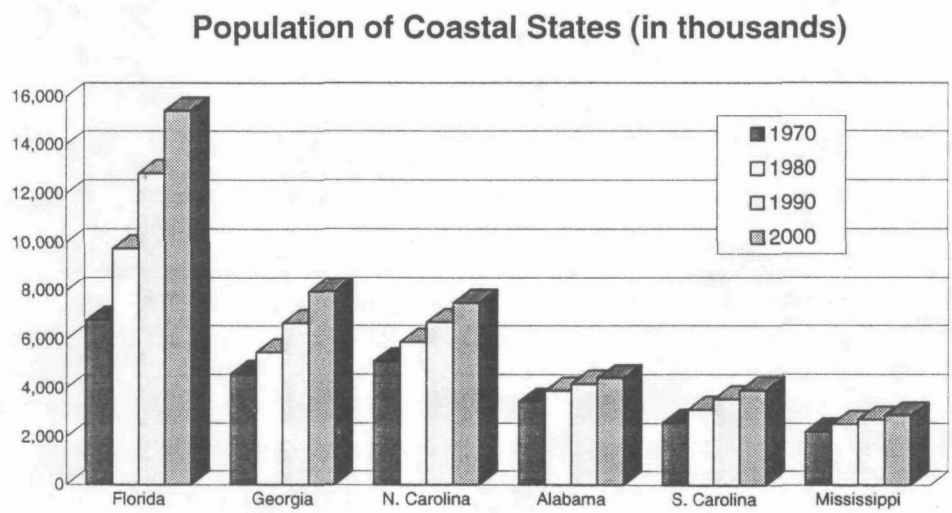
State sponsored population projections through the year 2000 show considerably higher growth in the Coastal states than in the Inland ones. For example, 33 counties in four (FL, GA, NC, SC) the Coastal states of have projected increases in population exceeding 100 percent between 1980 and 2000, compared with none in the Inland states. Overall, between 1980 and 2000, these four Coastal states are projected to experience a 44 percent increase in population, exceeding the national average of 18 percent; the Inland states' projected population growth is 11 percent.

TRENDS IN POPULATION 1970 TO 2000, COASTAL STATES

Total population growth in the Coastal states outpaced the national average by a considerable margin in both of the reported periods (1970-1980 and 1980-1987), and this trend is projected to continue through the year 2000. With this growth has come a steady increase in pressures on the environment (for example, lack of suitable landfill sites in North Carolina and inadequate freshwater supplies in Florida).



In each ten-year period, the Coastal states in Region 4 rank in the top quartile of the country's fastest growing states, with Florida consistently among the top five states, along with less populous Alaska, Arizona, Nevada, and New Hampshire. Net migration data for the Coastal states in Region 4 show that much of the above growth in population is drawn from other states outside of the Region, especially from the northeast and midwest.

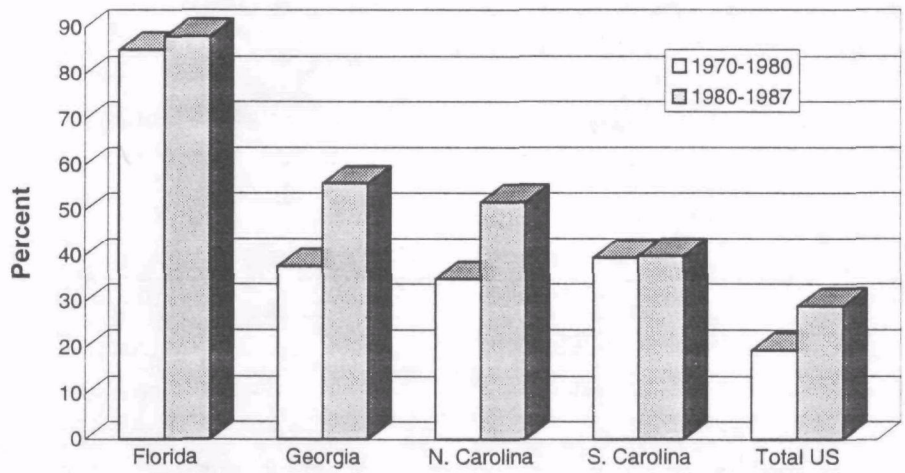


Coastal States' Population, in thousands

State	1970	1980	% Change 1970-80	1990	% Change 1980-90	2000	% Change 1990-2000	% Change 1970-2000
Alabama	3,444	3,894	13.1	4,181	7.4	4,410	5.5	28.0
Florida	6,791	9,746	43.5	12,818	31.5	15,415	20.3	127.0
Georgia	4,588	5,463	19.1	6,663	22.0	7,957	19.4	73.4
Mississippi	2,217	2,521	13.7	2,699	7.1	2,877	6.6	29.8
N. Carolina	5,084	5,882	15.7	6,690	13.7	7,483	11.9	47.2
S. Carolina	2,591	3,122	20.5	3,549	13.7	3,906	10.1	50.8
U.S. Total	203,302	226,546	11.4	249,891	10.3	267,747	7.1	31.7

As indicated by the migration data, the four states with the largest stretches of coastline (FL, GA, NC, SC) are growing by virtue of migration and not as a function of a particularly high birth rate or low death rate. This influx has created and will continue to create rapidly increasing immediate pressures on the local environment (e.g., new houses, transportation corridors, etc.).

Percent of Coastal States' Population Change Due To Migration



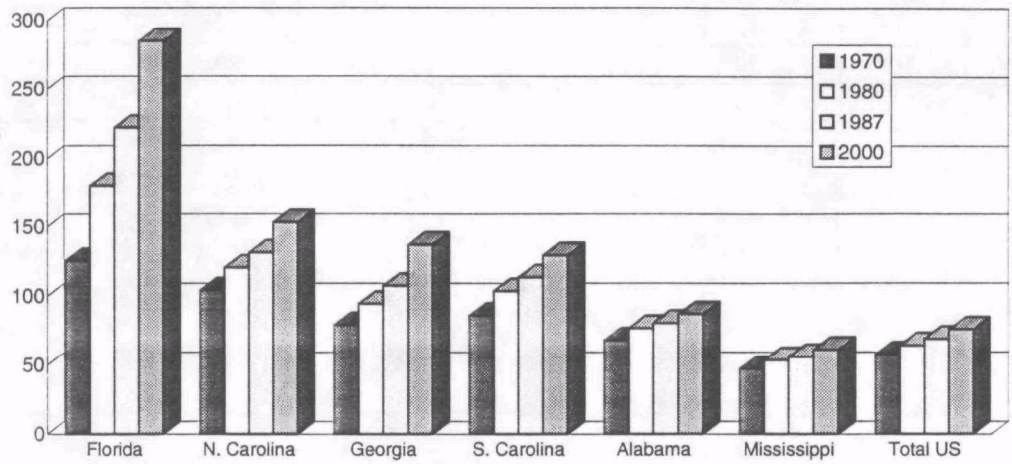
Net Total Migration — Coastal States (in thousands of people)

State	1970-1980 Change	1970-1980 Migration	1970-1980 %	1980-1987 Change	1980-1987 Migration	1980-1987 %
Florida	2,955	2,519	85.2	2,277	2,007	88.1
Georgia	875	329	37.6	759	424	55.9
N. Carolina	797	278	34.9	531	275	51.8
S. Carolina	531	210	39.5	303	121	39.9
U.S. Total	23,244	4,516	19.4	16,854	4,884	29.0

When arrayed by county, a pattern emerges showing the differential growth by state. By the year 2000, the most intense growth in the Region is projected to occur in the coastal counties of the Carolinas, the northwestern counties surrounding Atlanta, and central and southern Florida.

As a demographic measure, the change in population in the Coastal states lacks the dimension of density, an important factor indicative of preexisting population pressure and related ecological damage. Cities were built at the expense of native habitats and the infrastructure to support society's activities are in place. Population density increased by more than 25 percent in the Coastal states from 1970 to 1987 and is projected to increase through the end of the century.

Coastal States' Population Density (Population Per Square Mile)



Population Density (Pop/sq. mile) - Coastal States

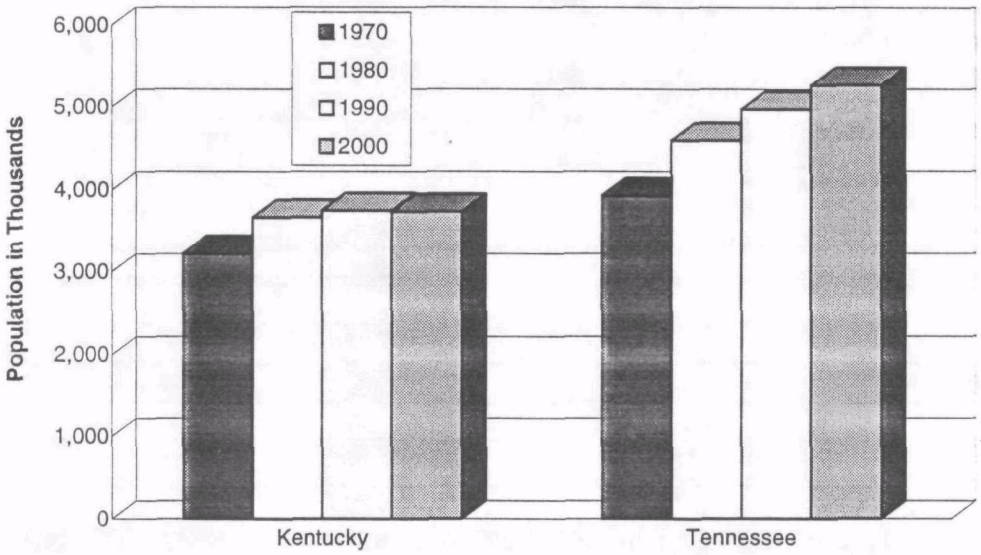
State	1970	1980	1987	2000	% Change 1970-87	% Change 1970-2000
Alabama	67.9	76.7	80.4	86.9	18.41	27.98
Florida	125.5	180.0	222.0	284.7	76.89	126.85
Georgia	79.0	94.1	107.2	137.1	35.70	73.54
Mississippi	46.9	53.4	55.6	60.9	29.85	29.85
N. Carolina	104.1	120.4	131.3	153.2	26.13	47.17
S. Carolina	85.7	103.4	113.4	129.4	32.32	50.99
U.S. Total	57.4	64.0	68.8	75.6	19.86	31.71

Population density change is best represented at the county level. The areas of greatest increase in total population do not always correspond with the areas with the highest population density. Some Standard Metropolitan Statistical Areas become stagnant with respect to population density. Comparing 1980 data to the projected 2000 levels shows that density is increasing throughout central Florida, in the counties surrounding Atlanta, along coastal South Carolina, and in North Carolina in the central Piedmont area and around the city of Charlotte. In general, the counties with the greatest sustained growth between 1980 and 2000 (projected) are those with moderate population densities (between 50 and 500 persons per square mile). As noted before, air quality problems have a strong correlation with areas of high population density and rapidly increasing population growth. Continued growth in these areas and in similar counties will more than likely aggravate air quality problems and increase the probability of ground water and surface water quality problems.

TRENDS IN POPULATION 1970 TO 2000, INLAND STATES

In contrast to population trends in the Coastal states in Region 4, the Inland states are projected to grow at a pace at or below the national average of 32 percent between 1970 and 2000, and therefore are not facing the same degree of environmental pressure resulting from the burgeoning population and development. The greatest growth in the inland states occurs between 1970 and 1980, with only modest growth occurring in the following decade and projected to 2000. In the period 1990 to 2000, in fact, Kentucky is expected to suffer a net decrease in population, due in part to decreasing demand for two of Kentucky's most significant commodities, tobacco and high sulfur coal.

Changes in Inland States' Populations

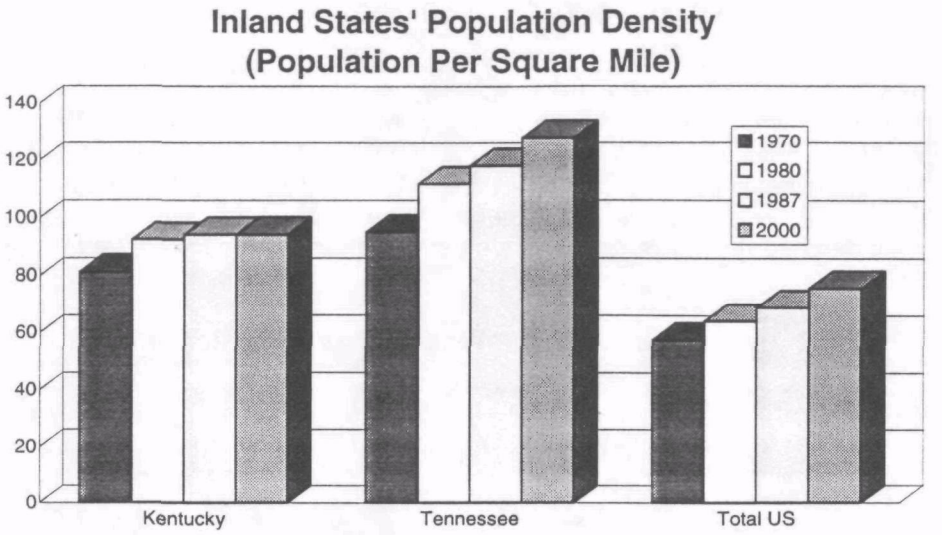


Inland States' Population, in thousands

State	1970	1980	% Change 1970-80	1990	% Change 1980-90	2000	% Change 1990-2000	% Change 1970-2000
Kentucky	3,221	3,661	13.7	3,745	2.3	3,733	-0.3	15.9
Tennessee	3,926	4,591	16.9	4,972	8.3	5,266	5.9	34.1
U.S. Total	203,302	226,546	11.4	249,891	10.3	267,747	7.1	31.7

When the population changes are shown at the county level, significant differences emerge among the two states. Kentucky shows population losses in a number of counties in every period whereas, overall, Tennessee shows modest increases. More than one third of the counties in the two Inland states experienced no appreciable growth or lost population. Between 1988 and 2000 only a few suburban counties, bordering metropolitan areas, are projected to increase as much as 25 percent.

Population density in the Inland states is expected to change relatively little through the year 2000. Similar to the patterns apparent through the last decade and projected through 2000 in the Coastal states, the counties experiencing growth are those with moderate population density, surrounding urban centers.



Population Density (Pop/sq. mile) - Inland States

					% Change	% Change
State	1970	1980	1987	2000	1970-87	1970-2000
Kentucky	81.2	92.3	94.0	94.1	15.76	15.89
Tennessee	94.9	111.6	118.0	128.0	24.34	34.88
U.S. Total	57.4	64.0	68.8	75.6	19.86	31.71

EMERGING TRENDS IN BUSINESS AND AGRICULTURAL PATTERNS

To structure a macro-level assessment of patterns of business activity in Region 4, businesses have been broken into three broad categories: manufacturing (construction and manufacturing), services (transportation, communication, public utilities, finance, insurance, real estate, recreation, entertainment, and professional and related services), and trade (wholesale and retail). Agriculture will be discussed separately due to the difficulties associated with assessing seasonal versus permanent employment.

The pattern of non-farm employment in the Region varies from the national average, generally balancing employment in manufacturing, services, and trade.

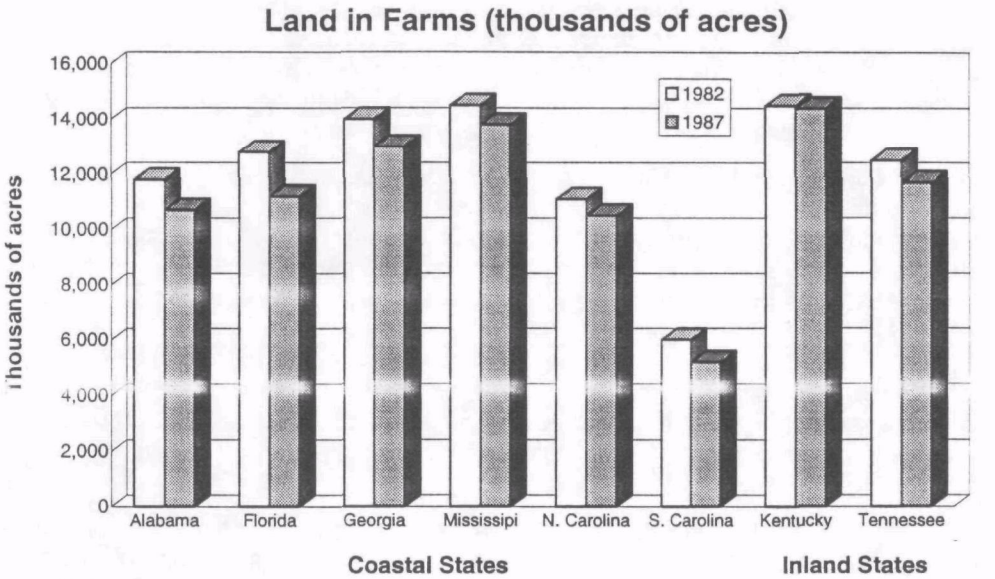
Employment by Non-Farm Business Sector, 1985

Area	Manufacturing	Services	Trade
U.S. Total	29.5%	39.9%	27.7%
Region 4	33.5%	35.5%	28.5%

Trend analysis is an important part of demographic analysis. The demographics of the southeastern U.S. are changing quickly: rapid migration is occurring into Coastal states and into selected urban areas throughout the eight states. The change in demographics has spurred changing patterns of business activity and employment and, potentially, the nature of environmental pressures in Region 4. Increases in the service industry are notable. Preliminary data from the most recent census-taking suggest that the trend continues through 1990. If the trend continues, those counties showing significant increases in employment in service and trade sectors may preface a longer trend away from manufacturing, a lessening of the environmental pressures imposed by the manufacturing

industry, and a corresponding increase in pressure on landfills and other solid waste disposal facilities as plastic and paper waste is generated by service and trade industries. The ability of EPA to focus attention and action on pollution prevention can mitigate the aforementioned problems.

Agriculture and silviculture are major industries in the southeast: approximately ten percent of the farm acreage and fifteen percent of the total national gross receipts from agriculture are controlled by the eight Region 4 states. Unlike non-farm business sectors, the potential environmental pressure applied by land use in agriculture is not meaningfully indicated by statistics on employment. Indicators of potential environmental pressure are available as data on total cropland and use of irrigation.



Both the number of farms and the total cropland have steadily declined in the Region and the entire U.S. over the past decade. Commercially available timberland in seven of the eight states exceeds total farm land and represents more than one quarter of the national total.

Trends In Agricultural Land Use and Commercial Timberland

	Number of Farms (in thousands)			Land in Farms (thousand acres)			Timberland* (thousand acres)
State	1982	1987	% Change	1982	1987	% Change	1987
Florida	36	37	2.78	12,800	11,200	-12.50	15,238
Georgia	57	48	-15.79	14,000	13,000	-7.14	23,384
North Carolina	86	70	-18.60	11,100	10,500	-5.41	18,358
South Carolina	31	26	-16.13	6,000	5,200	-13.33	12,179
Alabama	55	49	-10.91	11,800	10,700	-9.32	21,659
Kentucky	103	99	-3.88	14,500	14,400	-0.69	11,909
Mississippi	53	44	-16.98	14,500	13,800	-4.83	16,674
Tennessee	91	80	-12.09	12,500	11,700	-6.40	12,840
U.S. Total	2401	2213	-7.83	1,027,795	1,002,603	-2.45	483,072

* Land classified as commercial timberland includes both public and privately-held forest land capable of producing 20 cubic feet per acre per year.

Since the distribution of agricultural land among the eight states varies geographically, it is more useful to see the pattern of agricultural land use at the county level. The greatest concentration of regional cropland is located in the Mississippi Valley and in the southeastern plains in the Coastal states. The decrease in agricultural land use in the four years preceding 1982 is reflected by the fact that 514 of the 736 counties in Region 4 lost acreage devoted to agriculture, for a total of 70 percent of the counties.

Taken alone, a decrease in the acreage devoted to agricultural production might imply a potential reduction in pressure on the environment from a reduced rate of soil erosion and depletion and a reduction in the total pesticide load. But the drop in acreage devoted to agriculture does not exist in a vacuum. At the same time total cropland has been shrinking, the level of intensity of the farming has been steadily increasing. One example of this is the emergence of confinement farming practices for poultry and dairy production. Confinement farming is typified by housing hundreds to thousands of animals in a minimum amount of space, producing high levels of animal waste. In addition, agricultural land taken out of production is generally put into a more intensive land use and thus decreases its potential use as regional habitat for wildlife.

Many of the counties showing a decrease in cropland are at the same time experiencing a rapid increase in population, presumably applying different environmental pressures to the land. For the land remaining in agricultural production, in order to maintain or increase total crop yield, increased pressures have been applied to the land and natural resources. For example, while the total cropland acreage has been decreasing, the use of irrigation on remaining cropland has been increasing. State agriculture departments also show an increased reliance on fertilizer applications in the eight states and the second highest rate of pesticide application in the nation (behind the six states of Region 5). Combining the increase in irrigation with an increasing use of fertilizers and pesticides has resulted in a steadily increasing pressure on soil and ground water resources and increased the risk from non-point source runoff of the toxic chemicals used in modern, high intensity farming.

Taken together, the employment data on manufacturing, services, and trade along with the land use data on agriculture and irrigation show two pictures. First, the counties which are heavily invested in manufacturing or have a high percentage of cropland under irrigation change relatively little both in terms of employment/land use and population. Second, the geographic regions in which employment is more evenly divided among manufacturing, services, and trade industries, and in which the land is less heavily invested in agriculture, have grown most heavily in population and have increased employment in service industries relative to trade and especially manufacturing.

Reducing Future Environmental Risk

The Comparative Risk Evaluation provided a status report — a snapshot of the current environmental situation — of environmental risk in the Southeast. Although demographic data do not indicate the point sources of pollution, the smokestacks, the effluent pipes, and the landfills, the data can show the patterns of living which lead to more or less of those large point sources as well as multitudes of small sources, such as dry cleaners and gasoline service stations, which follow population growth and are hard to control.

In surveying population trends, areas of environmental sensitivity, and already identified environmental problem areas in Region 4, two inferences emerge. First, as demonstrated by the location of NAAQS non-attainment areas, many of the Comparative Risk Evaluation problem areas identified as "high risk" with respect to human health are located in geographic areas of high population density. This may seem obvious, but it reinforces the conclusion that without close monitoring and control, environmental problems naturally follow in population centers and grow as density increases.

Second, with regard to ecological risk, many of the geographic areas of highest projected growth in the next decade are also environmentally sensitive. A plot of the southeastern ecoregions overlaid with projected high population growth rates indicates that new growth in many coastal and inland

urban counties may severely stress natural environments. The prime example of habitat at risk is coastal wetlands. Along the Atlantic coastline, throughout Florida, and in the Coastal Plain, ecoregion population is projected to grow very rapidly. Around urban centers, population in counties of both high and low density is increasing and spilling into surrounding open land. Without supervision these areas of highest growth will degrade and follow the pattern of environmental problems mentioned above. Many of the areas of highest growth lack the infrastructure necessary to manage the demands of a rapidly expanding population and will therefore feel the negative effects especially acutely.

One key for reducing future risk is to integrate the concept of sustainable development into the fabric of our society. Environmental risk, regrettably too often, follows population growth. The assumption underlying this discussion of demographic data as an environmental indicator is that increasing population means increasing pressure on the environment through increased solid waste generation, increased human waste disposal problems, increased air emissions from automobiles and residential fuel use, and decreased undeveloped open land. EPA will reduce future risk by targeting specific high risk stressors and protecting areas that are environmentally sensitive.

The Issues of the Regional Environmental Strategic Plan

On June 7 and 8, 1996, the eight secretaries and commissioners of the state environmental agencies in Region 4 and the management of EPA Region 4 met at the Carter Presidential Center in Atlanta. With the regional and state comparative risk studies as an informational basis, they began work on this RESP with the development of a list of 10 environmental issues that they believed best summarized the major environmental challenges facing the Region over the next 20 years. Those issues are:

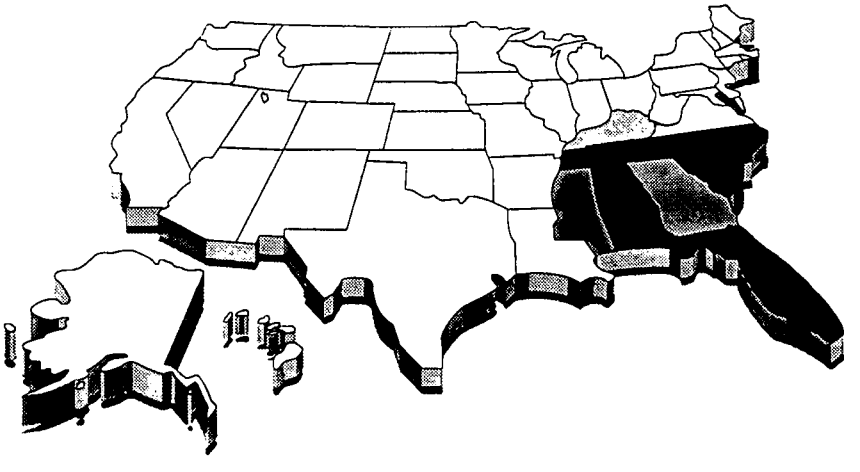
- Alteration and Loss of Ecosystems
- Alteration and Loss of Coastal and Inland Wetlands
- Environmentally Damaged Lands
- Contaminants in the Environment
- Waste Management
- Surface Water Quality
- Ground Water Quality
- Water Resources
- Air Quality
- Healthy Communities

The decision was made to leave the issues unranked; therefore, the order presented here reflects no priority and no attempt should be made to associate the order of these issues with the prioritized ranking of the regional and states comparative risk assessment studies presented above.

Over the past ten months the management and staff of the eight states and EPA have been meeting to examine these issues to set goals and devise strategies for their resolution The result is this RESP.

Section B

Guiding Principles



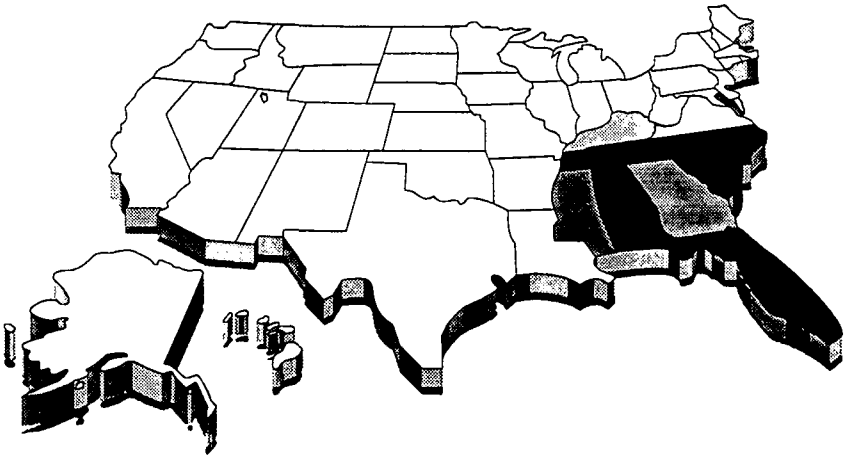
Guiding Principles:
Regional Environmental Strategic Plan (RESP)

The purpose of this Regional Environmental Strategic Plan (RESP) is to:

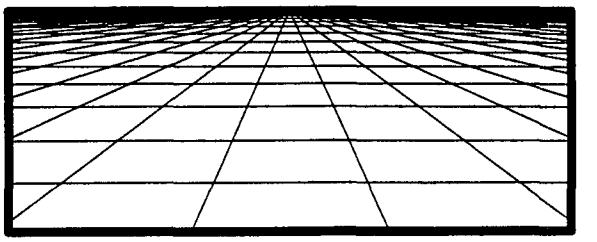
- Establish a cooperative and collaborative environmental planning process between the states and EPA in Region 4,
- Provide strategic direction to the joint activities of the states and the Regional Office in achieving regional environmental goals and objectives,
- Shift the focus of the EPA-State relationship from program accomplishments to the achievement of explicit environmental results,
- Create the foundation for the negotiation of individual state agreements based on the achievements of environmental results, and
- Prepare the Region and its states for participation in the new roles offered by Performance Partnership Agreements and by opportunities for changes in EPA oversight practices.

Section C

Vision Statement



An Environmental Vision for Region 4: *2015*



The National Vision

The New Generation of Environmental Protection: EPA's Strategic Plan envisions a world in which:

All individuals and institutions value the environment and choose to act in a manner that ensures achievement of sustainable environmental and economic goals.

The natural balance of all living things is no longer threatened and all individuals -- rich and poor, young and old -- share in the benefits of a healthy environment.

This vision is expanded in the ***Proposed Environmental Goals for America with Benchmarks for Year 2005:***

We envision a 21st century where healthy and economically secure people sustain -- and are sustained by -- a healthy environment. Every person breathes clean air, drinks clean water, eats safe food, and lives, works and plays in clean, pleasant, and safe surroundings. Natural processes carry on side-by-side with human activities and diverse natural systems support economic development for years to come.

The Regional Vision

The U.S. Environmental Protection Agency and the states of Region 4 accept this national vision and offer their own vision, refined to reflect the special environmental values of the southeast.

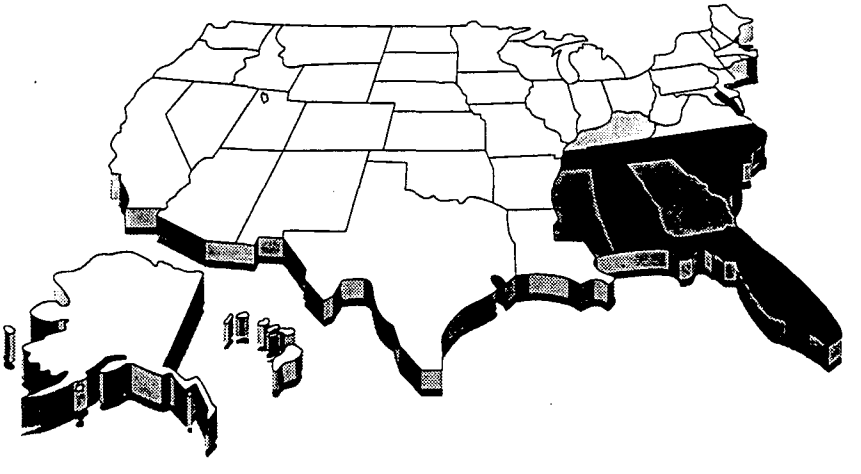
Our Natural Areas
Region 4 will be rich in quality natural areas of wide physical and biological diversity. The most important ecosystems will have been identified and afforded the special protection they require to flourish. Natural habitats supporting secure populations of all native plants and animals exist throughout the Region. Special value resources -- the wetlands of the rivers, streams, lakes, and estuaries -- will be protected from further loss and will be improving in quality.

Our People
The citizens of the southeast will lead environmentally safe and healthy lives in communities free of environmental disease. The air they breathe and the water they drink will be clean. Whether our citizens live in urban or rural settings, we will ensure that these environments fully meet the standards of environmental quality we want for all of our citizens. None of our citizens will endure low quality environmental conditions because of their income, race, or age. Our citizens will be our partners in environmental protection. They will have an environmental ethic that allows them to recognize their personal role in preventing pollution and protecting our environmental values and resources. We will provide them with the opportunities and the support they need to participate in the protection of their environment.

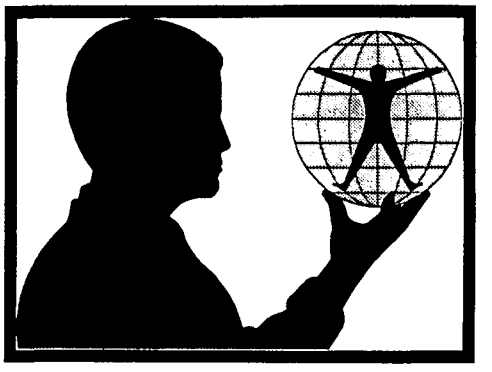
Our Economy
The protection of our environment and the vitality of our economic system are mutually reinforcing. We will be working cooperatively with the private sector to make them partners in maintaining our key environmental values and we will -- through sound, scientifically-supported public policy -- jointly and flexibly set the allowable, sustainable limits necessary to ensure environmental quality. Private industry will become a major partner in solving environmental problems and will learn to minimize, reuse, and recycle their wastes to virtually eliminate chemical releases or the need to dispose of hazardous wastes. There will be a rebirth of old economic areas of the southeast -- an environmental redevelopment -- to convert environmental and economic liabilities into assets for the future.

Section D

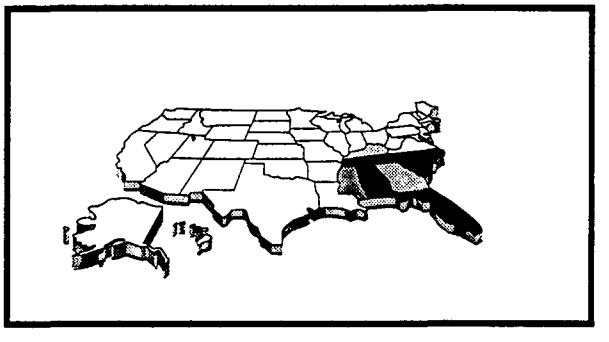
Strategy Statement



An Environmental Strategy Statement For Region 4: *2015*



Since the creation of the U.S. Environmental Protection Agency over two decades ago, we have made tremendous progress in improving the environmental quality of life in the United States. This progress was achieved through the implementation of large programs designed to firmly regulate major sources of air and water pollution and waste. The federal Clean Water Act, Clean Air Act, Resource Conservation and Recovery Act, and the Safe Drinking Water Act were comprehensive programs, focused to deal directly with large, obvious, and clearly important sources of pollution. This concentration on large polluters has resulted in tremendous progress, with marked improvement in air and water quality in most of our more heavily polluted areas. After 20 years of such regulatory, or "command and control" types of programs, much of the pollution caused by such sources is being successfully managed, and the opportunity to make further gains by increased regulatory activities is being made on the margin. While the continuance of regulatory programs is an essential element in protecting our environment, it is apparent to most of our citizens that the environmental values of our nation and our states remain threatened and that our current activities are not sufficient to provide the type and amount of environmental protection our citizens demand.



It is becoming clear, therefore, that current environmental laws do not support an environmental policy that is dealing with the totality of our current environmental problems. By focusing on large and visible environmental issues, we have created a national environmental policy that is defined by a limited set of issues that have a very public or political context. The result is that important and potentially more environmentally dangerous or damaging issues whose effects are less obvious, less political, or not as emotionally charged receive disproportionately less attention and financial support than they deserve. Increasingly, this creates the potential for a serious misallocation of public resources and the distortion of environmental public policy.

This continued threat to our environmental values is attributable to several factors. First, even if each source of pollution or ecological degradation is being more tightly regulated, the total number of sources, particularly in a high growth area, increases the total level of pollution or degradation. Our raw numbers are starting to work against us. Second, rapid technological advances often outstrips the ability of government to provide adequate safe-guards for new pollution effects. Finally, much of our current pollution emanates from sources that are largely beyond regulation and are personal rather than institutional in nature. Much of our pollution results from *individual* decisions that we all make on a daily basis. The single greatest source of water pollution today comes from stormwater -- the water that runs off of our roads, parking lots, and farms. Individual decisions that we make about how we treat our parking and how we apply fertilizers, pesticides, herbicides, and other yard chemicals have major impacts on the quality of our waters. Our indoor air environments are consistently ranked as having the highest risk to human health, yet they are generally unsupported by programs and are beyond regulation. The largest source of air pollution is the automobile. How we maintain our vehicles and the number of miles we drive them contributes profoundly to air pollution.

The emphasis on command and control programs tended to focus attention of specific problems generally confined to specific media -- air, water and waste. In many cases, compartmentalizing environmental issues has increasingly limited our ability to deal with them comprehensively and effectively. As the interconnectedness of environmental issues has become more obvious, the structure of current environmental programs has received increasingly stronger and more frequent challenges.

It is clear that at both the national and the state level we will need to begin making hard choices concerning funding and the array of environmental programs provided. Scarce resources will demand that our selection of environmental programs and our allocation of resources accurately reflect the reality of environmental needs if we are to be successful in meeting future demands.

Further, the clarity of our mission did not demand sophisticated planning and management processes. The sources of pollution were so large, so obvious and so institutional and budgetary resources so expandable, that good decision systems supported by effective planning and information systems were underutilized.

The mission largely followed the actions of Congress who passed laws based upon the most egregious environmental needs. Thus, our way of doing business followed "problem-specific" or "media-specific" approaches, based upon environmental laws as they came into being. In the past, this served as an efficient way of dealing with environmental issues and many areas of our environment improved as a result.

Though much has been accomplished in environmental and public health protection since EPA's inception and the creation of state environmental health agencies, the most difficult problems remain. Such complex problems, usually encountering pollution sources in several media, require a comprehensive planning approach to solving our remaining problems and beginning to proactively protect our environment. We must consciously move from the reactive, "response mode" into a comprehensive, proactive planning mode. This approach must include all of our stakeholders: EPA, the states, industry, environmental groups, and the public.

The focus on regulation tended to create an adversarial relationship with the private sector, making command and control types of programs expensive, litigious and time consuming for both the regulator and the regulated. Because of the institutional character of regulatory types of programs, the roles and opportunities for citizens to participate in the protection of their own environmental values were limited and often confrontational.

Industry must have more opportunities to protect the environment before pollution is created through the use of pollution prevention and industrial excellence programs and through the information sharing promoted by EPA Region 4 and states. The public, too, will have greater input in solving its own environmental problems through the use of community-based environmental protection (CBEP). CBEP mobilizes state and EPA resources, the public and industry of a community, to solve its own environmental problems and to plan for future environmental, human health, and wildlife protection. EPA will increasingly rely on CBEP and other voluntary activities to take us farther toward comprehensive environmental protection than our current regulations prescribe.

A Regional Strategy

Dealing with these circumstances will require some fundamental changes in the way environmental agencies in Region 4 must approach their missions. This Regional Environmental Strategic Plan identifies five major strategic changes that need to be made if EPA and states of Region 4 are to successfully adapt to meet the environmental challenges of the next 20 years.

Strategy 1: The environment must be treated within an integrated and more comprehensive framework. The recognition that environmental issues are highly interconnected and increasingly more complex has raised questions concerning the appropriateness of the categorical, media-based programs that presently dominate federal and state environmental policy and activities. Dealing with environmental problems on a media basis can achieve important

results, but important benefits can be lost. If a resource is being confronted by several different problems, dealing with just one of them may not have enough impact to bring about a full solution. Further, without viewing a resource in a systemic fashion, the impacts of a single medium activity cannot be comprehended in terms of how it affects the broader system, which can sometimes be negative.

As environmental issues are conceptualized in broader terms as opposed to individual issues, new frameworks are being offered that are focused on taking a more integrated, more holistic, and more systemic approach. Current approaches being developed include:

- ecosystem management,
- place-based management,
- community-based environmental protection,
- watershed management, and
- cross-media management.

Whether some, all or none of these frameworks are finally recognized and used, environmental management will develop some sort of system-based management process to structure a broader assessment of environmental issues.

Strategy 2: The role of the public in environmental protection must become larger and more profound. New forms of public involvement in environmental protection are evolving that can change the way the public participates in environmental policy. Approximately half of the states have now completed comparative risk assessment studies that have, in most cases, created significant opportunities for the public to directly participate in setting environmental priorities, a new and promising role. Increasingly, important environmental issues are arising that result from millions of individual, personal decisions (indoor air, stormwater, automobile-based pollution discussed above) for which institutional solutions are difficult if not impossible. The education of the citizen as an actor involved in solving one's own problems as an educated, aware, good environmental citizen possessing a strong environmental ethic of stewardship is the goal for the future. Groups of such individuals working at the community level have the potential to provide higher levels of environmental protection, with organizational and technical assistance from EPA and the states, than governmental programs could ever offer alone.

Strategy 3: The private sector needs to become a partner with government in solving environmental problems. One of the artifacts of command and control approaches is the development of an adversarial, confrontational, and litigious relationship between government and the private sector. While the continuance of regulation as a strategy for environmental protection will likely prevent the elimination of this negative association, a great many opportunities exist or can be created to soften this conflict through regulatory reform and through the creation of new, highly positive, collaborative, and cooperative relationships capable of making the private sector an active partner of government in protecting the environment. The growing success of pollution prevention initiatives provides a foundation for further growth in private sector activities in dealing creatively with their own waste processes and provides a model for the development of other approaches to involving private industry. Some other activities to be explored or continued are: increasing our technical assistance and information sharing to industry, providing incentives, involving industry early on in the rule-making process, and fostering participation in community-based environmental protection projects. During the next 20 years environmental agencies and the private sector need to define and implement new strategies that benefit both the environment and private interests. Such approaches as performance permitting, compliance-based regulation, and market-based incentives need to be reevaluated and used whenever feasible.

Strategy 4: The range of environmental strategies needs to be expanded to deal with more diversified environmental issues and new types of clients. EPA and its counterpart state agencies employ an increasingly wide range of environmental strategies to accomplish its mission. However, the preponderance of their resources and attention are focused on the management of monolithic regulatory programs and on restoration activities associated with cleaning up polluted sites. While regulation and restoration will remain important, if not central, parts

of any overall environmental program structure, their ability to resolve remaining environmental problems is being questioned. Environmental protection during the next 20 years will need to add fundamentally different approaches than in the past. Some strategies useful in dealing with this changed setting might include:

- assisting in the **financing** of environmental solutions through partnering, developing new financing mechanisms, and by reducing the impacts of unfunded mandates,
- providing **technical assistance** in the form of consulting, training, and monitoring to private industry, community-based groups and private citizens,
- participating in the presentation of **environmental education** in a variety of forums to make our citizens and their children good environmental partners,
- the greater use of **acquisition** and related techniques like mitigation banking to protect critical resources,
- supporting key **research and technology development** to support the solution of priority problems,
- building coalitions of private sector and community-based groups for **partnering** solutions to environmental problems,
- increasing the scope and depth of **monitoring** activities to provide environmental information for making sound, more holistic decisions and supporting the activities of community-based groups, and
- designing and conducting serious, information-based, results-driven **planning** processes to ensure better, more timely decisions, and the more effective use of resources.

Strategy 5: The tools and techniques employed for environmental management need to be improved and more conscientiously employed. For the past 25 years environment management may have been too easy; the problems were egregious and obvious, the solutions fairly straightforward and the resources were available and expandable. Under such circumstances the need to make tough management choices was not urgent. This has been reflected in a number ways in the manner in which environmental organizations have managed themselves to include, among others:

- a general absence or weakness of strategic planning processes,
- the lack of a serious connection between planning and budgeting systems,
- a weakness in monitoring or other information gathering processes that could be used to make environmental decisions, and
- a lack of systematic environmental analysis as the foundation of environmental policy.

Circumstances have changed. Environmental issues are no longer quite so obvious or simple, the solutions are not so direct, the problems and their sources are more diverse, and the financial resources available to deal with environmental issues are static or shrinking. Dealing with more complex and difficult circumstances will require better decisionmaking processes and tools and more dedication to applying and using them.

At the center of this change in management process is a fundamental change in the nature of the EPA-state relationship. The proposed Performance Partnership Agreement process is an important first step in a changed relationship, a true partnership that is based more in environmental performance than in prescriptive guidance. Support for this initiative or for other that will follow will require:

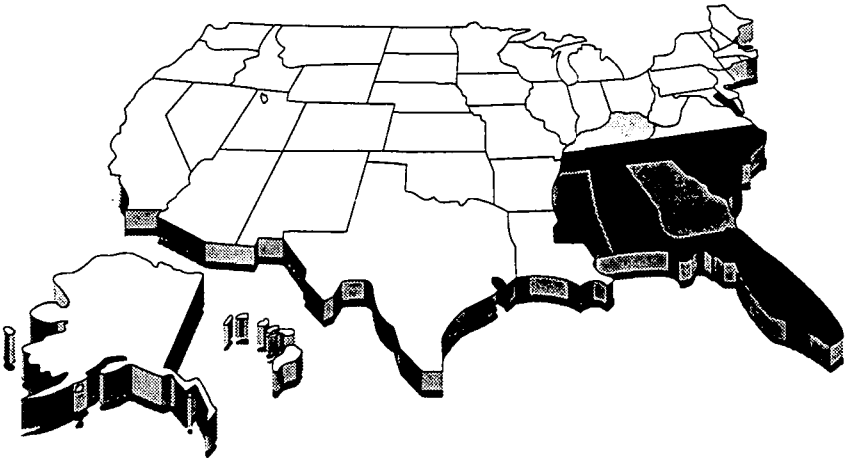
- more emphasis on the design and use of effective planning processes,
- a reliance on environmental indicators that are derived from better information which is, in turn, derived from better data systems that focus on environmental, not programmatic, concerns,
- more comprehensive, risk-based analyses of environmental problems and issues,
- the use of better evaluation tools to gauge our programmatic and environmental success, and
- the development of a results orientation to ensure that our decisions are based on achieving environmental benefits.

Strategy 6: EPA, the states, and local governments need to develop a stronger and more collaborative partnership to strengthen their joint capacity to address environmental issues. Solving environmental problems is not the responsibility of any single level of government. Federal, regional, state, and local governments all have strengths that are needed if continuing progress is to be made. Environmental agencies at all levels need to assess these strengths and negotiate a system of environmental protection that establishes roles that complement and reinforce one another.

EPA has begun reforming its oversight of state-run programs by focusing on results instead of the minutiae of state activities and by reducing oversight of states which are performing effectively. Through a process of accountable devolution, responsibilities are being passed to states and localities when national management is less effective and where the state has shown the commitment and capacity to effectively perform. As EPA continues to delegate program responsibility to states and decreases oversight of these state-administered programs, the agency will be free to redirect resources to more productive activities. These activities should stress state and local capacity-building and assistance functions and should include helping states address complex multi-state, multi-media activities, establishing environmental training institutes, increased capacity to share environmental information through improved monitoring and GIS applications, and specialized knowledge of all major industries in the Region.

Section E

Issues, Goals, and Strategies



Regional Strategic Issue 1: *Alteration and Loss of Ecosystems*

An ecosystem is comprised of the biological community together with its physical environment. The alteration and loss of ecosystems is important concern because as these systems become degraded the overall environmental health of the Region will be impacted. This issue provides a broad view of the relative health and present status of components of marine, estuarine, freshwater, and upland ecosystems present in the Region. The primary concerns are habitat degradation, fragmentation, and loss; loss of terrestrial and aquatic species; effects of contaminants on ecosystems; and patterns of development and balancing the future uses of public lands. Loss of terrestrial and aquatic species addresses the status of plant and animal species populations, biodiversity, and the introduction of exotic species. The effects of contaminants deals with the accumulation and deposition of toxics and sedimentation in lakes and streams. This issue also addresses impacts resulting from the use and management of land resources, including the impacts from the growth and development of cities, towns, suburbs, and urban areas; the impacts resulting from sprawling land development patterns (including the lack of parks and reduction of greenspaces); the use and creation of infrastructure; and forestry, mining, and agricultural practices.

Trends and Conditions

Ecosystems within Region 4 vary perhaps more widely than any other region in the nation. With systems that range from mountainous Appalachians to thousands of miles of coastal areas fronting the Atlantic Ocean and the Gulf of Mexico, the Region includes temperate, sub-tropical, and tropical environments. Region 4 has 40% of the continental U.S. coastlines and one of the highest growth rates of any region of the country. The greatest growth is occurring largely in coastal areas, compounding the Region's environmental challenges. The range of premier ecosystems includes such diverse systems as the Great Smoky Mountain Park, the Everglades National Park, the Okefenokee Swamp, and the Florida Keys National Marine Sanctuary.

The condition of ecosystems in EPA Region 4 varies widely depending on levels of human development and associated land use activities, pollution impacts, and introduction of exotic plant and animal species. A major indicator of the condition of ecosystems is the condition and amount of natural upland, wetland, and marine communities that are present in the Region. Degradation of ecosystems can be caused by alteration and loss of critical natural communities that provide essential ecological functions. Examples of some natural communities that have been significantly altered by human uses include bottomland hardwood forests, longleaf pine forests, spruce-pine forests, wetlands, and large free flowing rivers. The amount of exotic plant and animal species within the Region is also an indicator of the condition of its ecosystems. Introduction of exotic species into ecosystems can cause declines in native species populations and diversity within the Region. The number of threatened and endangered species in the Region and in individual states provides another indicator of the condition of ecosystems. Many species require very specific ecosystem and habitat conditions. Rapid changes in conditions caused by human development can degrade ecosystem quality to the point that species' survival is threatened.

Physical modification of terrestrial and aquatic ecosystems by human development activities is the primary pressure on the quality of ecosystems within the Region. Wide ranges of upland, wetland, and aquatic disturbances occur during industrial, commercial, residential, agricultural, forestry, and mining activities. The

principal pressure associated with development activity is the removal of natural vegetative cover and the alteration of land surfaces. The impacts of these activities on ecosystems range from fragmentation of ecosystems and habitat, to simplification of ecosystems through forest management practices and agricultural activities, to complete elimination of all natural ecosystem functions from activities such as dense urban development and mining. The impacts of these pressures can cause loss of ecological functions, reductions in plant and animal diversity, degradation and loss of soil structure, and eutrophication of water bodies. Trends for the alteration of ecosystems are not readily available for all natural community types; however, information is available for some types from state Heritage programs, the U.S. Fish and Wildlife Service, the U.S. Forest Service, and private conservation organizations such as the Nature Conservancy.

The introduction and spread of exotic species in the Region is also a critical pressure on ecosystem conditions. As exotic plant and animal species are introduced into ecosystems, they can out-compete native species and change natural ecosystem functions. The uncontrolled growth of exotic species can have long-term consequences for ecosystems by displacing native species, destroying food sources, and affecting water quality. The spread of exotic species can cause serious ecological damage to ecosystems that in some instances is irreparable.

that land use changes may have. Monitoring at all levels is necessary because changes in land use can have different impacts on different geographic scales. For example, the loss of 1,000 acres of forest may seem insignificant at the regional level while in a certain community the change could have a substantial impact on a local ecosystem.

Understanding the reasons for changes in land use patterns is important in developing strategies for future land management. Several social and economic changes during the past 25 years have influenced the rate at which land is converted to urban uses. Changes in population, the economy, and expansion of infrastructure have significantly contributed to changes in land conversion rates. Primary factors driving land conversion rates were the increase in population, expansion of urban areas, improvements in rural transportation, and the beginning of the interstate highway system.

Rapid growth in many areas of the country during the 1970s accelerated the degradation of ecosystem conditions caused by development and the condition of the environment as a whole. If a healthy natural environment is necessary to maintain human health and welfare, then preserving the ecological integrity of the environment should be a primary focus in land management decisions. Preserving the Region's ecological resources will depend on land management strategies and the ability to control impacts caused by land development.

States	Land Use/Land Cover Types			
	Forest	Agriculture	Urban	Water Area
Alabama	63%	21%	6%	3%
Florida	33%	29%	12%	9%
Georgia	58%	22%	8%	3%
Kentucky	40%	43%	6%	3%
Mississippi	52%	32%	4%	3%
North Carolina	47%	24%	11%	8%
South Carolina	55%	21%	9%	4%
Tennessee	43%	37%	8%	3%

The distribution of land use in the Region is constantly changing. Monitoring long-term land use trends helps to evaluate the pressures development places on land resources. Though the net change in acreage of land use may be slight for any single year, changes in land use patterns over time can have significant implications for preservation of the ecological integrity of natural lands. Land use patterns should be monitored at the regional, state, and local levels in order to detect significant impacts

One of the major issues for land management efforts in Region 4 has been the tremendous population growth since the 1970s. The percent increase in population for each state in Region 4 from 1980 to 1990 is shown in the following table. The percentage of the population residing in coastal areas is projected to increase from the 1990 level of 35.2% to 37.1% by the year 2010. The Region's population is projected to grow to over 50 million residents by the late 1990s, from just over 45 million in 1990. Region 4 is

currently witnessing some of the negative environmental effects of this growth and increased economic activity.

States	Percent Increase in Population 1980 - 1990
Alabama	3.8%
Florida	32.7%
Georgia	18.6%
Kentucky	0.7%
Mississippi	2.1%
North Carolina	12.7%
South Carolina	11:7%
Tennessee	6.2%

Much of this growth is taking place in major urban centers and in the Region's coastal areas. Population density in Region 4 for 1990 was approximately 120.8 persons per square mile of land area, and density is projected to increase to 150.7 persons per square mile by the year 2010. The expansion of development to support this population growth and human activity has caused a shift from environmentally beneficial uses of land to less desirable uses that alter or destroy the ecological functions of these lands. In addition, the environmentally beneficial uses of land that is not developed or altered can suffer when adjacent land is changed in such a way as to isolate or degrade habitat or ecological function. Sensitive coastal and inland ecosystems will be subject to increasing pressure as this growth continues.

Strategies have been undertaken by both governmental bodies and private entities to address the issue of ecosystem alteration and loss. One method that has been employed is to purchase sensitive or critical lands to protect them from development or alteration. This strategy has been used by federal, state, and local governments as well as by private conservation groups. Other strategies that address this issue have focused around land use planning activities and laws developed by federal, state, and local governments.

At the federal level, the National Environmental Policy Act (NEPA), section 404 of the Clean Water Act, and the Endangered Species Act are all legislative mandates that require consideration of ecosystem impacts. NEPA requires that the environmental impacts of all federal projects, including ecosystems impacts, must be reviewed and alternatives to reduce the impacts must be developed. Section 404 is used to protect wetland ecosystems and preserve associated ecosystem functions. The Threatened and Endangered Species Act requires protection of critical habitats that support populations of endangered and threatened species.

Some states have similar environmental policy acts that require, in much the same manner as NEPA, the review of potential environmental and ecosystem impacts created by state government projects. Among the states of the Region 4, Florida is particularly active in ecosystem-based environmental protection. Responding to legislative direction, the Florida Department of Environmental Protection has completed a process involving over 300 public and private stakeholders to design and implement the reorientation of the agency to provide ecosystem-based environmental protection. Pilot projects involving seven Florida ecosystems are presently underway.

The principal method used to protect ecologically important lands from these pressures is through conservation efforts by federal, state, and local governments. The most visible protected lands are state and national forests and parks. Region 4 includes approximately 845,000 acres of state parks and 7,000,000 acres of national forest lands. Each state park and forest program protects ecologically important lands. In addition to these two programs, there are numerous other land conservation and protection programs in each state such as Florida's Conservation and Recreation Lands Program and Tennessee's State Natural Areas Program. The combination of federal, state, and non-governmental conservation programs in each state serves as the primary method for protecting ecologically significant lands in the Region.

No single federal or state agency has the sole responsibility for management of public lands in the Region. State fish and wildlife agencies have the primary responsibility for managing fish and wildlife habitat on state owned waters and lands. Federal land management agencies such as the Fish and Wildlife Service, Forest Service, Bureau of Land Management, and others are responsible for managing fish and wildlife habitat on federally owned lands and may assist states in the management of habitats on other lands. Some agencies, such as the Natural Resources Conservation Service and the Cooperative Extension Service, also provide technical assistance, information, and education on fish and wildlife management to private land owners and land users.

Governmental regulation of land development activities also plays a significant role in land management in Region 4. There is a wide diversity of state land use planning initiatives throughout the Region. Examples of this diversity are illustrated by the approaches of Kentucky and Florida. Kentucky's approach has been to allow the choice to engage in local planning to be decided on a community-by-community basis. According to a 1987 survey conducted by the Kentucky Legislative Research Commission, 53 of the state's 120 counties have established planning commissions and 61 cities have established independent city planning commissions. On the other hand, Florida's approach has been to legislatively mandate each municipal government to develop a comprehensive plan. It is based on a top down management system with basic planning requirements set by the state legislature and overseen by the Florida Department of Community Affairs. Local government comprehensive plans must meet the requirements laid out in planning legislation.

It is important to note that throughout the Region, the majority of the authority over land use and zoning decisions rests in the hands of local governments. This leaves the power to protect environmental resources through directing the patterns of development with local governments. Many local governments implement their own ordinances and projects such as greenways and conservation zones that protect local environmental resources and ecosystems.

In addition to state and local planning mandates and regulations, the federal government also has regulations to control the environmental impacts caused by federal projects. For instance, legislation was enacted in the 1980s to ensure that actions by the federal government do not encourage poor choices in land use decisions. The Farmland Protection Policy Act, included in the Agriculture and Food Act of 1981 and amended in the Food Security Act of 1985, requires federal agencies to consider the effects their programs will have on prime farmlands. The conservation provisions of the 1985 act are designed to ensure that the USDA commodity programs do not subsidize unwise changes in land use. Program benefits will be denied to producers who drain wetlands or remove the plant cover from grass or forest land to plant agricultural commodities.

The actions and approaches taken by each level of government in part dictate the impact that future growth will have on ecologically important lands. Continual and consistent evaluation of land use changes throughout the Region will enhance efforts to coordinate land management strategies between different levels of government. As urban growth continues, coordination of different land management efforts will direct development in a way that reduces the harmful impacts to the environment and will help achieve land management goals in the Region.

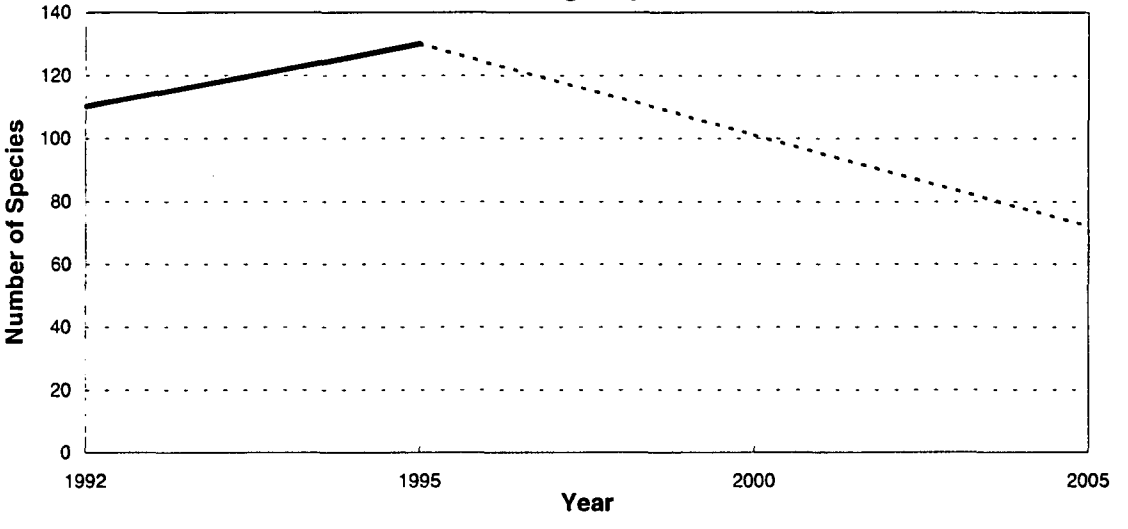
Regional Goals

Prospective Goal: ***By 2015, increase by 25 percent, based on 1995 acreage, the acreage of ecologically unique, threatened, and/or important habitats in protection or being managed specifically for their environmental integrity.***[1]

(Data Under Development)

Goal: ***By 2005, 45 percent of all threatened and endangered animal species with declining populations in 1995 will have stable or improving populations.***[2]

Number of Federally Listed Animal Species With Declining Populations

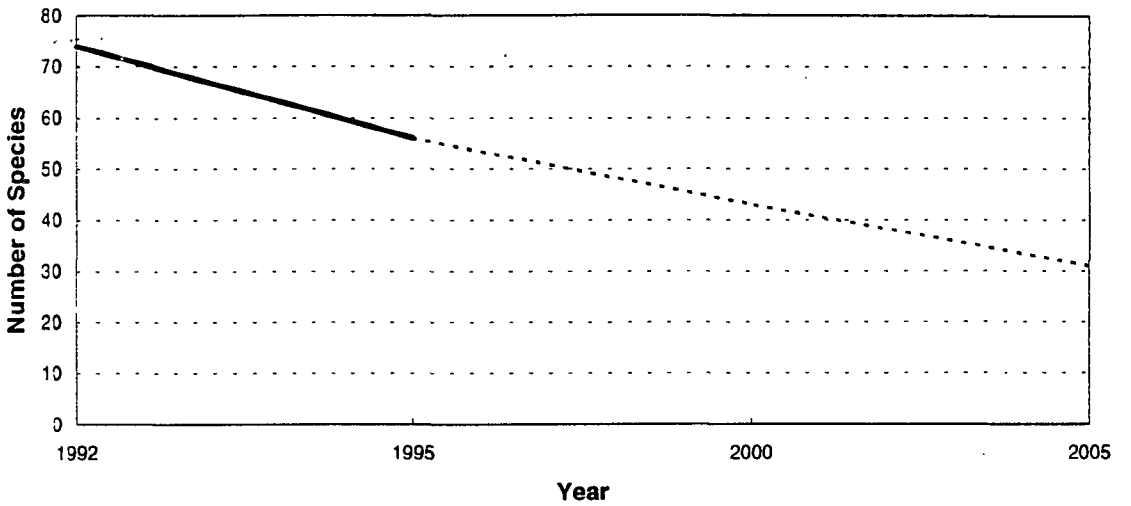


The data to support this goal are not currently available for each state in the Region. The data to support this indicator will include all lands currently owned and managed through federal, state, local, and non-governmental programs and organizations for the purpose of protection or conservation of ecologically significant lands. U.S. EPA Region 4 is currently developing a comprehensive database of these lands. Though complete or partial information is available for several states, this information is not available for all states in the Region.

[2] The data to support this goal are provided by the U.S. Fish and Wildlife Service's 1992 *Report to Congress: Endangered and Threatened Species Recovery Program,* and preliminary data from the 1995 Report. The data are available in hard copy format for each state. Supplementary data for these and other years can be obtained from state environmental agencies and nongovernmental organizations such as the Nature Conservancy's Natural Heritage programs.

Goal: ***By 2005, 45 percent of all threatened and endangered plant species with declining populations in 1995 will have stable or improving populations.***[3]

Number of Federally Listed Plant Species With Declining Populations



Indicators

- Acres of ecologically unique, threatened, or important habitats in protected or managed status through federal, state, local government, and private programs
- Forest land area by acre and type
- Change in land cover types
- Number of federally listed threatened and endangered plant and wildlife species with stable or increasing populations
- Population of commercially/recreationally harvested fish species
- Invasive exotic plant and animal species

Strategies[4]

1. Define and identify all major ecosystems of regional concern.

2. Identify all ecologically unique, threatened, or important habitats.

3. Implement cooperative, collaborative, goal-driven, results-based planning for all ecosystems of regional concern.

4. Develop monitoring and indicator systems capable of measuring the status and trends associated with each ecosystem of regional concern.

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[3] See footnote #2.
[4] Numbering of strategies does not imply any order of significance or priority.

5. Develop a regional strategy for coordinating sound land management practices for conservation and preservation among and between the Region, the states, other federal agencies, community groups, and private landowners.

6. Develop management structures and process in the Region to support ecosystem protection.

7. Develop standards for sustainability for each ecosystem of regional concern.

8. Include the private sector in land management planning and programs.

9. Coordinate land management planning with economic development and transportation planning.

10. Develop a process for including local governments and community-based groups in regional land management.

11. Facilitate interstate planning to protect ecosystems located in several states.

12. Develop, prioritize, and implement a research agenda dealing with the key needs of each ecosystem of regional concern.

13. Increase the coordination between groups or agencies that are responsible for corridor planning efforts in the Region.

14. Develop methodologies to assess the cumulative and secondary effects on ecosystems from the alteration and loss of critical natural lands.

15. Provide organizational and technical support to community-based environmental protection projects.

16. Develop a regional GIS system to monitor changes in land cover.

17. Provide incentives for private landowners to preserve critical and important plant and animal species.

Regional Strategic Issue 2: *Alteration and Loss of Wetlands*

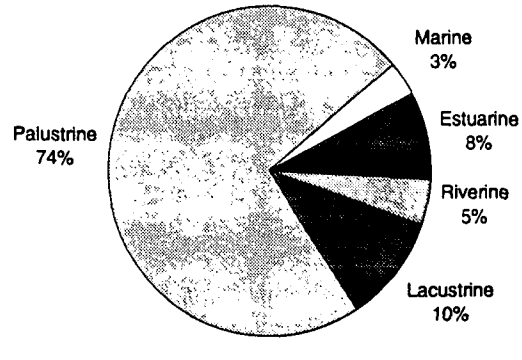
A wetland ecosystem can be defined as a water-dependent biological community together with its physical environment. Wetland systems provide essential habitat to many indigenous plant and animal species. Wetlands also serve many important functions to humans: they moderate the effects of floods, improve water quality, and have aesthetic value. This issue addresses the alteration and loss of coastal and inland wetlands including the filling, draining, and drowning of wetlands along with the mitigation of wetland losses through restoration and construction of wetlands.

Trends and Conditions

There are two primary sources of data on wetland acreage for the Southeast, the U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) covering the mid 1970's to the mid 1980's and the Natural Resource Conservation Service's National Resource Inventory (NRI) for the period from the mid 1980's to the early 1990's. Though the two reports have different methodologies and report different results, they are both important data sources to consider because they cover two separate time periods.

Based on wetland status and trends data collected by the U.S. Fish and Wildlife Service (FWS), in the mid 1980's there were approximately 37 million acres of coastal and inland wetlands in the eight Region 4 states, comprising more than 35% of all the wetlands in the 48 contiguous United States. This represented a net loss of roughly 1.86 million acres of wetlands between the mid-1970s and the mid-1980s in Region 4. Wetlands covered approximately 16% of the Southeast's landscape.

Percentage of 1992 Wetland Acreage in Region 4 by Type of System



The Natural Resource Conservation Service (NRCS) reported that there were just over 43 million acres of wetlands in Region 4 in 1982. There was a general decrease in the acreage of wetlands in Region 4 on non-federal lands from 43,065,900 acres in 1982 to 42,654,800 acres in 1992. The total wetland acreage decrease was approximately one percent -- 411,100 acres -- of the Region's wetlands. The overwhelming majority of this loss was the 517,000 decline in acres of palustrine wetlands. The major sources of loss were the alteration of wetlands through agricultural activities and urban development. These decreases are part of a continuing trend in wetlands loss in Region 4 though the rate of loss appears to have slowed since the mid 1970s.

In some cases, alteration involves changing from one wetland type to another, such as from a bottomland hardwood system to a planted pine system. This can cause the loss of some of the wetland's functions (i.e., habitat), though a portion of the functions may remain. In other alterations, wetlands are filled, inundated, or otherwise altered to such an extent that few, if any, original wetland functions

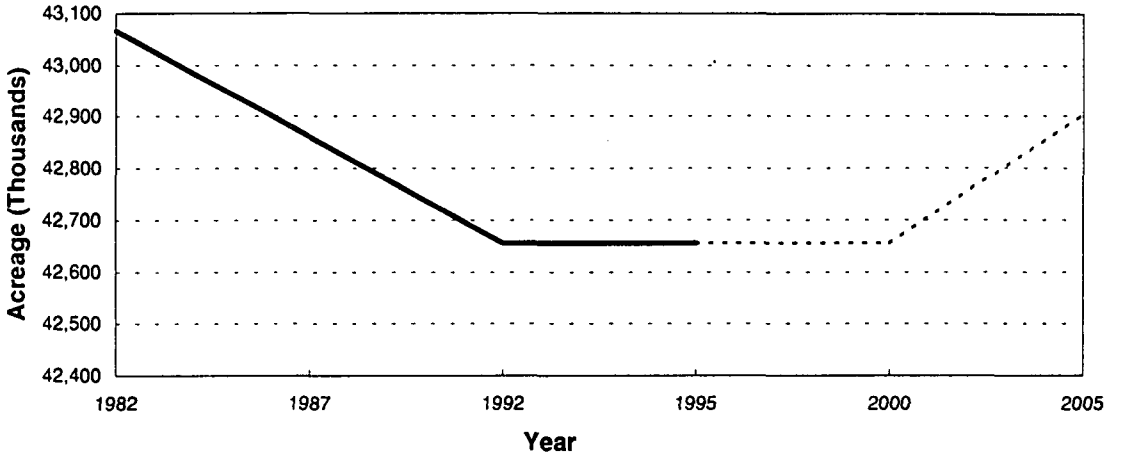
remain. Their is a strong movement toward evaluating wetland quality as well as total acreage at the national level. Measuring wetland loss and conversion based on wetland quality as opposed to acreage provides important information on the ability of existing wetlands to provide necessary natural functions such as flood abatement and habitat. Some low quality wetlands do not provide as many of these natural functions as high quality wetlands and thus their protection is less of a priority than the protection of wetlands that provide more natura functions. Future focus should and likely will be on measuring the quality of wetlands as well as total acreage.

Section 404 of the Clean Water Act (CWA) gives EPA, the Army Corps of Engineers (COE), the National Marine Fisheries Service, and the Fish and Wildlife Service the primary authority to address wetlands losses. However, other CWA provisions, particularly Section 401, as well as individual state wetland regulations can be an effective state tool to address wetland issues. Other actions that are being taken or that should be expanded include improved coordination between the states, U.S. EPA, the Army Corps of Engineers, the Natural Resources Conservation Service, and the U.S. Fish and Wildlife Service. This cooperation could be used in many areas to improve the permitting system, for both individual and general permits, and improve the resource protection that is provided through the current system. In addition, federal assistance should continue to be available to help those Region 4 states that have their own programs to regulate wetland loss. This would help states expand on their own ability to protect wetlands.

Regional Goals

Goal: ***From 1995 forward, there will be no overall net loss of the remaining wetlands base in the Region, and by 2005, there will be a net increase in the quantity of the wetlands base in the Region by a minimum of 50,000 acres per year for a five-year period.***[1,2]

Change in Wetland Acreage in Region 4



Indicators

- Acreage of wetlands identified through the National Wetlands Inventory
- Acreage of wetlands identified through the National Resources Inventory
- Acreage of wetlands lost, created, or restored through federally permitted activities

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[1] The data to support this goal are available for each state at 5-year intervals beginning with 1982 in hard copy in the *1992 Summary Report National Resources Inventory (NRI)* and on CD-ROM. The data can be obtained from the U.S. Department of Agriculture, Natural Resources Conservation Service (National Resources Inventory Section), P.O. Box 2890, Washington, D.C. 20013, or at (202) 720-5420. The NRI data were chosen over NWI based primarily on the frequency of data collection. Each set of data is considered statistically valid and the NRI data is collected once every five years while the NWI data is collected only once each ten years which limits its usefulness in monitoring the short-term changes in wetland coverage and condition.

[2] Wetland quality is another measure that should be included in any goal or indicator on the condition of wetlands throughout the Region. At this time, comprehensive data on wetland quality or function rankings of wetlands in Region 4 do not exist. Development or collection of this type of data should be a priority in future efforts at both the Regional and state levels. When this information becomes available, it should be included as an indicator and an assessment of current trends and conditions should be made to determine which, if any, wetland quality goals should be established for Region 4.

Strategies[3]

1. Develop and implement *Wetlands Comprehensive Plans* at the watershed, ecosystem, state, and regional levels.

2. Track wetland losses and gains by basin and by identified ecosystem.

3. Use the *Advance Identification of Wetlands (ADID)* program as a proactive planning process.

4. Use the *State Wetlands Grant Program* as the foundation for building state capacity in wetlands protection.

5. Implement wetlands education and training programs to provide wetlands education to the general public, and the educational community.

6. Provide specialized education and training in wetlands protection to state agencies, local governments, the agriculture, forestry, and development sectors, and community-based environmental protection groups.

7. Incorporate pollution prevention into wetland protection activities.

8. Plan and conduct place-based wetland restoration activities.

9. Promote mitigation planning and mitigation banking in the Region.

10. Increase the use of the *Section 319 Nonpoint Source Grant Program* as a funding source for wetland restoration projects.

11. Develop improved techniques for wetlands restoration and creation.

12. Distribute wetlands information to state land use planning officials.

13. Increase coordination between entities who are responsible for planning and corridor efforts.

14. Obtain access to the Regulatory Analysis and Management System to better track wetland losses and gains through regulatory activities.

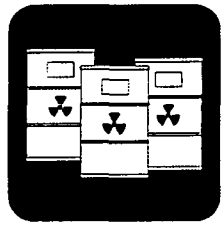
15. Streamline process between the COE and the EPA regarding 404 permits and enforcement.

[3] Numbering of strategies does not imply any order of significance or priority.

Regional Strategic Issue 3: *Environmentally Damaged Lands*

Natural systems can become degraded due to human alteration or use. Humans cause environmental damage to land when resources are used, extracted, or altered. This issue is concerned with the physical and chemical damage caused to land. The issue of physically damaged lands comprises natural lands altered through the effects of human activities such as mining, channelization, damaged stream segments, and industrial activities. Chemically damaged lands focuses on deposition of toxics, radiation, nutrients, pathogens, and metals from hazardous waste disposal, agricultural practices, and other human uses of land. Chemical contamination can occur via permitted or accidental releases of hazardous substances; how these contaminants are introduced into the environment and how they are removed is a primary focus of this issue.

Trends and Conditions



Human use and alteration of lands can cause degradation to the ecological functions of natural systems. The environmental damage to lands occurs during resource use, extraction, and alteration. This issue addresses the concerns of physical and chemical damage caused to natural systems by human activities.

The issue of physically damaged lands deals primarily with natural lands altered through mining and industrial activities. These activities disturb ecosystems in part through the clearing of lands, which destroys the natural vegetation and habitats for many types of wildlife. In addition, exposed soil and wastes are subject to erosion by wind and water and can pollute the atmosphere and nearby waters. Acids, silt, and toxic compounds resulting from mining or industrial activities can be washed away by stormwater runoff into nearby surface waters or leached into ground waters. Particles of dust and toxic metals may also be blown from these sites into the atmosphere. Pollution prevention practices control a portion of these impacts to natural systems but, overall, the disturbance of sites can cause great stress on natural systems and can impair their functions.

Chemically damaged lands focuses on the deposition and accumulation of toxics, radioactive materials, nutrients, pathogens, and metals from hazardous waste disposal, agricultural practices, and other human activities. Land becomes contaminated in a number of different ways. In Region 4:

- There are 5,981 sites in the Comprehensive Environmental Response, Compensation, and Liability Inventory System (CERCLIS). These include sites that have been or are being investigated for possible contamination as well as sites that have been otherwise addressed by the remedial and removal programs. Of this number, more than 3,400 have been assigned to the No Further (federal) Action category.

- There are 173 sites in the Region, including 19 federal facilities, having a severe enough problem to qualify them for the National Priorities List (NPL). The contamination is severe enough to warrant further action under the federal Superfund program.

- There are 29,843 small quantity generators and 5,011 large quantity generators of hazardous waste.

- There are 837 Resource Conservation and Recovery Act (RCRA) facilities subject to Corrective Action. This means these existing facilities are required to take remedial cleanup action for past disposal practices.

- There are 745 treatment, storage, and disposal facilities. These facilities treat hazardous waste currently generated or waste material from remediation efforts.

The basic cause of the environmental problems at NPL and Corrective Action sites was the improper disposal of hazardous wastes. Sites vary in size and causes of contamination. Remediation is both expensive and time consuming, and absolute restoration of the site may not occur. A Superfund site is designated as "construction complete" when all physical work (e.g., excavation, removal of contamination, installation of a treatment facility) has been completed at that site. Once long-term response activities (i.e., performance standards) have been met, the site can be removed from the National Priorities List.

Hazardous waste releases can impact surface waters, ground water, land, and air. The impacts vary from site to site, although most sites involve contaminated ground water and many sites potentially impact citizens who live nearby. There is no one typical site that could be used as a benchmark. The number of Corrective Action sites and NPL sites has increased over the years, although the rate of increase has slowed over the last several years due primarily to changes in national listing policy.

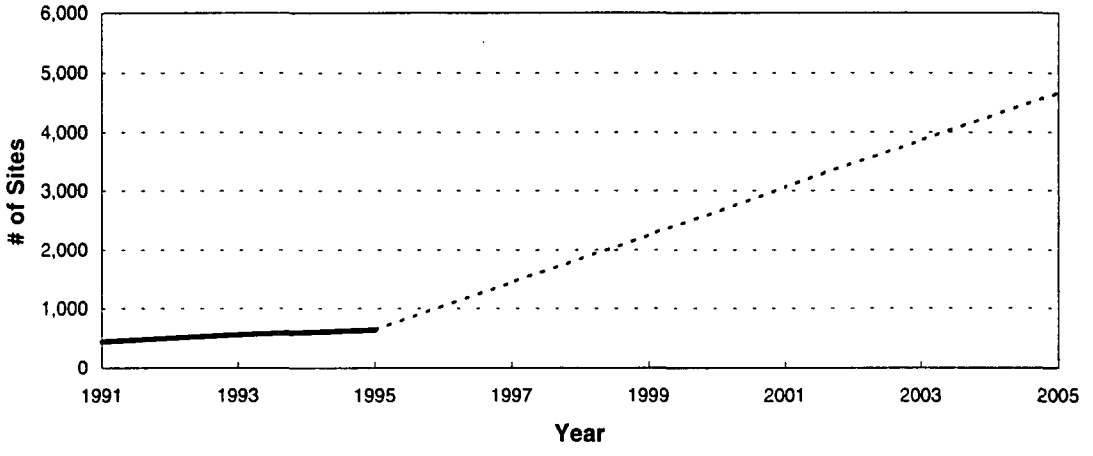
In order to prevent the need for future cleanup, hazardous waste treatment, storage, and disposal facilities are heavily regulated. The primary legislative acts that address hazardous waste remediation and regulation are the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA). The regulations require generated hazardous waste to be handled in a safe manner. To address past improper disposal, the Corrective Action program and the NPL program are used for existing operating facilities for abandoned sites or sites where the owner is unknown. To date, 49 NPL sites have reached the stage called construction completed and over 177 Corrective Action sites have completed stabilization measures. Due to technical, legal, and financial issues, remediation projects take considerable time to complete. Each project requires a substantial study phase, and nearly all NPL sites involve public controversy.

Use, transportation, and/or storage of chemicals can result in the occurrence of accidental spillage, release, and environmental contamination. Since individual states create their own legislation regarding how chemical emergencies are to be managed, responses differ from state to state. The federal Emergency Planning and Community Right-to-Know Act of 1986 reiterated state responsibility for response activity and required that states establish emergency planning committees and contingency plans that prepare states to respond to chemical emergencies.

Regional Goals

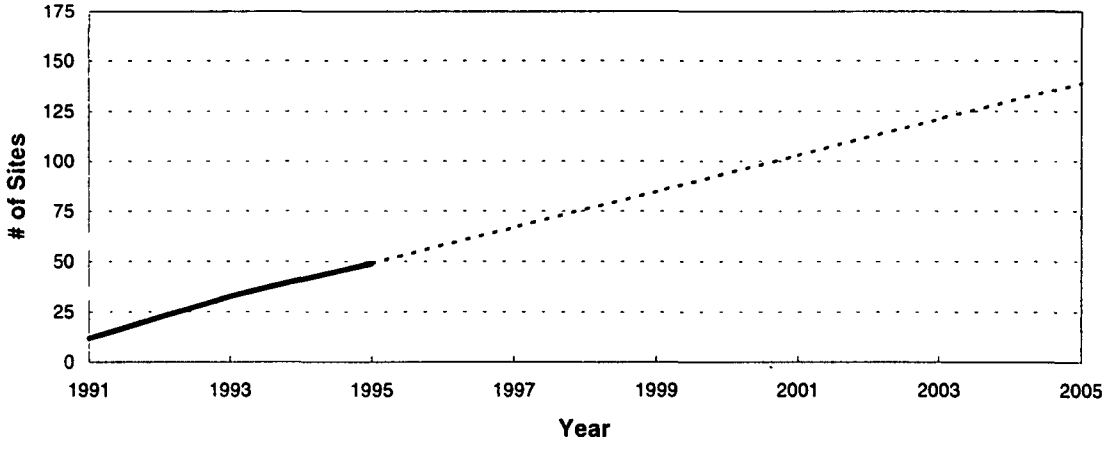
Goal: ***By 2005, 78% of the 5,981 abandoned hazardous waste sites in the Comprehensive Environmental Response, Compensation, and Liability Inventory System (CERCLIS) in EPA Region 4 in 1995 will be cleaned up or have construction completed.***[1]

1995 CERCLIS Sites Cleaned Up or With Construction Completed



Goal: ***By 2005, 78% of the 173 abandoned hazardous waste sites on the National Priorities List (NPL) in EPA Region 4 in 1995 will be cleaned up or have construction completed.***[2]

1995 NPL Sites Cleaned Up or With Construction Completed



[1] The data to support this goal are provided by the U.S. EPA Region 4, Office of Waste, 345 Courtland Street NE, Atlanta, GA 30365, or at (404) 347-3555. The data are collected annually for the sites cleaned up through federally funded projects and are available in hard copy format.

[2] The data to support this goal are provided by the U.S. EPA Region 4, Office of Waste, 345 Courtland Street NE, Atlanta, GA 30365, or at (404) 347-3555. The data are collected annually for the sites cleaned up through federally funded projects and are available in hard copy format.

Indicators

- Number and status of NPL sites
- Number and status of CERCLIS sites
- Acreage of lands altered through mining activity

Strategies[3]

1. Complete the assessment of Superfund sites.

2. Initiate and complete construction at Superfund sites.

3. Involve and educate citizens located in areas or communities near Superfund or other remediation sites.

4. Develop a joint EPA/state strategy for dealing with remediation needs of CERCLIS sites not qualifying for Superfund response.

5. Implement Corrective Action measures at RCRA facilities.

6. Return former military base lands to public/private ownership.

[3] Numbering of strategies does not imply any order of significance or priority.

Regional Strategic Issue 4: *Contaminants in the Environment*

This issue addresses existing ambient concentrations of pollutants in the environment, including the permitted and accidental releases of hazardous contaminants and the effects that they have. The focus of this issue is on releases or depositions of contaminants. The primary concerns regarding these two sub-issues are TRI releases, chemical releases, bioaccumulation of contaminants, cumulative and interactive effects of contaminants, pesticide use, and atmospheric deposition.

Trends and Conditions

The pathways by which contaminants enter the environment are dependent on the type of pollutant and the method of disposal. Sources of contamination include releases or emissions of gases to the air, chemicals which are spilled, landfilled, or injected into the earth, and waste which is discharged into water bodies from point and nonpoint sources such as treatment plants and accidental spills. The cumulative effects of these contaminants impact the food chain, air supply, drinking water, and entire ecosystems.

Air pollution from various sources impacts the environment through the atmospheric deposition of chemicals such as nitrogen oxides, mercury vapor, and polychlorinated biphenyls (PCBs). In ambient concentrations, nitrogen oxides can contribute to the formation of acid rain while mercury and PCBs can be deposited into watersheds and subsequently accumulated in fish. The accidental release of similar air pollutants can ultimately cause serious injury or death to those who come into contact with them. Pollutants emitted into the atmosphere can travel various distances and be deposited to ecosystems far removed from their original source.

Among other emissions, a number of air pollutants are required to be regularly reported to the EPA through the Toxic Release Inventory (TRI). A facility must report to the Toxic Release Inventory if it conducts manufacturing operations within Standard Industrial Classification primary codes 20 through 39, has the equivalent of 10 or more full-time employees, and manufactures or processes more than 25,000 pounds or otherwise uses more than 10,000 pounds of any listed chemical during the calendar year. For 1993, TRI reporting was required for 316 chemicals and 20 chemical categories. In that same year, reported air releases were part of 718 million pounds of listed toxic chemicals released to air, surface water, land, and underground injection wells. Additionally, 896 million pounds were transferred to off-site locations for recycling, energy recovery, publicly owned waste treatment services (POWTS), private treatment, and disposal.

Studies have shown that atmospheric deposition of gases has been a contributing factor in the degradation of water quality and associated adverse human health and ecological effects. Section 112(m) of the Clean Air Act, as amended in 1990, the Great Waters Program, requires the evaluation of atmospheric deposition of air pollutants into coastal waters, among other water bodies. All of the pollutants targeted by the Great Waters report (cadmium, chlordane, DDT/DDE, dieldrin, HCB or HCH, lindane, lead, mercury, PCBs, polycyclic organic matter, TCDF, TCDD, toxaphene, nitrogen compounds) are of concern because of their persistence in the environment, tendency to bioaccumulate, and potential toxicity to humans and the environment.

Contaminants in the water arrive not only by air, but also by storm water discharges and point and nonpoint sources. These contaminants bio-

accumulate in the flesh of species which eat, breathe, and/or live in aquatic conditions. Consequences have included shellfish bed closures, periodic fish kills, and the poisoning of birds which consume fish tainted with toxic chemicals. In some cases, the impacts of contaminants released into water have included human fatalities as well.

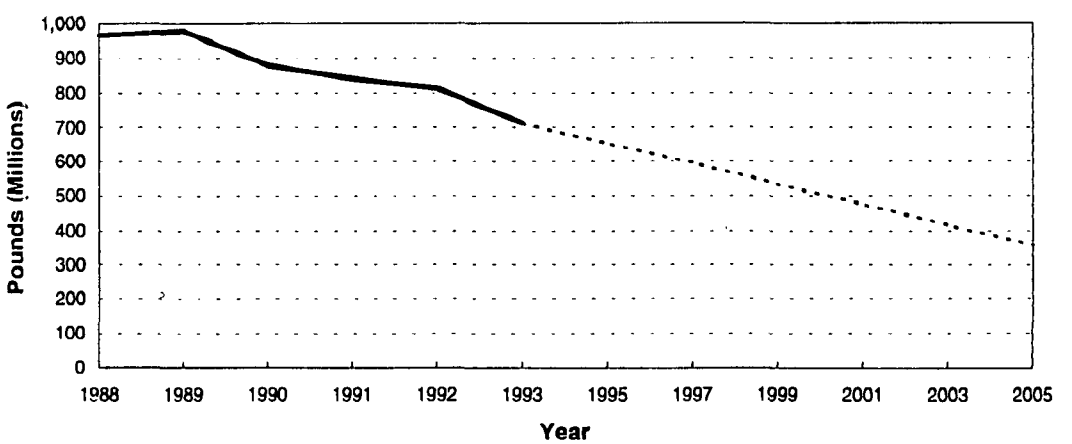
The composition and volume of waste and incidences of contamination have increased over time along with increases in population and industrialization. Different categories and toxicities of wastes, such as hazardous waste, solid waste, and medical waste, must be dealt with on a regular basis. Even wastes that are properly managed have the potential to impact the environment because of accidental spills, leaks, or explosions. Contamination of the ground results from improper disposal of these wastes, indiscreet dumping, or the application of pesticides. In 1993, the EPA listed 450 wastes as hazardous. An estimated 300 to 700 million tons of hazardous waste are produced annually and must be recycled, treated, incinerated, stored, or disposed. Storage and disposal methods usually require the use of land (above or below the ground). For example, the disposal of hazardous waste into a landfill or through deep-well injection must be done in a manner that does not result in waste leaching through the landfill, contaminating nearby soil or infiltrating drinking water sources. Regular monitoring of underground injection wells is now required by the Safe Drinking Water Act.

The use of pesticides to combat vermin and insects and to produce larger and healthier crops has also taken its toll on the environment. Pesticides used on the ground have affected wildlife through direct exposure and by contamination of their food supplies. Contaminated soils impact species that live in those soils and indirectly impact the animals that feed on those species. Residues from pesticides used in agricultural operations have also been found in water-supply wells. The federal statute regulating pesticides is called FIFRA (the Federal Insecticide, Fungicide, and Rodenticide Act). FIFRA regulates the sale and distribution of pesticides and mandates that chemical manufacturers conduct a cost/benefit analysis that shows new pesticides will not cause "unreasonable and adverse effects on the environment."

Regional Goals

Goal: *By 2005, reduce by 50% from 1993 levels the toxic chemicals released from industrial facilities.*[1]

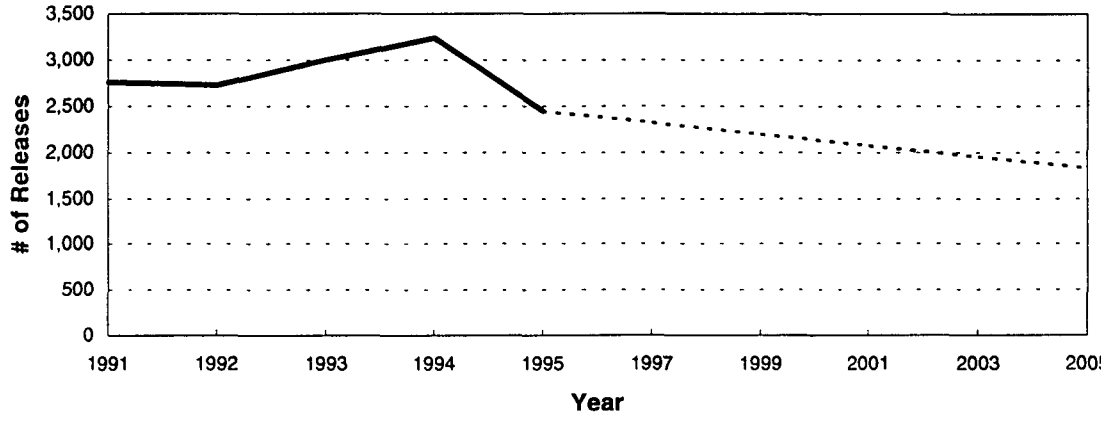
Total TRI Releases in Region 4



[1] The data used to support this goal can be obtained from the 1993 *Toxics Release Inventory Public Data Release*. The data are available in hard copy format or on CD-ROM for the years 1987 to 1993. These data can be obtained from the Title III Implementation Unit, U.S. Environmental Protection Agency Region 4, 345 Courtland Street NE, Atlanta, GA 30365, or at (404) 347-3555.

Goal: *By 2005, the number of accidental releases of hazardous chemicals potentially harmful to humans, animals, and vegetation will be reduced by 25% from 1995 levels.*[2]

Total Number of Accidental Releases of Hazardous Chemicals in Region 4



Indicators

- Toxic releases by medium
- Accidental releases of hazardous chemicals potentially harmful to humans, wildlife, and ecosystems
- Pesticide residues found in raw agricultural products
- Accumulation of toxic substances in the environment

Strategies[3]

1. Identify pollutants of regional concern.

2. Identify communities and sensitive ecosystems that have been subjected to high concentrations of chemical releases or where accumulation of toxics may adversely impact public health or the environment.

3. Implement monitoring to determine the extent and concentration of pollutants of regional concern or accumulation of pollutants in communities identified as being of regional concern.

4. Identify sources of pollutants of concern or impacting communities of regional concern.

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[2] The data used to support this goal can be obtained from the Emergency Response Notification Database. The data are available for the years 1987-1995. These data can be obtained by contacting the ERNS Manager at the Emergency Response Division, U.S. Environmental Protection Agency, Mail Code 5202G, 401 M Street SW, Washington, D.C. 20460 or at (202) 260-2342.

[3] Numbering of strategies does not imply any order of significance or priority.

5. Develop strategies to reduce the release of pollutants of concern or chemicals in communities of regional concern.

6. Develop measures to determine levels of contaminants which would not pose an unacceptable risk to public health or the environment within communities of regional concern.

7. Implement pollution prevention incentives at industrial facilities to reduce the amount of pollutants discharged.

8. Require and enforce Best Management Practices (BMPs) plans at industrial and municipal facilities.

9. Complete a pilot indicator-driven, comparative risk-based strategic plan with an industry.

10. Develop and incorporate environmental stewardship and other innovative strategies into pesticide management programs, involving the appropriate stakeholders in the process.

11. Develop qualitative measures of success which recognize behavioral changes in the regulated community.

12. Establish enhanced education and awareness programs and activities related to pesticide use.

13. Establish mechanisms to reward voluntary prevention efforts and to incorporate pollution prevention techniques, such as pesticide alternatives, into pesticide programs and activities.

14. Establish incentives for innovation in education through supplemental environmental projects identified in enforcement negotiations.

15. Provide technical assistance to state and local agencies for emergency prevention/preparedness/planning efforts; provide technical assistance to state agencies and businesses regarding techniques to minimize their generation of waste.

16. Support interagency coordination for accidental release incidents reported to state emergency response commissions and local emergency planning committees.

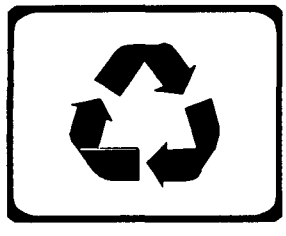
17. Investigate the cause of accidents to identify means for prevention of future accidental releases.

18. Provide emergency preparedness first response training and simulation exercises, including EPA and OSHA standards, for state and local government employees and the public, for shelter-in-place and evacuation activities.

Regional Strategic Issue 5: *Waste Management*

Waste management addresses the municipal solid waste, sewage sludge, and hazardous waste and materials generated from residential, commercial, governmental, or institutional establishments that are collected, processed, and disposed of through a public or private waste management service. This issue deals with the effects on the ecology and on human health from wastes that are improperly managed. Contaminants that are of concern include radioactive materials, pathogens, toxics, nutrients, and metals.

Trends and Conditions



Two principal concerns of waste management are the generation and management of municipal solid waste and hazardous waste materials. Municipal solid waste is garbage and trash (generated by households, schools, offices, and similar facilities) and sewage sludge (generated by publicly and privately owned wastewater treatment facilities). Hazardous waste is primarily waste that meets the legal definition of hazardous and must be managed in accordance with federal regulations.

The major problems associated with this issue include:

- addressing citizen concerns pertaining to old landfills,
- the operation of existing landfills,
- the siting problems associated with locating new landfills,
- hazardous waste generation,
- addressing citizen concerns pertaining to use of sewage sludge as a soil amendment,
- the siting problems associated with locating sewage sludge land application and disposal sites, and
- addressing local and state government concerns regarding the interstate or interregional transport of sewage sludge.

Historically the primary means of solid waste disposal has been through landfills, both public and private. Within the last decade some areas have begun to turn to alternative disposal options such as reuse, recycling, and incineration. Use of these alternative options has resulted in a significant reduction in the percentage of waste disposed of in landfills. The principal reason communities have turned to these other options is government-mandated goals to reduce the amount of waste disposed in landfills.

There are presently 491 operating municipal solid waste landfills in Region 4. In 1990 there were 914. The decrease is primarily due to the many landfills not able or willing to meet the federal criteria for landfill sites. All states in Region 4 have adopted the criteria.

Recycling and incineration have had a significant impact on reducing the waste sent to landfills. In 1990 there were 235 curbside recycling programs in place; by 1994, there were 920 programs in place.

All states in Region 4 have adopted EPA national criteria for solid waste reduction in their state programs. EPA's efforts in the area of municipal solid waste are focused on encouraging and promoting recycling and reuse programs, leaving states to actually regulate solid waste landfills.

From 1988 to 1994 there was an overall increase of approximately 59 percent in the total tonnage of municipal solid waste generated for the eight states in EPA Region 4. The total tonnage of waste recycled or composted for the Region increased from 2,380,000 tons in 1988 to 13,082,000 tons in 1994; this was an increase of approximately 450 percent. The total tonnage of waste incinerated experienced an overall increase of approximately 25 percent from 1988 to 1994. Although recycling, composting, and incineration have experienced increases in the

tonnage of waste processed at those facilities, the tonnage of landfilled waste has also increased by approximately 35 percent.

The primary methods of disposal of sewage sludge have been placement in landfills, application to agricultural lands, and incineration. Due to 1) increasing costs of landfill disposal, 2) a decreasing number of landfills that meet federal criteria for landfill sites, and 3) the elimination of the ocean disposal of sewage sludge in the Northeast, the Region is facing increasing pressures to find safe uses of this necessary by-product of wastewater treatment.

compliance, and enforcement of sewage sludge use or disposal practices; 2) encouraging the states to pursue federal sewage sludge program authorization; 3) encouraging states to adopt regulations similar to EPA's national sewage sludge standards; and 4) encouraging and promoting sewage sludge reuse programs.

Hazardous waste is of particular concern to the southeast Region as it requires special management due to the serious threat it poses to human health and the environment. In accordance with 40 CFR 262.41 of the Resource Conservation and Recovery Act, businesses which generate over 2,200 pounds

Municipal Solid Waste Generated (in tons)

Year	Tons of Solid Waste Generated	Tons of Waste Recycled (percent)	Tons of Waste Incinerated (percent)	Tons of Waste Landfilled (percent)
1988	39,160,000	2,380,000 (6%)	5,392,000 (14%)	31,388,000 (80%)
1989	45,000,000	1,172,000 (2%)	4,385,000 (10%)	39,443,000 (88%)
1990	47,400,000	4,139,000 (9%)	4,895,000 (10%)	38,366,000 (81%)
1991	47,500,000	6,289,000 (13%)	4,502,000 (10%)	36,709,000 (77%)
1992	55,238,000	8,783,000 (16%)	6,086,000 (11%)	40,369,000 (73%)
1993	55,642,000	10,779,000 (19%)	5,877,000 (11%)	38,986,000 (70%)
1994	62,175,000	13,082,000 (21%)	6,758,000 (11%)	42,335,000 (68%)

There are approximately 2,700 National Pollutant Discharge Elimination System (NPDES) permitted facilities in Region 4 that produce sewage sludge. In addition, the Region has a significant number of non-NPDES public and private wastewater treatment facilities that treat domestic sewage. There are significant amounts of available agricultural lands within the Region that are economically accessible to major municipalities outside of the Region. The combination of the above factors has added increasing pressures within the Region to effectively manage the safe use or disposal of sewage sludge.

Currently, no state in Region 4 is authorized to manage the federal sewage sludge program. EPA's efforts in the area of sewage sludge management are focused on 1) permitting,

of hazardous waste must report information regarding their waste generation and management activities to state environmental agencies and the U.S. EPA.

As shown in the following chart, the tonnage of hazardous waste generated in the eight southeastern states decreased significantly from 1985 to 1993. The overall tonnage of hazardous waste generated decreased nearly 81 percent during that period. The largest amount was in 1985, with 28,864,072 tons of hazardous waste generated.

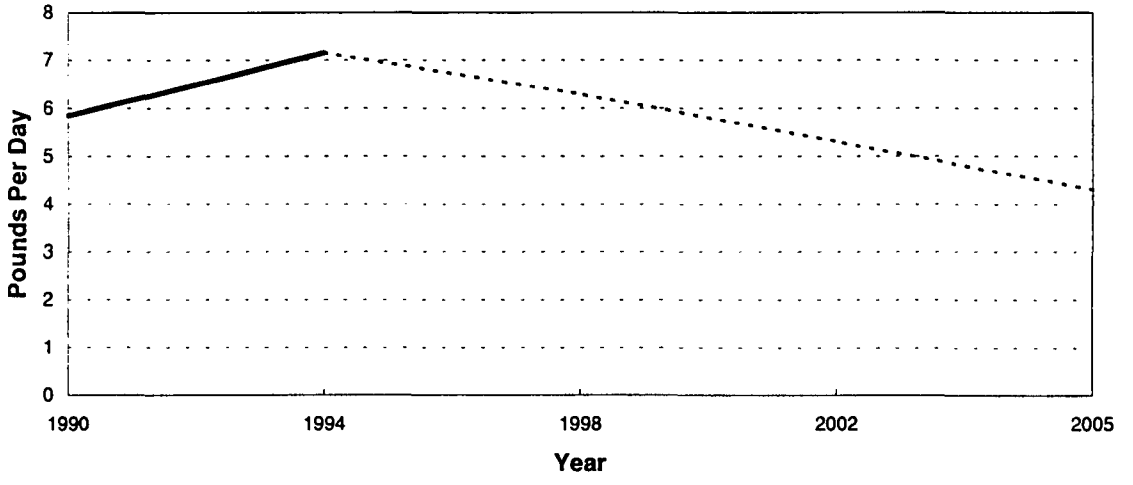
Future increases in the quality and quantity of data collected will allow the Region to continue to examine the progress of waste reduction as a waste management tool.

Hazardous Waste Generated by States In Region 4 (Tons per Year)					
State	**1985**	**1987**	**1989**	**1991**	**1993**
Alabama	7,406,169	3,049,028	403,701	559,823	779,645
Florida	833,653	518,645	411,832	508,839	213,888
Georgia	2,783,149	2,948,917	2,615,210	757,885	921,076
Kentucky	7,661,906	5,850,529	149,612	487,622	397,488
Mississippi	2,507,466	1,296,270	717,291	1,463,460	1,882,053
North Carolina	1,285,340	928,424	586,338	281,849	447,718
South Carolina	5,300,808	4,850,200	106,224	604,456	310,399
Tennessee	1,085,581	884,182	1,827,000	1,697,402	607,541
Total	**28,864,072**	**20,326,195**	**6,817,208**	**6,361,336**	**5,559,808**

Regional Goals

Goal: *By 2005, the generation of municipal waste per capita will be reduced to the level of 4.3 pounds per day.*[1]

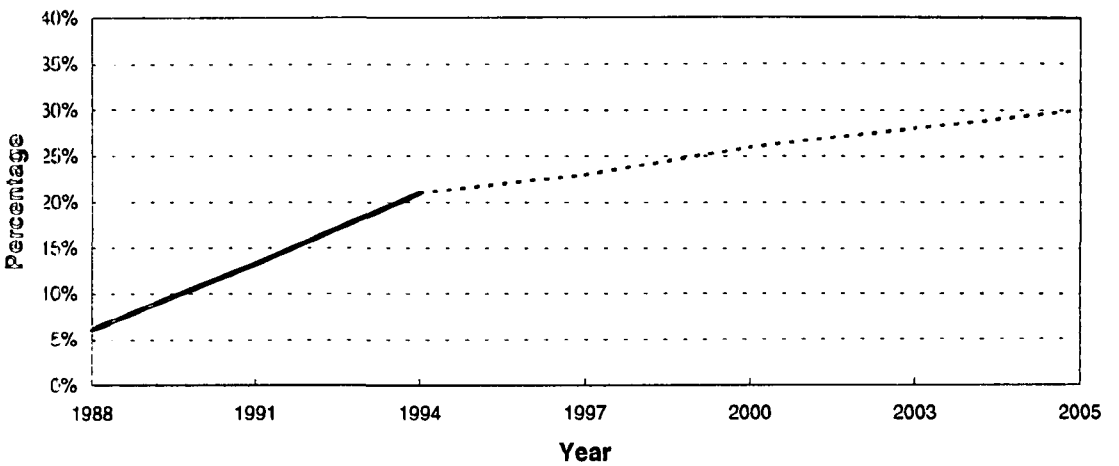
Generation of Municipal Solid Waste Per Capita Per Day



[1] The data to support this indicator were provided by *BioCycle*. The survey tracks data from 50 states and the District of Columbia. The bulk of the figures comes from state agencies and represents the best data available.

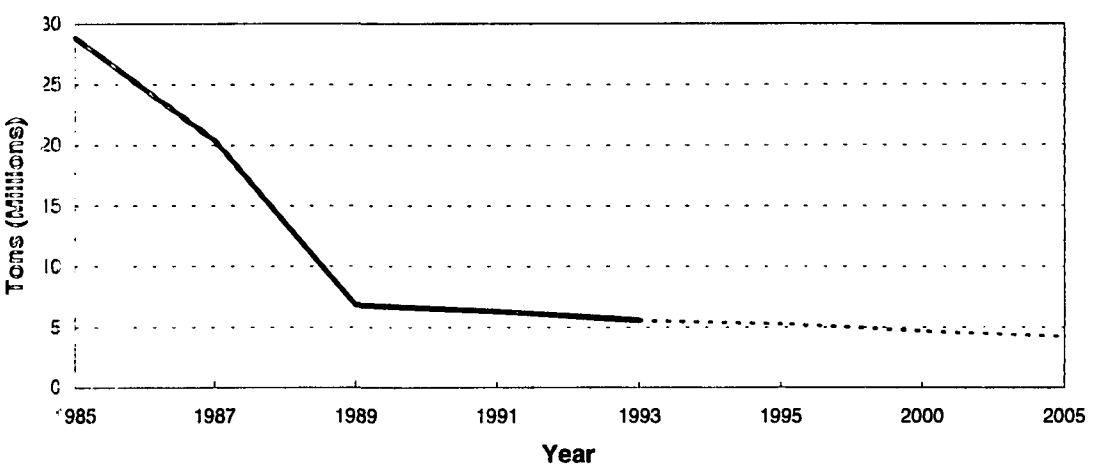
Goal: *By 2005, 30% of the municipal waste that is generated will be recycled.*[2]

Percentage of Municipal Solid Waste Recycled in Region 4



Goal: *By 2005, hazardous waste generation will be reduced by 25% from the 1993 levels of hazardous waste generated.*[3]

Hazardous Waste Generated in Region 4



[2] The data to support this indicator were provided by *BioCycle*. The survey tracks data from 50 states and the District of Columbia. The bulk of the figures comes from state agencies and represents the best data available.

[3] The data to support this goal were provided by the U.S. Environmental Protection Agency, Office of Solid Waste, as part of their biennial report, *National Biennial RCRA Hazardous Waste Report*. States report information biennially to EPA. The data are available in hard copy format.

Indicators

- Generation of municipal solid waste -- tons generated, landfilled, incinerated, recycled
- Radioactive waste generated
- Volume of hazardous waste generated, recycled, and reused
- Volume of industrial solid waste generated, recycled, and reused

Strategies[4]

1. Support the development of new technologies that reduce waste or eliminate the generation of waste.

2. Reduce the amount of hazardous waste being incinerated.

3. Implement pollution prevention strategies at every opportunity.

4. Support the development of new technologies that provide improved strategies for remediating waste.

5. Promote source reduction activities through education, program support, and technical assistance.

6. Provide compliance assistance through inspections that highlight alternative treatment or source reduction activities.

7. Assess recycling markets and provide assistance to increase capacity.

8. Assist in the development of effective infrastructure for the collection, processing, and marketing of recyclables.

9. Increase awareness and purchase of recycled-content products.

10. Examine economies of scale in monitoring efforts.

11. Target large industrial firms for recycling.

12. Examine landfill monitoring processes for opportunities to reduce costs.

13. Study the methods used for the transport of wastes.

[4] Numbering of strategies does not imply any order of significance or priority.

Regional Strategic Issue 6: *Surface Water Quality*

This issue addresses the quality of surface waters as it affects human health, ecology, and quality of life. It includes all freshwater lakes, rivers, streams, springs, and waters from estuaries and marine systems. In addition, this issue addresses the impacts to surface water quality from domestic wastes, industrial/hazardous wastes, solid wastes, atmospheric deposition, contaminated soils and sediments, nonpoint sources of pollution, and soil erosion.

Trends and Conditions

Surface water resources in EPA Region 4 include a rich and diverse group of rivers, lakes, and estuaries that provide significant ecological, aesthetic, and economic value to all states within the Region. The waters are essential for providing the habitat needed to support aquatic life and wildlife. They also provide water for drinking, recreation, agriculture, food, industry, and power generation. The main threats to the basic functions provided by water resources in Region 4 are pollution from human activities and habitat destruction.

During the years of 1993 and 1994, the Region 4 states reported in their 305(b) water quality reports that the water quality conditions of approximately 27% of streams, 72% of lakes and 89% of estuaries were assessed. Of the waterbodies assessed, approximately 62% of the rivers, 65% of the lakes, and 73% of the estuaries fully supported designated uses as established by the individual states. These designated uses typically include drinking water supply, recreation, support of fish and other aquatic life, and support of wildlife. While water quality improvements have occurred in some areas due to improved treatment of point source discharges, water quality conditions in other areas have declined. These declines are due to a variety of human impacts.

At the present time a major source of stress on surface water resources comes from land use changes associated with increases in human population and societal demands on water resources. The primary sources of stressors on surface water quality can be separated into two categories: point sources and nonpoint sources. These sources of water pollution may contribute to increased loadings of sediment, nutrients, metals, pathogens, toxic substances, and airborne pollutants as well as to habitat destruction.

There are three principal sources of point source water pollution: municipal wastewater discharges, industrial wastewater discharges, and storm water discharges from municipal and industrial activities. Municipal wastewater is generated by households, public buildings, commercial establishments, and some industries that discharge into municipal sewer systems. The primary impacts on water quality from municipal wastewater are from the amounts of toxics, nutrients, and organic matter discharged into waterbodies. Though municipal wastewater is treated to reduce the impacts on receiving waters, the level of treatment varies greatly and is not always sufficient to reduce these impacts to acceptable levels. Inadequately disinfected municipal wastewater can result in increased levels of pathogens in receiving waters.

Water use in industry varies with the type of industry. Water uses include processing raw materials or food, controlling air pollution and, to a minor degree, cooling or cleaning machinery. The primary pollutants associated with industrial wastewater are acids, detergents, oil and grease, heavy metals, halogenated solvents, toxics, organic matter, and suspended solids. The primary impacts of industrial, as well as municipal, wastewater are on aquatic organisms. Chemicals and heavy metals can accumulate and cause an acute or chronic effect on organisms in the receiving waters.

Secondary treatment is required for municipal wastewater, industry must meet technology-based limits, and both are subject to all applicable water quality standards. The overall impacts of wastewater discharges have been significant in the past, but new and improved treatment technologies and regulations have substantially reduced the impacts from point source discharges.

Urban runoff and industrial-related storm water discharged through conveyances, such as separate storm sewer systems, are point sources under the Clean Water Act and are, therefore, subject to the National Pollutant Discharge Elimination System (NPDES) program. Storm water discharges from these urbanized areas and from industrial and commercial activities can contain high levels of contaminants, such as sediment, suspended solids, nutrients, heavy metals, pathogens, toxics, oxygen-demanding substances, and floatables. In urban areas, the cumulative effect of widespread development changes natural drainage patterns, causing much higher peak flows and reduced dry-weather base flows in urban streams and wetlands. Increased peak flows can cause severe hydrologic modifications such as stream bank erosion, stream bed scour, flooding, channelization, and alteration and/or elimination of habitat. Industrial and commercial operations, generally located in urban areas, can be significant sources of storm water contamination because of the nature of the activities conducted and the materials stored outdoors.

Across the Region, EPA estimates that nonpoint sources account for over 65% of the total amount of pollutants reaching rivers, lakes, and estuaries. Categories of nonpoint source pollution are agriculture, silviculture, construction, urban runoff, resource extraction, land disposal including onsite disposal systems, hydrologic and habitat modification, and other sources including atmospheric deposition, leaking storage tanks, spills, in-place contaminants, and natural sources. Sediment is the single largest nonpoint source pollutant. Other pollutants include nutrients (in excessive amounts), pesticides, organic matter, petroleum products, heavy metals, salts, fecal coliform and other bacteria, and oxygen-demanding materials. Impacts from some categories of nonpoint source pollution appear to be following an increasing trend in many areas of Region 4.

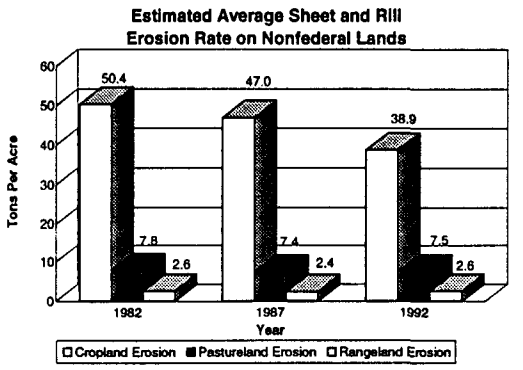
Point and nonpoint discharges arise primarily from human actions such as land development, highway construction, agricultural production, industrial activities, and other uses to support human needs. Without proper controls to limit discharges from developed lands, severe pollution can occur from these sources. In addition, destruction of riparian zones and aquatic habitat from various land uses also severely affects the ability of natural processes to mitigate the impacts of pollutants found in storm water run-off. Atmospheric deposition of pollutants generated through air emissions (primarily from automobile and industrial sources) is also a significant contributor to pollutant loadings. Atmospheric deposition is a primary factor in the acidification of waterbodies due to acid rain and a major source of excessive nutrient loadings to surface waters.

The major strategies to control point source discharges are required under the Clean Water Act and procedures for implementing these strategies are developed and undertaken by states with assistance from federal agencies, local governments, industry, and concerned citizen groups. Federal agencies such as the U.S. Forest Service, Department of Defense, and Department of Energy are responsible for control of pollutants from sources on lands under federal management. The primary legislative authority associated with water quality comes from the federal Clean Water Act, state clean water, erosion control, or other acts, and local ordinances.

Acceptable levels of point source stressors are established by in-stream standards for pollutants and controlled by issuance of NPDES permits that do not allow pollutants to be discharged in excess of water quality standards and technology-based standards, and based on the assimilative capacity of the receiving waters. Some accidental spills and releases are controlled by municipal and industrial permitees, with required actions outlined in spill prevention and control plans developed by the individual facilities. However, some accidental spills reach water-bodies and can cause severe localized environmental damage.

Point and nonpoint source pollution from land use activities is controlled by the proper implementation of best management practices (BMPs) to control pollutants that result from these activities. Implementation of these BMPs is controlled by state and local ordinances, with voluntary compliance encouraged in some instances.

The measures taken to control sources of both point and nonpoint discharges (but primarily point sources) have led to significant improvements in the prevention of degradation of surface waters, and overall water quality is improving. Though past efforts have resulted in improved water quality conditions within Region 4 over the last twenty years, additional strategies will be needed to continue this improvement so that eventually all waters fully support their designated uses.



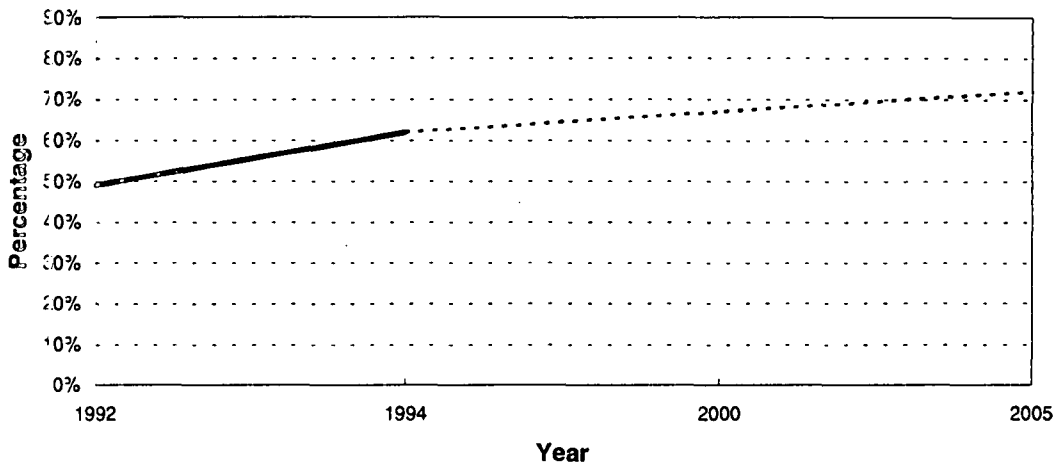
Erosion and resulting sedimentation are major problems associated with many types of land use. Two primary examples are erosion from unprotected construction sites and agricultural lands. Soil erosion in urban areas is a serious problem in Georgia, particularly from construction sites without adequate erosion control measures. Such sites may contribute up to 400 tons of sediment per acre. Erosion caused by agricultural activities is not as great a problem and does not provide a sediment yield per acre as high as construction sites, but the cumulative effects of eroding agricultural lands do have considerable impacts on lands throughout the Region. Mississippi's erosion concerns focus primarily on cropland erosion, and conservation treatments to protect lands from erosion are needed for 65% of all pastureland and 58% of forest lands. Kentucky is particularly concerned with erosion from lands that have been strip-mined or used as quarries, pits, and road construction sites; the erosion rates are as high as 72.2 tons per acre per year for these sites.

Land users and all levels of government are cooperating to reduce erosion. In Alabama, research is being conducted to determine soil loss and management requirements for minimum tillage systems on erodible lands. Fertility requirements of eroded lands are also being studied. The U.S. Department of Agriculture has developed a system for indexing the sensitivity of soil to erosion damage; this erosion index (EI) system indicates the need for erosion control more precisely than other systems of classifying soil erosion hazards.

Regional Goals

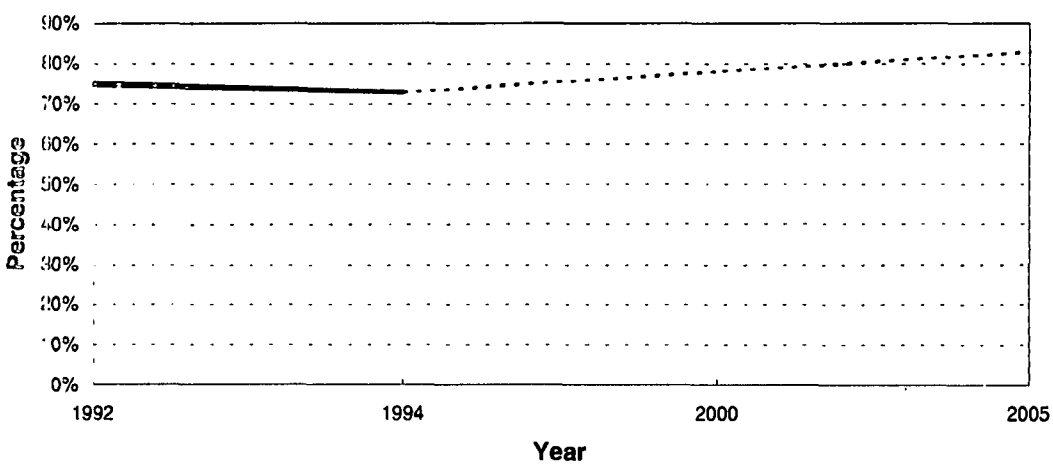
Goal: *By 2005, increase the percentage of river miles fully supporting designated uses by 10% over 1994 levels.*[1]

Percentage of River Miles Fully Supporting Designated Uses



Goal: *By 2005, increase the percentage of lake acres fully supporting designated uses by 10% over 1994 levels.*[2]

Percentage of Lake Acres Fully Supporting Designated Uses



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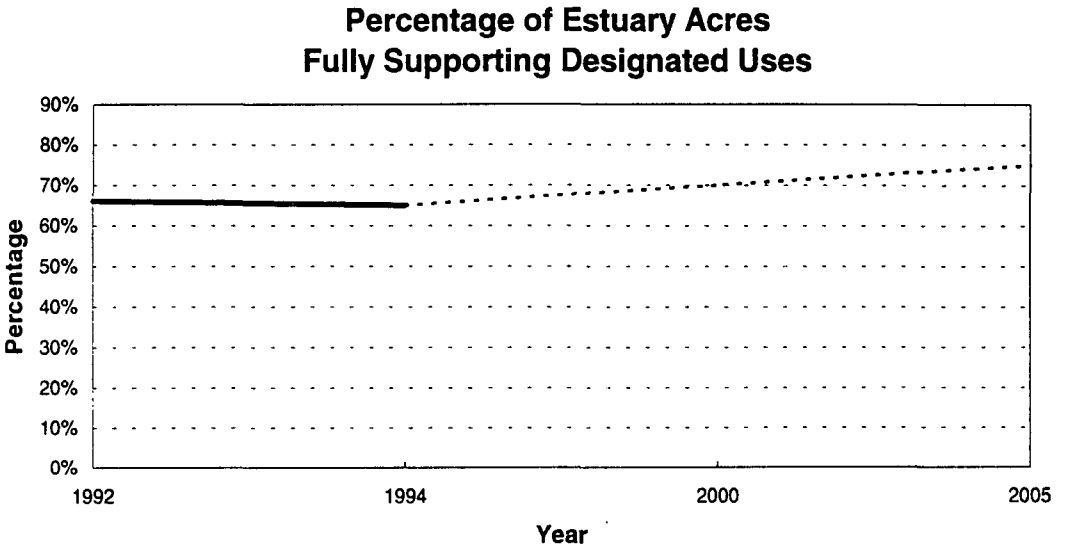
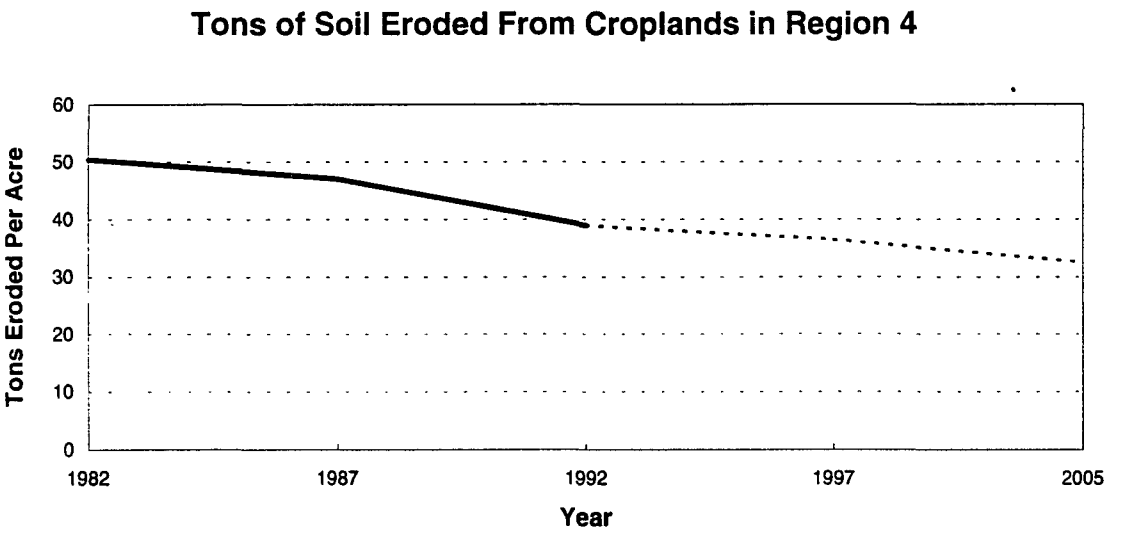
[1] Water quality data for each state are available in the 305(b) reports prepared by each state's environmental agency and submitted to U.S. EPA. Copies of each state report are available from the individual states. For information, contact David Melgaard, Division of Water, EPA Region 4, 345 Courtland Street NE, Atlanta, GA 30365, or at (404) 347-2126 ext. 6590.

[2] See footnote #1.

Goal: *By 2005, increase the percentage of estuary acres fully supporting designated uses by 10% over 1994 levels.*[3]



Goal: *By 2005, the annual rate of soil eroded from agricultural croplands will be reduced 20% from 1992 levels.*[4]



[3] See footnote #1.

[4] The data are provided by the U. S. Department of Agriculture, Natural Resources Conservation Service, National Resources Inventory Division. The data are collected every five years and are available in both hard copy and CD ROM formats.

Indicators

- Percentage of miles or acres of streams, lakes, and estuaries not meeting designated use
- Trophic status of lakes
- Index of biotic integrity
- Erosion rates on non-federal land
- Erosion rates from agricultural cropland
- Point source loadings (pounds per year) to surface waters

Strategies[5]

1. Expand the coverage of the Region's water quality monitoring system.

2. Improve the efficiency of using existing monitoring data.

3. Develop new techniques to better assess biological/ecological trends and conditions.

4. Improve 305(b) consistency among states.

5. Prioritize the causes of waterbodies' failure to meet designated use standards and develop strategies to deal with each cause.

6. Use monitoring data to make environmental and program decisions.

7. Establish effective GIS capabilities for Region 4 and the states.

8. Establish effective monitoring methods, data sharing, and coordination of resource expenditures among states, agencies, and others involved in monitoring.

9. Increase the amount of biological monitoring in the states.

10. Identify successful models of nonpoint source pollution mitigation and share the information with the other states in the Region.

11. Provide organizational and technical support for the community-based environmental protection approach to water quality protection.

12. Use closed-loop industrial wastewater processes.

13. Incorporate pollution prevention into water quality protection programs and activities.

14. Use sound science in environmental decision-making and priority setting.

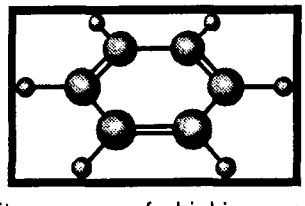
15. Identify needed environmental indicators of water quality and set baseline values for each.

[5] Numbering of strategies does not imply any order of significance or priority.

Regional Strategic Issue 7: *Ground Water Quality*

This issue addresses the quality of ground water as it affects human health, ecology, and quality of life. The primary concerns related to the quality of the ground water resource are the effects from numerous contaminants such as petroleum compounds, other organic compounds, nitrates, organic pesticides, metals, and bacteria. These contaminants are introduced into ground water from sources such as underground storage tanks, pesticide and fertilizer applications, landfills, septic tanks, above ground storage tanks, surface impoundments, and shallow injection wells.

Trends and Conditions



Ground water supplies over half of the nation's population with drinking water. Over 90% of rural America relies on ground water as its source of drinking water. In general, the southeastern states mirror these numbers; the notable exceptions are Florida and Mississippi, where over 90% of each state's total population relies on ground water for its drinking water. Other important ground water uses include agricultural, commercial, and industrial applications. The ecological importance of ground water in providing streamflow to surface waters and in supporting habitat needs must also be recognized.

Since contamination of ground water typically occurs in localized areas, it is difficult to make broad statements concerning ground water quality conditions. Many locations within each state have shown ground water quality degradation that constrains the use of ground water, but these instances are localized and typically do not affect large regional ground water resources. In a number of coastal areas, overpumping of ground water has led to saltwater intrusion, which can result in unacceptable levels of salinity in local ground water supplies.

When asked to rank categories of contaminant sources for the 1994 305(b) report, the states responded with assignment of high, medium, low, and unspecified priority. Those categories of contaminant sources that received rankings of high or medium priority are as follows (in alphabetical order):

- above ground storage tanks,
- fertilizer applications,
- landfills,
- pesticide applications,
- septic tanks,
- shallow injection wells,
- surface impoundments, and
- underground storage tanks.

The states were also asked to rank ground water contaminants for the 1994 305(b) report. The following ground water contaminants were found to be of the highest concern:

- petroleum compounds,
- other organic compounds,
- nitrates,
- organic pesticides,
- metals, and
- bacteria.

State environmental agencies receive funding from EPA under Section 106 of the Clean Water Act in support of their state ground water protection programs. These state programs address a variety of issues, concerns, and activities including the development of Comprehensive State Ground Water Protection Programs (CSGWPPs). CSGWPPs are intended to be a framework for states to coordinate and set priorities for all ground water-related activities in each state. CSGWPPs are to be customized to meet the needs and vision of each state, should emphasize the need to prevent ground water contamination, and should build upon the principles of state/EPA partnerships in protecting ground water.

The Wellhead Protection Program (WHPP) was established by the Safe Drinking Water Act

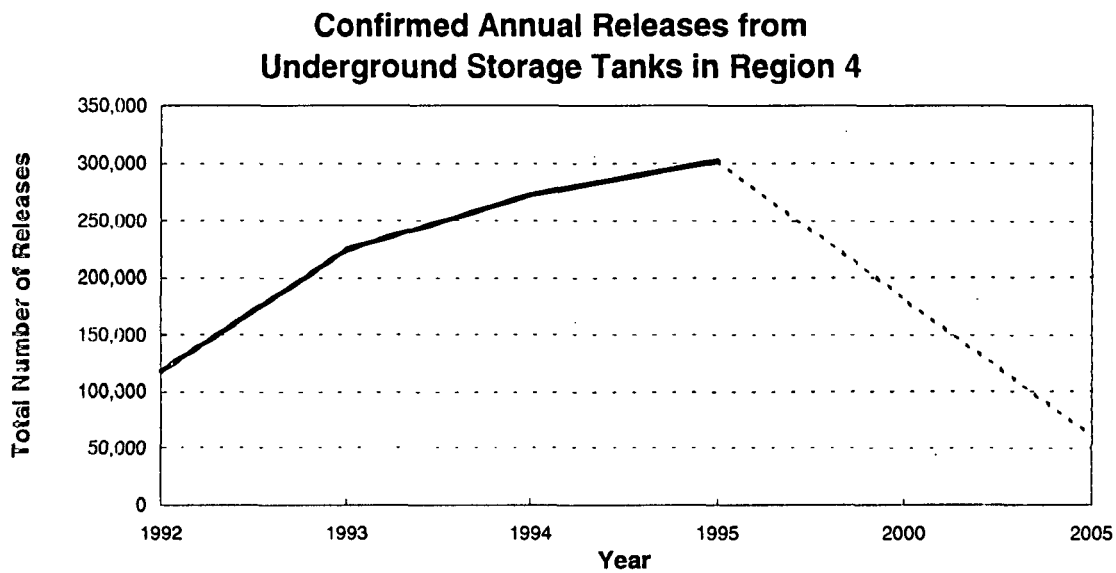
Amendments of 1986. The Act requires states to develop programs to protect the areas around public water supply wells from contamination. WHPP efforts are funded by EPA primarily through the 106 Ground Water Protection Program Grants. Numerous small grants to local governments have also been made in support of local program development and implementation. Currently, seven Region 4 states have had their wellhead protection programs approved by EPA.

Other activities supported by the 106 Ground Water Protection Program Grant include the development of ground water standards, regulations, and classification systems; monitoring networks; permitting programs; response actions; the development of management systems; review and technical support to other programs; outreach and education; and ground water resource investigations and mapping.

Other environmental statutes dealing with Superfund sites, hazardous waste sites, underground storage tanks, pesticides, and underground injection control have established ground water-related programs that also address ground water protection and remediation concerns.

Regional Goals

Goal: *By 2005, confirmed annual releases from underground storage tanks will be 80% lower than in 1995.*[1,2]

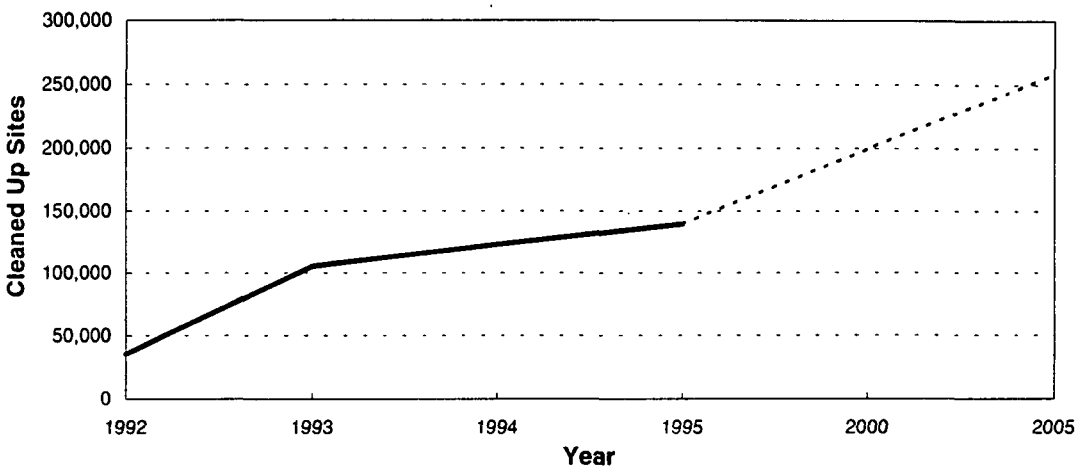


[1] Data to support this goal are available from the Leaking Underground Storage Tanks database. The data are available in hard copy format and are reported quarterly for each state. For information, contact John Mason, Division of Water, EPA Region 4, 345 Courtland Street NE, Atlanta, GA 30365, or at (404) 347-3866.

[2] Ground water quality is difficult to measure and quantify. Other than for very site-specific conditions, numeric goals and true environmental indicators do not currently exist that reflect ambient environmental conditions for ground water resources. Programmatic goals such as the UST goals and indicators are being used as surrogate measures until more appropriate indicators for ground water resources can be developed.

Goal: *By 2005, the number of cleaned up underground storage tank contamination sites will be 85% higher than in 1995.*[3]

Total Number of Underground Storage Tank Contamination Sites Cleaned Up in Region 4



Indicators

- CERCLIS sites with confirmed contamination of ground water
- Number of municipal drinking water wells closed due to contamination
- Number of Leaking Underground Storage Tanks (LUST) sites and sites cleaned up

Strategies[4]

1. Develop a regional ground water protection strategy.

2. Develop a comprehensive ground water protection strategy for each state.

3. Develop a regional ground water quality monitoring system.

4. Identify critical areas for ground water protection.

5. Incorporate pollution prevention into ground water quality protection programs and activities.

6. Implement scientifically-sound, rapid, and cost-effective action at all UST release sites requiring corrective action through the use of streamlined processes, risk-based corrective action, and improved cross-program coordination.

7. Implement strong UST enforcement programs such that owners and operators routinely and correctly monitor all regulated tanks and piping for leaks in accordance with regulations.

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[3] See footnote #1.
[4] Numbering of strategies does not imply any order of significance or priority.

8. Develop sufficient authorities and capabilities to be approved by EPA for states to operate their UST program in lieu of the federal program.

9. Upgrade or replace tanks to meet new UST standards by the 1998 deadline.

10. Implement the National Class V UIC Strategy through the efforts of the Region 4 Class V Team through the efforts of Region 4 states as supported by the UIC Grant Program.

11. Develop and implement state and local wellhead protection activities by providing technical and financial assistance.

12. Link ground water-related activities with other environmental initiatives such as the Community Based Environmental Protection (CBEP) approach, Watershed Protection Planning, etc.

13. Implement the use of Geographic Information Systems (GIS) in mapping ground water resource areas and delineated wellhead protection areas, and encourage the use of this information by ground water-related programs in setting priorities.

Regional Strategic Issue 8: *Water Resources*

This issue addresses the impacts to human health, ecology, and quality of life resulting from the depletion of fresh water supplies. Water quantity considers the water supply and management of both surface and ground water resources. The primary concerns of this issue are overdraft and minimum flows and levels. The sub-issue of overdraft deals with the impacts on wetlands and surface waters from ground water overdraft as well as issues of saltwater intrusion, depletion, and competing uses. Minimum flows and levels deals with concerns of depletion, competing uses, and effects on aquatic communities.

Trends and Conditions

The available water supply for the Region 4 area is controlled by a combination of geography, geology, hydrology, and yearly precipitation. The rapidly increasing population growth in the southeast region of the United States has constrained the availability of water resources in some areas to supply human needs as well as to maintain aquatic ecosystems. Population centers dependent on the headwaters of watersheds are vying for river flows, and in some areas available surface water quantities are not adequate for all uses. The current negotiations between Georgia, Florida and Alabama over allocation of the Chatahoochee River water is a prime example of a situation where potential overuse of a resource by competing uses can occur, and decisions on proper use of the limited quantity must be carefully made to satisfy all demands. In some coastal areas, cities that depend on aquifers are looking for solutions to saltwater intrusion and overuse of aquifers. Also, in other areas communities are depending on limited ground water supplies and are seeking new sources of potable water to meet increasing demands. Municipalities are having to find ways to conserve and reuse supplies, develop water use strategies to reduce the need for new infrastructure, and develop new expensive supplies.

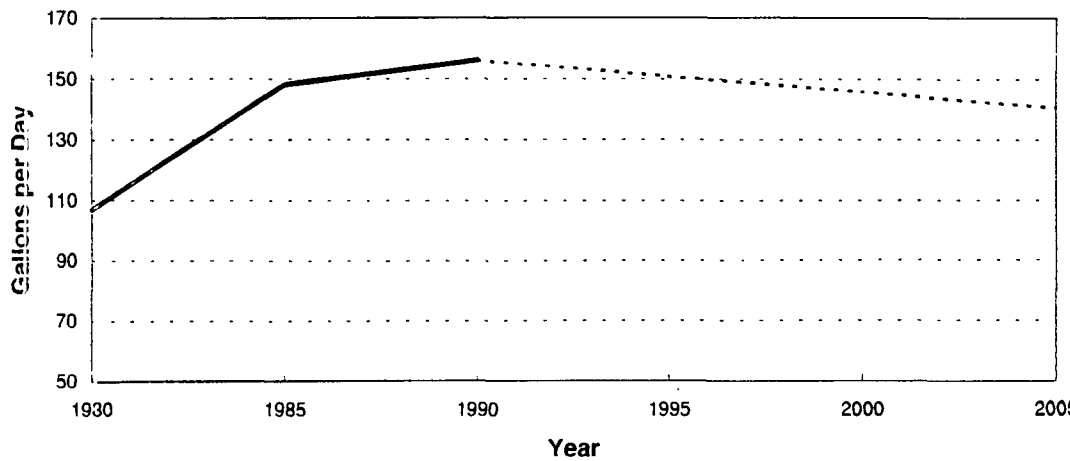
The primary stressors associated with this issue are related to increased human populations and societal demands on the resource. Increased industrial and agricultural demand for water are also related to increasing human needs. The trend for increased water use is prevalent in most of the Region 4 area. Several areas have taken steps to reduce per capita consumption of water by developing water use strategies and less consumptive technologies aimed at conserving the resource, while other areas are expending capital to build new water supply reservoirs and infrastructure to meet new demands.

The development and maintenance of water supplies are primarily under state and local jurisdiction and control. Maintenance of surface water flows adequate for protection of aquatic life is controlled by state and federal pollution control acts. Water conservation and control strategies are often developed by individual municipalities, counties, or regional commissions with the overall goals of reducing per capita consumption rates in critical areas and developing conservation and reuse programs.

Regional Goals

Goal: ***By 2005, per capita use of water will be reduced by 10% from the 1990 level of 156 gallons per day.***[1]

Public Supply and Domestic Self-Supplied Withdrawals per Capita in Region 4



Indicators

- Water withdrawals by sector
- Average water use per person
- Agricultural water use per acre of agricultural lands

Strategies[2]

1. Assess the amount of water withdrawn for different uses and develop strategies for minimizing the use of water.

2. Promote the development of wastewater reuse programs.

3. Support education programs for water conservation.

4. Support efforts to improve the efficiency of water conservation technologies.

5. Facilitate the exchange of information between states.

6. Identify areas where the use of water is damaging future water supplies and ecological functioning.

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[1] The data used to support this goal are available from U.S. Geological Survey reports that estimate the use of water in the United States. These data are collected every five years and are available in hard copy format from the USGS, Federal Center, Box 25286, Denver, CO 80225.
[2] Numbering of strategies does not imply any order of significance or priority.

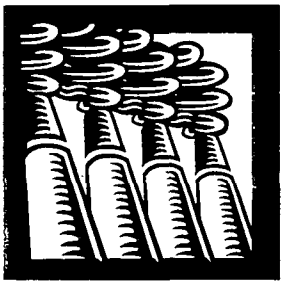
7. Involve private industry in the process of reducing water use for their sectors.

8. Establish safe flows and levels for all rivers and streams of regional significance and develop strategies to ensure their maintenance.

Regional Strategic Issue 9: *Air Quality*

The issue of air quality is concerned with the air outdoors and the upper atmosphere. It addresses the effects of criteria pollutants, toxics, and stratospheric ozone depletion. It includes effects on air quality from auto, industrial, and biohazardous emissions. The sub-issue of criteria pollutants deals with the six criteria pollutants (particulate matter less than 10 micrometers in diameter, ozone, sulfur dioxide, nitrogen dioxide, lead, and carbon monoxide), acid rain, mobile sources, and non-attainment areas. Toxics addresses mobile sources and TRI releases.

Trends and Conditions



Air pollution, as identified by exceedances of the National Ambient Air Quality Standards (NAAQS), can cause sickness, especially in the elderly and the very young, and damage to the environment and to property. The accidental release of some air pollutants can cause serious injury or death. Pursuant to the Clean Air Act (CAA), six criteria air pollutants are monitored throughout the Region by state and local agencies: particulate matter less than ten micrometers in diameter (PM_{10}) (276 sites), ozone (175 sites), sulfur dioxide (63 sites), nitrogen dioxide (42 sites), lead (99 sites) and carbon monoxide (86 sites). Over half of these monitors have been collecting data for over ten years. All areas in Region 4 are meeting the NAAQS for three (carbon monoxide, PM_{10}, and nitrogen dioxide) of the six criteria pollutants.

Certain areas have been identified as "nonattainment" for one or more of the criteria air pollutants. These areas have been designated nonattainment in accordance with the requirements of the CAA. States are required to develop state implementation plans (SIPs) which describe each state's plan to bring its nonattainment areas back into attainment. These SIPs are the compilation of state regulations which have been approved by the EPA and are therefore federally enforceable.

Pursuant to the 1990 amendments to the Clean Air Act, there were a total of 33 NAAQS nonattainment designations relating to criteria pollutants. Currently, only six of the areas continue to record violations. The Region had nineteen ozone NAAQS non-attainment areas, pursuant to the 1990 amendments; since that time, fifteen areas are experiencing attainment and twelve areas have been redesignated to attainment status. The Region had six sulfur dioxide NAAQS nonattainment areas at the time of the 1990 amendments, and since that time two areas have been redesignated to attainment status and two areas are pending redesignation. The Region had four carbon monoxide NAAQS nonattainment areas pursuant to the 1990 amendments; all four areas have since been redesignated to attainment status. The Region had five lead NAAQS nonattainment areas pursuant to the 1990 amendments; since that time, three of the five lead nonattainment areas are monitoring attainment and one area has been redesignated to attainment status.

The following chart displays the number of areas that have exceeded NAAQS and the numbers of people residing in those areas:

Year	Number of Areas Violating NAAQS	Population in Areas Violating NAAQS
1990	23	15,167,302
1991	15	8,532,049
1992	10	5,607,809
1993	7	4,589,756
1994	5	3,480,401
1995	8	5,341,100

A limited amount of ambient hazardous air pollutant (HAP) data has been collected in some urban areas over the past several years. These

data are not sufficient to describe trends in ambient levels of hazardous air pollutants. Although there is some variation, since 1990 there has been a downward trend in emissions of criteria pollutants or their precursors from mobile sources and from stationary sources such as utilities and the auto manufacturing industry. In ozone nonattainment and maintenance areas, the emissions of ozone precursors (volatile organic compounds (VOCs) and nitrogen oxides (NO_x)) have remained constant or decreased due to the regulatory requirements for ozone nonattainment areas.

Title III of the CAA addresses requirements for both major and non-major sources of air pollution for HAPs. The Act requires EPA to issue standards over a ten-year period in order to regulate emissions of 189 toxic air pollutants from various industries and other sources. Once a source becomes subject to a certain EPA-issued HAPs rule, the source will also be required to submit applications for the approval of new construction and reconstruction and to undertake performance testing, monitoring, record keeping, and reporting.

For 1993, the Toxics Release Inventory (TRI) reported that 502 million pounds of TRI chemicals were released to the air (stack and fugitive emissions). This reflects a decrease of 70 million pounds as compared with 1988. Some of the 189 HAPs listed in the CAA are not included in the TRI. However, as recently as November 22, 1994, nine of these were added as part of the expansion of TRI. The remaining HAPs have not been added because of, among other reasons, their low production quantities.

Title V of the CAA addresses the permitting of major stationary sources and certain other sources of both criteria and non-criteria pollutants. The permit program will ensure that all of a source's obligations with respect to its pollutants will be contained in one permit document, and that the source will file periodic reports identifying the extent to which it has complied with its obligations. Both these requirements enhance the ability of federal and state agencies to evaluate air quality.

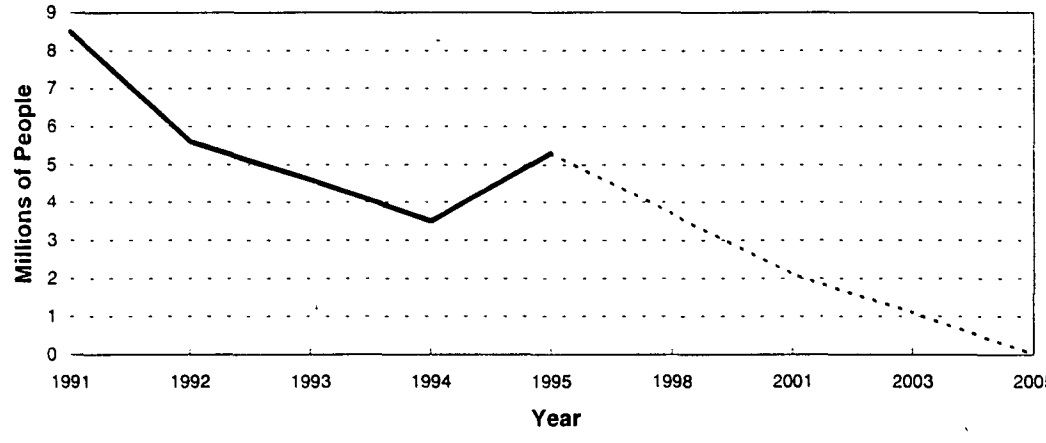
Substances reaching the upper atmosphere can have adverse impacts on global air quality, largely through destructive effects on ozone and the subsequent depletion of the stratospheric ozone layer. The main group of ozone-depleting chemicals is organic halogen compounds. Chlorine, fluorine, and bromine are the primary halogen constituents of these substances. In terms of effects on stratospheric ozone, the chemicals of major significance in this class are chlorofluorocarbons (CFCs) and methyl bromide. CFCs have been widely used as refrigerants, propellants, solvents, and in synthetic foams; methyl bromide is a common agricultural fumigant and an end product of certain types of combustion. Because these compounds are chemically stable, they can survive for years, reaching the troposphere and, ultimately, the stratosphere. Ultraviolet radiation from sunlight causes decomposition of these chemicals, resulting in the release of chlorine and bromine atoms. These halogens are highly reactive, have a high chemical affinity for ozone molecules, and can remain in the stratosphere for a long time. For each chlorine or bromine atom that reaches the stratospheric ozone layer, thousands of molecules of ozone may be destroyed. The amount of stratospheric ozone is inversely correlated with the amount of ultraviolet (UV) radiation that reaches the surface of the Earth: the less ozone there is, the more that UV radiation reaches the planet. Increased UV radiation can negatively impact human health as well as the health of aquatic and other land organisms. In addition, the stratospheric ozone layer is important because it is an influence on global warming and cooling.

In 1987, the Montreal Protocol on Substances that Deplete the Ozone Layer was approved, and well over one hundred countries currently participate in the Protocol. This international effort has resulted in the creation of time-based objectives for countries to ultimately end production and use of eight major organic halogens. In addition, the phaseout of CFCs and other ozone-depleting chemicals was addressed in the 1990 amendments to the Clean Air Act. Under the Montreal Protocol, CFC production in developed countries was scheduled to stop by the end of 1995 and, at the present time, developing countries are scheduled to phase out CFCs by 2010. The production of methyl bromide by developed countries is scheduled to be reduced by 25 percent by 2001 and by 100 percent by 2010. Because halogens can remain in the stratosphere for a very long time (the lifespan is thought to be around 100 years), even complete and immediate cessation of the use of these chemicals would not result in termination of halogen-induced ozone depletion until around the year 2100.

Regional Goals

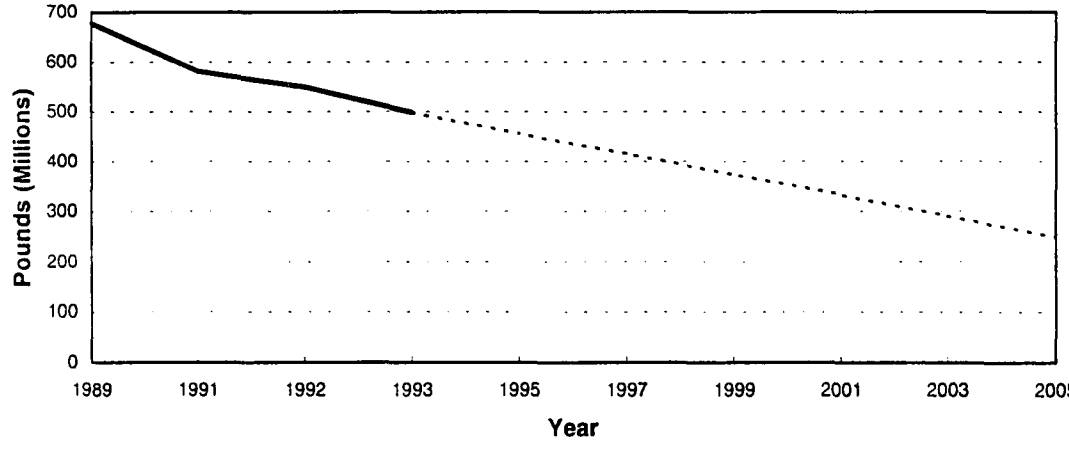
Goal: *By 2005, the population of Region 4 will live in areas that do not violate National Ambient Air Quality Standards.*[1]

Population Living in Nonattainment Areas in Region 4



Goal: *By 2005, reduce TRI emissions to air by 50% from 1993 levels.*[2]

Total TRI Releases to Air in Region 4



[1] The data to support this goal are provided by the U.S. EPA, Region 4 Air Division as part of their NAAQS program. The data are available annually for each state and may be obtained in hard copy format at no cost from U.S. EPA Region 4, Pesticides and Toxics Branch, 345 Courtland Street NE, Atlanta, GA 30365, or at (404) 347-1033.

[2] The data to support this goal are provided by the U.S. EPA in the 1993 *Toxics Release Inventory Public Data Release.* The data are available on CD-ROM for the years 1987 to 1993 or in hard copy format for the same period. These data can be obtained from the Title III Implementation Unit, U.S. EPA Region 4, 345 Courtland Street NE, Atlanta, GA 30365, or at (404) 347-3555.

Indicators

- Number of nonattainment areas in Region 4
- Toxic Release Inventory releases to air
- Carbon monoxide emissions and exceedances
- Nitrogen dioxide emissions and exceedances
- Sulfur dioxide emissions and exceedances
- PM_{10} emissions and exceedances
- Lead emissions and exceedances
- Volatile organic compound (VOC) emissions from motor vehicles and stationary sources
- Exceedances of the ambient standard for ozone
- Numbers of people living in areas where exceedances of the ambient standard for all criteria pollutants occur

Strategies[3]

1. Develop cooperative strategies to ensure that attainment status is maintained.

2. Reduce emissions through pollution prevention measures.

3. Use strategies such as pollution prevention to involve the private sector in efforts to reduce air pollution.

4. Improve and expand the ability to monitor air toxics and target strategies to respond to areas with high risk.

5. Develop and support community-based environmental protection efforts.

6. Conduct research into unique regional ozone strategies.

7. Promote the management of CFCs in the Region.

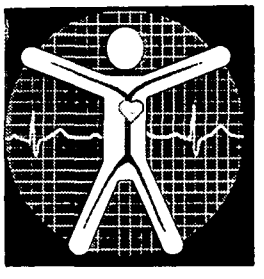
8. Expand and improve provision of technical assistance to communities on Title V.

[3] Numbering of strategies does not imply any order of significance or priority.

Regional Strategic Issue 10: *Healthy Communities*

The environment is composed of living organisms and the non-living media that surround them. Because of the numerous and complex interactions between organisms and their environment, separation of entities into categories of "living things" and "environment" is, for the most part, an artificial concept. How humans affect their surroundings largely determines how the environment affects humans; just as people can degrade the health of the environment, a contaminated environment can adversely impact human health. This issue focuses on some of the major toxics that adversely influence human health and the environment via their introduction into the various environmental media (i.e., water, air, land) and through exposure to toxic substances in the home and workplace.

Trends and Conditions



Living organisms come into contact with toxic substances via air, water, soil, and direct exposure. Routes whereby toxics are introduced into living things include inhalation, ingestion, and direct absorption through the skin.

Between 1985 and 1991, the National Governors' Association (NGA), under a cooperative agreement with the U.S. Agency for Toxic Substances and Disease Registry (ATSDR), conducted biennial surveys to identify contaminated sites that were closed or restricted to the public. The compilation of these Toxic Site Surveys (TSSs) displays information on sites that have restrictions for ground water, land area, surface water, and other sites (i.e., waste ponds/lagoons and buildings). The five contaminants most frequently found in the states of EPA Region 4 are shown in the chart that follows for 1991, the last year in which the survey was conducted.

Volatile organic compounds (VOCs) are commonly found in the air (e.g., via gasoline vapors), ground and surface water sources, and indoor air. In addition to the fact that some VOCs are carcinogenic, various VOCs can cause eye irritation and visual disorders, respiratory irritation, fatigue, impaired memory, and other disorders. Benzene is a VOC which is frequently found in contaminated ground water and in other contaminated sites; it is a constituent of petroleum products and is a commonly used industrial solvent. Benzene is a confirmed human carcinogen; routes of human exposure include ingestion, inhalation, and absorption through contact with skin. VOCs also contribute to the formation of photooxidant smog (ozone), and exposure to ozone can impair lung function in healthy people and can seriously endanger people with existing respiratory problems (e.g., asthmatics). Ozone is extremely reactive, promoting free-radical oxidation that leads to cell aging, cell death, DNA damage, and mutagenesis.

Humans may come into contact with polychlorinated biphenyls (PCBs), a group of 209 fat-soluble chemicals, through the ingestion of fish, meat, eggs, milk, and other substances in which these chemicals have bioaccumulated. PCBs are no longer manufactured in the United States, and although they are carcinogenic, they appear to pose little threat to human health in concentrations typically found in the environment. Occupational exposure, however, has been associated with the occurrence of chloracne, a disfiguring skin disorder. Some types of electrical equipment still contain PCBs.

Most Frequently Found Contaminants in Region 4 States in 1991			
All Sites		Ground Water Wells Only	
contaminant	# of sites	contaminant	# of wells
benzene	41	EDB	2,308
gasoline	28	benzene	2,224
pesticides	27	pesticides	2,212
EDB	26	fertilizers	2,012
PCBs, VOCs	21	solvents	1,667

EDB = ethylene dibromide
PCBs = polychlorinated biphenyls
VOCs = volatile organic compounds

Fertilizer-contaminated water can cause elevated levels of nitrates and other chemicals. Ingestion of nitrate-contaminated well water can result in an acute blood condition called methemoglobinemia, to which newborns are particularly susceptible. In addition, long-term exposure to nitrates may contribute to the development of cancer in children and adults, since nitrates can react with other chemicals to form nitrosamines, which are known animal carcinogens.

The effects of long-term exposure to low levels of pesticide residues in food and water are unknown. Adequate toxicological data are available for only about 100 of the 600 active pesticide ingredients currently found in the United States. High levels of occupational exposure to pesticides have resulted in symptoms of acute intoxication, ranging from nausea or muscle tremors to coma and sometimes death. Ethylene dibromide (EDB) is a grain fumigant and is also a component of some anti-knock gasolines. Acute exposure to EDB causes severe skin irritation, and EDB inhalation can result in pulmonary lesions; prolonged contact may injure the liver and kidneys. EDB is strongly suspected to be carcinogenic. The U.S. has no national database for the reporting of acute pesticide poisoning.

In addition to the above-referenced toxics of regional significance, there are many other toxic substances that are ubiquitous in the environment and which can negatively impact human health. Following is a discussion of some of these chemicals including some of their impacts on indoor air and drinking water.

Mercury is a metallic element that is found in some pesticides and which can enter surface waters through atmospheric deposition. When converted to organic methyl mercury by aquatic microorganisms, this toxic progressively bioaccumulates through the food chain. Being at the top of the food chain, humans can ingest high levels of mercury when contaminated fish are consumed. In humans, organic mercury is neurotoxic, can damage kidneys, and is teratogenic. Inorganic mercury, largely in the form of mercury vapor, can also adversely affect human health. Before August 1990, when the EPA banned mercury additives from indoor paint, latex paint manufacturers frequently added mercury compounds to preserve paint from the growth of microorganisms. Walls that were painted with these products are sources of mercury vapor, since mercury can vaporize and be released into the air, resulting in high indoor air levels of mercury. Inorganic mercury fumes can cause tremors and irritability in humans.

Lead is a heavy metal that is emitted into the atmosphere primarily via industrial activities, combustion of solid waste, and energy production. Lead is deposited onto soil and into water, and because lead is very stable, it does not degrade. Although lead was banned from general use in automobile gasoline around 1980, lead from gasoline burned before then persists in the environment. Human exposure to lead primarily results from inhalation and ingestion. Lead water pipes, lead soldering used in water pipes, and lead-based paint are significant sources of ingestible lead. Other sources of lead poisoning include exposure to the homes of persons involved in an occupation or hobby that uses lead and who carry lead dust or particles home on clothing or other materials; fumes and dust from lead-related industrial sources; food that is stored or served in containers made with lead (for example, ceramic food or beverage containers coated with leaded glazes); and folk remedies that contain lead (for example, azarcon, greta, kohl, and surma).

The term "lead poisoning" in children no longer has a specific definition. The Centers for Disease Control and Prevention have defined a blood-lead level "of concern" for children at any level at or above 10 micrograms per deciliter (ug/dL). Follow-up of individual children is recommended when their blood-lead levels reach 15 ug/dL or more. In children, a level of over 70 ug/dL is considered a medical emergency. The health effects of lead include central nervous system damage ranging from cognitive deficits to brain damage, kidney impairment, anemia, increased blood pressure, and many other medical manifestations. Central nervous system effects may be irreversible.

Children are much more vulnerable to lead poisoning than adults. Lead enters children's bodies primarily through hand-to-mouth activities such as playing in dust and soil that contains lead and then putting their fingers in their mouth; eating flaking paint chips from deteriorated lead-based paint; and chewing on easily accessible surfaces coated with lead-based paint. The human body has no need for and makes no beneficial use of even the smallest amounts of lead. In addition, since lead accumulates in bones, blood-lead levels may not be indicative of past lead exposure.

The main treatment for lead poisoning is to stop the exposure. Removing the lead from a person's environment helps to ensure a decline in blood-lead levels. In some cases, medications are used to lower blood-lead levels. The longer a person is exposed to lead, the greater the likelihood that damage to the person's health will result. Distillation and reverse osmosis are two effective means of treating water to remove lead. Any house or apartment built before 1978 may contain lead-based paint. Also, any other painted surface such as toys and furniture may contain lead-based paint. Paint in poor condition - chipping or peeling - poses the greatest health hazard. A person can temporarily reduce lead hazards by taking actions such as repairing damaged painted surfaces, repainting, and planting grass to cover soil with high lead levels. These interim controls will minimize the risk of exposure to lead. To permanently remove lead hazards, a person should hire a lead abatement contractor. Abatement (or permanent hazard elimination) methods include removing, sealing, or enclosing lead-based paint with special materials.

The air we breathe indoors often contains combustion gases, radon, chemicals, and biological contaminants, any of which may cause illness if present in sufficient quantities. Many signs and symptoms are non-specific, making differential diagnosis a challenge and "Sick Building Syndrome" a recognized problem. Because most people spend 90% of their time indoors, exposures may be significant.

Environmental tobacco smoke (ETS) is a preventable health risk. EPA estimates that approximately 3,000 American non-smokers die each year from lung cancer caused by secondhand smoke. An estimated 150,000 to 300,000 children under 18 months of age get pneumonia or bronchitis from breathing secondhand smoke. It is also a risk factor for asthma in children.

Other combustion gases typically are the result of malfunctioning combustion appliances or are from motor vehicle emissions. The most deadly, carbon monoxide, is an asphyxiant, causing fatigue, dizziness, and nausea at lower exposure levels and death at higher levels.

Chemical indoor air contaminants include formaldehyde, which is used to make wood products; pesticides; household products, including paints and cleaning products; and office materials, such as correction fluid. EPA is working with groups of product manufacturers to encourage substitution of lower-emitting products, where feasible, across an entire industry.

Biological contaminants are found everywhere. Sources include indoor air, human occupants, animal occupants, and water reservoirs where fungi and bacteria grow. They may cause infections (e.g., Legionnaire's Disease or tuberculosis) and hypersensitivity diseases (e.g., allergies or humidifier fever).

"Sick Building Syndrome" (SBS) is a diagnosis that there is an unspecified cause of problems in a building. Typically, people have non-specific symptoms while in the building and feel better out of the building. Measurements of contaminants typically fail to demonstrate a cause. SBS is often solved by taking multiple steps to improve indoor air quality. Psychological factors may also be of significance. EPA has no regulatory authority over "sick buildings" or any other buildings, as a general rule.

Asbestos is a generic term describing a variety of naturally-occurring fibrous mineral silicates found in certain types of rocks. Asbestos is a

known human carcinogen that, after a long latency period following inhalation of high levels of asbestos fibers, can lead to an increased risk of lung cancer; mesothelioma (a cancer of the lining of the chest and the abdominal cavity); and asbestosis (a serious, chronic, non-cancerous respiratory disease in which inhaled asbestos fibers aggravate lung tissues, which causes them to scar). The risk of lung cancer and mesothelioma from worker exposure increases with the number of fibers inhaled. The risk of lung cancer from inhaling asbestos fibers is also greater in smokers. People who get asbestosis have generally been exposed to high levels of asbestos for a long time. It is thought that most people who live or work in buildings that contain asbestos materials are at little risk of adverse health effects from these substances. And, although asbestos is also present in some cement drinking water pipes, a U.S. Department of Health and Human Services study concluded that increased risk of gastrointestinal cancer is unlikely from this source.

Radon is a radioactive element formed naturally in the soil. Since radon is a gas, it migrates through the soil and is typically drawn into buildings by low air pressures typically found in the lowest floor. Radon can also be brought into a building in well water and be released to the air as the water is used. Once in a building, radon mixes with the interior air and continues to decay to other radioactive elements. When these "radon progeny" are inhaled, they can lodge in the pulmonary system and expose the tissues to radiation.

Radon and its decay products are known human carcinogens which greatly increase an individual's risk of lung cancer. Radon and indoor air quality issues have been identified in several comparative risk studies as the greatest threats to human health that EPA must face. Human studies have led to lifetime risk estimates of 1/100 to 1/1000 at EPA's action level for indoor radon concentrations. Radon is the second leading cause of lung cancer in the United States. It is easy and inexpensive to reduce the likelihood of a radon problem at the time a structure is built; mitigating radon levels in existing buildings is reliable and simple.

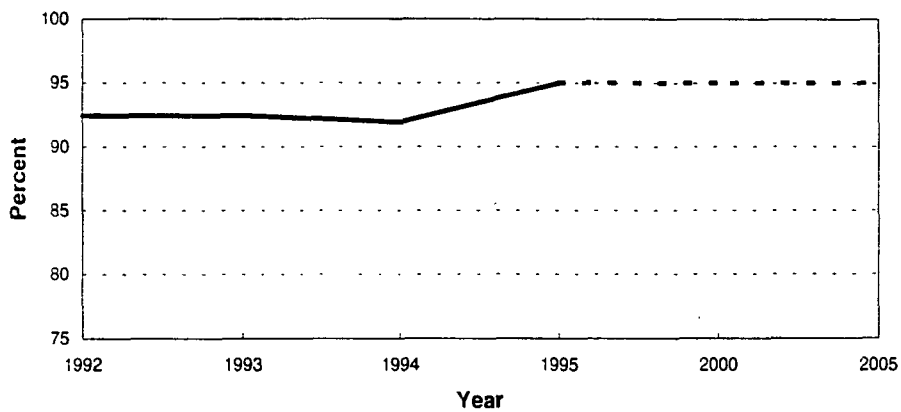
While the United States has one of the safest drinking water supplies in the world, all of the water that we drink may not always be free from contamination. For example, from October 1992 through September 1993, 11% of people served by community water systems in the U.S. (about 25 million people) were provided water that did not meet all drinking water standards. Eleven percent is too high, even though this number was lower than in previous years. Region 4's goal is to have more people with access to water meeting all federal standards. The progress made toward meeting the Region 4 Goals for Safe Drinking Water will let everyone know how well EPA and its state partners are doing the job.

Recorded violations of drinking water health standards have increased significantly since implementation of major new regulations under the 1986 Safe Drinking Water Act Amendments. One source of drinking water contamination is lead from pipes and solder. Federal regulation currently addresses this contamination threat through testing and corrosion control. Other regulations address acute microbiological contamination, chronic chemical contamination, and treatment to prevent viruses. Acute contamination is currently given the highest priority nationwide.

Regional Goals

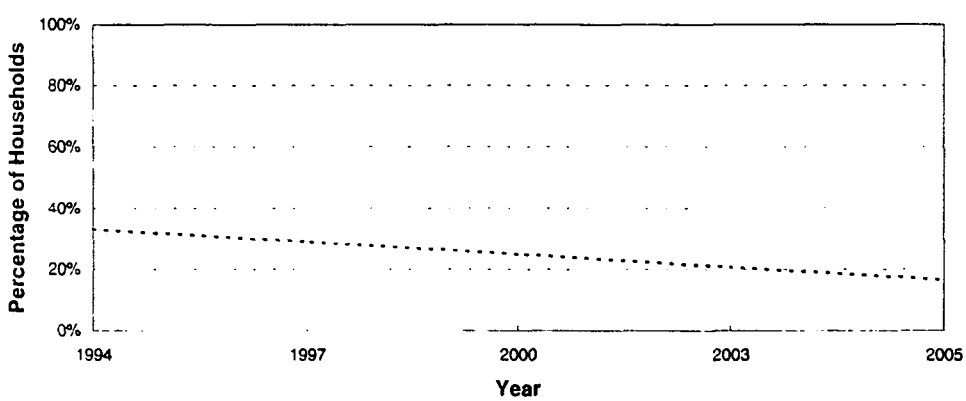
Prospective Goal: *From 1995, 95 percent of the population in Region 4 served by community water systems will meet all health requirements..*[1]

Percentage of Population Served by Community Water Systems Meeting all Health Requirements in Region 4



Goal: *By the year 2005, the number of children exposed to environmental tobacco smoke will be reduced by 50% compared to 1994.*[2]

Percentage of Households with Children Under the Age of Six that Allow Smoking

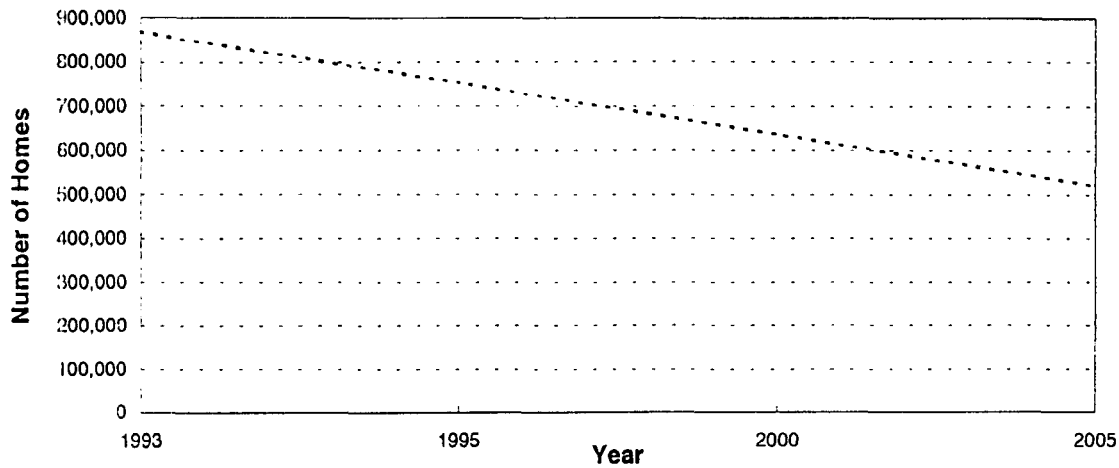


[1] The data to support this goal were provided by the U.S. EPA Region 4, Office of Water, 345 Courtland Street NE, Atlanta, GA 30365, or at (404) 347-3555. The data were obtained from the state data in EPA's Safe Drinking Water Information System, 1995. The data for 1995 may be revised in the future because not all water systems completed the required monitoring. The compliance status of those systems could not be assessed from the data reported and will be updated when the data are available.

[2] The data to support this goal were obtained from the report *Radon Risk Communication and Results Study*, commissioned by the Council of Radiation Control Program Directors (CRCPD). The report was provided in hard copy by the U.S. EPA Office of Radiation, 345 Courtland Street NE, Atlanta, GA 30365, or at (404) 347-3907.

Goal: *By 2005, 40% of the 867,000 homes in Region 4 with radon levels exceeding 4pCi/L in 1993 will have been mitigated.*[3]

Number of Homes in Region 4 with Radon Levels Exceeding 4pCi/L



Indicators

- The number of people served by community water systems that meet all drinking water quality standards
- Ambient levels of lead in surface waters
- Blood lead levels in children
- Number of homes tested for radon with levels of 4pCi/L or above that have been mitigated
- Number of children exposed to environmental tobacco smoke in their homes

Strategies[4]

1. Develop research capable of linking human health effects to environmental conditions.

2. Coordinate with state and local health organizations to screen for environmental causes of disease.

3. Develop partnerships between other governmental and non-profit organizations to more efficiently use resources.

4. Encourage parents to test their children for blood-lead levels.

5. Establish statewide screening programs to identify children with elevated blood-lead levels.

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[3] The data to support this goal are available in the EPA National Radon Database report *Volume 6: National Residential Radon Survey.* The report can be obtained from the U.S. EPA Office of Radiation, 345 Courtland Street NE, Atlanta, GA 30365, or at (404) 347-3907.

[4] Numbering of strategies does not imply any order of significance or priority.

6. Incorporate lead-based paint maintenance and hazard control standards into housing codes and health regulations.

7. Ensure follow-up housing interventions, protecting families with children with elevated blood-lead levels from improper retaliation, and identify priority areas for prevention efforts.

8. Establish state and local lead-based paint program infrastructure development through passage of state and local legislation and regulations.

9. Maintain direct federal training, education, and outreach for lead-based paint program issues.

10. Develop public education processes pertaining to indoor air quality.

11. Significantly increase the number of homes tested for radon.

12. Implement and expand activities to mitigate radon levels in homes.

13. Identify the areas of greatest risk from radon for early attention.

14. Develop/refine state strategies by continually sharing results of different approaches states and EPA have tried in radon testing programs.

15. Use a voluntary approach that incorporates incentives and regulation in the development of radon programs.

16. Prevent future radon problems by adopting/promoting EPA's radon resistant residential building codes.

17. Use EPA Radon Proficiency Programs which identify qualified testing and mitigation contractors.

18. Develop performance partnership grants and identify new resources for use in radon programs.

19. Develop new radon-resistant building codes.

20. Provide radon education for specific groups (i.e., public, real estate agents and commissioners, lending industry, legislators, homebuilders, code officials, and community-based groups).

21. Educate regarding good building maintenance practices to reduce growth of fungi, Legionella, allergens, and other microbes which affect indoor air quality.

22. Prevent pollution in the home or workplace through the use of lower-emitting building and consumer products.

23. Reduce the health risks of secondhand smoke by information dissemination and public outreach on the hazards of environmental tobacco smoke.

24. Prevent pollution by reducing combustion gases through improved maintenance and ventilation of combustion appliances.

25. Develop state-specific action plans for indoor air quality, identifying the greatest sources of risk within each state.

26. Maintain communication among states and EPA concerning new program materials, research, and project results.

27. Form partnerships with other governmental and non-profit organizations to efficiently distribute resources for specific projects.

28. Continue a voluntary approach to reducing the public health threats posed by indoor air pollution, incorporating incentives and regulations where appropriate.

29. Support training of occupational groups to help ensure better indoor air quality for the public.

30. Identify new funding resources for indoor air quality activities.

31. Provide compliance assistance to public water systems on drinking water regulations.

32. Conduct strategic enforcement on public water systems.