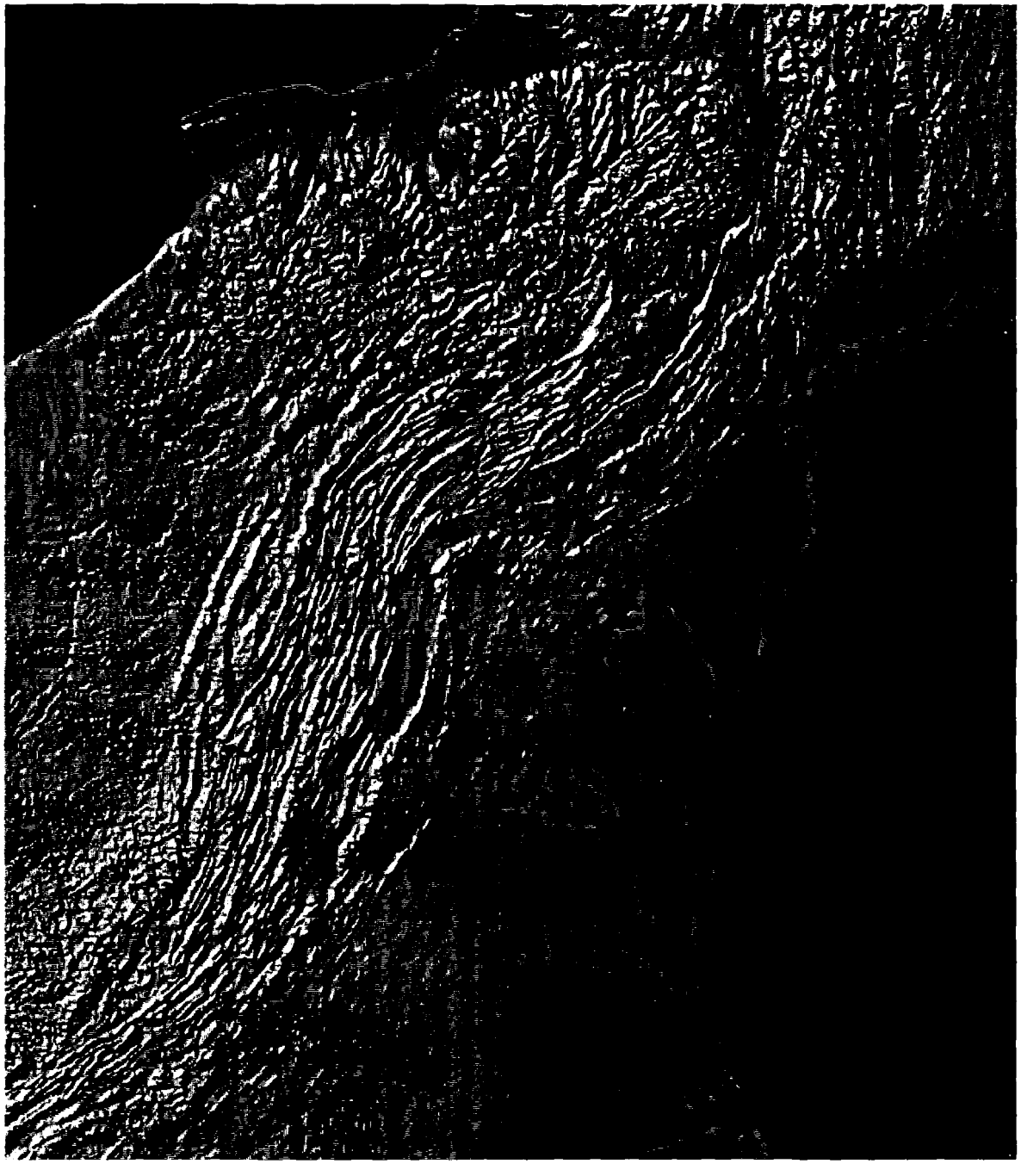


ENVIRONMENTAL INDICATORS TRANSITION PROJECT

Briefing Package
April 27, 1993

"While assessment of program performance is a critical component of an agency's management system, the inability to link that performance to environmental results deprive the agency of the true measure of its success and precludes the agency from developing the visionary perspective it needs to meet future environmental needs."

Strategic Assessment of Florida's Environment (March, 1992).

"Resistance to seeing the strategic threats often focuses on the lack of complete information and perfect understanding. We should acknowledge that we will never have complete information. Yet we have to make decisions anyway; we do this all the time. And one way we draw conclusions from incomplete information is by recognizing patters."

Earth in the Balance, Vice President Al Gore (January, 1993).

Environmental Indicators Transition Project

The Environmental Indicators Transition Project was an intense three month multi-divisional effort. The project was designed to provide an analysis of the status of the Region's forests, rivers and streams, and human health. This was accomplished by evaluating existing information as it relates to the quality and quantity of and associated risks to these resources to the Strategic Planning Team as an input into the FY'94 Strategic Planning Process. To the extent the data, information and analysis allow, the goals of the project were to:

* describe the current condition of the selected resources,

* identify potential causes of impacts and threats to the resources,

* describe the flaws, biases and gaps in the data and information,

* present recommendations to management based on the information for strategic planning, and

* identify relationships to existing programs and make recommendations for agency response.

The Project has three deliverables: 1) this briefing book, 2) a presentation to the Strategic Planning Team on April 27, and 3) a technical support document, providing detailed descriptions and explanations of the information provided in summary form in the briefing book, which will be available in a draft final form in May.

Project Background:

The project originated at the November, 1992 Senior Managers' meeting where it was decided that the Region would focus its resources over the following months in three Strategic areas: Strategic Planning; Environmental Indicators and Team Building.

The first step in the project was a Regional Workshop to develop a workplan for the Transition Project. The participants at the workshop focused on three general resources: aquatic ecosystems, terrestrial ecosystems and human health. These subgroups identified the questions they believed, if answered, could describe the health of these resources and identified potential data sources which would help answer these questions. After considering budget and time constraints and comparing the needed information with the available data, the core project team decided to focus on three resource subsets: rivers and streams, forests, and human health. These subsets were selected because they are important and because the team believed that data was available for these resources and would allow presentation of meaningful information for strategic planning.

On January 11 the Senior Managers approved the Project Proposal and use of the resources necessary to implement the proposal. Shortly thereafter the Rivers and Streams, Forest and Human Health Teams were formed. The members of those teams are listed on the following page.

The data included in each team's analysis was determined by common criteria. Although the teams considered some additional factors, all of the teams focused on data that: a) was available within the project time frame, b) was regional in scope and c) could be used in strategic planning and linked to agency programs.

What follows is the result of an exceptional effort by all Project Team Members. The GIS Team headed by David West deserves special recognition for the support and dedication they gave to the project.

The project has already had many successes: 26 additional data layers have been added to the GIS system and are available for use by us all. The participants in the Project have learned a tremendous amount about the condition of the environment in their own area of expertise, as well as other areas in which they do not traditionally work. We have all learned that focused work designed to address true environmental causes can call forth from a multi-disciplinary team almost limitless energy and enthusiasm. However, the true measure of success for this Environmental Indicators Transition Project will be in the use you make of it. If you find the information important and use it in selecting regional environmental goals and objectives for the FY'94 Strategic Plan, all of the work of the past months will have moved us closer to the goal of real environmental improvement, returning to us all many times the amount of our investment.

ENVIRONMENTAL INDICATORS TRANSITION PROJECT TEAM MEMBERS

Champions: Cynthia Giles (ORC)
Randy Pomponio (ESD)

Project Leader: Carol Stokes-Cawley (ESD)

Rivers and Streams Team

Team Leaders: Margaret Passmore (ESD)
Sumner Crosby (WMD)

Team Members: Francisco Cruz (WMD)
Ghassan Khaled (WMD)
Helene Drago (WMD)
Glenn Hanson (ARTD)
Karen Angulo (ARTD)
Jennifer Hubbard (HWMD)
Ron Preston (ESD) (advisor)

Forest Team

Team Leaders: Art Spingarn (ESD)
Susan McDowell (ESD)

Team Members: Dave Cutter (ESD)
Pat Flores (ARTD)
Karen Angulo (ARTD)
Thomas Stolle (HWMD)
Catherine Brown (ESD)
Fred Suffian (WMD-SCS)
Randy Piersol (ESD)

Human Health Team

Team Leaders: Lorna Rosenberg (OPM)
Nancy Rios (HWMD)

Advisor: Bruce Smith (OPM)

Team members: John Noble (ARTD)
Jeffrey Burke (ESD)
Debra Forman (ARTD)
Carol Ann Gross (WMD)
Alice Chow (ARTD)
Jack Kelly (ATSDR)

GIS Team

Team Leader: David West (OPM)

Team Members: Brian Burch (OPM)
Don Evans (CSC)
Nancy Coleman (CSC)
Mike Perpiglia (CSC)

GIS Team: (left to right): David West, Brian Burch, (missing: Don Evans, Nancy Coleman, Mike Perpiglia).

Rivers & Streams Team

WATERSHED FRAMEWORK

This map depicts the watersheds defined by the United States Geological Survey as hydrologic units. The hydrologic units are grouped into larger basins such as the Delaware, Susquehanna, and Ohio.

Findings:

* A watershed is defined as an area of land from which water drains to a single point or given place on a stream. Its boundary is usually delineated by following topographic divides.

* Hydrologic Units of the United States Geological Survey have a stream coding system that allows a standardized base for locating, storing and retrieving hydrologic data.

* The watershed framework is useful for many water management activities.

* The watershed framework may not correspond to patterns in vegetation, soils, land forms, land use and other characteristics that control water quality and biological potential.

Management Recommendations:

* The watershed framework provides a logical framework for managing water quality and addressing diverse impacts. Watersheds should be used to organize water quality control activities in place of political frameworks such as state or county boundaries. Natural variation in water quality has been observed to follow ecoregion rather than watershed boundaries, so the ecoregion effects need to be considered as well.

* Non-water resources, such as air and wildlife do not observe watershed boundaries. Therefore different frames of reference may be needed for different analyses.

RIVERS AND STREAMS INDICATORS

MAJOR FINDINGS AND RECOMMENDATIONS

Management Recommendations:

* As a federal agency, we should ensure consistency in assessment and management of waters crossing political boundaries. We must recognize inequities in income and resources available to address problems. For example, West Virginia appears to have minimal resources and widespread water quality problems.

* We should identify sources of contamination in areas with contaminated fish and evaluate or initiate remediation efforts.

* We should integrate fish tissue data with other identified stressors to human health, especially in populations consuming larger quantities of fish, to locate communities for priority attention.

* We should develop criteria to identify other possible high risk fish tissue sites, based on the criteria used in the National Bioaccumulation Study and other applicable information on toxics sources.

* We should continue to work aggressively with the agricultural community to mitigate the widespread impact from this source.

* EPA and the Office of Surface Mines (OSM) should develop a better relationship to ensure remediation of existing mine impacts and prevent additional impact. On a parallel track, we should consider existing tools within EPA to address this extensive problem.

* We should develop a plan with adjoining Regions to reduce emissions contributing to acid deposition.

RIVERS AND STREAMS INDICATORS

MAJOR FINDINGS AND RECOMMENDATIONS

Findings:

* Based on the initial analyses, there are several large impacted watersheds as well as many minimally impacted areas. The most impacted areas are the urban corridor from Philadelphia to the District of Columbia; the coal bearing regions of Pennsylvania, West Virginia and Virginia; and portions of agricultural areas of the Delmarva Peninsula, central Maryland and central Virginia. The minimally impacted areas are northeastern and northern Pennsylvania, the Clinch River, and portions of eastern Virginia.

* Potentially significant risks from the ingestion of contaminated fish do exist, particularly near urban and industrial areas.

* State fish consumption advisories may not always be adequate to protect against such risks.

* In streams assessed by the states, nonpoint sources cause the greatest impact. Resource extraction and agriculture are the major nonpoint sources.

* The lesser impact of point sources may be due to the greater amount of legislation, resources and time historically spent addressing point source problems.

* Acid deposition poses an additional major threat to streams in the Mid Appalachian Highlands and the Atlantic Coastal Plain.

Management Recommendations:

* In areas where the available data suggest severe impact, we recommend a comprehensive, cross-program approach which addresses all impacts in the watershed.

RIVERS & STREAMS TEAM: (left to right): Sumner Crosby (co-leader), Margaret Passmore (co-leader), Karen Angulo, Jennifer Hubbard, Francisco Cruz, Helene Drago (missing: Glenn Hansen).

Dieldrin Fish Tissue Concentration

FILLET SAMPLES

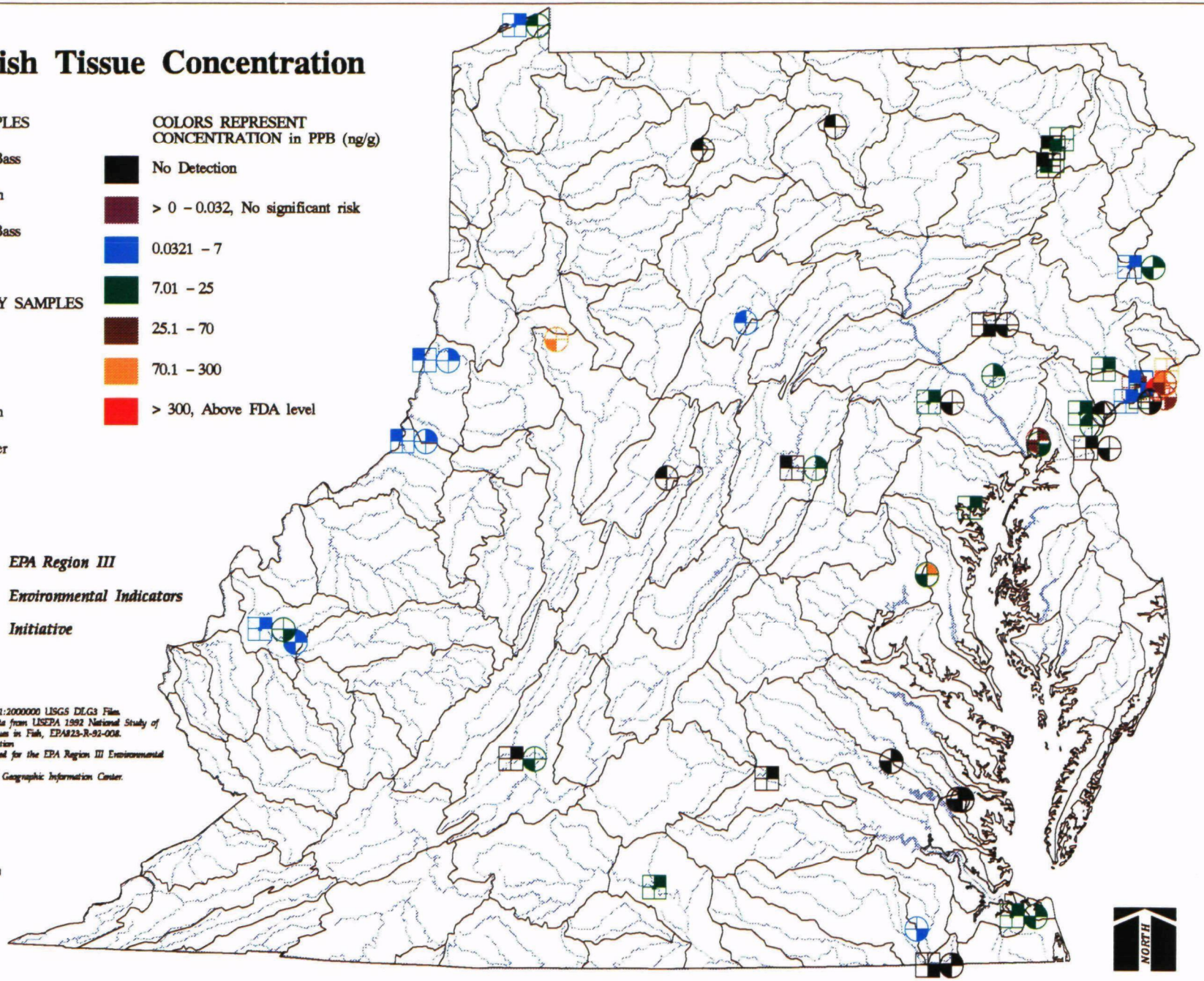
- Small Mouth Bass
- Channel Catfish
- Large Mouth Bass
- All Other

WHOLE BODY SAMPLES

- White Sucker
- Carp
- Channel Catfish
- Redhorse Sucker
- All Others

COLORS REPRESENT CONCENTRATION in PPB (ng/g)

- No Detection
- > 0 – 0.032, No significant risk
- 0.0321 – 7
- 7.01 – 25
- 25.1 – 70
- 70.1 – 300
- > 300, Above FDA level



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Fish Tissue Data from USEPA 1992 National Study of Chemical Residues in Fish, EPA823-R-92-008.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 9, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

PCB Fish Tissue Concentration

FILLET SAMPLES

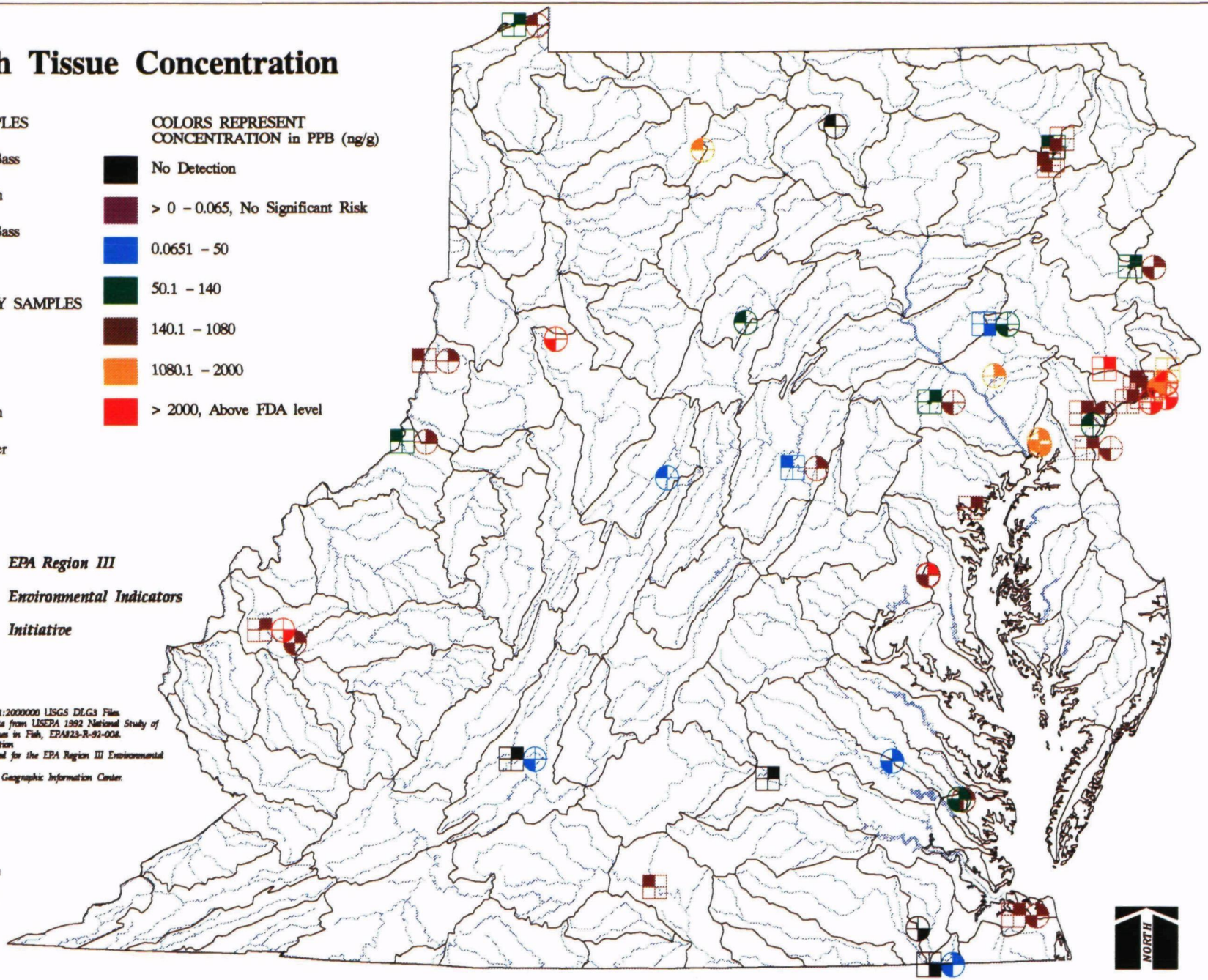
- Small Mouth Bass
- Channel Catfish
- Large Mouth Bass
- All Other

WHOLE BODY SAMPLES

- White Sucker
- Carp
- Channel Catfish
- Redhorse Sucker
- All Others

COLORS REPRESENT CONCENTRATION in PPB (ng/g)

- No Detection
- > 0 – 0.065, No Significant Risk
- 0.0651 – 50
- 50.1 – 140
- 140.1 – 1080
- 1080.1 – 2000
- > 2000, Above FDA level



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Fish Tissue Data from USEPA 1992 National Study of Chemical Residues in Fish, EPA823-R-92-008.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 9, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

DDE Fish Tissue Concentration

FILLET SAMPLES

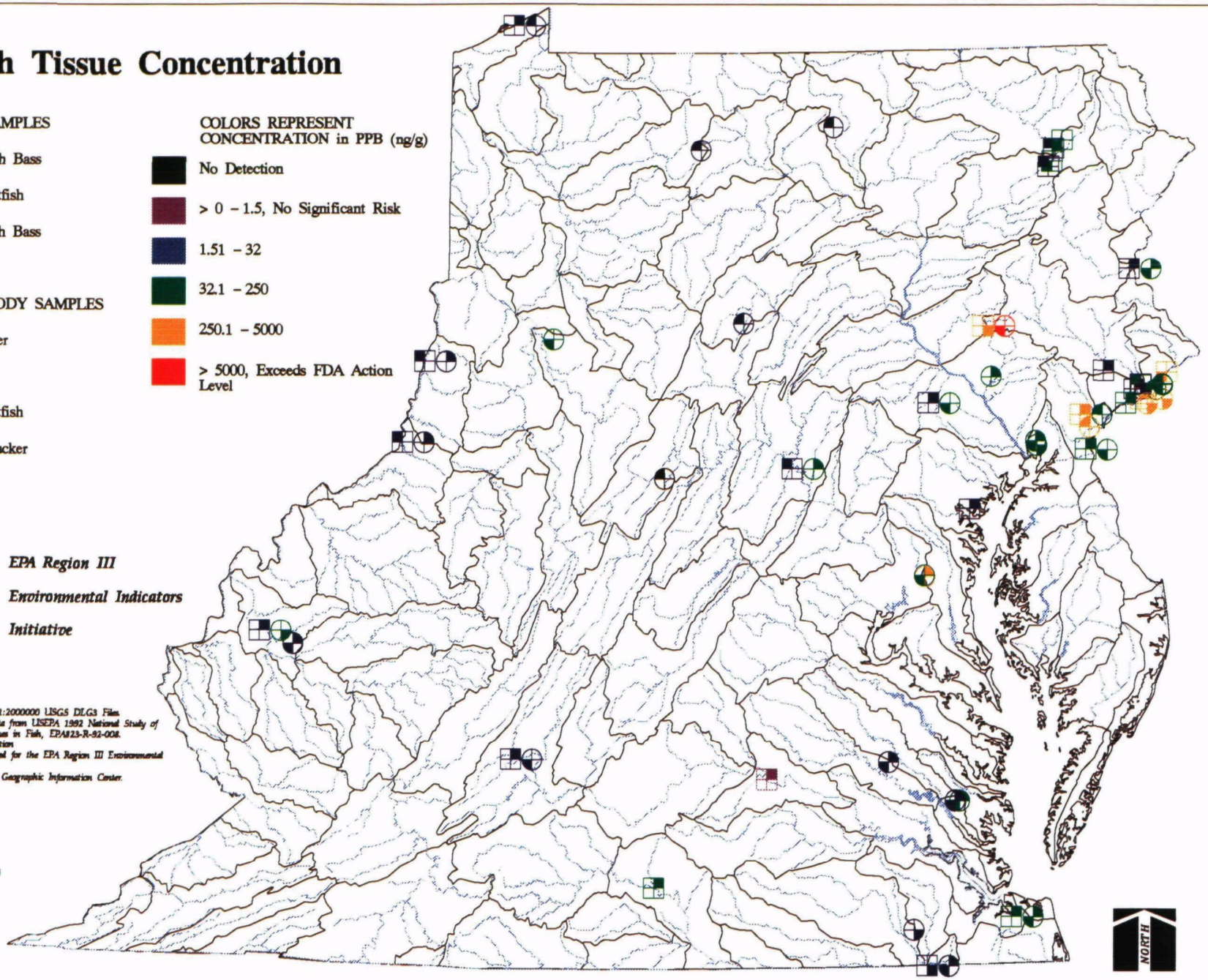
- Small Mouth Bass
- Channel Catfish
- Large Mouth Bass
- All Other

WHOLE BODY SAMPLES

- White Sucker
- Carp
- Channel Catfish
- Redhorse Sucker
- All Others

COLORS REPRESENT CONCENTRATION in PPB (ng/g)

- No Detection
- > 0 – 1.5, No Significant Risk
- 1.51 – 32
- 32.1 – 250
- 250.1 – 5000
- > 5000, Exceeds FDA Action Level



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Fish Tissue Data from USEPA 1992 National Study of Chemical Residues in Fish, EPA823-R-92-008.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 9, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

TEC Fish Tissue Concentration

FILLET SAMPLES

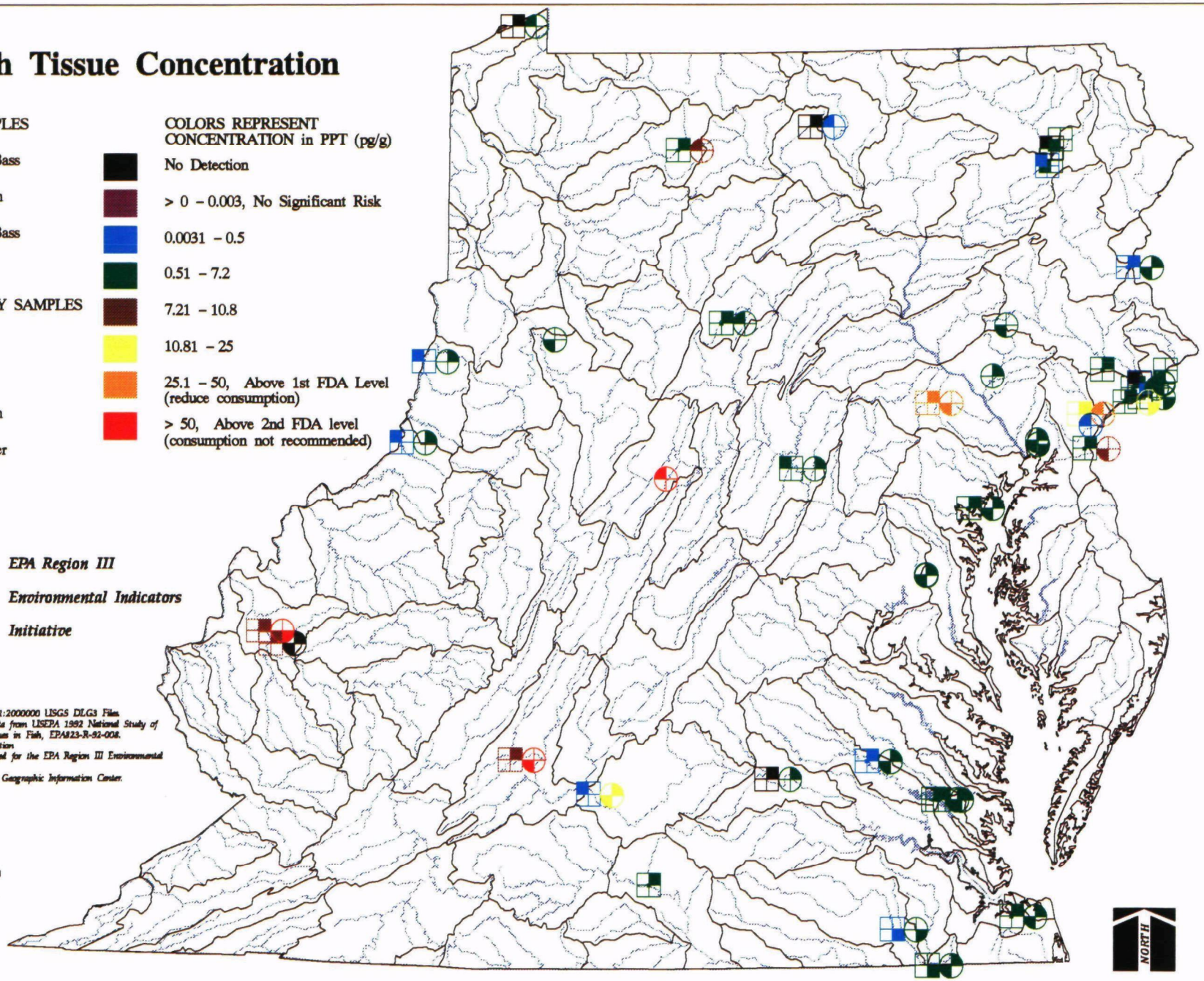
- Small Mouth Bass
- Channel Catfish
- Large Mouth Bass
- All Other

WHOLE BODY SAMPLES

- White Sucker
- Carp
- Channel Catfish
- Redhorse Sucker
- All Others

COLORS REPRESENT CONCENTRATION in PPT (pg/g)

- No Detection
- > 0 – 0.003, No Significant Risk
- 0.0031 – 0.5
- 0.51 – 7.2
- 7.21 – 10.8
- 10.81 – 25
- 25.1 – 50, Above 1st FDA Level (reduce consumption)
- > 50, Above 2nd FDA level (consumption not recommended)



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Fish Tissue Data from USEPA 1992 National Study of Chemical Residues in Fish, EPA823-R-92-008.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 9, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

Mercury Fish Tissue Concentration

FILLET SAMPLES

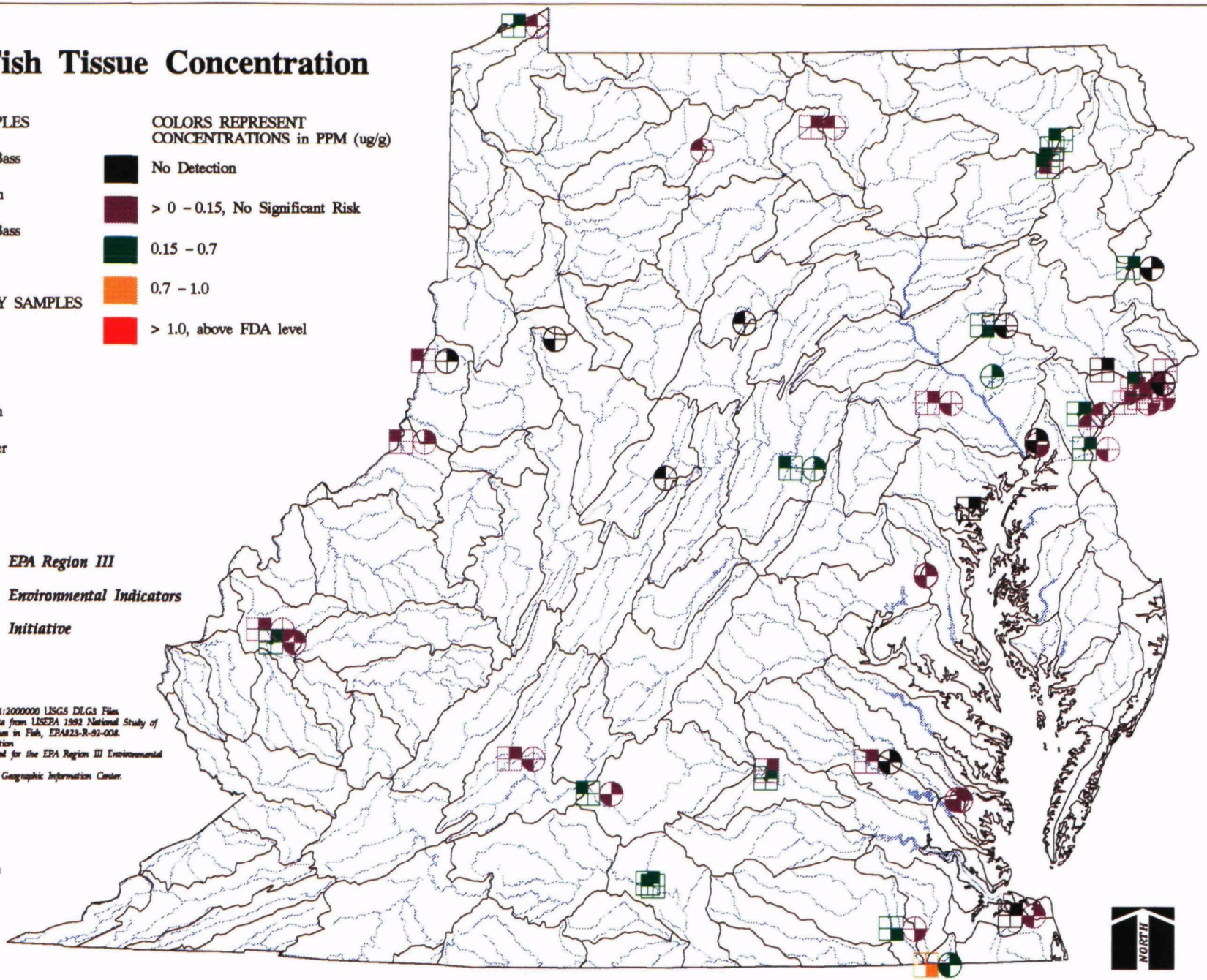
- Small Mouth Bass
- Channel Catfish
- Large Mouth Bass
- All Other

WHOLE BODY SAMPLES

- White Sucker
- Carp
- Channel Catfish
- Redhorse Sucker
- All Others

COLORS REPRESENT CONCENTRATIONS in PPM (ug/g)

- No Detection
- > 0 – 0.15, No Significant Risk
- 0.15 – 0.7
- 0.7 – 1.0
- > 1.0, above FDA level



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Fish Tissue Data from USEPA 1992 National Study of Chemical Residues in Fish, EPA823-R-92-008.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 9, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

NONATTAINMENT OF DESIGNATED USES IN RIVERS AND STREAMS

Section 305(b) of the Clean Water Act requires each state to submit a water quality inventory report to Congress, through the EPA, every two years. This report provides information to the EPA and the public on the overall condition of water quality including whether or not each assessed waterbody meets its designated use, as defined by the states' water quality standards (eg aquatic life use, primary contact, etc.). This map represents percentages of only those rivers and streams that have been assessed by the states and that do not fully support the States' designated uses for those waterbodies. This map does not depict the extent of the problem, only the percentage not meeting designated uses. River mile estimates of impaired rivers and streams are available.

Findings:

* The states use different assessment methods and assessment criteria, so the quantitative estimates of impacted stream miles are not readily comparable among states.

* In many states, monitoring and water quality assessments are biased toward impacted areas. States often assume unassessed reaches are probably not impacted.

* In many watersheds in each state, more than 40% of the assessed stream reaches in the watershed are impacted and do not support their designated use.

* The most impacted areas are the urban corridor from Philadelphia to the District of Columbia; coal bearing regions of southwestern Pennsylvania, the Scranton-Wilkes Barre area, West Virginia and Western Virginia; and portions of agricultural areas of the Delmarva Peninsula, central Maryland and central Virginia.

* The minimally impacted areas are northeastern and northern Pennsylvania, the Clinch River, and portions of Eastern Virginia.

Management Recommendations:

* In areas where the available data suggest severe impact, we recommend a comprehensive, cross-program watershed approach. A watershed protection approach can also be applied in minimally impacted areas to protect high quality areas. The maps following present problems and recommendations in more detail.

Percent Non-Attainment of Designated Uses for Waterbodies

- No Data
- < 10%
- 10% - 20%
- 20% - 30%
- 30% - 40%
- > 40%

Under Section 305(b) of the Clean Water Act, States must report to Congress, through EPA, on a biennial basis, on the condition of their waters. The report is developed by performing assessments on a subset of a State's waterbodies; for each waterbody assessed, the State determines whether or not the waterbody meets its designated uses, as defined in the State's Water Quality Standards.

This map represents percentages of only those waterbodies that have been assessed by the States and do not fully support the States' designated uses for those waterbodies.

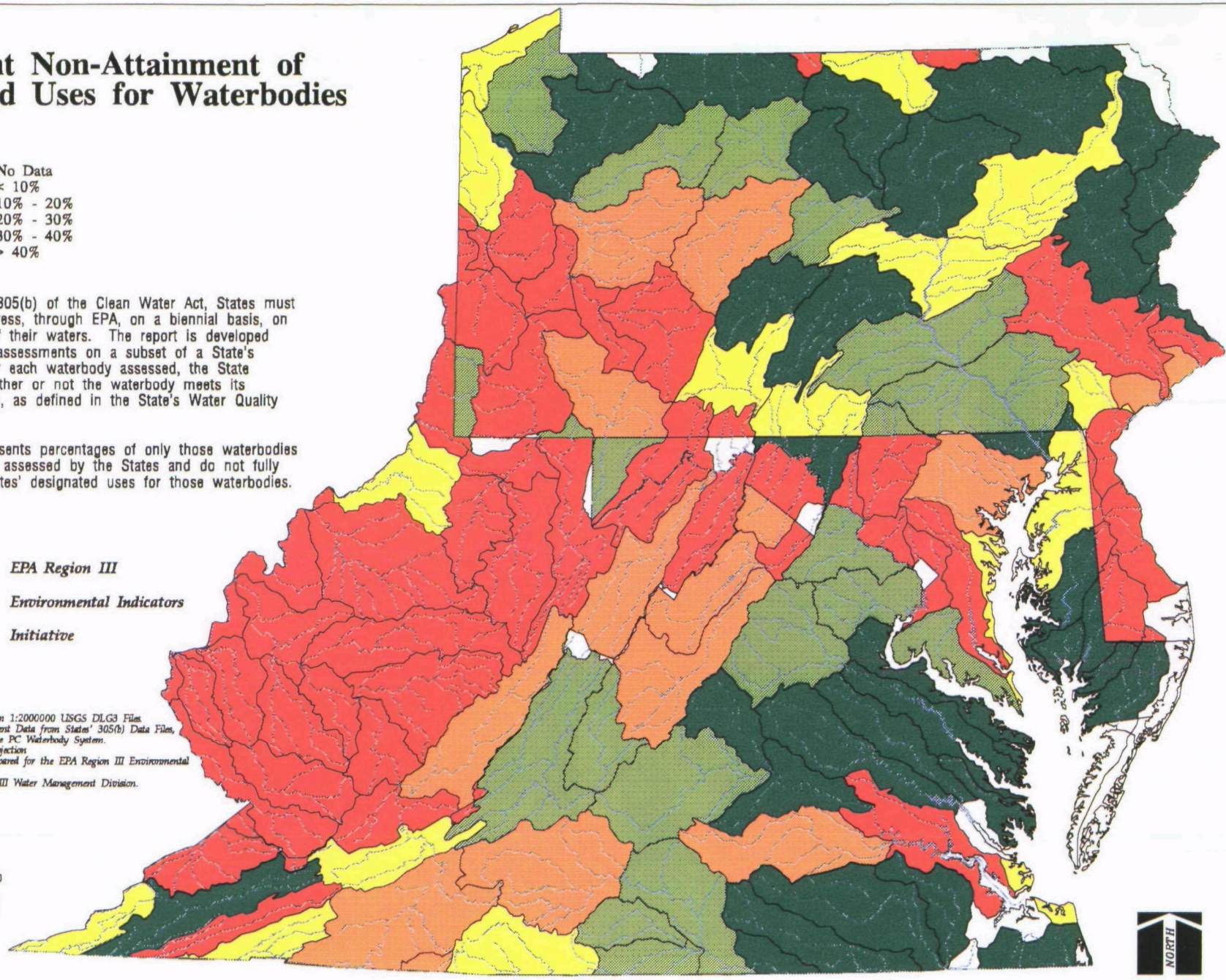
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Use Attainment Data from States' 305(b) Data Files, Submitted to EPA through the PC Waterbody System.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Water Management Division.
Date: April 15, 1993



0 10 20 30 40 50

MILES

Scale 1 : 3500000

NONATTAINMENT OF DESIGNATED USES FOR RIVERS AND STREAMS
POINT SOURCE IMPACTS

Where waterbodies do not meet designated uses, the states determine possible sources of nonattainment. This map shows the percentage of river miles associated with particular sources that are regulated within existing EPA NPDES programs, including industrial, municipal, and stormwater runoff discharges, construction, and sludge and wastewater land applications.

Findings:

* Although there are only a few watersheds where nonattainment of designated uses is primarily due to point sources, this source category still has a large impact throughout the Region. There are over 6000 miles of rivers and streams impacted by three principal point source types: urban runoff/storm water, municipal, and industrial discharges.

* Impacted watersheds are located in the more heavily populated and urbanized areas.

* Point sources are responsible for less than 20 percent of the identified impact in a majority of the watersheds in the Region. This lesser impact, compared to nonpoint sources, may reveal benefits from the historical investment in the point source program.

Management Recommendations:

* Watersheds most dominated by point source impacts offer an immediate opportunity to the NPDES program to affect improvement wholly from within their program. In watersheds dominated by point source impacts, EPA should work with the states to identify the facilities responsible for the impact. Appropriate control measures should be taken.

* For the majority of watersheds in the Region, a more comprehensive cross-program approach will be necessary. We should build on the concept of watershed protection, applying tools such as the development of Total Maximum Daily Loads (TMDLs). The TMDL process involves assessing relative contributions from both point source and nonpoint sources within a watershed and allocating wasteloads to maintain water quality.

Point Source Impacts on Non-Attainment of Designated Uses for Waterbodies

- 0
- < 20%
- 20% - 40%
- 40% - 60%
- 60% - 80%
- > 80%

Under Section 305(b) of the Clean Water Act, States must report to Congress, through EPA, on a biennial basis, on the condition of their waters. The report is developed by performing assessments on a subset of a State's waterbodies; for each waterbody assessed, the State determines whether or not the waterbody meets its designated uses, as defined in the State's Water Quality Standards.

Where waterbodies do not meet designated uses, the State determines possible sources and causes of non-attainment. This map shows the percentage of miles associated with particular sources that are regulated within existing EPA NPDES programs, including industrial, municipal, and stormwater runoff discharges, construction, as well as sludge and wastewater applications to land.

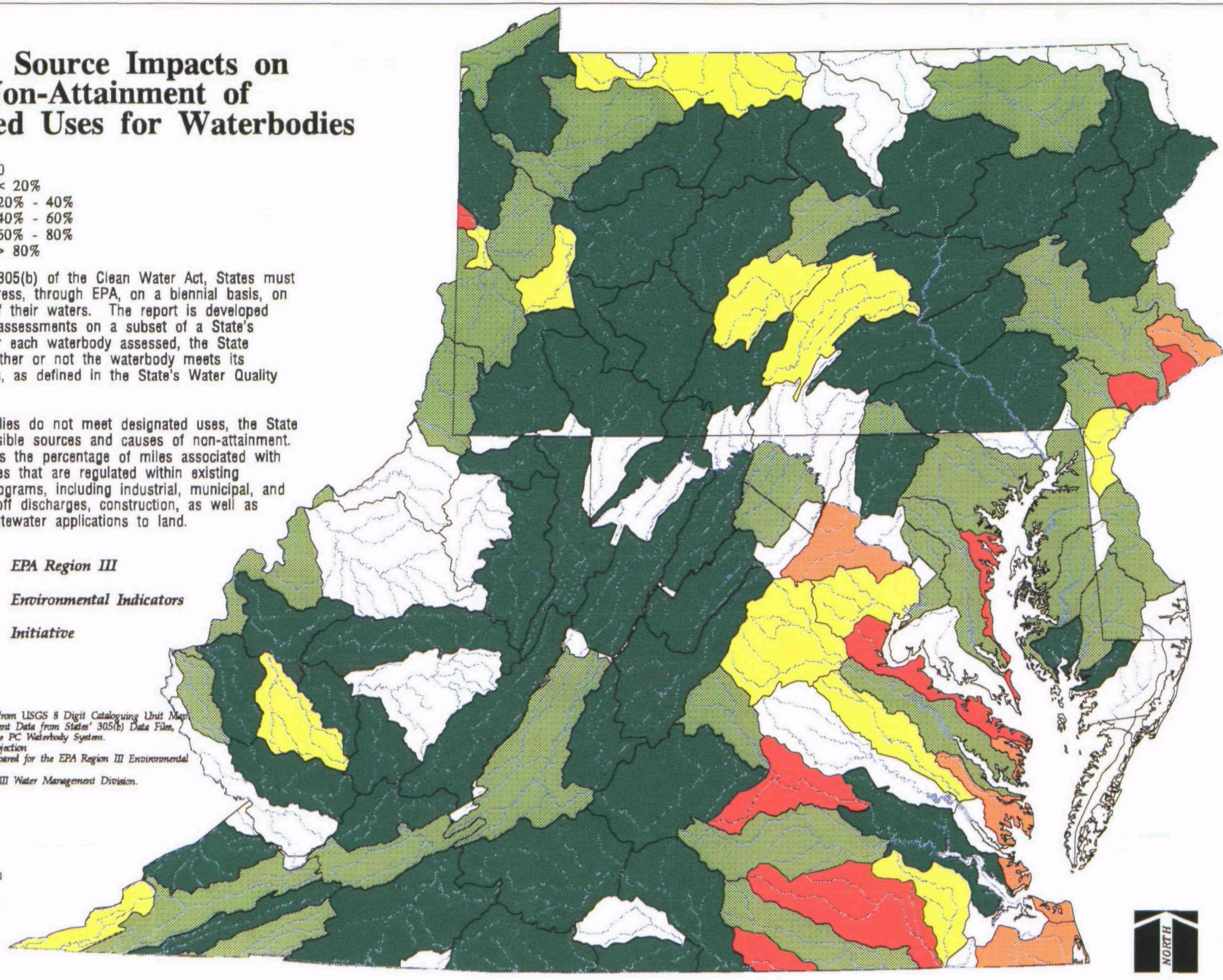
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: Watershed Boundaries from USGS 8 Digit Cataloguing Unit Map
Use Attainment Data from States' 305(b) Data Files,
Submitted to EPA through the PC Waterbody System.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Water Management Division.
Date: April 15, 1993



0 10 20 30 40 50

MILES

Scale 1 : 3500000

F

NONATTAINMENT OF DESIGNATED USES FOR RIVERS AND STREAMS
NONPOINT SOURCE IMPACTS

Where waterbodies do not meet designated uses, the states determine possible sources of nonattainment. This map shows the percentage of river miles associated with particular sources that fall under the general category of nonpoint source, including agriculture, silviculture, resource extraction and on-site wastewater systems.

Findings:

* Nonpoint sources account for over 80% of the identifiable sources of nonattainment in many watersheds. Over 18,000 assessed stream miles were impacted by nonpoint sources.

* Impacted watersheds are located in more rural areas of the Region.

* The major sources of impact are agriculture, resource extraction, silviculture and on-site wastewater systems. The following maps identify areas impacted by resource extraction and agriculture.

* Untreated domestic sewage continues to cause impacts in southern West Virginia and portions of western Virginia.

Management Recommendations:

* The areal nature of nonpoint source problems and the current voluntary approach to mitigating impact make these sources harder to control than point sources. The watershed protection approach requires all interests to participate in defining and addressing problems. In the absence of a regulatory approach, cooperation among all interests is our strongest tool.

* For resource extraction and agriculture, see the following maps.

* EPA should work closely with the US Forest Service to encourage Best Management Practices within forested areas.

* EPA should explore avenues to solve remaining untreated domestic sewage problems in the Region.

Non-Point Source Impacts on Non-Attainment of Designated Uses for Waterbodies

- 0
- < 20%
- 20% - 40%
- 40% - 60%
- 60% - 80%
- > 80%

Under Section 305(b) of the Clean Water Act, States must report to Congress, through EPA, on a biennial basis, on the condition of their waters. The report is developed by performing assessments on a subset of a State's waterbodies; for each waterbody assessed, the State determines whether or not the waterbody meets its designated uses, as defined in the State's Water Quality Standards.

Where waterbodies do not meet designated uses, the State determines possible sources and causes of non-attainment. *This map shows the percentage of miles associated with* particular sources that fall under the general category of Non-Point Sources, including agriculture, silviculture, resource extraction, and on-site wastewater systems.

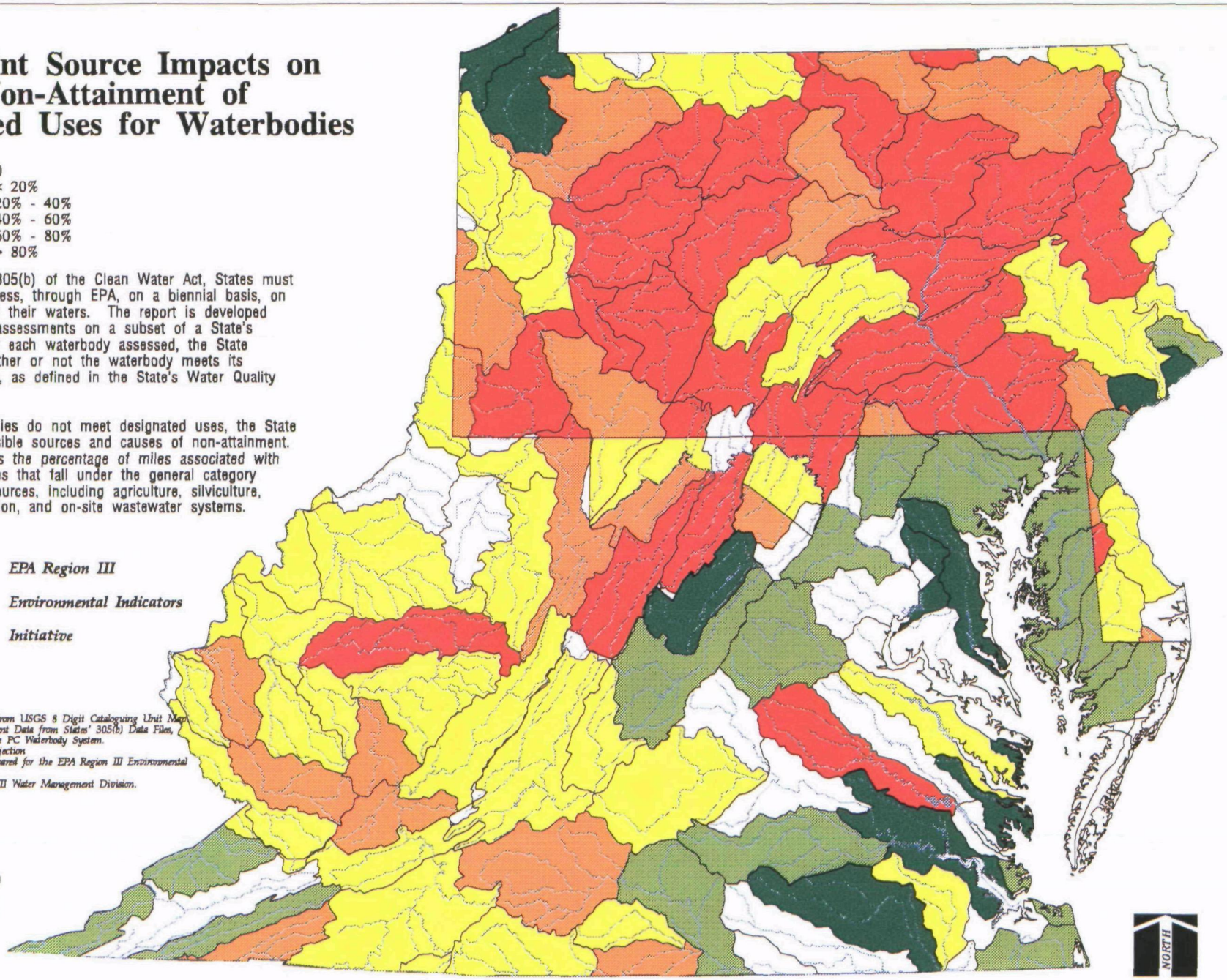
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: Watershed Boundaries from USGS 8 Digit Cataloguing Unit Map
Use Attainment Data from States' 305(b) Data Files,
Submitted to EPA through the PC Waterbody System.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Water Management Division.
Date: April 15, 1993



0 10 20 30 40 50

MILES

Scale 1 : 3500000

F

NONATTAINMENT OF DESIGNATED USES FOR RIVERS AND STREAMS
AGRICULTURAL IMPACTS

Available data indicate that agriculture impacts the greatest number of stream miles in the Region. Measured impacts total over 8600 miles. This map shows two measures of impact by a general source category of Agriculture, which includes cropland, pastureland, feed lots, and animal holding/management areas. The variable-sized dots represent the actual miles attributed to this source category. The color of the watershed reflects the miles, expressed as a percentage of identified impacts within the watershed.

Findings:

* Watersheds in the lower Susquehanna basin, the western half of Virginia and the DelMarva Peninsula are impacted by agriculture.

* The lower Susquehanna basin and the western half of Virginia are all underlain by fertile soils and are located in the Valley and Ridge and Piedmont physiographic provinces. The underlying carbonate bedrock formations, which form the rich soils, are also very vulnerable to contamination from land activities.

* The unconsolidated sediments underlying the DelMarva Peninsula also form fertile soils which support extensive agricultural activity and are vulnerable to contamination from land activities.

Management Recommendations:

* The most important aspects of a holistic watershed protection approach in these areas should include full understanding of and cooperation with the agricultural community, as well as consideration of the interdependence of surface and ground water systems.

* We should continue to encourage the application of Best Management Practices.

* We need to improve our ability to quantify the pollutants from agriculture so that we can make accurate predictions for the calculation of watershed wasteload allocations.

Agricultural Impacts on Non-Attainment of Designated Uses for Waterbodies

0
< 20%
20% - 40%
40% - 60%
60% - 80%
> 80%

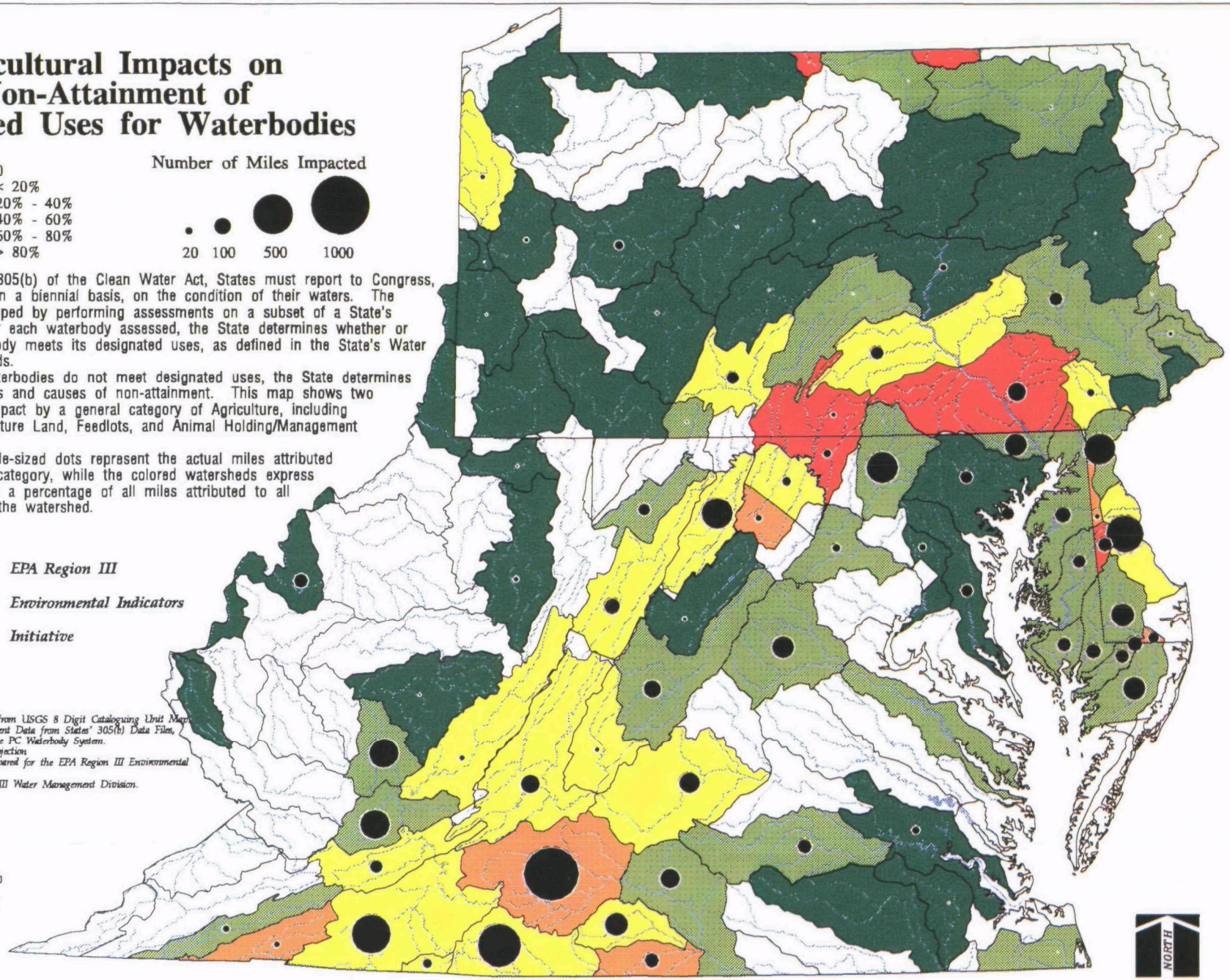
Number of Miles Impacted

20 100 500 1000

Under Section 305(b) of the Clean Water Act, States must report to Congress, through EPA, on a biennial basis, on the condition of their waters. The report is developed by performing assessments on a subset of a State's waterbodies; for each waterbody assessed, the State determines whether or not the waterbody meets its designated uses, as defined in the State's Water Quality Standards.

Where waterbodies do not meet designated uses, the State determines possible sources and causes of non-attainment. This map shows two measures of impact by a general category of Agriculture, including Crop Land, Pasture Land, Feedlots, and Animal Holding/Management Areas.

The variable-sized dots represent the actual miles attributed to this source category, while the colored watersheds express that quantity as a percentage of all miles attributed to all sources within the watershed.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: Watershed Boundaries from USGS 8 Digit Cataloguing Unit Map
Use Attainment Data from States' 305(b) Data Files,
Submitted to EPA through the PC Waterbody System.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Water Management Division.
Date: April 15, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

NORTH

MEAN TOTAL PHOSPHOROUS CONCENTRATION IN RIVERS AND STREAMS

The state water pollution control agencies, EPA and the USGS enter water quality monitoring data into STORET, a water quality database maintained by the EPA. The map depicts average values of total phosphorous concentrations calculated from samples collected by state water pollution control agencies from 1989 to 1992.

Phosphorous is an essential nutrient for aquatic plants which at elevated levels can contribute to eutrophication. Phosphorous is often used as an indicator of agricultural and municipal impacts. The threshold levels used in the map are taken from the EPA Gold Book which serves as guidance for the development of state water quality standards. At concentrations exceeding 0.1 mg/l, the potential for eutrophication problems is high.

Findings:

* Mean phosphorous concentrations exceed the 0.1 mg/l threshold level in areas with identified agricultural impact. These data help to support the state water quality assessments.

* Mean phosphorous concentrations are also elevated in urbanized and more densely populated areas.

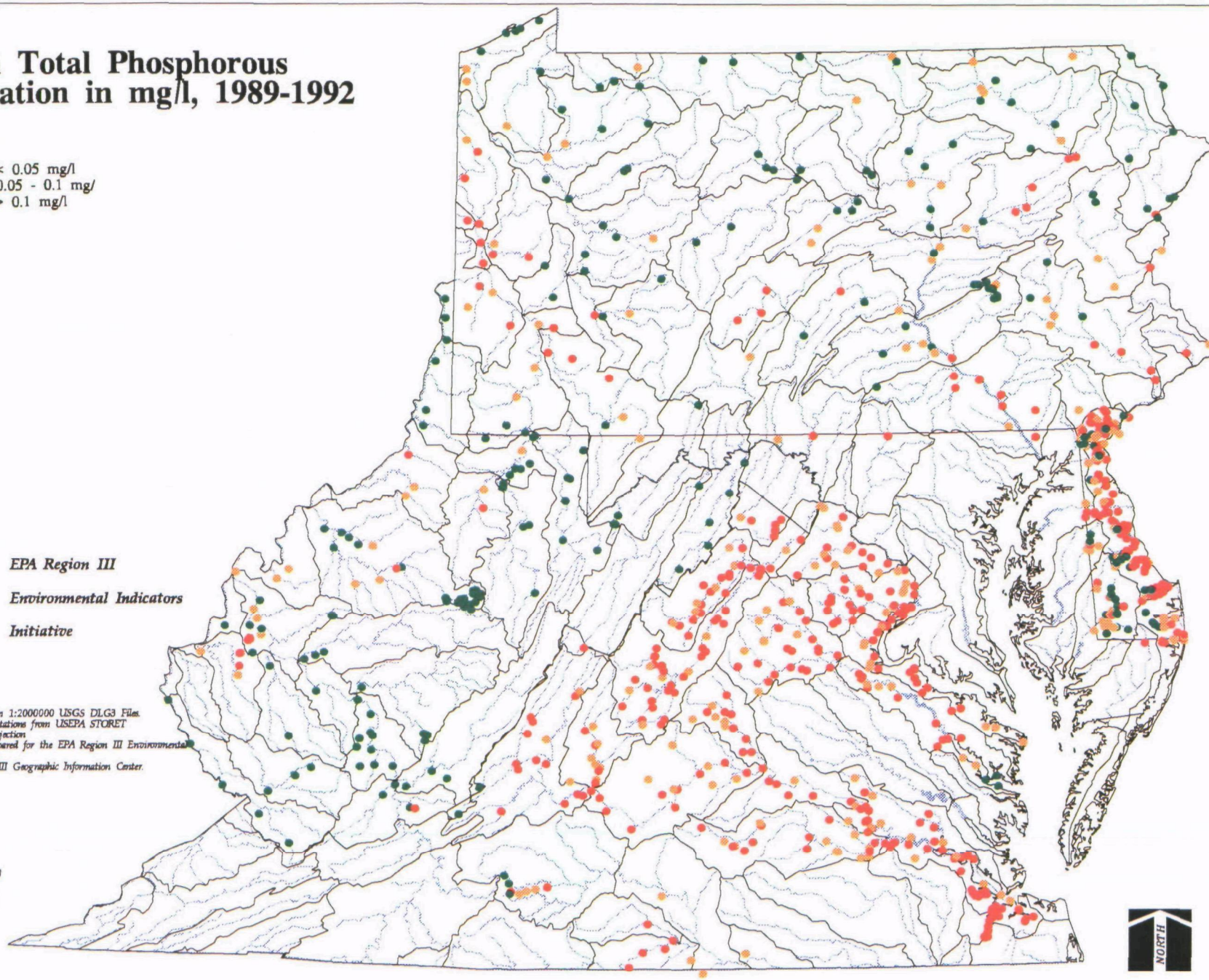
Management Recommendations:

* See discussion under previous map, entitled "Agriculture".

* Phosphorous is an example of a pollutant with both point and nonpoint origins. The control of phosphorous in some watersheds will require a comprehensive, cross-program approach.

Mean Total Phosphorous Concentration in mg/l, 1989-1992

- < 0.05 mg/l
- 0.05 - 0.1 mg/
- > 0.1 mg/l



EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Monitoring stations from USEPA STORET
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 10, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

NORTH

F

NONATTAINMENT OF DESIGNATED USES FOR RIVERS AND STREAMS
RESOURCE EXTRACTION IMPACTS

Resource extraction impacts the greatest number of stream miles in the western half of the Region. Measured impacts in the Ohio, Monongahela, Allegheny, Kanawha and Susquehanna basins total over 6200 miles.

This map shows two measures of impact by a general source category of Resource Extraction, which includes surface, subsurface, placer, and dredge mining practices, petroleum activities and mill and mine tailings. The variable-sized dots represent the actual miles attributed to this source category. The color of the watershed reflects the miles, expressed as a percentage of identified impacts within the watershed.

Findings:

* In both Pennsylvania and West Virginia, a majority of the impacts are due to abandoned mine drainage and the associated acidification, elevated metals, sulfate and sedimentation. Resulting conditions can be extremely toxic to most stream biota and can destroy the stream habitat.

* Active mining and petroleum activities have also been identified as sources of impact.

* Both Pennsylvania and West Virginia have specifically requested assistance from EPA in the form of improved coordination between EPA and the Office of Surface Mines (OSM).

Management Recommendations:

* Resource extraction activities in Region III continue to impact a large number of rivers and streams. Although much of the problem is caused by older abandoned mines, "new" abandoned mines appear and active mines also cause impact. Region III should work closely with OSM to explore a more active role for EPA in the reclamation of abandoned mines and the prevention of "newly" abandoned and active mining impacts.

* On a parallel track, we should consider existing programs within EPA (NPS and NPDES stormwater) to address this widespread problem.

Resource Extraction Impacts on Non-Attainment of Designated Uses for Waterbodies

0
< 20%
20% - 40%
40% - 60%
60% - 80%
> 80%

Number of Miles Impacted

20 100 500 1000

Under Section 305(b) of the Clean Water Act, States must report to Congress, through EPA, on a biennial basis, on the condition of their waters. The report is developed by performing assessments on a subset of a State's waterbodies; for each waterbody assessed, the State determines whether or not the waterbody meets its designated uses, as defined in the State's Water Quality Standards.

Where waterbodies do not meet designated uses, the State determines possible sources and causes of non-attainment. This map shows two measures of impact by a general category of Resource Extraction, including Surface, Subsurface, Placer, and Dredge Mining practices, Petroleum activities, and Mill and Mine Tailings.

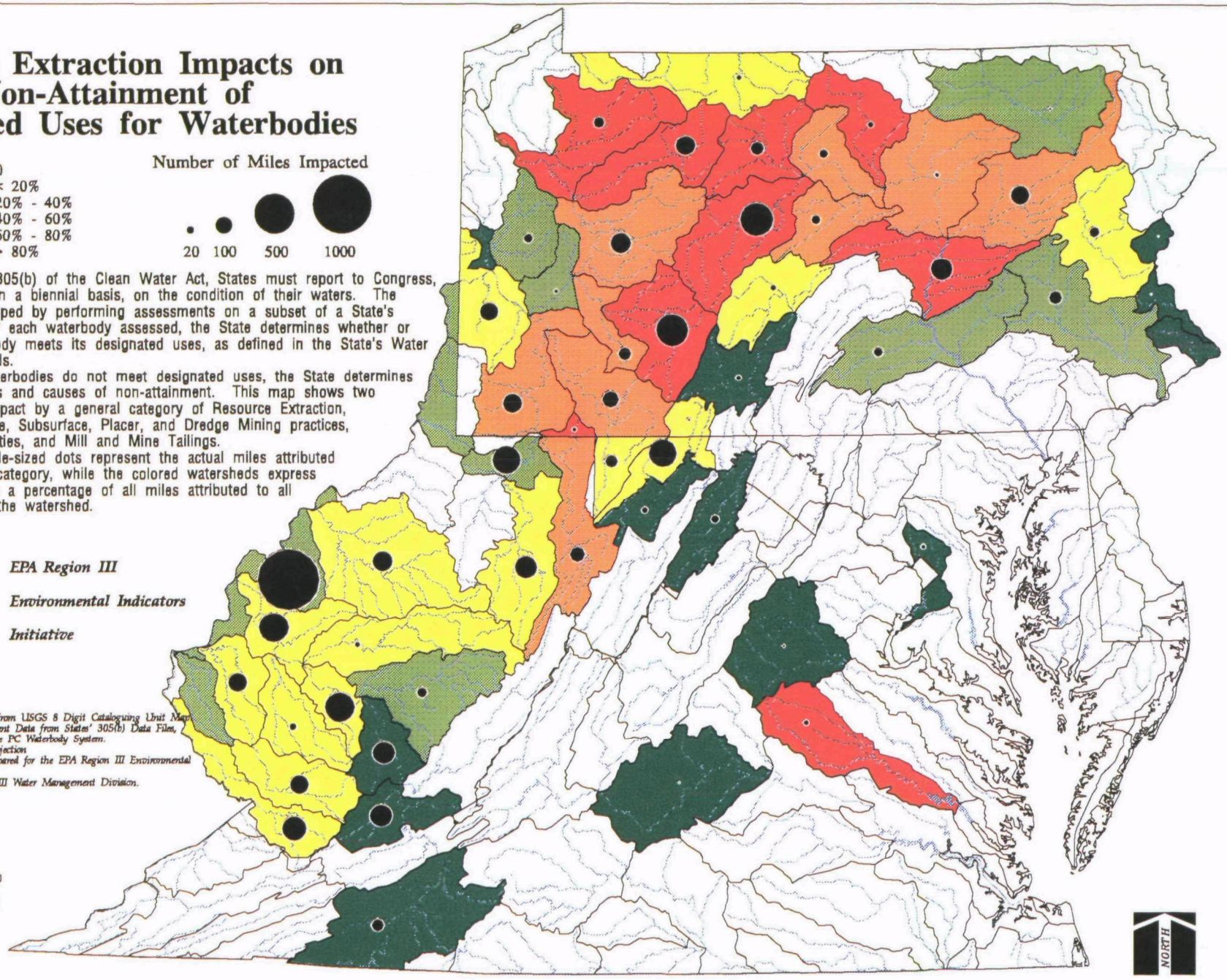
The variable-sized dots represent the actual miles attributed to this source category, while the colored watersheds express that quantity as a percentage of all miles attributed to all sources within the watershed.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative



Source: Watershed Boundaries from USGS 8 Digit Cataloguing Unit Maps
Use Attainment Data from States' 305(b) Data Files,
Submitted to EPA through the PC Waterbody System.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Water Management Division.
Date: April 15, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

MEAN SULFATE CONCENTRATION IN RIVERS AND STREAMS

The state water pollution control agencies, EPA and the USGS enter water quality monitoring data into STORET, a water quality database maintained by the EPA. The map depicts average values of sulfate concentrations calculated from samples collected by state water pollution control agencies from 1989 to 1992.

Sulfate is released during the combustion of sulfur-bearing fossil fuels and when sulfur bearing minerals are exposed to the atmosphere during mining. Acid mine drainage waters are commonly characterized by high sulfate concentrations, therefore ambient sulfate concentrations can be used as an indicator of impact from resource extraction. This map supports the previous map, entitled "Resource Extraction Impacts".

Findings:

* Mean sulfate concentrations are elevated in coal bearing regions of western and eastern Pennsylvania and West Virginia.

* The spatial patterns of sulfate in the western part of the Region correspond well to the impact associated with resource extraction in the state water quality assessments of attainment of designated uses.

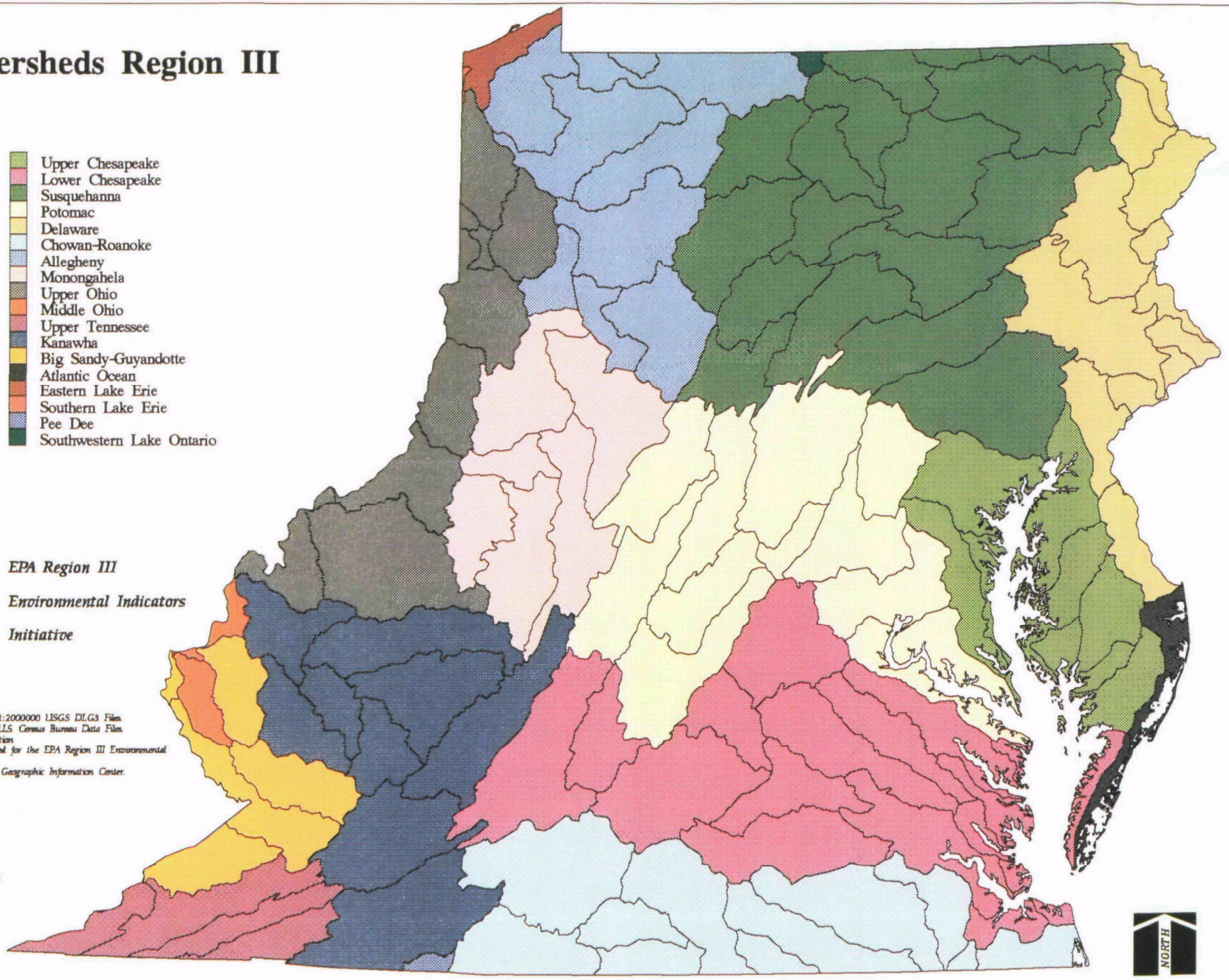
* In the higher elevation, western areas which receive large sulfate loadings from atmospheric deposition, some of the sulfate in the streams may be generated outside of the watershed.

* Mean sulfate concentrations are also elevated in the Lower Potomac, Lower James and the Hampton watersheds of Virginia. Point source discharges are the suspected sources of the elevated sulfate levels in these areas.

Management Recommendations:

* See discussion under previous map, entitled "Resource Extraction Impacts".

Watersheds Region III



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Demographic Data from 1990 U.S. Census Bureau Data Files.
Projection: Albers Equal Area Projection.
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 23, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

ECOREGION FRAMEWORK

This map depicts the ecoregions of Region III as defined by the United States Environmental Protection Agency. Terrestrial variables such as vegetation, soils, land forms, land use and other characteristics were used to delineate the ecoregions. The ecoregions depict regions of similar aquatic and terrestrial ecosystems.

Findings:

* Surface waters generally reflect the land forms which they drain.

* Ecological and water quality data should be summarized by ecoregions rather than watersheds because ecoregions better correspond to the natural spatial variations and patterns in water quality.

* Many states are using the ecoregion framework to develop biological criteria for waters.

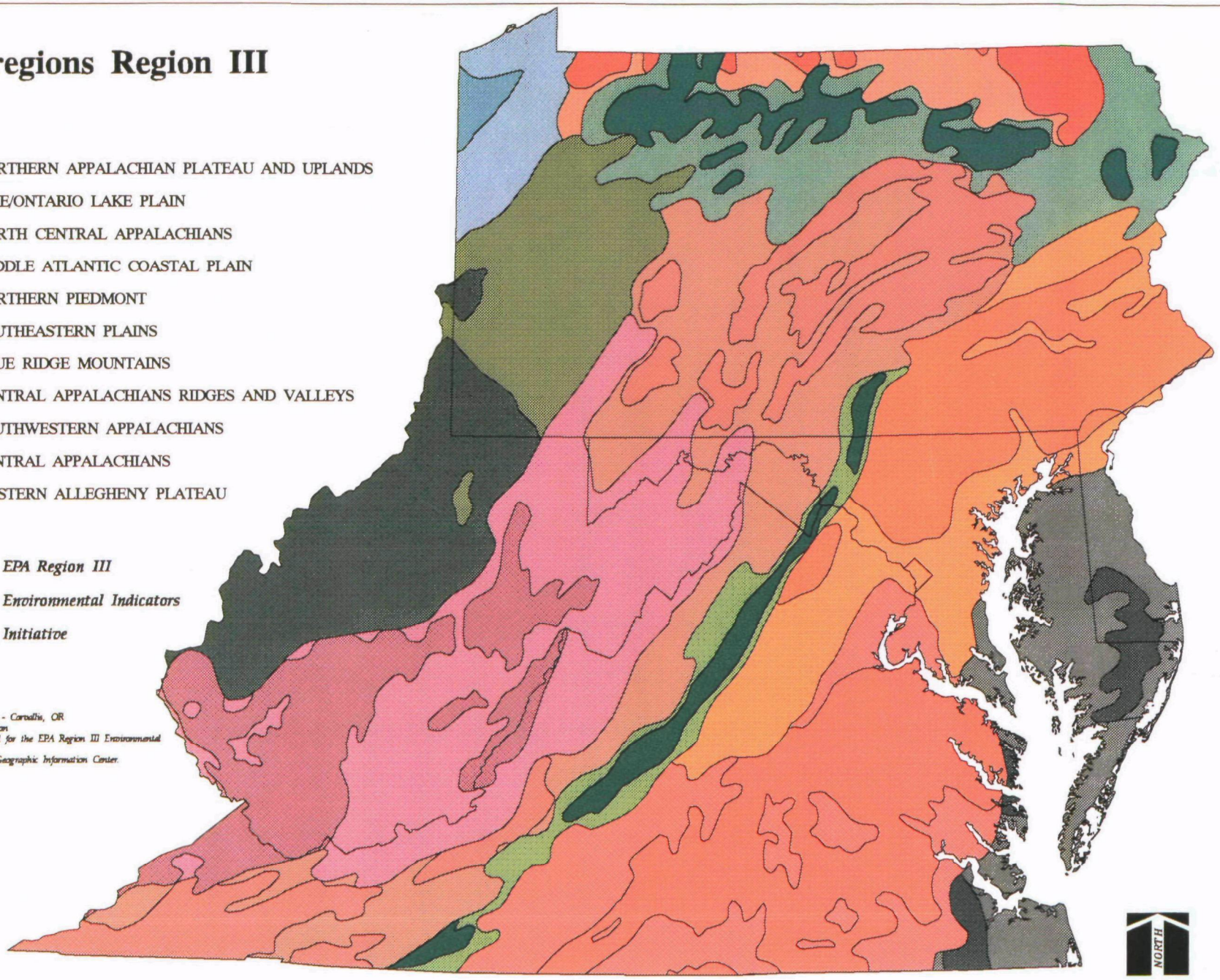
* Region III is participating in a Regional Environmental Monitoring and Assessment Program (REMAP) called the Mid-Atlantic Highlands Assessment (MAHA). It is an ecological assessment project based on the ecoregion framework. The project will determine minimally impacted conditions, describe the current ecological condition of parts of 6 major ecoregions and investigate diverse impacts. This study will cover 65% of Region III.

Management Recommendations:

* This project did not use the ecoregion framework primarily because watersheds provide a more familiar frame of reference. However, the Region should begin to investigate the use of the ecoregion framework for assessing and managing water resources and protecting aquatic and terrestrial ecosystems. It should be noted that at a recent all employees meeting at EPA Headquarters, both Vice President Gore and Administrator Browner considered ecosystem protection as a top Agency priority.

* The Region should coordinate with the MAHA project and use information from the project as it becomes available. This project will provide real information on the utility of the ecoregion framework in water quality management.

Ecoregions Region III



BIOLOGICAL MONITORING OF BENTHIC MACROINVERTEBRATES

Benthic macroinvertebrates are an assemblage of animal groups that live in bottom habitats in the aquatic environment. The major taxonomic groups of benthic macroinvertebrates include the insects, annelids, mollusks, flatworms and crustaceans. Healthy macroinvertebrate communities indicate good water quality and physical habitat. In-stream communities are excellent indicators because they live in the stream and thus their condition reflects long-term water quality, unlike ambient samples which are often taken monthly and offer only a snapshot of water quality.

Findings:

* Data are collected using different methods and are not strictly comparable between the states.

* More data are readily available for the state of Maryland and the non-tidal streams of southern Delaware. Coverage is limited in Pennsylvania and Virginia and very sparse in West Virginia.

* On the Eastern Shore of Maryland, 34% of sampled sites indicate severe impact while 55% indicate moderate impact.

* In the nontidal streams of southern Delaware 26% of sampled sites show severe impact and 40% are moderately impacted. Delaware reports that 80% of sites with poor quality biology are limited by habitat.

* Although the coverage is sparse, available data indicate impacted sites are also clustered in the middle and lower Allegheny, the Monongahela, the Ohio and the lower Kanawha watersheds. Areas that appear to be minimally impacted include the Upper Delaware River basin in the northeastern corner of Pennsylvania.

Management Recommendations:

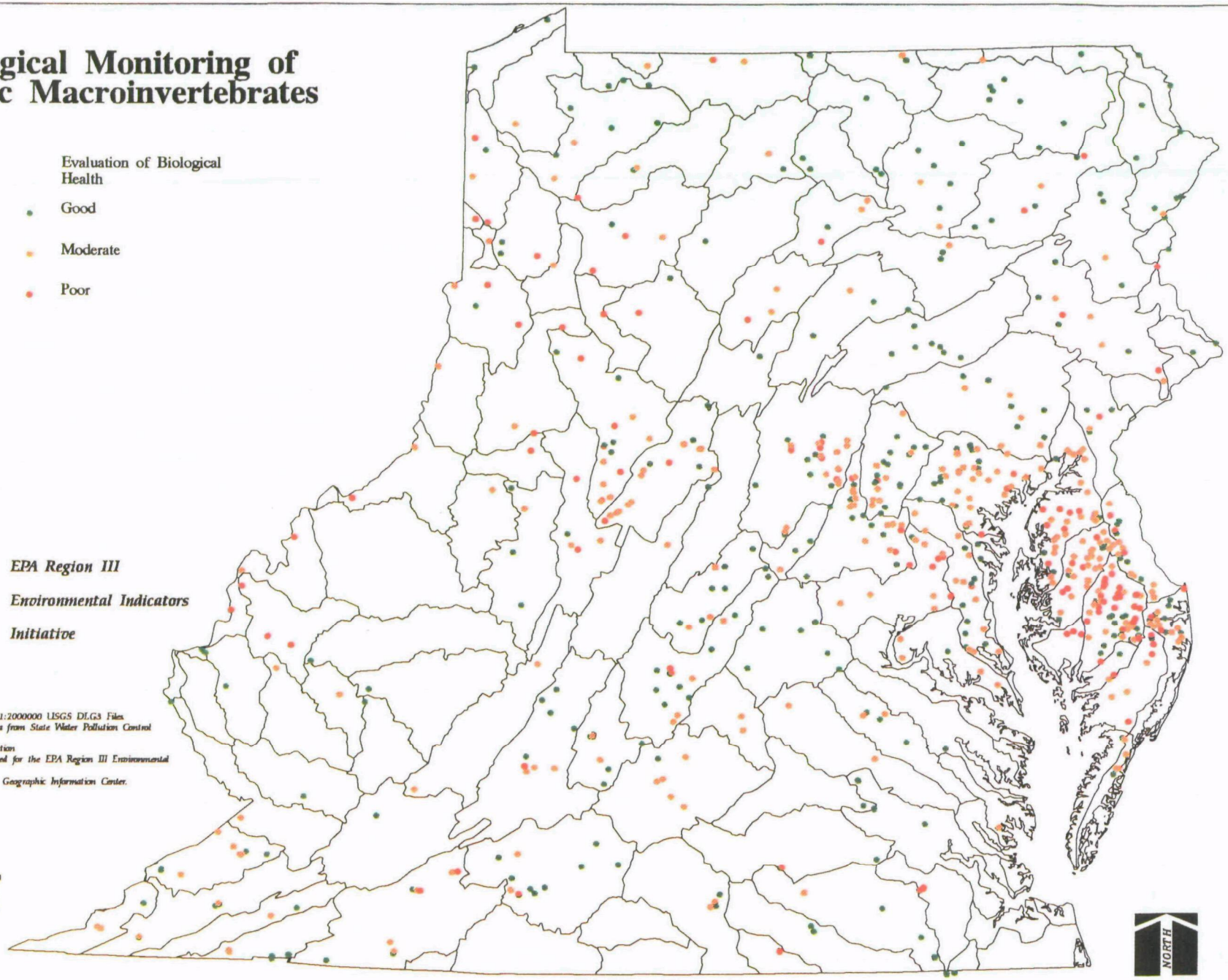
* The most impacted areas should be targeted for source identification, control measures should be implemented to reduce stressors in those areas (including enforcement for traditional sources and innovative approaches for other sources). 305(b) data can be used to identify sources.

* The least impacted areas should be targeted for pollution prevention activities and protection through awareness of these areas in permitting, standards review and enforcement.

Biological Monitoring of Benthic Macroinvertebrates

Evaluation of Biological Health

- Good
- Moderate
- Poor



EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Monitoring data from State Water Pollution Control Agencies.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 10, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

NORTH

CANCER RISKS BASED ON FISH TISSUE DATA

Concentrations of chemical residues in fish fillets can be used to determine fish edibility. The following map illustrates the estimated total (based on 45 chemicals) cancer risk for human fish consumption at a low ingestion rate.

Findings:

* All estimated cancer risks exceeded 1 case in 100,000, except for the background location. Risks would be even higher for subsistence fishermen.

* Most sampling locations were chosen primarily because of suspected contamination and this was confirmed through the study results.

* Most high risk locations currently have some type of fish consumption advisory in place.

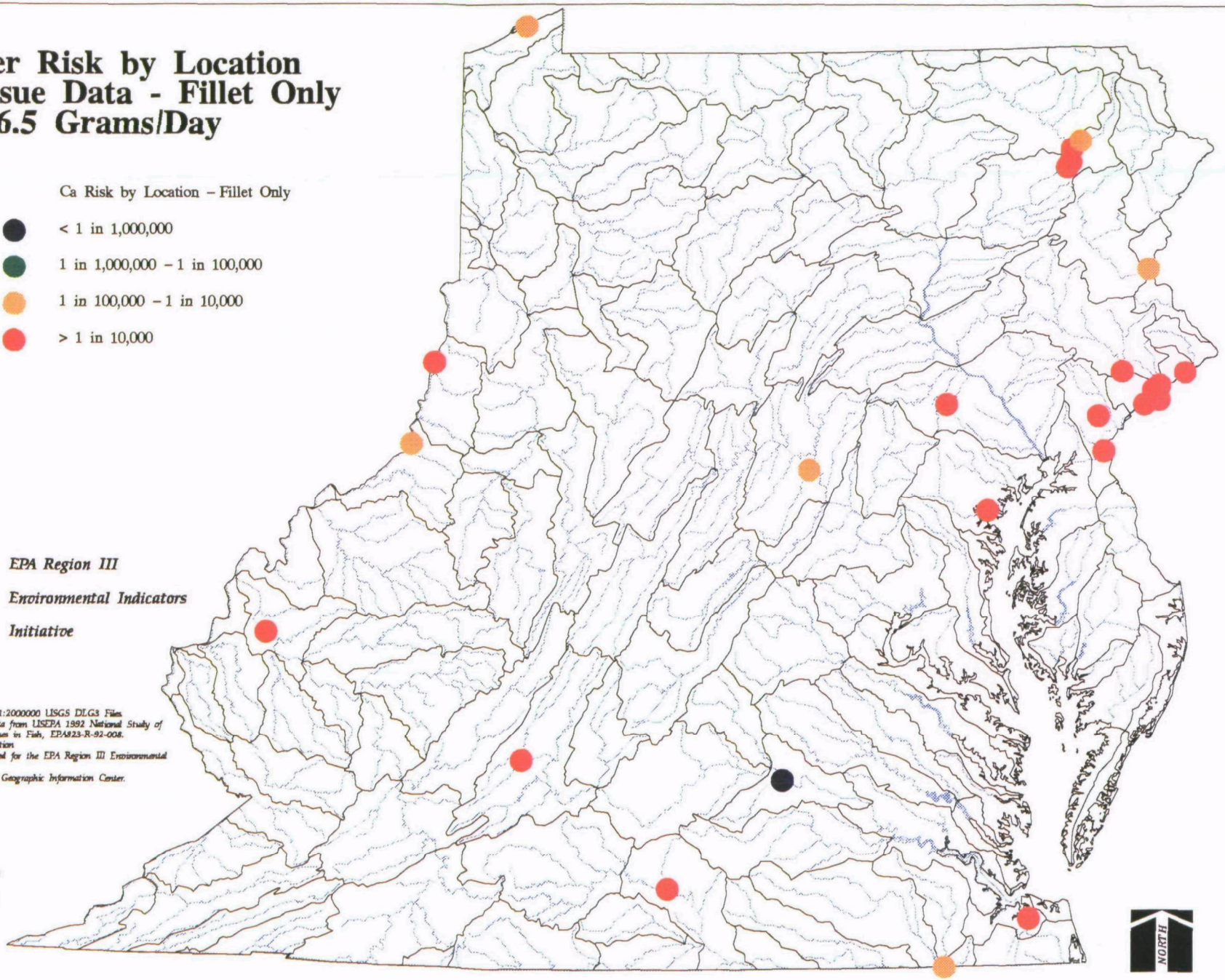
Recommendations:

* See Occurrence of Toxics in Fish Tissue

Cancer Risk by Location
Fish Tissue Data - Fillet Only
6.5 Grams/Day

Ca Risk by Location – Fillet Only

- < 1 in 1,000,000
- 1 in 1,000,000 – 1 in 100,000
- 1 in 100,000 – 1 in 10,000
- > 1 in 10,000



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Fish Tissue Data from USEPA 1992 National Study of Chemical Residues in Fish, EPA823-R-92-008.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 9, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

OCCURRENCE OF TOXICS IN FISH TISSUE

Toxic chemical residues in fish tissue (both whole body and fillet) can indicate the presence of these chemicals in the watercolumn and/or sediments and can be used to determine fish edibility. There is limited information on the effects of chemicals on fish health. Some of the most significant toxics in fish for human consumption in this region are dioxins and furans as TEC, PCBs, dieldrin, p,p'-DDE, and mercury.

Findings:

* For organic chemicals, the highest concentrations were generally found in southeastern Pennsylvania and southeastern Virginia. For mercury, the highest concentrations generally occurred in eastern Pennsylvania and southern Virginia.

* Most Region III states use FDA Action Levels to set advisories. Risk-based concentrations could be more protective.

Recommendations Based on all Fish Tissue Information:

* Identify sources of contamination and evaluate remediation efforts.

* Increased federal assistance to states for monitoring fish tissue and developing fish advisories.

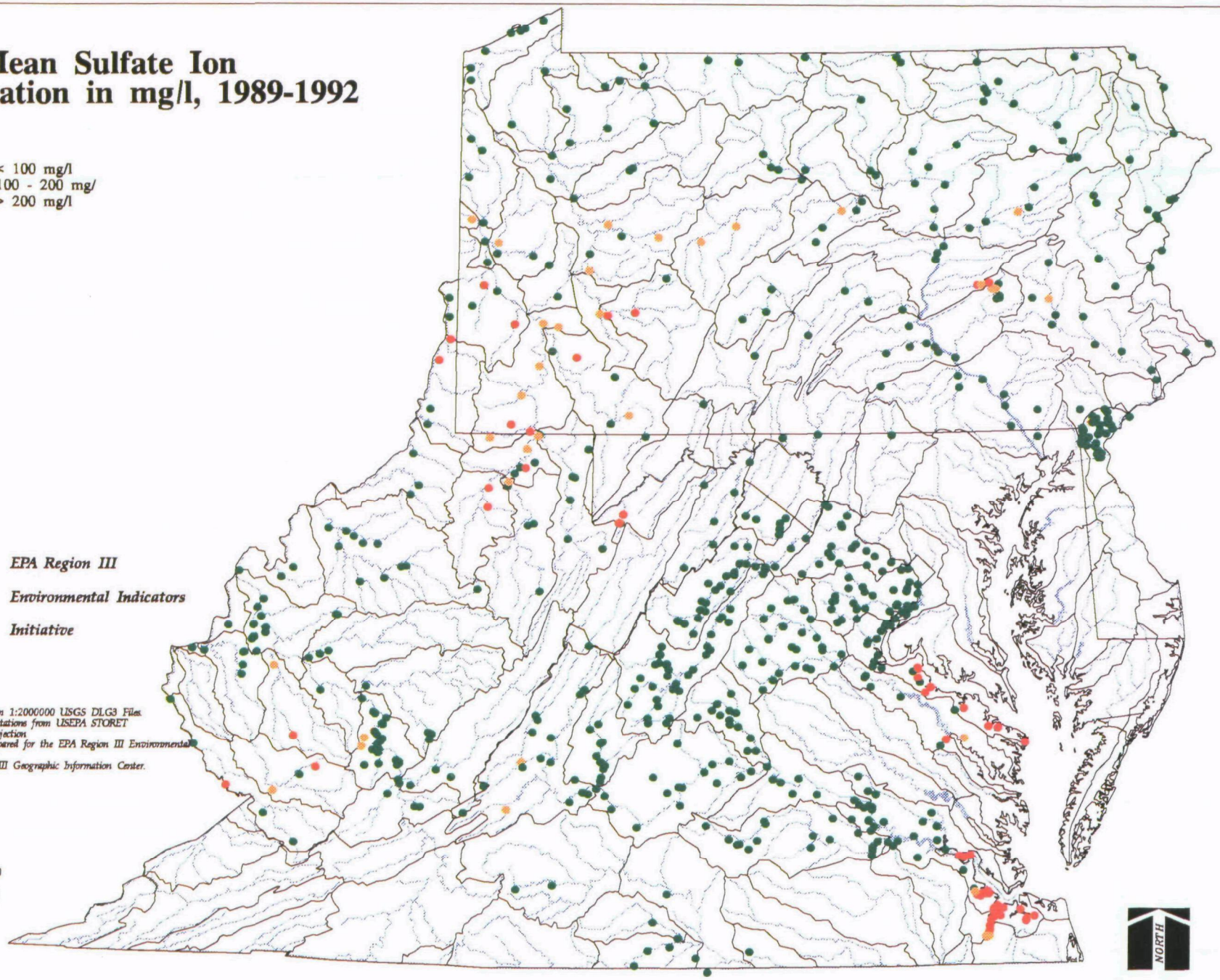
* Identify criteria used to select sampling locations and determine if these criteria apply elsewhere in the region (look for high risk sites not yet identified).

* Integrate this information with other identified stressors to human health, especially in populations consuming larger quantities of fish to locate communities for priority attention.

* Provide technical assistance to the states through the National OST Fish Contamination Program ~~(Regional Contact Chuck Kanetsky)~~ to develop water and sediment quality management and pollution prevention control strategies.

Mean Sulfate Ion Concentration in mg/l, 1989-1992

- < 100 mg/l
- 100 - 200 mg/
- > 200 mg/l



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Monitoring stations from USEPA STORET
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 10, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

NONATTAINMENT OF DESIGNATED USES FOR RIVERS AND STREAMS
TOXICS IMPACTS

Where waterbodies do not meet designated uses, the states determine possible sources and causes of nonattainment. For example, a stream may not meet its designated use as a cold water fishery because of high temperature discharges from a power plant. The source of the impact is the industrial power plant, the cause of the impact is increased temperature. This map serves as an example of how the impacts from a particular cause can be mapped throughout the Region.

This map show two measures of impact by a general cause category of Toxics, which includes Metals, Pesticides, Priority and Nonpriority Organics, Ammonia, Chlorine, and Unknown Toxicity.

Findings:

* This map serves as one example of how problem pollutants can be mapped within the Region. The greatest causes of impact to the Region's waters included nutrients, organic enrichment, and siltation; these causes are represented partially in the Agriculture and Resource Extraction source maps since these activities contribute these pollutants. This toxics map shows additional problem areas, somewhat reflected in the Resource Extraction and Point Source Impacts maps.

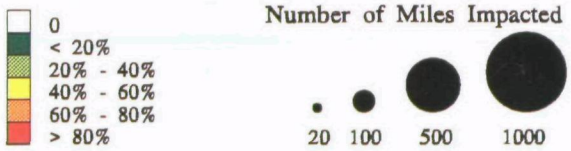
* Out of the total 3910 miles impacted by any of the causes in the Toxics category, 2051 of these miles were due to metals problems. Many of these metals problems coincide with Resource Extraction activities in the western portions of the Region, though there are some additional industrial point source related problems, in the Lehigh valley in Pennsylvania, the Greenbrier in West Virginia, and numerous watersheds in southern Virginia.

Management Recommendations:

* See the Resource Extraction and Point Source Impacts maps for recommendations.

* In this project, we did not use ambient metals monitoring data because there were questions concerning the quality of the data. The impacts reported by the states and shown in this map could not be verified analyzing the ambient data. EPA should work with USGS and the states to improve all future ambient water column monitoring for metals.

Toxics Impacts on Non-Attainment of Designated Uses for Waterbodies



Under Section 305(b) of the Clean Water Act, States must report to Congress, through EPA, on a biennial basis, on the condition of their waters. The report is developed by performing assessments on a subset of a State's waterbodies; for each waterbody assessed, the State determines whether or not the waterbody meets its designated uses, as defined in the State's Water Quality Standards.

Where waterbodies do not meet designated uses, the State determines possible sources and causes of non-attainment. This map shows two measures of impact by a general category of Toxics, including Metals, Priority and Nonpriority Organics, Pesticides, Ammonia, Chlorine, and Unknown Toxicity.

The variable-sized dots represent the actual miles attributed to this source category, while the colored watersheds express that quantity as a percentage of all miles attributed to all sources within the watershed.

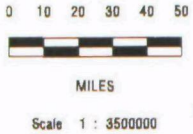
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: Watershed Boundaries from USGS 8 Digit Cataloguing Unit Map
Use Attainment Data from States' 305(b) Data Files,
Submitted to EPA through the PC Waterbody System.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Water Management Division.
Date: April 15, 1993



Scale 1 : 3500000

POINT SOURCES OF TOXIC POLLUTANTS

Section 304(l) of the Clean Water Act (CWA) required the states to list those waterbodies which the state did not expect will achieve applicable water quality standards, both numeric and narrative, due entirely or substantially to point source discharge of toxic pollutants. For those point sources causing a violation of water quality standards a National Pollutant Discharge Elimination System (NPDES) permit with water quality-based limits and a compliance schedule was required. This map consists of the location of the Region III 304(l) facilities classified as major and minor facilities. A major facility is a municipal facility with a design flow of greater or equal than one million gallon per day or an industrial facility with a rating greater or equal than 80 points. A minor facility is a municipal facility with a design flow less than one million gallon per day or and industrial facility with a rating less than 80 points. The point system is based on facility characteristics such as flow and industrial category.

Findings:

* The Region III 304(l) list consists of 138 facilities. The 138 facilities are composed of 100 major facilities and 38 minor facilities. Because there is no latitude and longitude information for 32 of the minor facilities and these facilities, as well as several of the major facilities, they are not shown on the map.

* The basins where the majority of 304(l) facilities are located are: Lower Susquehanna, Upper Susquehanna-Lackawanna, Schuylkill, Lehigh, Youghiogheny, Upper Roanoke, Lower James and Gunpowder-Patapsco.

* There is no discharge monitoring information for the minor facilities in the Permit Compliance System (PCS). PCS is a system that contains information on NPDES permits.

Management Recommendations:

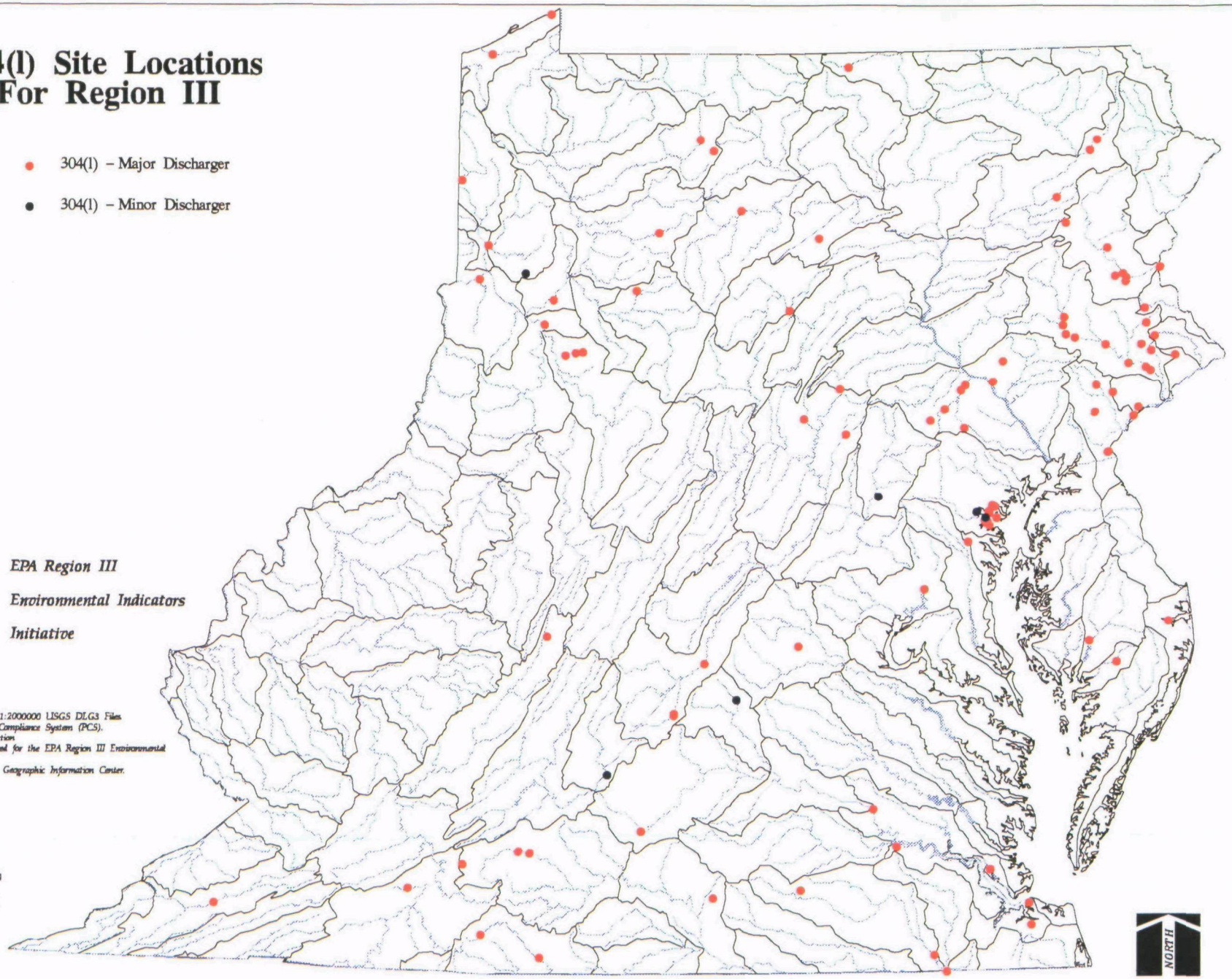
* If management of 304(l) sites is a priority within the NPDES program, EPA should coordinate with the states to try to get discharge monitoring information for the 304(l) minor facilities into the PCS. Since we have only 38 304(l) minor facilities, we could commit our own staff to enter information into the PCS.

* The recently issued EPA Locational Data Policy mandates collection of accurate locational descriptors for all regulated facilities. Accurate locational data are necessary to integrate with existing data and to assess potential impacts to receiving waters.

304(l) Site Locations For Region III

304(l) – Major Discharger

304(l) – Minor Discharger



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
304(l) data from EPA Permit Compliance System (PCS).
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: April 6, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

COMPLIANCE WITH TOXICS DISCHARGE LIMITS
COPPER LOADINGS AS AN EXAMPLE

The 304(l) program consists of National Pollutant Discharge Elimination System (NPDES) permits with water quality-based limits and compliance schedule for toxics pollutants. This map depicts the ratio of actual copper loadings to allowed copper loadings for the 304(l) facilities discharging copper in Regions III. For example, 119% of the permissable limit means the discharger is exceeding their permissable limit by 19%. Copper was chosen because more data were available for this parameter than for other toxic parameters at 304(l) sites.

Findings:

* The basins where there are 304(l) facilities discharging copper at levels that exceed the permissible loading are: Clarion, Lehigh, Schuykill, Brandywine and Gunpowder-Patapsco. The facilities discharging in these basins exceed the permissible loading for copper by more than 19 percent.

* The facilities discharging to the following basins are meeting the permissible loading for copper: Chinooteague, Hampton, Upper New, Upper Roanoke, Greenbrier, South Fork Shenandoah, Conococheague, Bald Eagle and Youghiogheny.

* There are 39 outstanding 304(l) facilities in the states of Maryland and Virginia operating without approved NPDES permits that meet 304(l) requirements. Therefore, we do not have loading information for those facilities.

Management Recommendations:

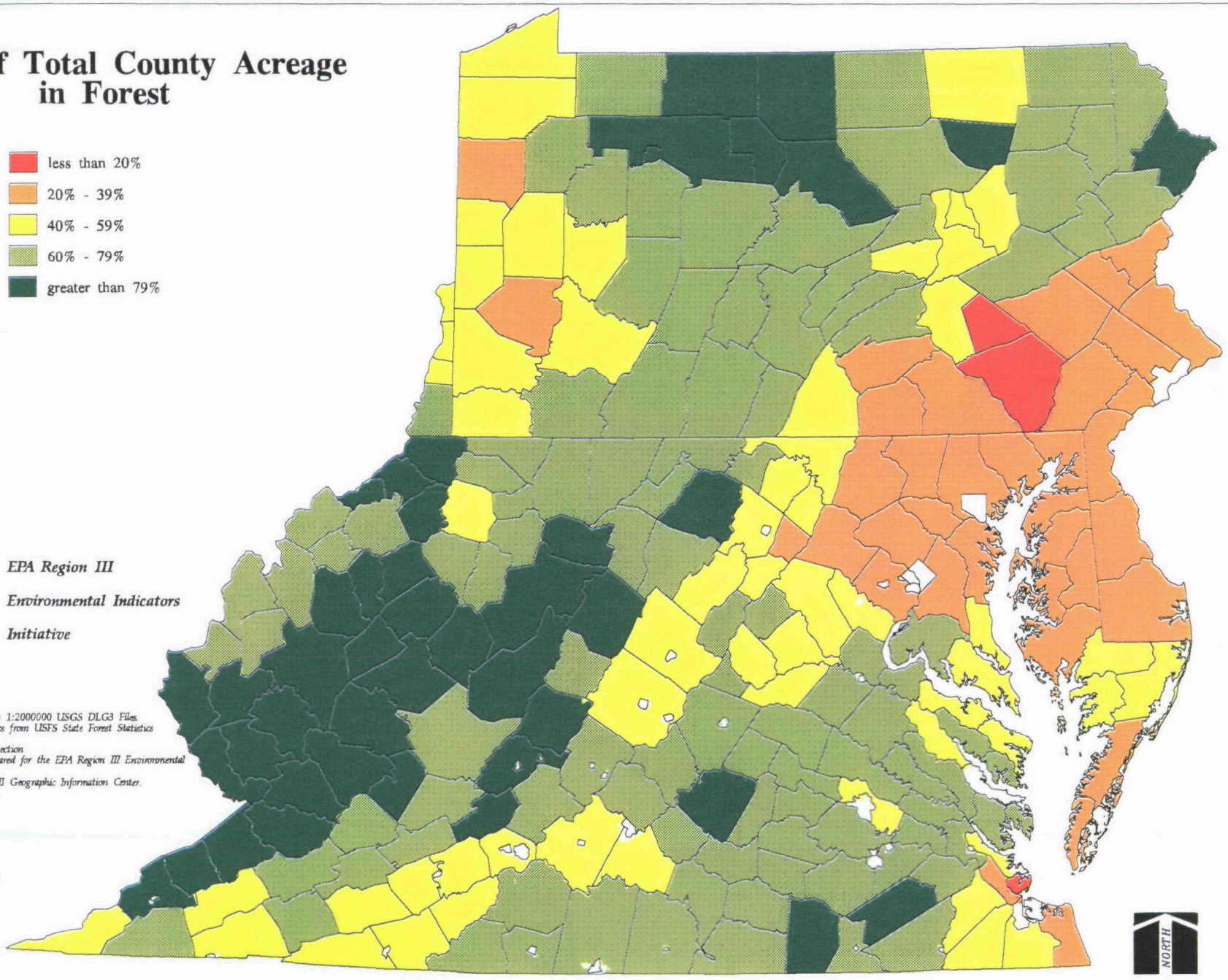
* For those facilities that exceed the permissible loading, we need to set a compliance date for the 304(l) parameters. Based on this information, we should develop enforcement actions as needed.

* For those basins where there are 304(l) facilities in compliance with the permissible loading, we should coordinate with the states to develop instream monitoring programs to determine what environmental benefit we achieved through the implementation of the section 304(l).

* We should coordinate with the states of Maryland and Virginia to issue the remaining 304(l) NPDES permits.

Percent of Total County Acreage in Forest

- less than 20%
- 20% - 39%
- 40% - 59%
- 60% - 79%
- greater than 79%



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Forest statistics from USFS State Forest Statistics Reports.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 10, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

NORTH

REGION 3'S FOREST RESOURCES

The Forest Indicators team gathered baseline data on the Region's forest resources to use as starting point for analyses of stressor data. The following 4 maps present baseline data on percent forest by county, forest cover type, public ownership, and elevation.

Findings:

* The majority of Region 3 is forested. The most heavily forested counties are located in the western portions of Pennsylvania, Virginia, and West Virginia.

* Forests are sparse on the coastal plain.

* Oak/hickory is the dominant forest type in the Region. There are also large components of beech/maple and loblolly pine forest.

* The vast majority of the Region's forests are in private ownership.

* High elevation forests occur along the Appalachian Mountain range as it passes through Pennsylvania, Virginia, and West Virginia.

Management Recommendations:

* Work with the Forest Service to establish watershed approaches to engage local/private protection.

* Work with the Forest Service to establish protection programs (P2) in existing forested areas.

* Work with the Forest Service to establish forest restoration efforts to encourage large forest patch size protection in coastal plain areas.

* Work with the Forest Service at the county level in outreach and education for local communities.

typo: dominant 2x

FOREST INDICATORS

MAJOR FINDINGS AND RECOMMENDATIONS

Findings:

* Region III is heavily forested; oak-hickory forests represent the dominate forest type.

* There is currently no comprehensive dataset which describes the biological diversity of the Region's forests. Information is limited to rare, threatened and endangered species and plant communities of which Region III is home to a wide variety of special species and communities of concern.

* Elements of forest biodiversity are doing well: deer, resident songbirds, small mammals; Other forest species have been extirpated or are declining in numbers: neotropical migratory songbirds, large predators (timber wolf, mountain lion, bobcat, wolverine), amphibians.

* Most rare forest communities are associated with extreme environmental conditions such as high elevations or saturated conditions

* Major stressors to forested ecosystems include air pollution in the form of ozone, air toxics, and acid deposition.

* Species sensitive to ozone include some of the Region's dominate tree species: white pine, black cherry, tulip poplar, red spruce and red maple.

* Research results support an indirect link between high elevation forest decline, acid deposition and poorly buffered soils [note: the pH of Region III's rainfall averages between 4.0 and 4.5].

* Forest fragmentation by roads, pipelines, subdivisions, clearcutting, etc. represent one of the greatest threats to the overall ecosystem functions of our forests.

* EMAP's Forest Health Monitoring is being implemented in our Region. However, PA and WV do not participate in the program, to date.

FOREST INDICATORS

MAJOR FINDINGS AND RECOMMENDATIONS

Management Recommendations:

* The Forest Team recommends working closely with the USDA Forest Service to better address the assessment and monitoring of air pollution impacts to forests.

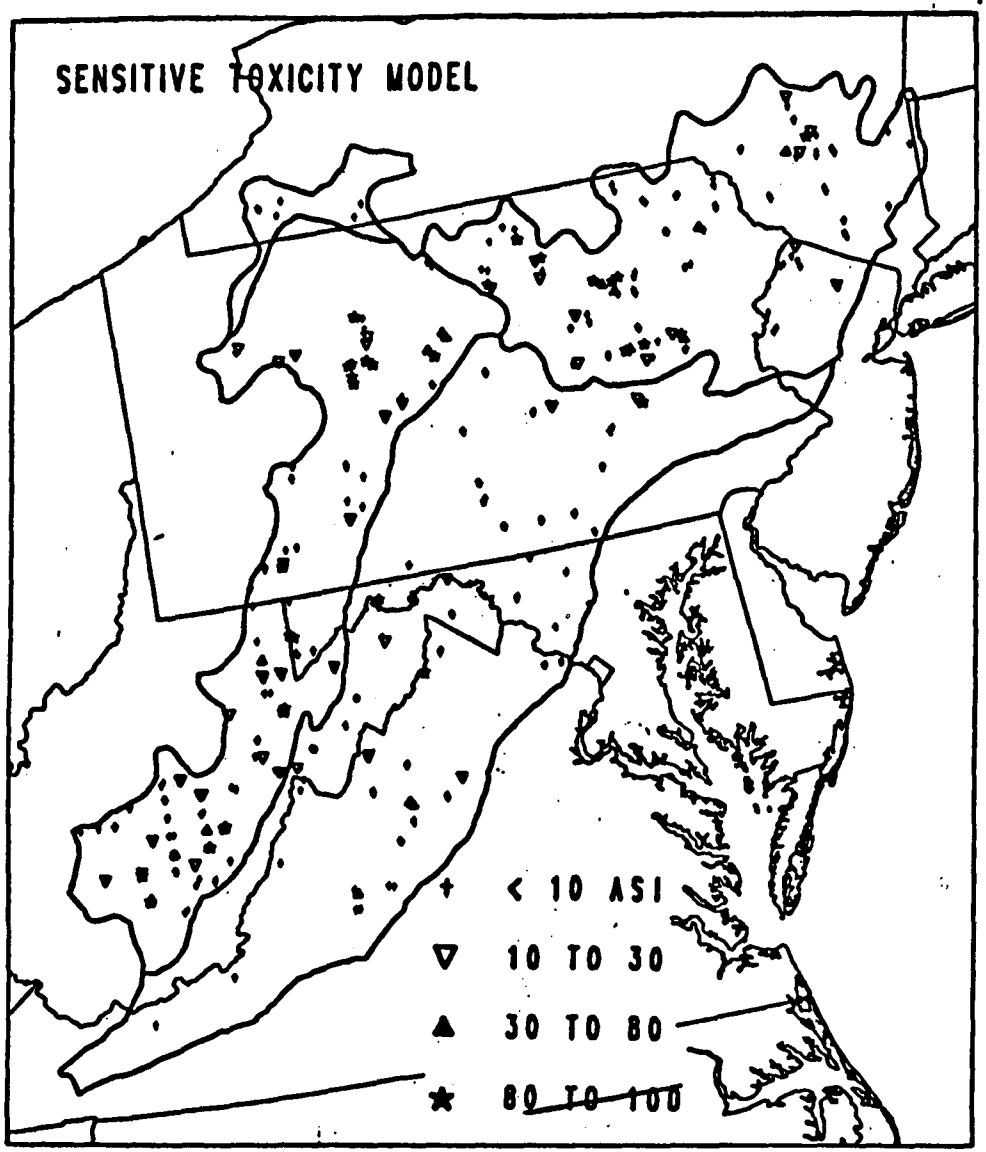
* The Forest Team recommends leveraging our existing regulations to better address forest fragmentation and means to reduce or mitigate its consequences.

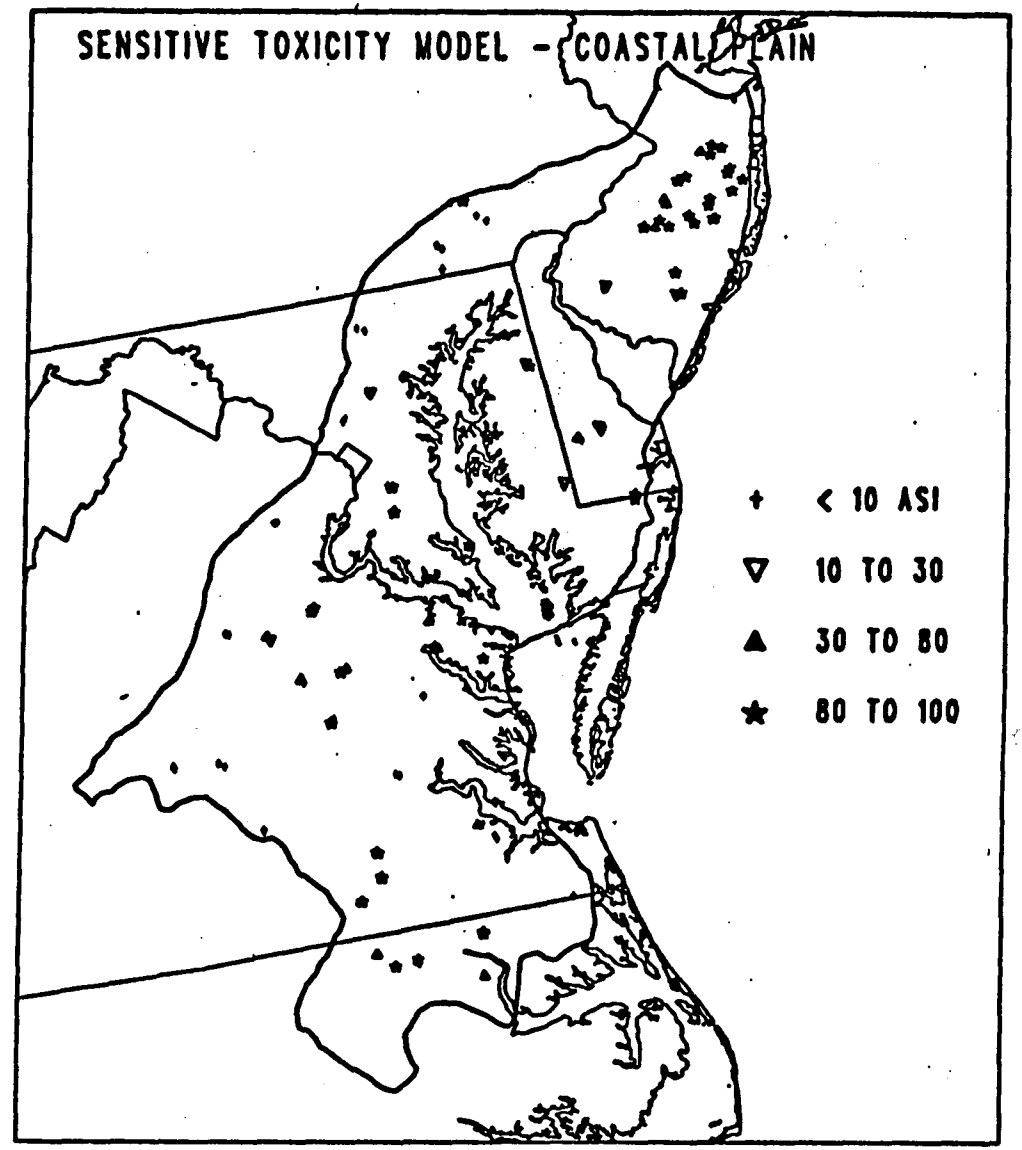
* The Forest Team recommends establishing closer links to EMAP's Forest Health Monitoring to achieve better Regional coverage.

* The Forest Team recommends the use of innovative techniques and tools to identify areas of high biodiversity and develop management plans to offset risks to biodiversity. Such tools/techniques include US Fish and Wildlife Service's Gap Analysis Program, EPA's Habitat/Biodiversity Research Plan and the Watershed Approach.

Forest Team

FOREST TEAM: (left to right): Karen Angulo, Thomas Stolle, Pat Flores, Art Spingarn (co-leader), Susan McDowell (co-leader), Dave Cutter, Catherine Brown, Randy Piersol, (missing: Fred Suffian).





Acidic stress index (ASI) for acid-sensitive fish species in the Mid Appalachian and the Mid Atlantic Coastal Plain regions. (ASI > 10 unsuitable for sensitive fish)

NATIONAL ACID PRECIPITATION ASSESSMENT PROGRAM - NATIONAL SURFACE WATER SURVEY BIOLOGICAL EFFECTS

A toxicity model, called an acid stress index, was used to estimate the acidity-related stress on fish associated with measured levels of pH, aluminum and calcium. The fish response measured most frequently in the laboratory bioassays is mortality. Thus, only experiments evaluating the effects of acidification on fish mortality were used for the toxicity model calibration.

Findings:

* Approximately 24% (9,317 miles) of the targeted population streams in the Mid Appalachia region exhibit ASI values which indicate chemical conditions unsuitable for the survival of acid-sensitive fish populations.

* Streams with the highest ASI values occur in the western part of the Mid Appalachian region in the higher-elevated upstream reaches.

* Acid stresses in the Mid Atlantic Coastal Plain region indicate that 45% (11,801 miles) of the targeted population stream reaches exhibit ASI values which indicate chemical conditions unsuitable for survival of acid sensitive fish populations.

* High ASI values are found in all areas of the Coastal Plain, but they are concentrated in the New Jersey Pine Barrens where the waters are naturally acidic.

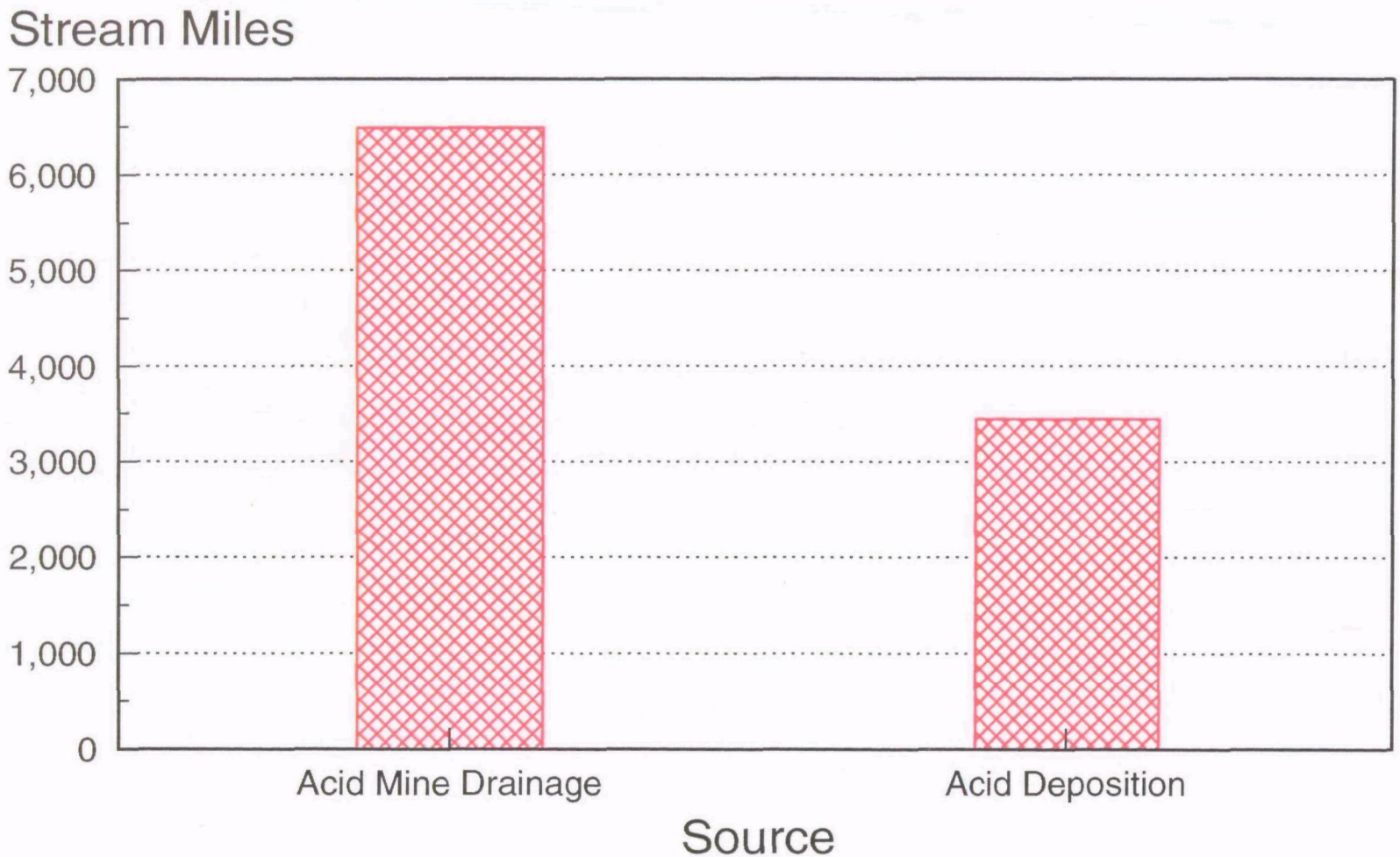
* Acidification is most likely one of the contributing causes of declines in fish stock in the Mid Atlantic Coastal Plain. Other confounding factors contributing to the decline in the Coastal Plain are overfishing, eutrophication and habitat modification in estuaries, land use changes, and toxic discharges.

Recommendations:

* In evaluating the priority of controlling acid deposition, impacts on important fisheries should be considered.

* Support the Regional Environmental Assessment and Monitoring Program (REMAP) project, the Mid Atlantic Highlands Assessment (MAHA), which will provide more information on biological effects due to acidification.

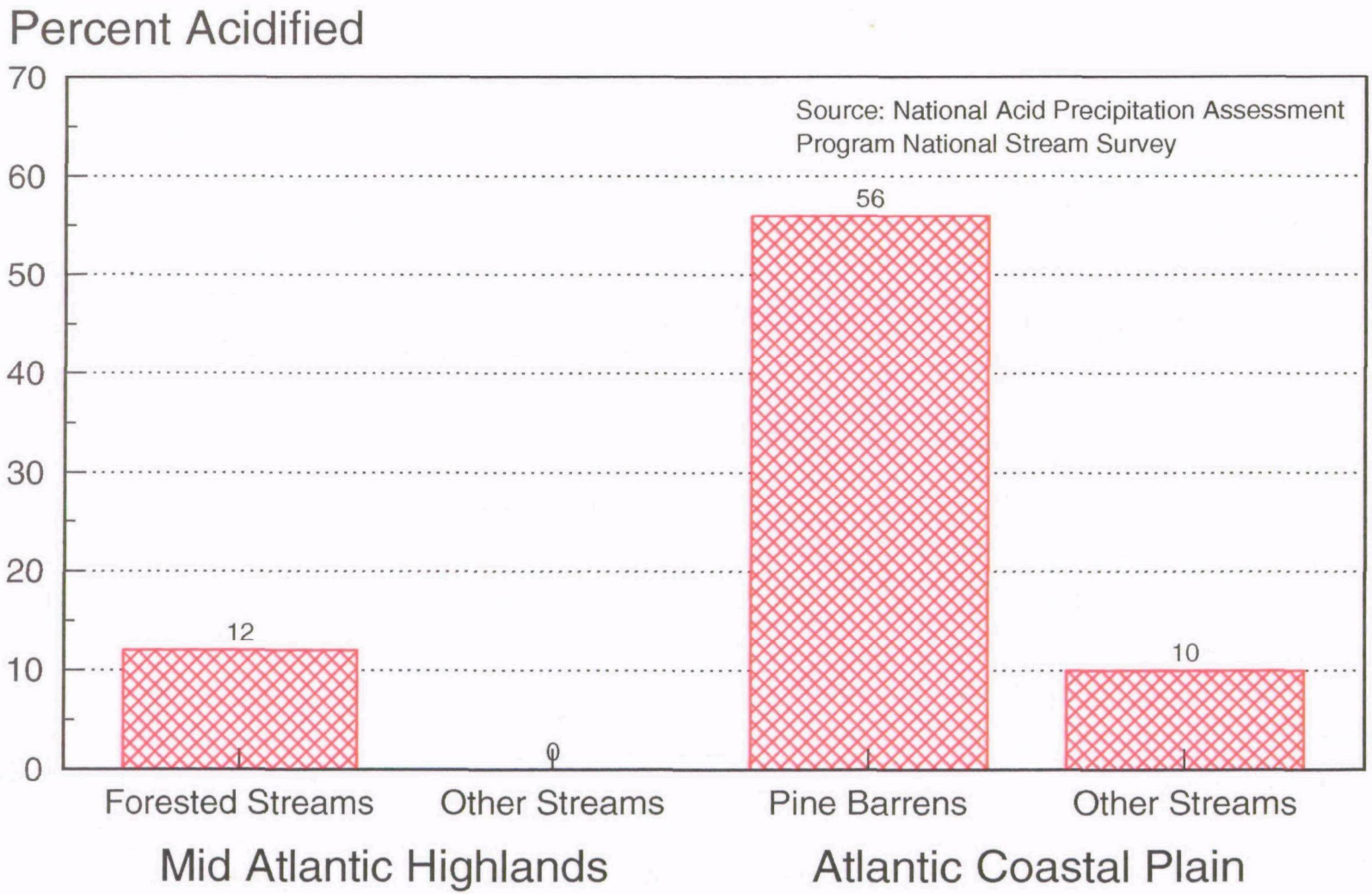
Estimated Stream Miles Impacted By Acid Mine Drainage Compared to Acid Deposition



Source: National Acid Precipitation Assessment Program National Stream Survey

Streams Acidified in Region III

(excludes acid mine drainage acidification)



NATIONAL ACID PRECIPITATION ASSESSMENT PROGRAM - NATIONAL SURFACE WATER SURVEY
ACID MINE DRAINAGE IMPACTS

Design of the National Surface Water Survey allowed quantitative estimates of acid mine drainage effects within the targeted stream population. The bar graph shows an estimate of the impact of acid mine drainage compared to an estimate of the impact of acid deposition.

Findings:

* Within the entire National Stream Survey area, an estimated 3441 miles of acidic streams not impacted by acid mine drainage were found. Most of this acidic stream length was located in the Mid Appalachian and Mid atlantic Coastal Plain.

* Within the entire National Stream Survey area, an estimated 2851 miles of streams were acidic because of acid mine drainage. Another 3590 miles of streams were estimated to be impacted by acid mine drainage but were not acidified. Therefore, a total of 6441 miles of streams were impacted by acid mine drainage.

* A large majority of the stream sites acidified because of acid mine drainage were located in western Pennsylvania and northern West Virginia.

* Stream sites impacted by acid mine drainage but capable of neutralizing the acidity were more numerous in southern West Virginia and Tennessee.

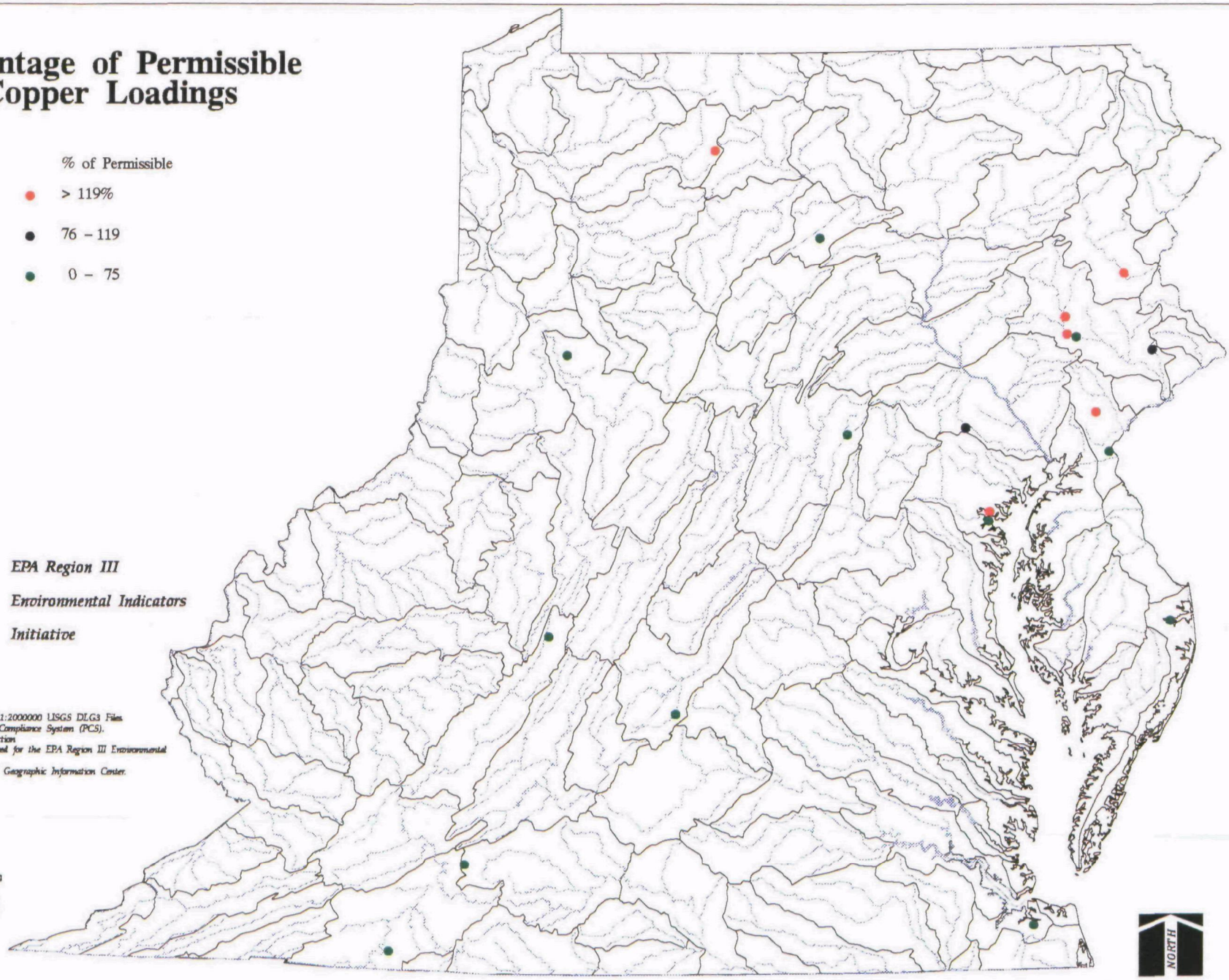
Management Recommendations:

* Control measures for both acid mine drainage and atmospheric deposition need to be implemented to address major threats to streams in the Mid Atlantic Highlands.

Percentage of Permissible Copper Loadings

% of Permissible

- > 119%
- 76 – 119
- 0 – 75



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
304(l) data from EPA Permit Compliance System (PCS).
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: April 6, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

NORTH

NATIONAL ACID PRECIPITATION ASSESSMENT PROGRAM - NATIONAL SURFACE WATER SURVEY STREAM ACIDIFICATION

This study targeted small to midsized streams and investigated the effect of atmospheric deposition on the acidification of streams. Areas in Region III included the Mid Atlantic Highlands (Allegheny Plateau and the northern Ridge and Valley Province) and the Mid-Atlantic Coastal Plain (including the New Jersey Pine Barrens). The NAPAP NSS provides more data for smaller streams in smaller, headwater watersheds which are often not priorities for the state monitoring networks.

Findings:

* Streams acidified by acid mine drainage were not included in the study. (The study considered acidification from natural causes and other sources.)

* In the Mid Atlantic Highlands, 12% of the target streams were acidified.

* Acidified streams in the Mid Atlantic Highlands are nearly always found in forested watersheds because thin soils and steep slopes make the watersheds unsuitable for agriculture or other uses and also make the streams more susceptible to acidification.

* Toxic effects of acidity on biota in streams are expected to be most prevalent in the Mid Atlantic Highlands.

* In the Mid Atlantic Coastal Plain 10% of the target streams were acidified (excluding the New Jersey Pine Barrens where acidification is organic and natural).

* The most likely source of acidity in both of these areas is atmospheric deposition.

Management Recommendations:

* Vigorous promotion of alternative transportation and energy conservation programs to limit emissions that contribute to acid deposition.

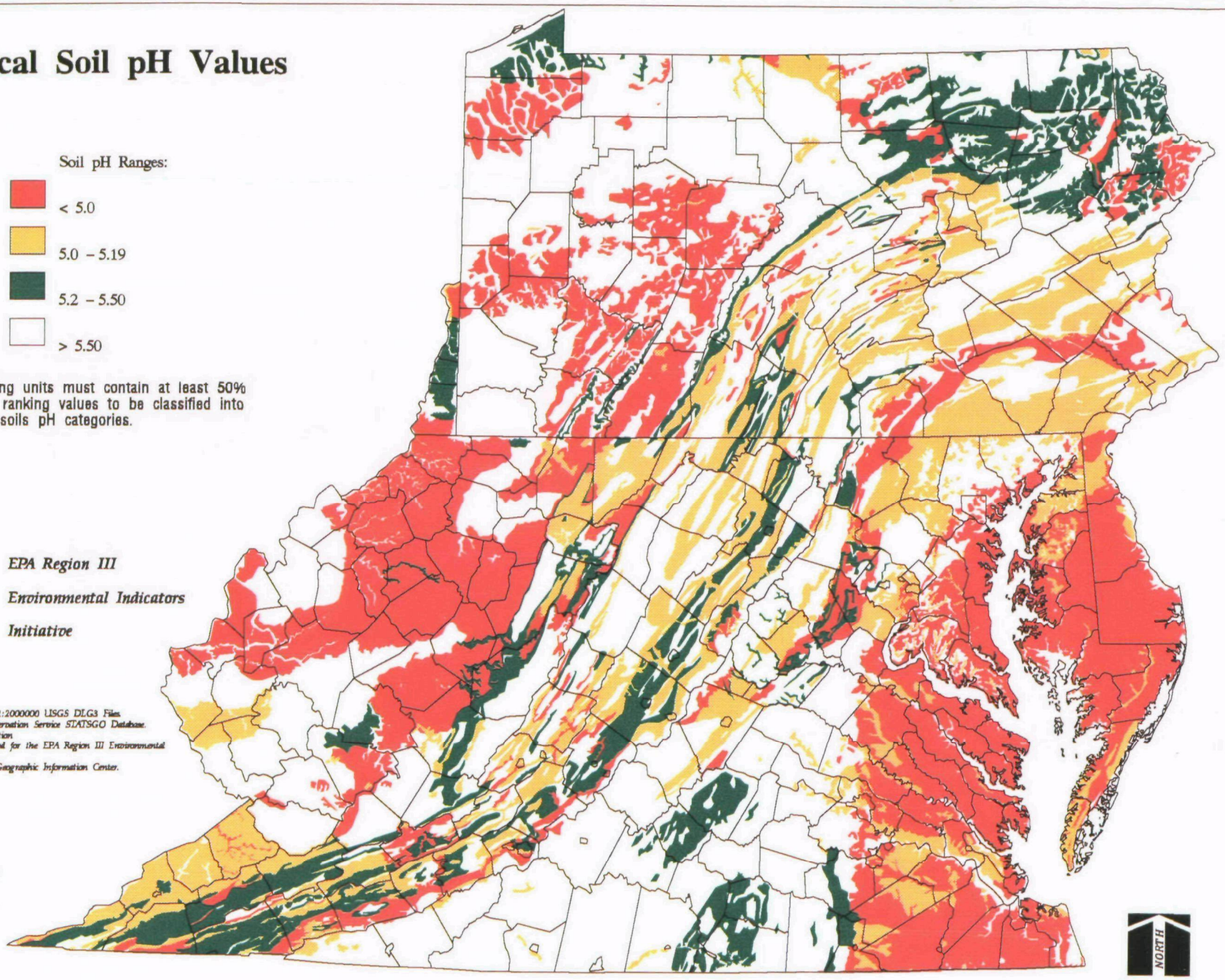
* Emission reductions in adjoining regions should be a matter of concern to Region III.

Typical Soil pH Values

Soil pH Ranges:

- < 5.0
- 5.0 – 5.19
- 5.2 – 5.50
- > 5.50

Soil mapping units must contain at least 50% of the pH ranking values to be classified into these low soils pH categories.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Soils Data from the Soil Conservation Service STATSGO Database.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 24, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

SOILS: SLOPE

Steep slopes are subject to erosion, excessive runoff, and topsoil loss. This creates a stress for tree growth, and also contributes to non-point source pollution.

Findings:

* Steep slopes are concentrated in the western part of the Region, especially in West Virginia.

* The majority of the Region's forests occur in areas with steep slopes. (Level areas, in general, have been converted to agriculture and urban/suburban development.)

* Forest cover can help reduce erosion, runoff, and non-point source pollution.

* Once forests are logged, reforestation efforts are often difficult on steep slopes.

Management Recommendations:

* Require information on slopes, sensitive soils and best management practices during the environmental review process.

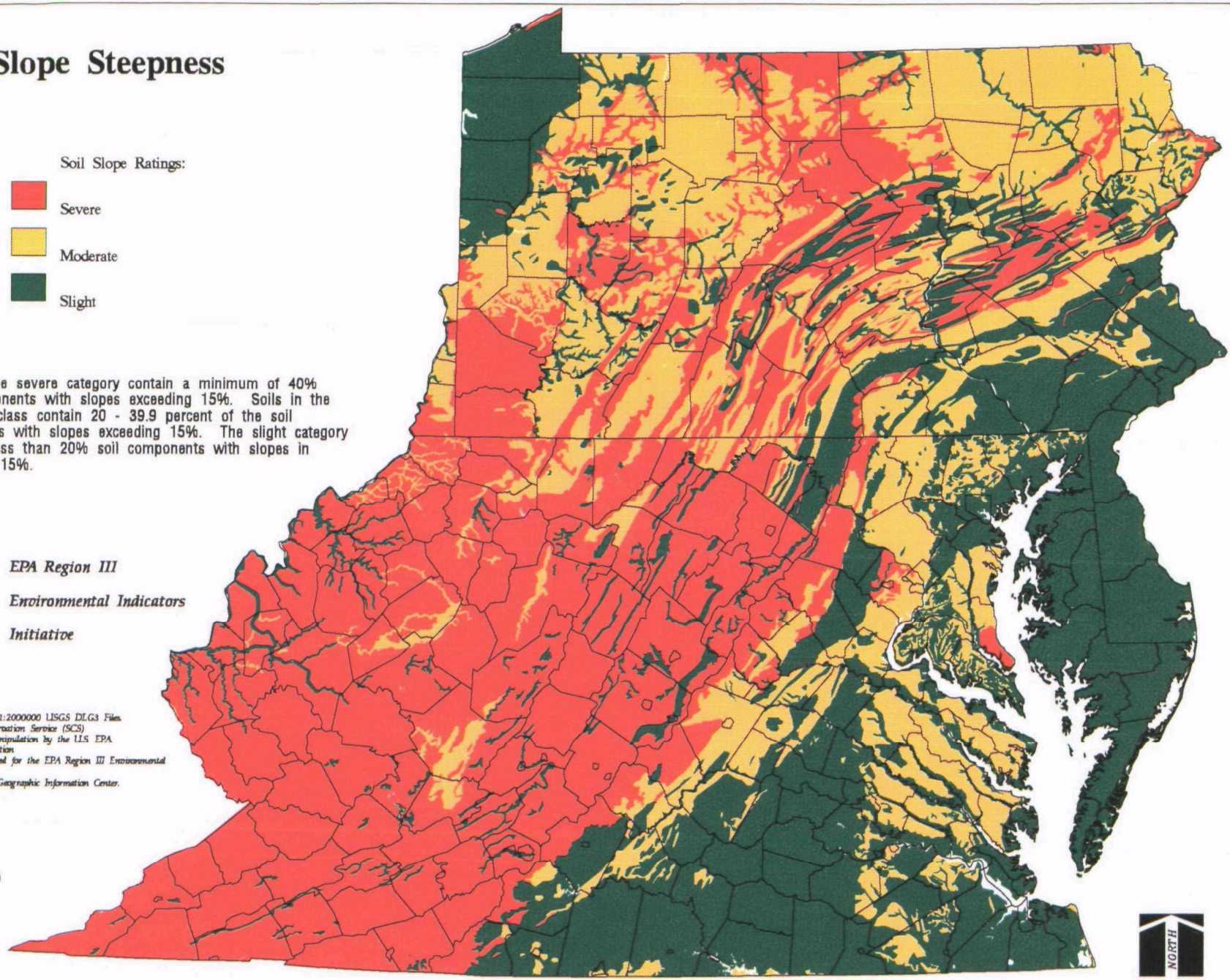
* Work with the U.S.D.A. Forest Service and Soil Conservation Service to promote stewardship and best management practices in areas with steep slopes.

Slope Steepness

Soil Slope Ratings:

- Severe
- Moderate
- Slight

Soils in the severe category contain a minimum of 40% soil components with slopes exceeding 15%. Soils in the moderate class contain 20 - 39.9 percent of the soil components with slopes exceeding 15%. The slight category contains less than 20% soil components with slopes in excess of 15%.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Soils Data from the Soil Conservation Service (SCS)
STATSGO Database. Data manipulation by the U.S. EPA
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 23, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

1990 POPULATION/SPECIES AND COMMUNITIES OF CONCERN

Expanding human populations have been responsible for the disappearance of many natural animal and plant occurrences and communities. This composite map was assembled to explore patterns between human population centers and biodiversity elements identified by State Heritage Programs.

Findings:

* There is a high concentration of mapped rare species and natural communities along the forested Appalachian Mountain Range that extends from PA south into VA and WVA. These are rural areas with low human population densities.

* High concentrations of rare species and natural communities are also mapped in DE and western PA. This may be an artifact of more intensive inventories in these areas.

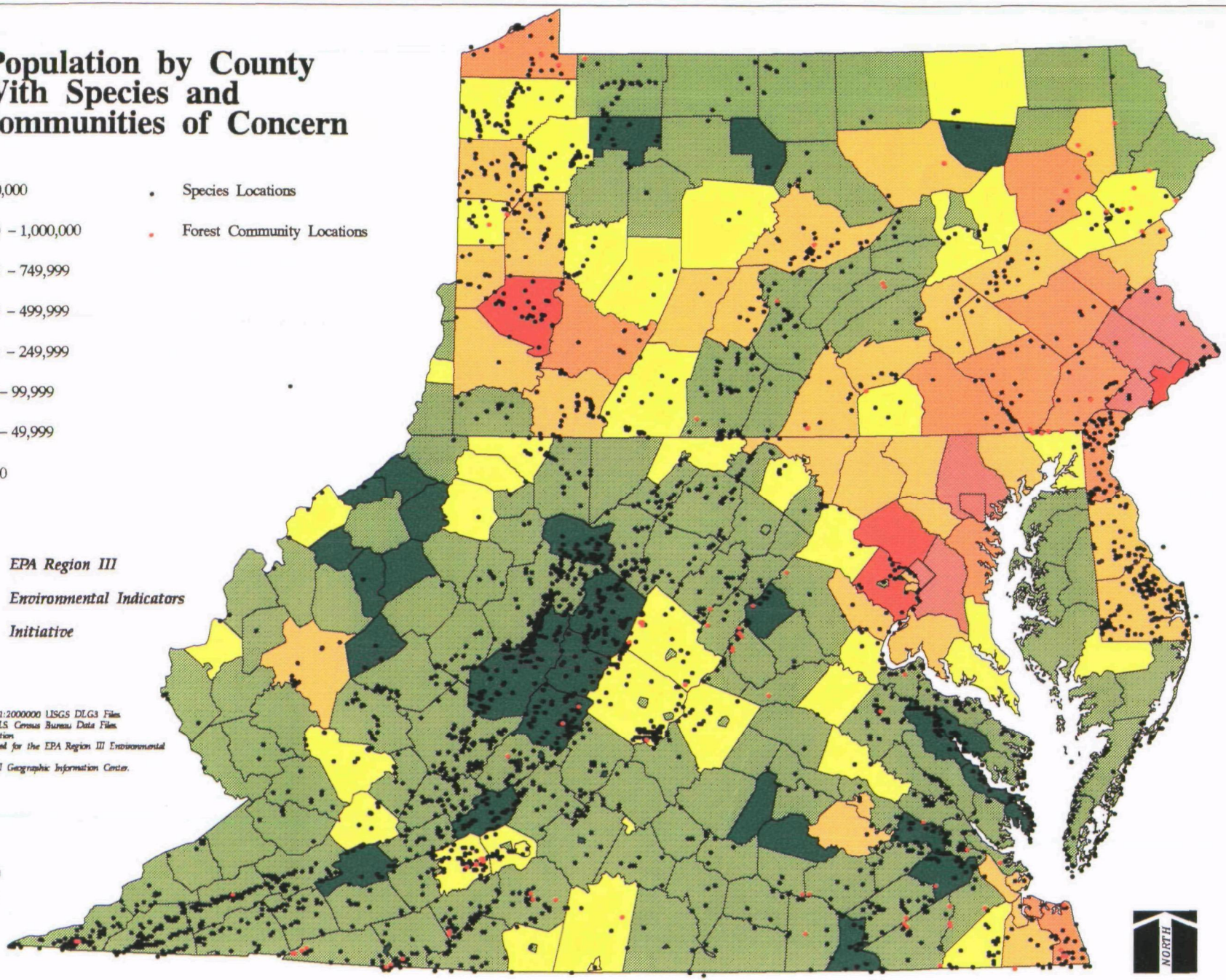
Management Recommendations:

* Use EPA grants programs and NEPA reviews to support innovative approaches to land use planning to ensure protection of areas with high biodiversity.

* Support/promote EMAP monitoring in forested areas with known high biodiversity.

* Target watersheds with high biodiversity for special educational, enforcement and pollution prevention initiatives.

1990 Population by County With Species and Forest Communities of Concern



DEER HERBIVORY

Deer herbivory (or deer browsing) represents one of the greatest potential threats to forest regeneration and subsequently places a variety of wildlife at risk due to the "opening up" of forests.

To date, several areas of our Region (most notably, PA) are subject to high deer densities which have an adverse impact on understory vegetation. Adverse impacts may affect other wildlife populations which depend on understory vegetation destroyed by deer.

Findings:

* High deer densities result in the overbrowse of young trees and plants up to six feet from the forest floor.

* Loss of forest regrowth potential, which is represented in the understory vegetation, bodes ill for the future health of our forests.

* The continued fragmentation of the forest landscape only presents more opportunities for deer to encroach further into forest interiors. The resulting overbrowse diminishes the availability of cover and nesting habitat for birds and mammals, opens the forest to intrusion of non-native (exotic) plants and animals which supplant native biodiversity and increases the risk to rare and threatened plants.

Management Recommendations:

* Work with the USDA Forest Service, local, state and federal land managers to increase public awareness of the deer overpopulation problem. Encourage management techniques that include:

  Shooting the deer.

  Reintroducing native predators such as wolves and mountain lions.

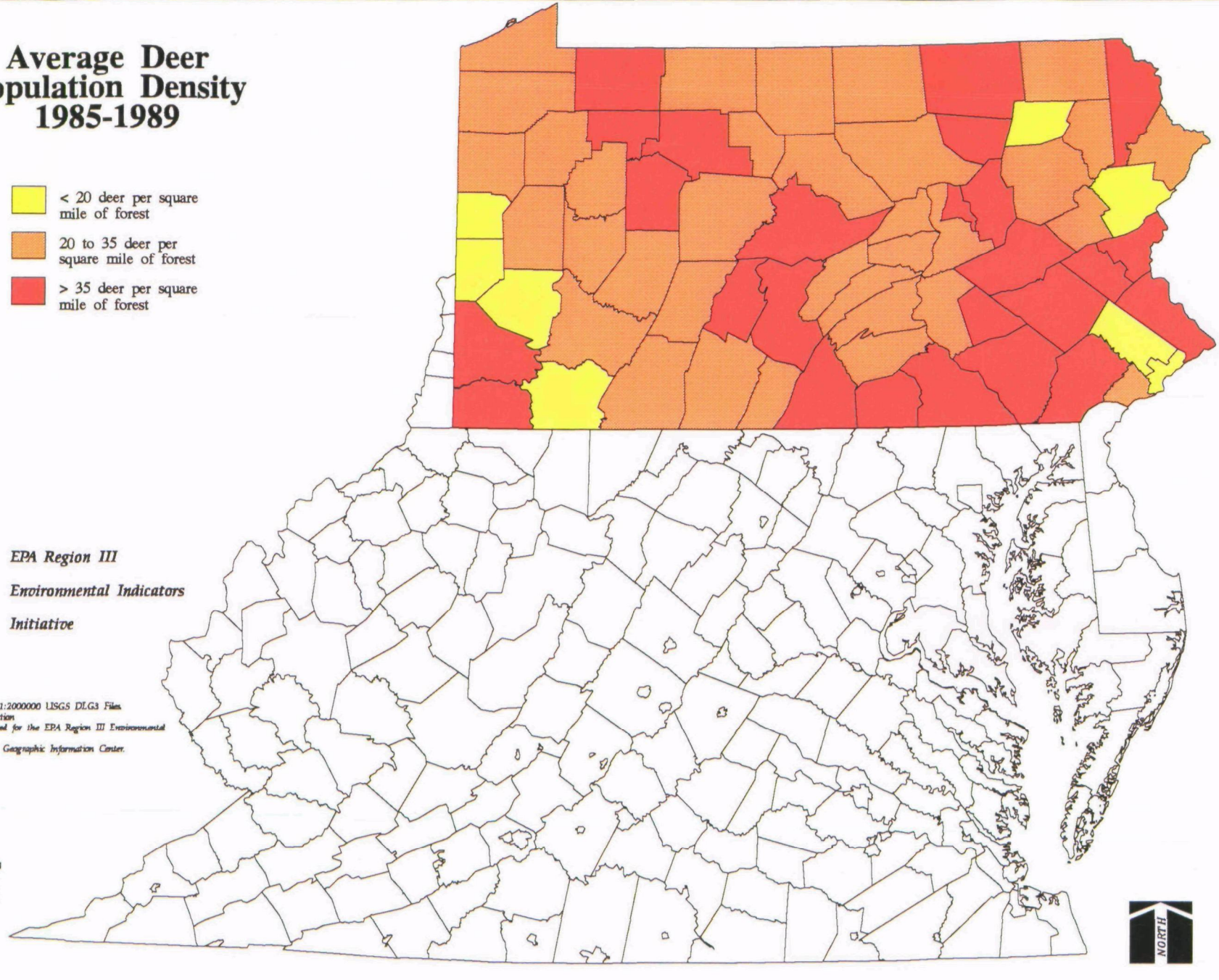
  Setting up family planning clinics in high deer density counties.

Average Deer Population Density 1985-1989

< 20 deer per square mile of forest

20 to 35 deer per square mile of forest

> 35 deer per square mile of forest



EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: April 8, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

NORTH

GYPSY MOTH AND OTHER PESTS

Gypsy moth and other insect pests are potentially serious stressors on the Region's forests. Widespread and recurring pest outbreaks can affect the forest's susceptibility to other stressors and, ultimately, change the nature of the forest itself (i.e. oaks are the preferred host for gypsy moth; widespread oak mortality could lead to the regeneration of another forest type (i.e. maple).

Findings:

* Region III has witnessed the onslaught of the gypsy moth as this pest's range continues to move south and west.

* Gypsy moth infestation, in combination with other stressors such as drought, acid deposition, and ozone can lead to increased oak decline and mortality.

* Gyspy moth infestations (and other pests) can lead to the conversion of one forest type to another. One can argue on both sides of this issue. Ramifications of an accelerated rate of conversion due to gypsy moth should be given careful consideration.

* On private land, the first line of attack appears to be pesticide use; continued gypsy moth infestation could lead to increased pesticide use and thus contribute to nonpoint source pollution and the loss of nontarget species such as Lepidoptera (butterflies and moths).

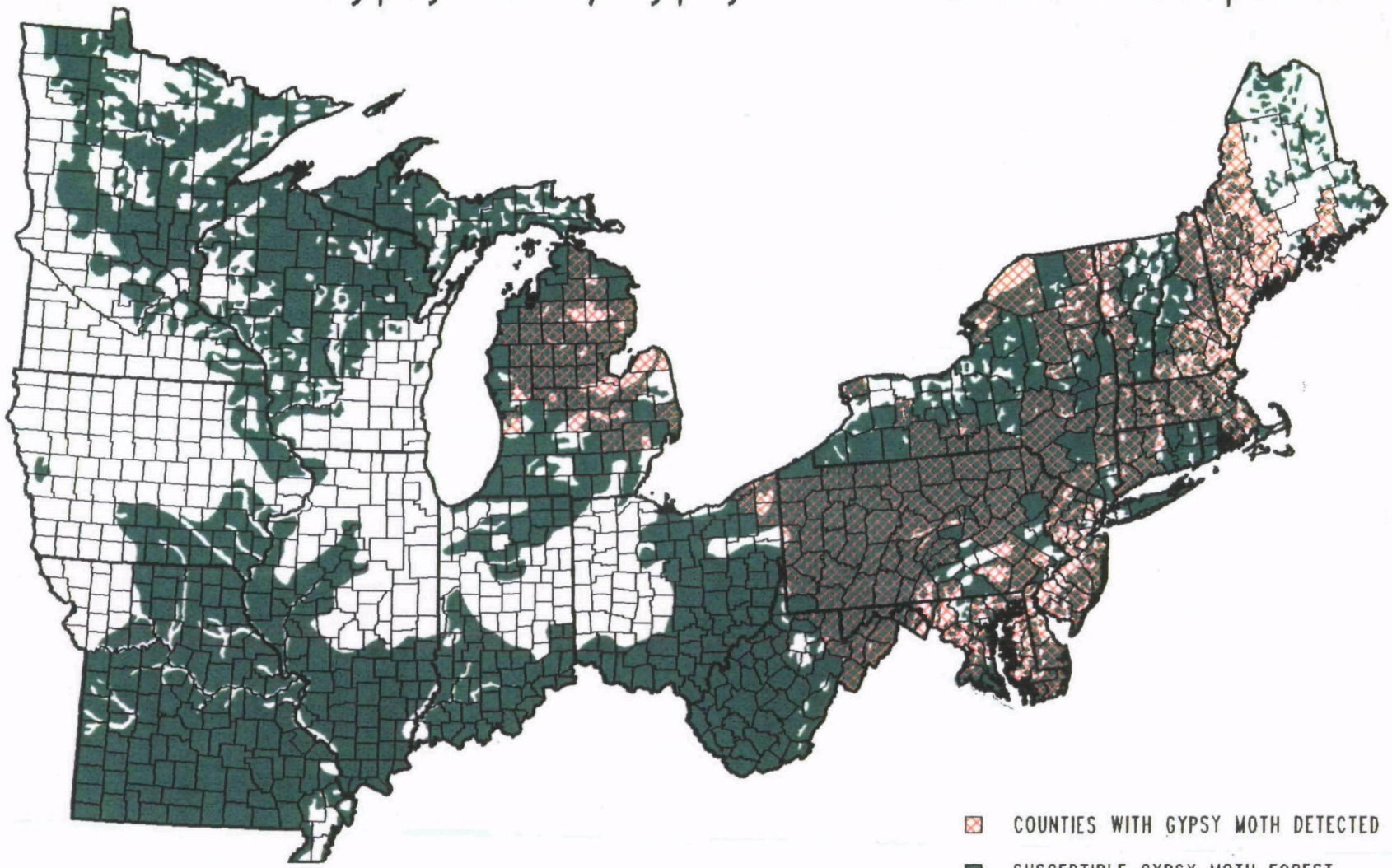
Management Recommendations:

* Work with the Forest Service to encourage integrated pest management on private lands.

* Support research on the effects of pesticide use on nontarget species.

* Look to gypsy moth infested areas as potential areas for nonpoint source control management and education as it regards pesticide use.

Counties with Gypsy Moth/Gypsy Moth Forest Susceptible



Produced by: USDA Forest Service, Northeastern Area
Forest Health Monitoring GIS Group

EMAP'S FOREST HEALTH MONITORING PROGRAM

To date, EMAP's Forest Health Monitoring (FHM) represents the only longterm, systematic monitoring program specifically designed to evaluate status and trends in forest health. The goal of the program is to measure and assess the effects of natural and anthropogenic stresses on our forests.

Several environmental indicators are currently used and many others are being tested and refined for incorporation into the program.

Findings:

* Three of the five states in our Region participate in Forest Health Monitoring (MD, DE, VA). These states commenced the detection monitoring in 1991; therefore, limited data are available at this time. Detection monitoring, the first level of the FHM, refers to the system of permanent plots (based, in part on EMAP's grid system); these plots are assessed annually. In addition, irregular aerial surveys to assess forest pest and other stressor effects are included in Detection Monitoring (see technical report for more details). In VA, several demonstration pilot plots are underway in an effort to evaluate environmental indicators and address specific concerns.

* Baseline data collected for the first year of monitoring indicate no regional trends in the decline of forest health. Some states are experiencing widespread pest problems, although, at present, these do not represent cause for alarm.

Management Recommendations:

* Encourage West Virginia and Pennsylvania to participate in FHM; this will provide Region III with a comprehensive assessment of our Forest and provide early warning signs of stressors that EPA should address more rigorously.

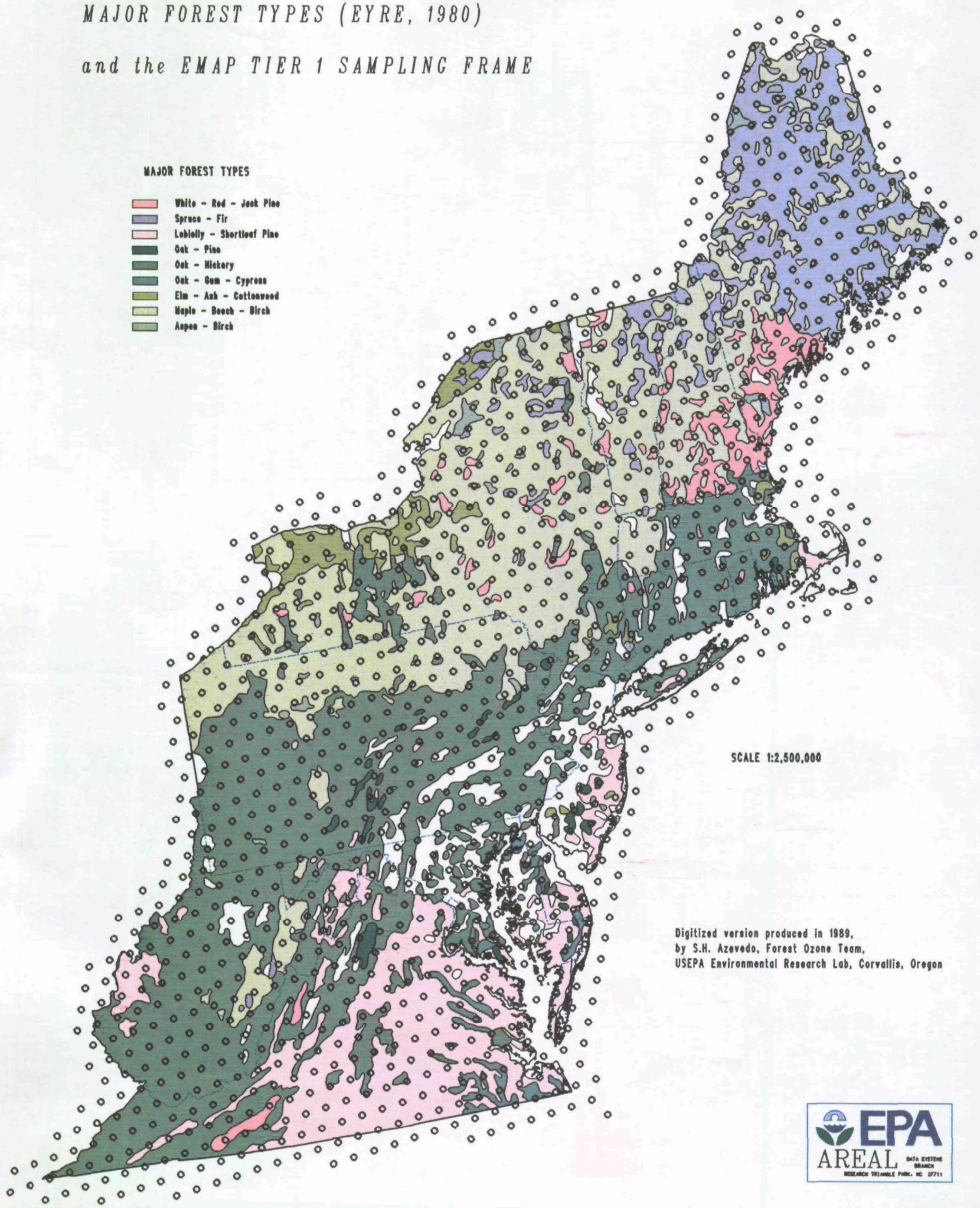
* Establish better communication links between the Forest Service FHM team and Region III scientists via regular roundtable discussions, exchange of staff and joint REMAP projects.

* Evaluate Regional needs for inclusion into EPA's REMAP projects.

NORTHEASTERN UNITED STATES

MAJOR FOREST TYPES (EYRE, 1980)

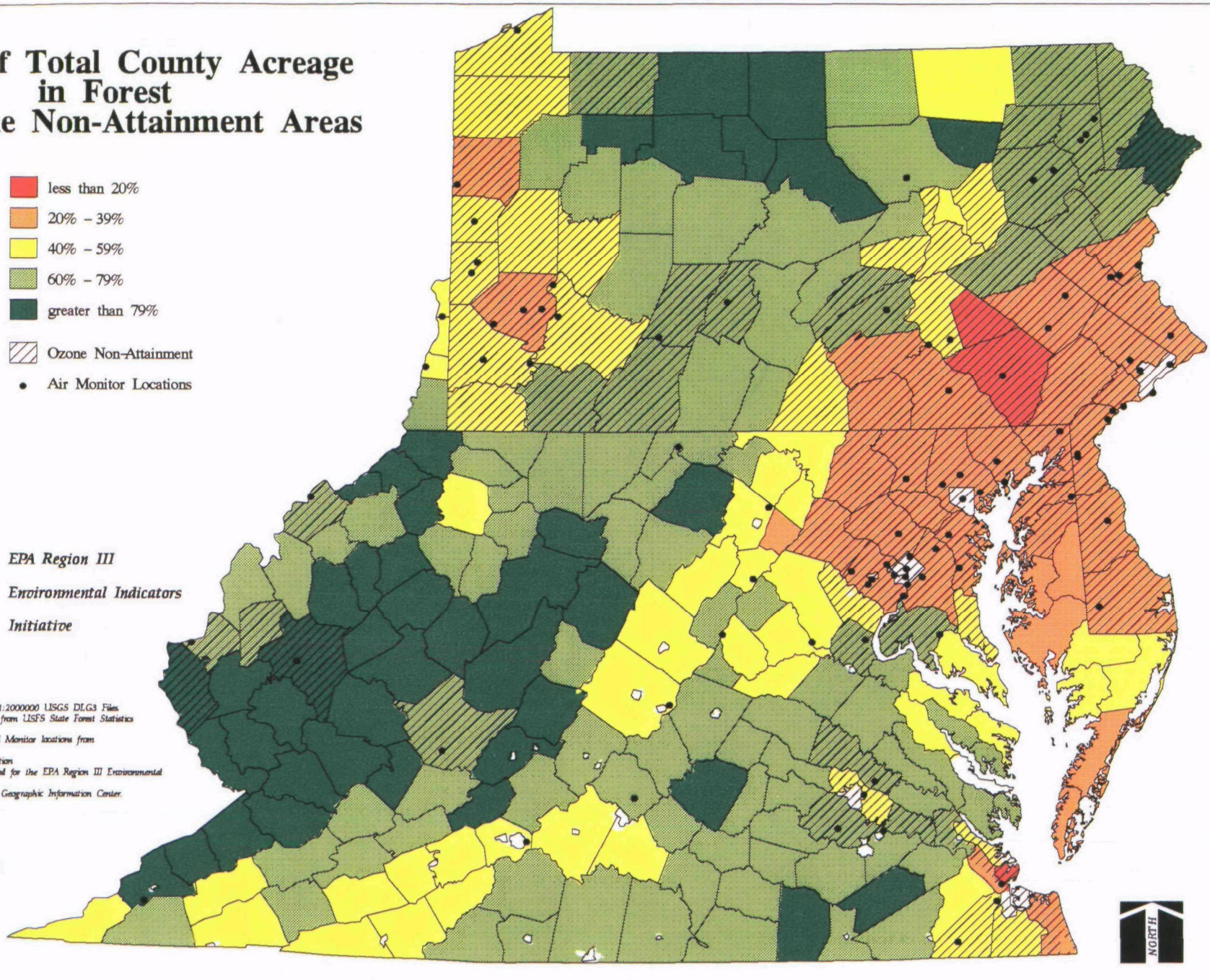
and the EMAP TIER 1 SAMPLING FRAME



Digitized version produced in 1989,
by S.H. Azevedo, Forest Ozone Team,
USEPA Environmental Research Lab, Corvallis, Oregon

EPA AREAL DATA SYSTEMS BRANCH RESEARCH TRIANGLE PARK, NC 27711

Percent of Total County Acreage in Forest with Ozone Non-Attainment Areas



POPULATION DENSITY WITH OZONE NONATTAINMENT

High ozone levels are strongly correlated with high population density. In densely populated areas, mobile and area sources contribute significant amounts of ozone precursors. As forested areas of Region III become more heavily populated, ozone levels increase and reach concentrations which may stress forest health.

Findings:

* Ozone levels have exceeded both EPA's National Ambient Air Quality Standard (120 ppb) and the Forest Service Redline Value (120 ppb) in forested areas of Region III .

* The impact of increasing population density on forest communities can be profound and includes the impact of increased concentrations of air pollutants such as ozone which are known to present a threat to forest health.

* The US Forest Service, the National Park Service and TVA operate air pollution monitoring stations in selected forests of the Region.

* Sensitive species include some of Region III's dominant forest trees: white pine, black cherry, tulip poplar, red spruce, red maple.

* There has been limited ozone monitoring in the higher-elevation, forested portions of Region III.

Management Recommendations:

* Increase ozone monitoring of rural, forested, high-elevation sites.

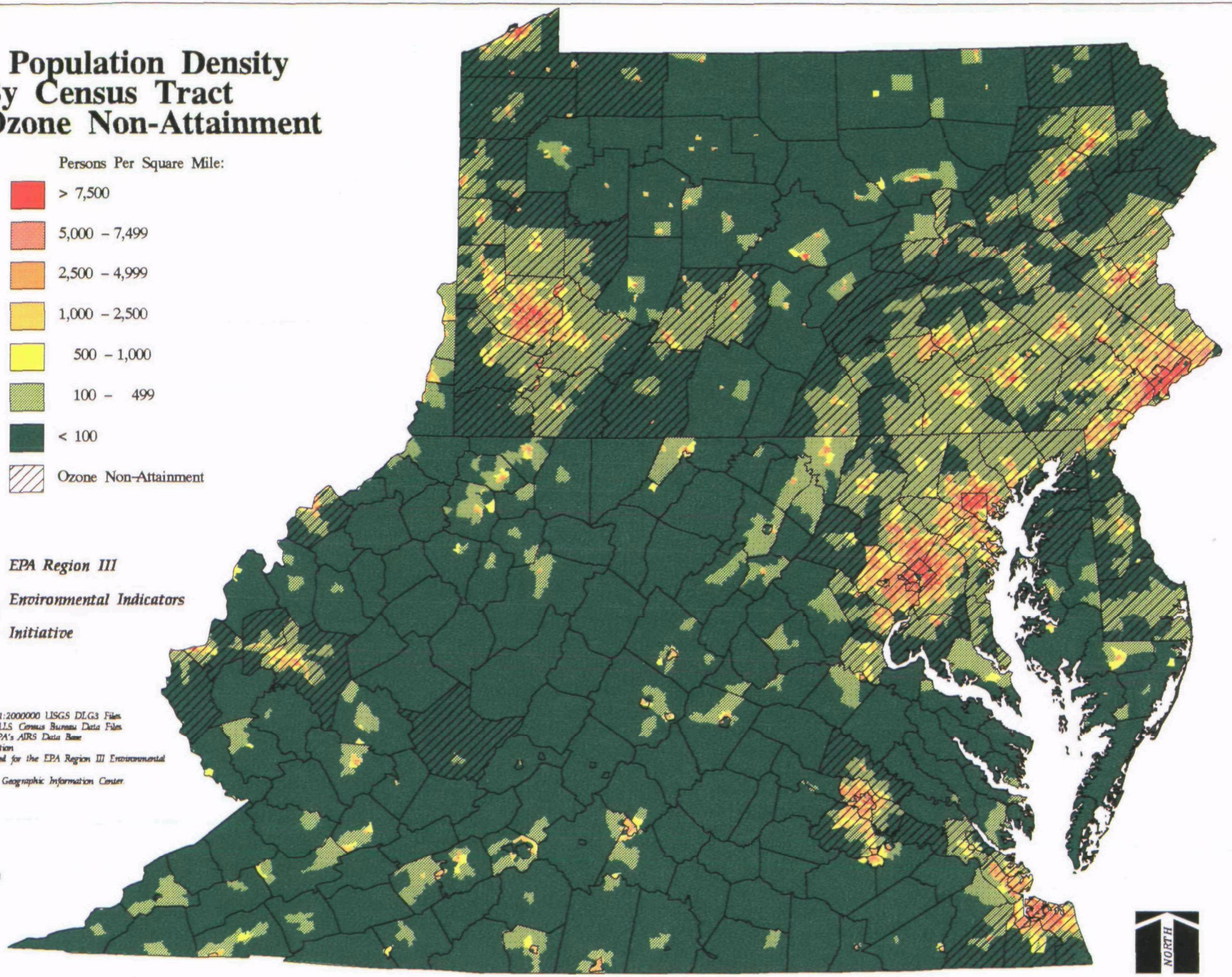
* Encourage the participation of the states of PA and WV in the Forest Health Monitoring Program for Region III.

* Identify sources or causes of ozone non-attainment in heavily forested counties.

* Work cooperatively with other EPA Regions to reduce source emissions of ozone precursors in other states which are impacting Region III through long-range transport.

* Coordinate data collection of Forest Service, National Park Service and TVA with the existing EPA AIRS database.

1990 Population Density By Census Tract With Ozone Non-Attainment



ACID DEPOSITION

Forests in Region III are exposed to the most acidic deposition in the U.S. Acid deposition may pose a long-term threat to forest health in sensitive areas. Sulfate (SO4) and nitrate (NO3) deposition and pH of precipitation were selected for review.

Findings:

* The pH of rainfall throughout the Region averages between 4.0 and 4.5.

* Sulfate loadings range from 10-40 kg/ha/yr; Nitrate loadings range from 10-30 kg/ha/yr.

* Emissions from other EPA Regions is widely acknowledged as a significant contributor to Region III acid deposition loadings.

* In 1990, the National Acid Precipitation Assessment Program (NAPAP) found that, "There is no evidence of widespread forest damage from current ambient levels of acidic deposition in the United States".

  However, symptoms of forest decline at high elevations have been linked to acid deposition. Region III's Appalachian forests fall into this category of high elevation.

* Possible long-term effects may occur, particularly on susceptible soils, due to nitrogen saturation, leaching of nutrients, aluminum mobilization or a combination of all these effects.

Management Recommendations:

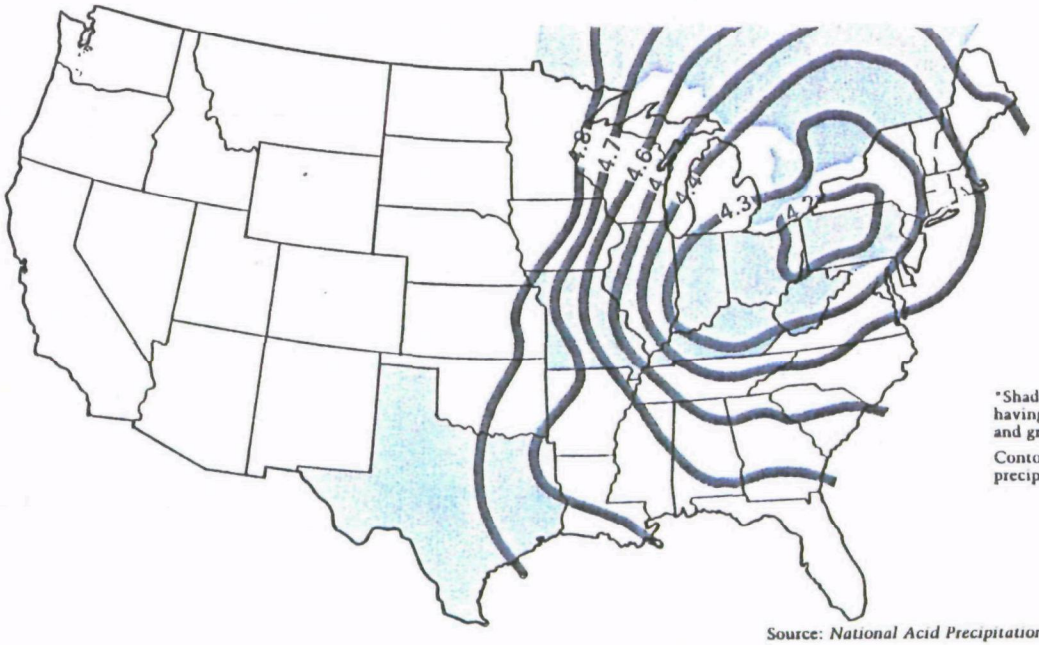
* Monitoring of acid deposition in our Region under the National Atmospheric Deposition Program (NADP) is limited. Increased cooperation with the States, the Forest Service and the National Park Service may make monitoring data more readily available to the EPA.

* Vigorous promotion of alternative transportation to reduce the Regional emissions of NOx.

* Vigorous promotion of energy conservation programs to limit emissions of NOx, and SO2.

Acid Deposition

Areas Where Precipitation in the East is below pH 5

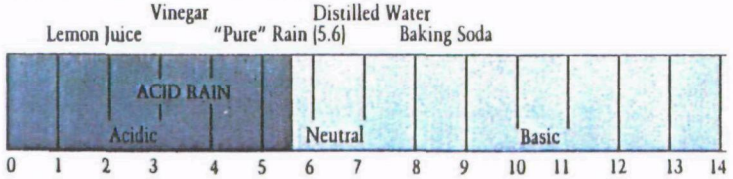


*Shaded areas indicate individual states having emissions of 1,000 kilotonnes of SO_2 and greater.

Contours connect points of equal precipitation pH.

Source: *National Acid Precipitation Assessment Program Interim Report*, 1987, USEPA

How "Acid" is Acid Rain?



The pH scale ranges from 0 to 14. A value of 7.0 is neutral. Readings below 7.0 are acidic; readings above 7.0 are alkaline. The more pH decreases below 7.0, the more acidity increases.

Because the pH scale is logarithmic, there is a tenfold difference between one number and the one next to it. Therefore, a drop in pH from 6.0 to 5.0 represents a tenfold increase in acidity, while a drop from 6.0 to 4.0 represents a hunderedfold increase.

All rain is slightly acidic. Only rain with a pH below 5.6 is considered "acid rain."

* Work cooperatively with other EPA regions to reduce emissions of NOx, and SO2 which are impacting Region III.

* Given the level of controversy over the effects of acid deposition on forest health, Region III should continue to support research efforts aimed at solving the issue.

ANNUAL AVERAGE pH OF RAINFALL FOR 1990 IN REGION III

0 10 20 30 40 50

MILES

Scale 1 : 3500000

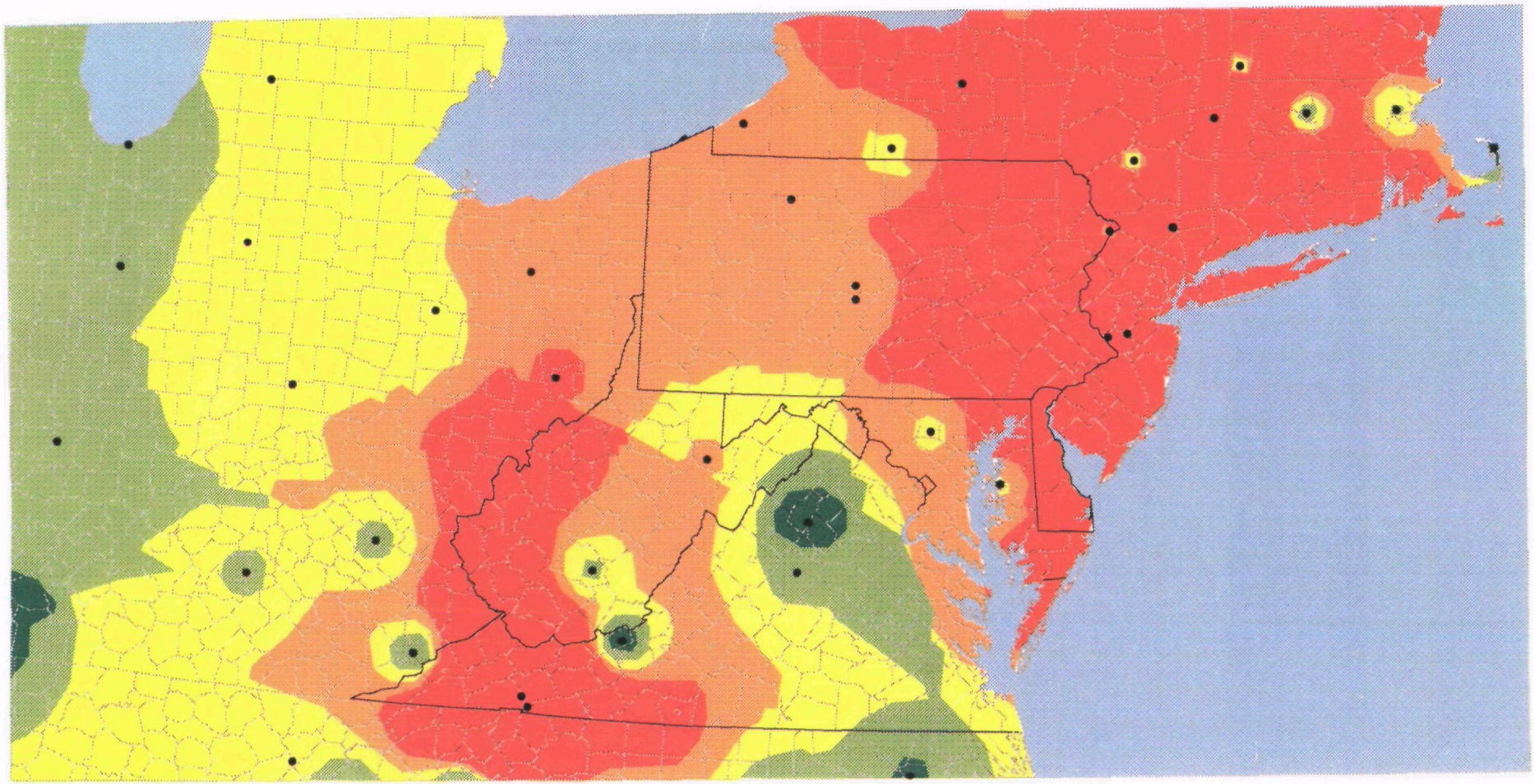
EPA Region III
Environmental Indicators
Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
pH data from the National Atmospheric Deposition Program
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: February 8, 1993

1990 Annual Average (pH)

- < 4.20
- 4.20 - 4.29
- 4.30 - 4.39
- 4.40 - 4.49
- > 4.49

• NADP Monitoring Site



NITRATE DEPOSITION FOR 1990 REGION III

1990 Annual Totals kg/ha

EPA Region III
Environmental Indicators
Initiative

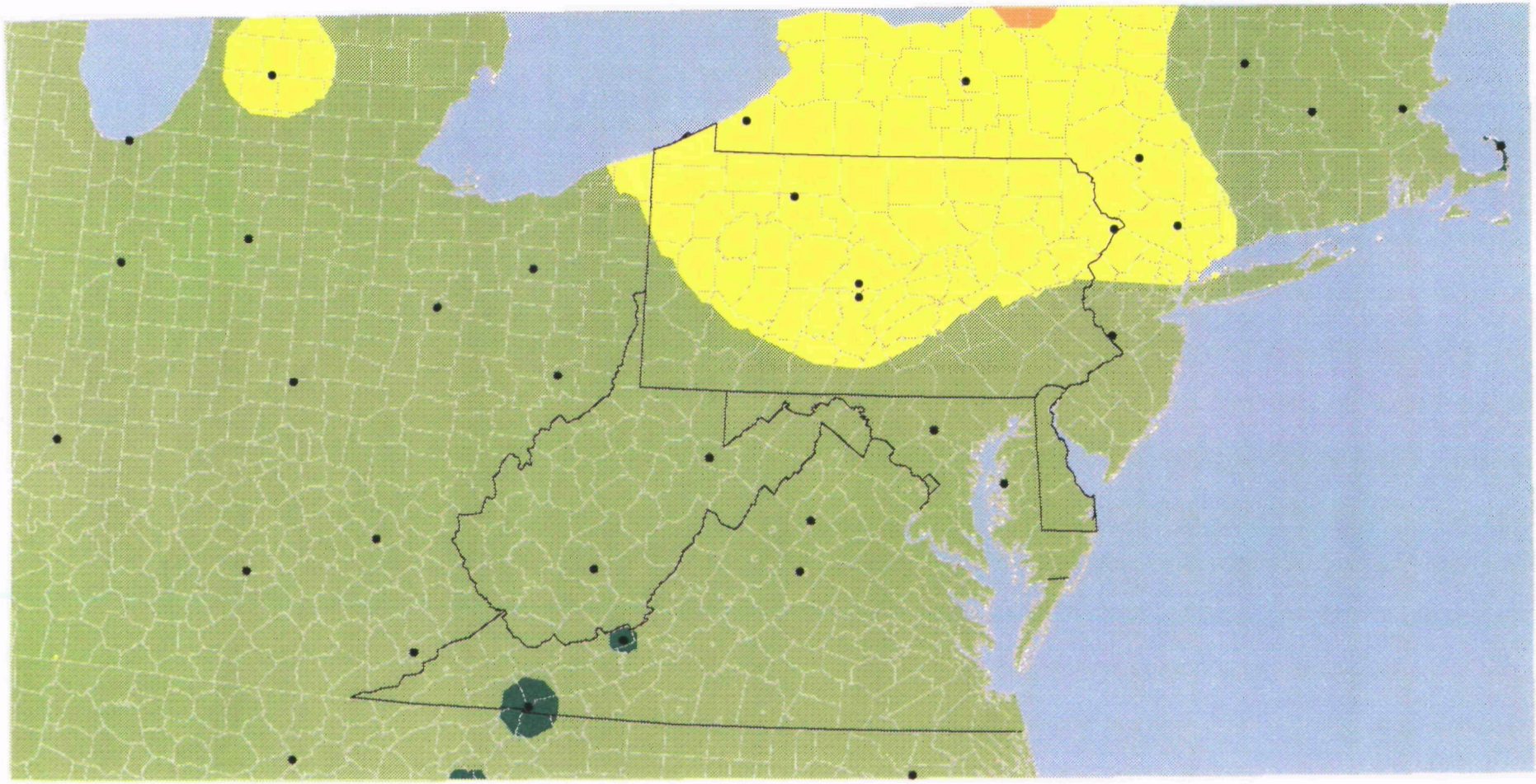
0 - 9.99
10 - 19.99
20 - 29.99
30 - 39.99
40 and above

• NADP Monitoring Site

0 10 20 30 40 50
MILES
Scale 1 : 3500000

NORTH

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Nitrate Deposition data from the National Atmospheric Deposition Program
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: February 8, 1993



SULFATE DEPOSITION FOR 1990 REGION III

1990 Annual Totals kg/ha

EPA Region III
Environmental Indicators
Initiative

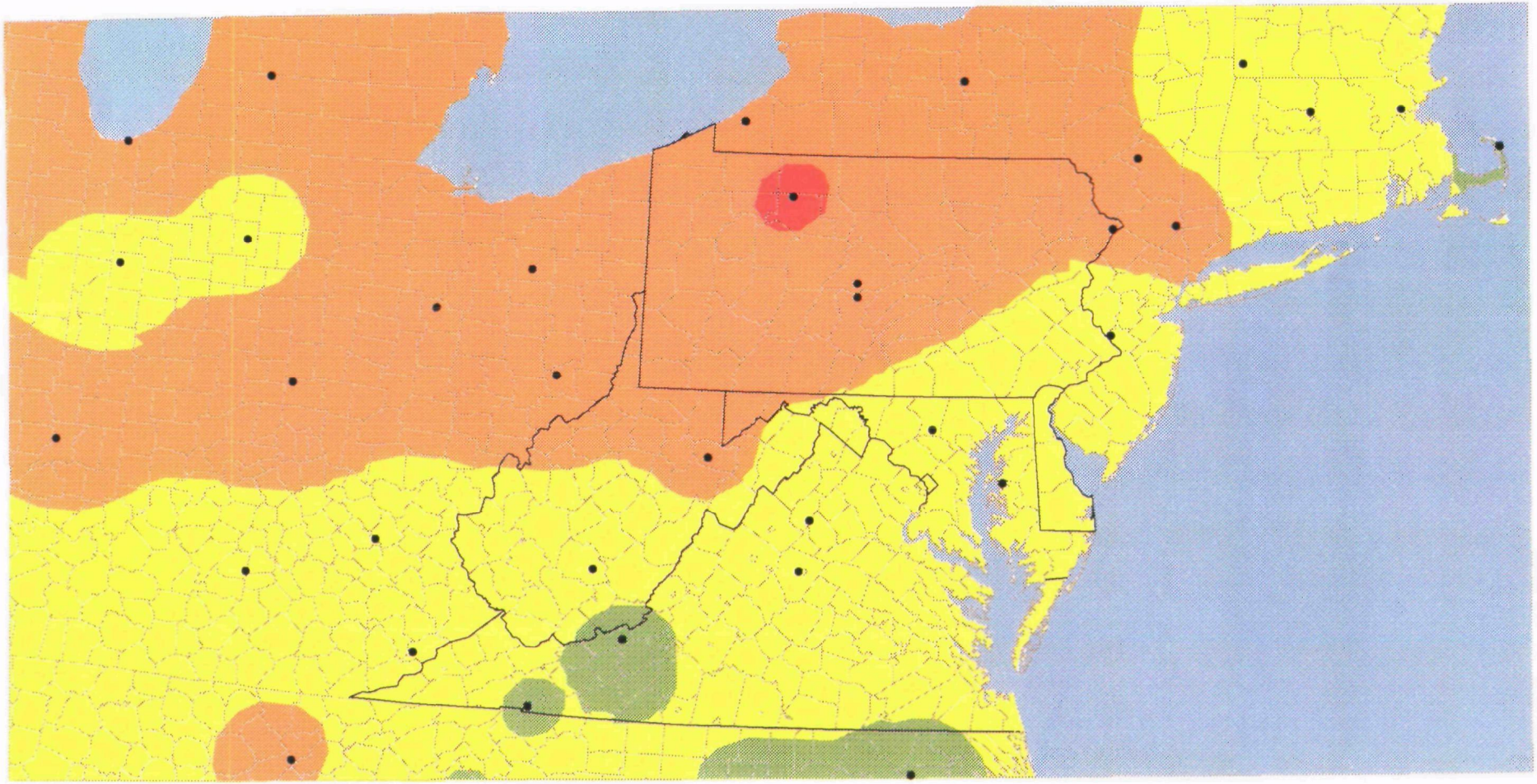
0 - 9.99
10 - 19.99
20 - 29.99
30 - 39.99
40 and above

• NADP Monitoring Site

0 10 20 30 40 50
MILES
Scale 1 : 3500000

NORTH

Source: County Boundaries from 1:1000000 USGS DLG3 Files.
Nitrate Deposition data from the National Atmospheric Deposition Program
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: February 8, 1993



GLOBAL WARMING - "THE GREENHOUSE EFFECT"

Forests could be adversely impacted by the effects of global warming. Certain species of trees may not be able to adapt to climatic changes, thereby potentially placing entire forests at risk.

Findings:

* Scientific consensus exists that global warming is likely to occur.

* Global Warming is caused by "greenhouse gases" in the atmosphere, including carbon dioxide (49%), methane (18%), chlorofluorocarbons (14%), and nitrous oxide (6%).

* It is likely to upset ecosystem balances and cause shifts in species ranges as the climate changes.

* Climatic change could also increase fire frequency and pest infestations.

Management Recommendations:

* Support reforestation efforts to counteract increasing carbon dioxide emission levels in the atmosphere.

* Educational programs (Center for Environmental Learning) directed toward causes and effects of global warming and the role of forests.

* Actions in Region III should be part of a coordinated national/international strategy.

* Air programs should use forest data/concerns to assist in gaining public support for control measures that would decrease emission of greenhouse gases.

FRAGMENTATION

Fragmentation represents one the greatest threats to the functioning of forest ecosystems as habitat for our diverse wildlife populations. Fragmentation can lead to increased exposure of the forest fragments to wind, solar radiation, increased rates of evaporation. Forest fragmentation contributes to the loss of biological diversity by reducing the numbers of species which can be supported in the remnant forests, increases forest species' exposure to higher rates of predation and parasitism, and creates barriers for migration thus contributing to genetic isolation.

Findings:

* There has been no systematic attempt to evaluate the degree and extent of fragmentation in the Region's forests.

* The above finding notwithstanding, Region III's landscape is highly fragmented by roads, pipeline corridors, powerline right-of-ways, impoundments, subdivisions, etc.

* The scientific literature is replete with studies that demonstrate the effects of forest fragmentation as it relates to the forest condition and the maintenance of biological diversity including loss of genetic diversity, increased exposure to predators or nest parasites, increased opportunities for deer encroachment and subsequent browsing damage, invasion of non-native species, increased exposure to climatic variables such as wind and solar radiation.

Management Recommendations:

* Use EPA's grants programs to leverage innovative approaches to local land use planning that reduce fragmentation and promote biodiversity.

* Work closely with the USDA Forest Service's Forest Stewardship program to improve best management practices and encourage good stewardship on private lands.

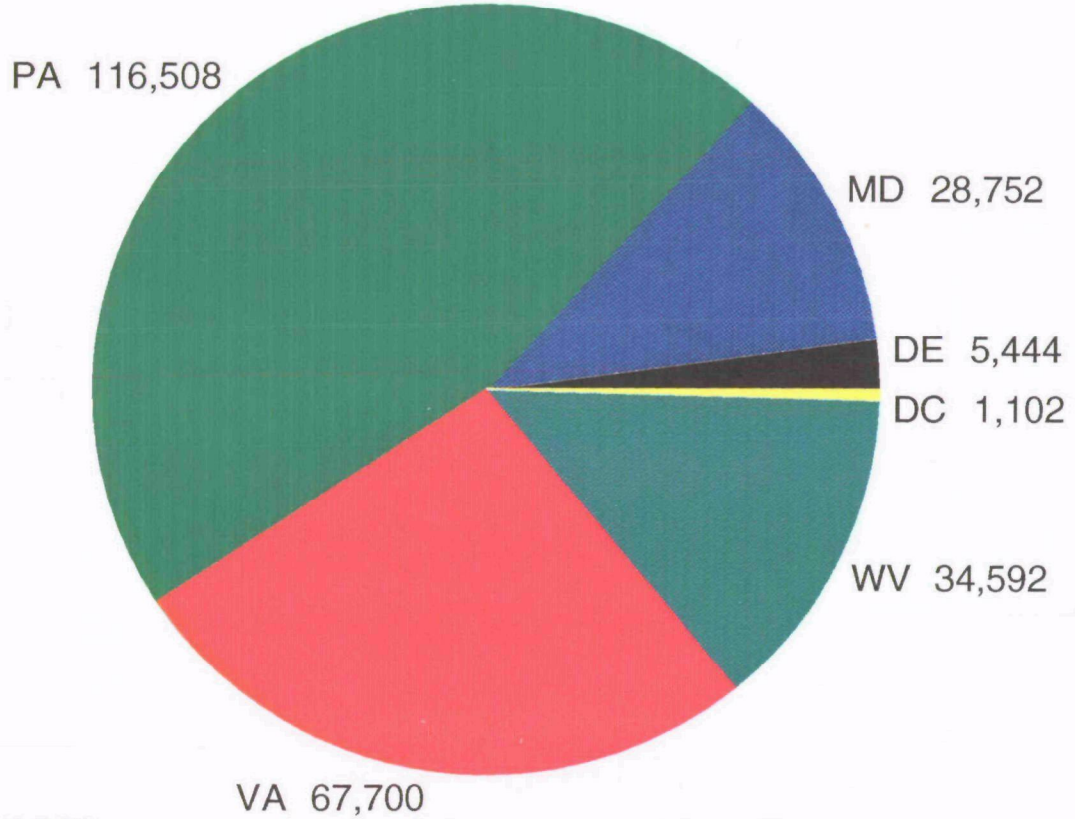
* Leverage NEPA to its fullest extent to better address habitat (forest) fragmentation.

* Work w/EMAP landscape and forest health to obtain digitized land use/land cover data.

* Use GIS to identify forest restoration opportunities that would decrease fragmentation effects and create wildlife/habitat corridors between currently disjunct forest patches. Use enforcement and mitigation agreements to achieve restoration goals.

Total Road Mileage for Region III

(By State)



Total Mileage = 254,098

Source: Office of Highway Infor. Mgt.
Federal Highway Administration

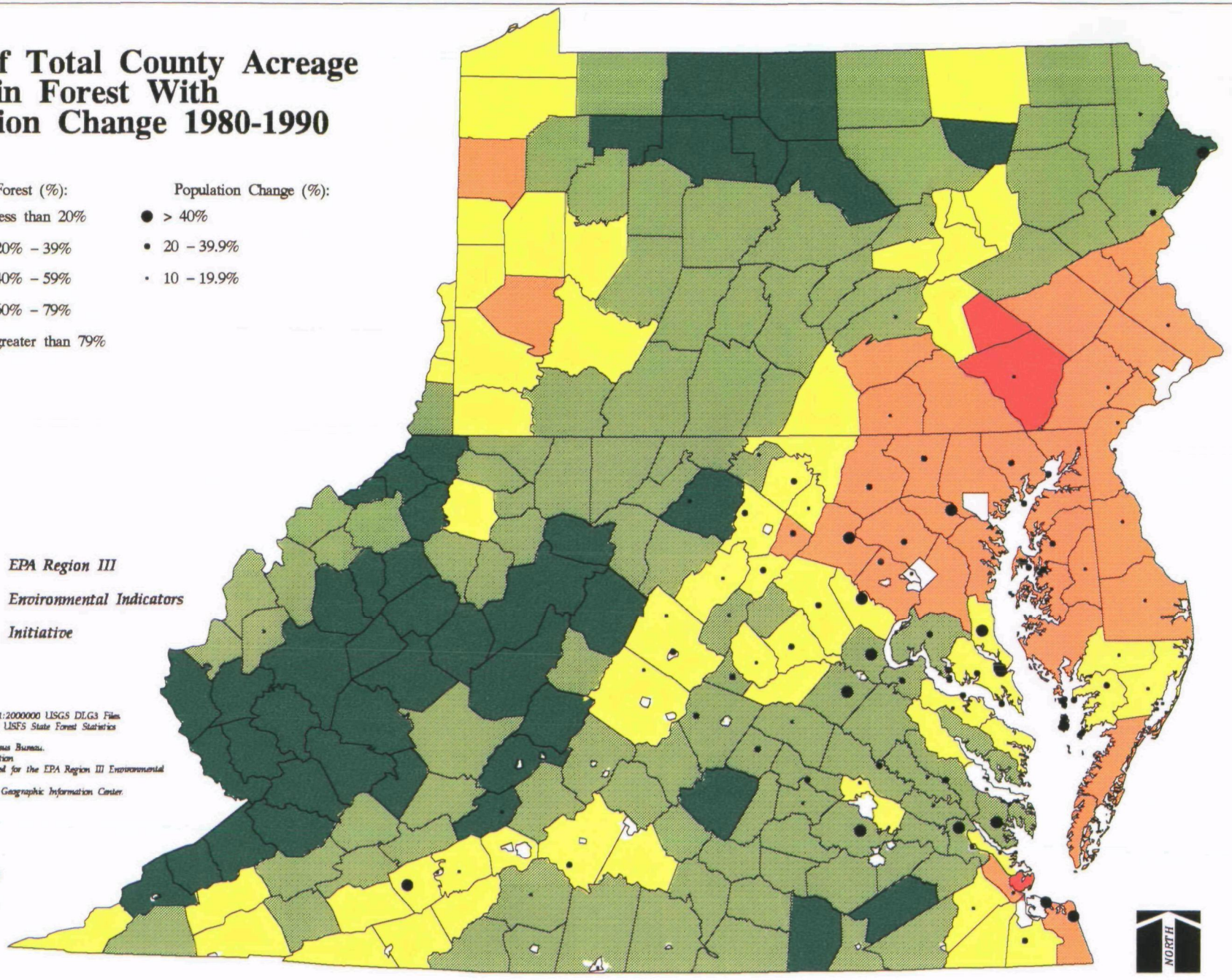
Percent of Total County Acreage in Forest With Population Change 1980-1990

Forest (%):

- less than 20%
- 20% – 39%
- 40% – 59%
- 60% – 79%
- greater than 79%

Population Change (%):

- > 40%
- 20 – 39.9%
- 10 – 19.9%



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Forest statistics from USFS State Forest Statistics Reports.
Population Data from U.S. Census Bureau.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: April 9, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

FRAGMENTATION: ROAD DENSITY/ROAD MILEAGE

In order to provide a coarse evaluation of the extent of fragmentation (by roads only), road density/acre of land was calculated on a county basis. Increased potential for fragmentation could also be related to population change.

Findings:

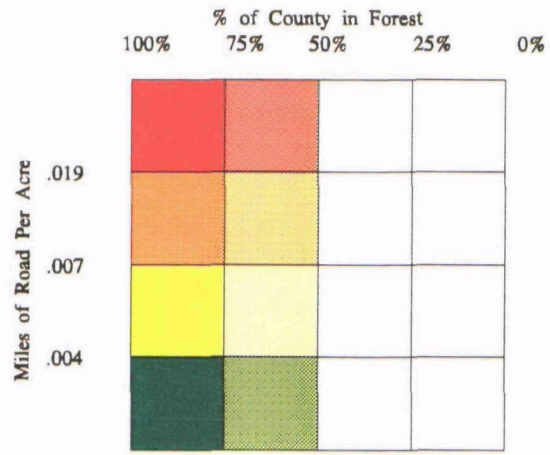
* Several areas of the Region represent potential for increased forest fragmentation by roads. Most notably is northeast PA (Monroe, Pike and Carbon Counties) which are highly forested and undergoing rapid development. Other "hot spots" include southcentral West Virginia and southern Virginia.

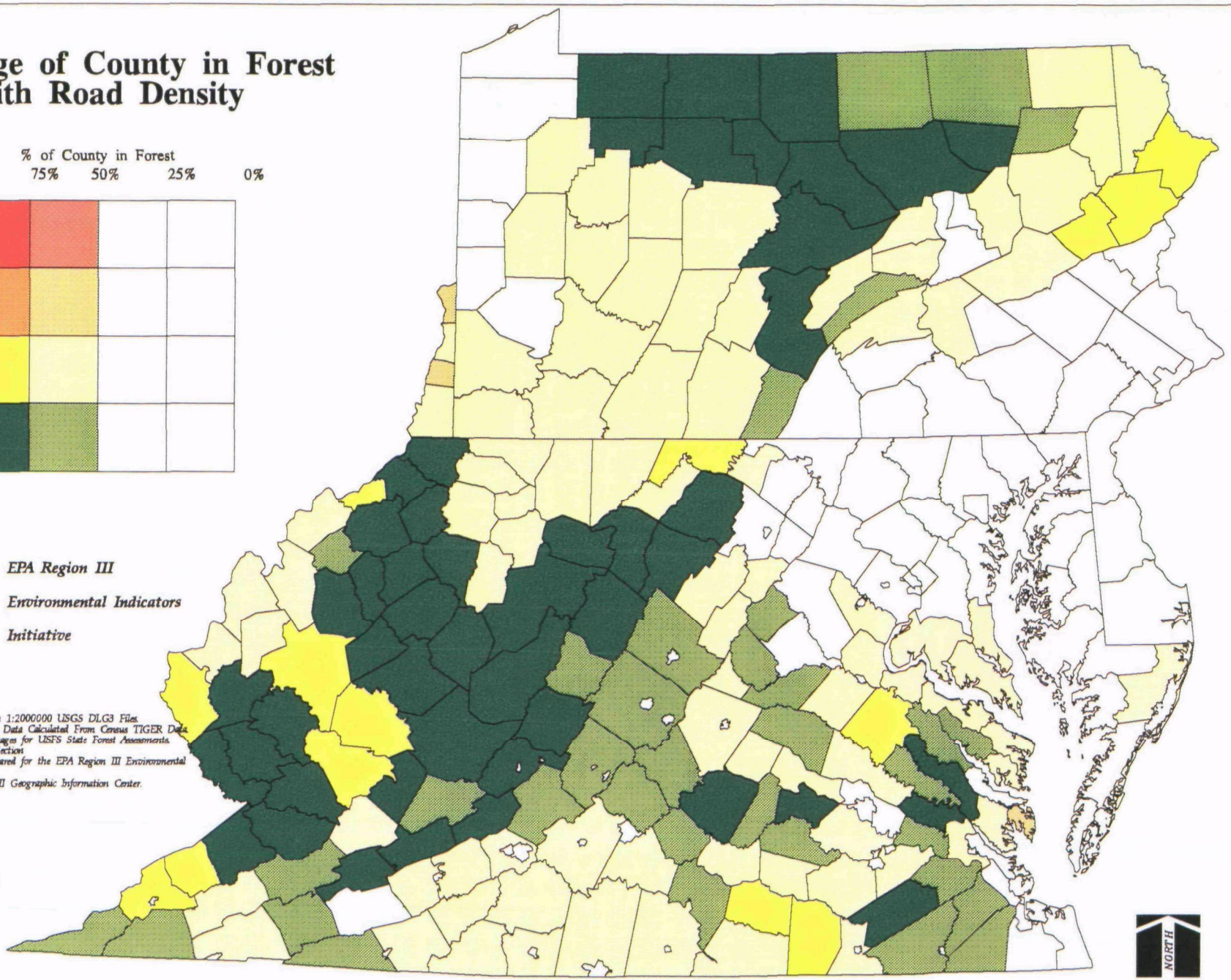
* As various areas within our Region undergo rapid development, primarily in rural areas, the Region's Forest will necessarily become more and more fragmented; thus subjecting the forests to the adverse impacts associated with fragmentation (see previous description)

Management Recommendations:

* Work with state, county and local planning and transportation agencies especially in NE PA, S. Central WV, and S. VA to develop regional transportation plans in an effort to use existing roadways more efficiently and to develop alternative modes of transportation.

Percentage of County in Forest With Road Density





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Road Density Data Calculated From Census TIGER Data.
Forest Percentages for USFS State Forest Assessments.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 19, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

NORTH

SOIL pH

Soil reaction or pH is a measure of the acidity or alkalinity of a soil. Acid soils are poorly buffered, and forests growing on them are therefore more susceptible to nutrient deficiencies and aluminum toxicity.

Findings:

* Many of the soils in Region 3 are naturally acid, with soil pH values below 5.5.

* The most acidic soils (below pH 5.0) occur in the coastal plain areas of Delaware, Maryland, and Virginia, and in western Pennsylvania and West Virginia.

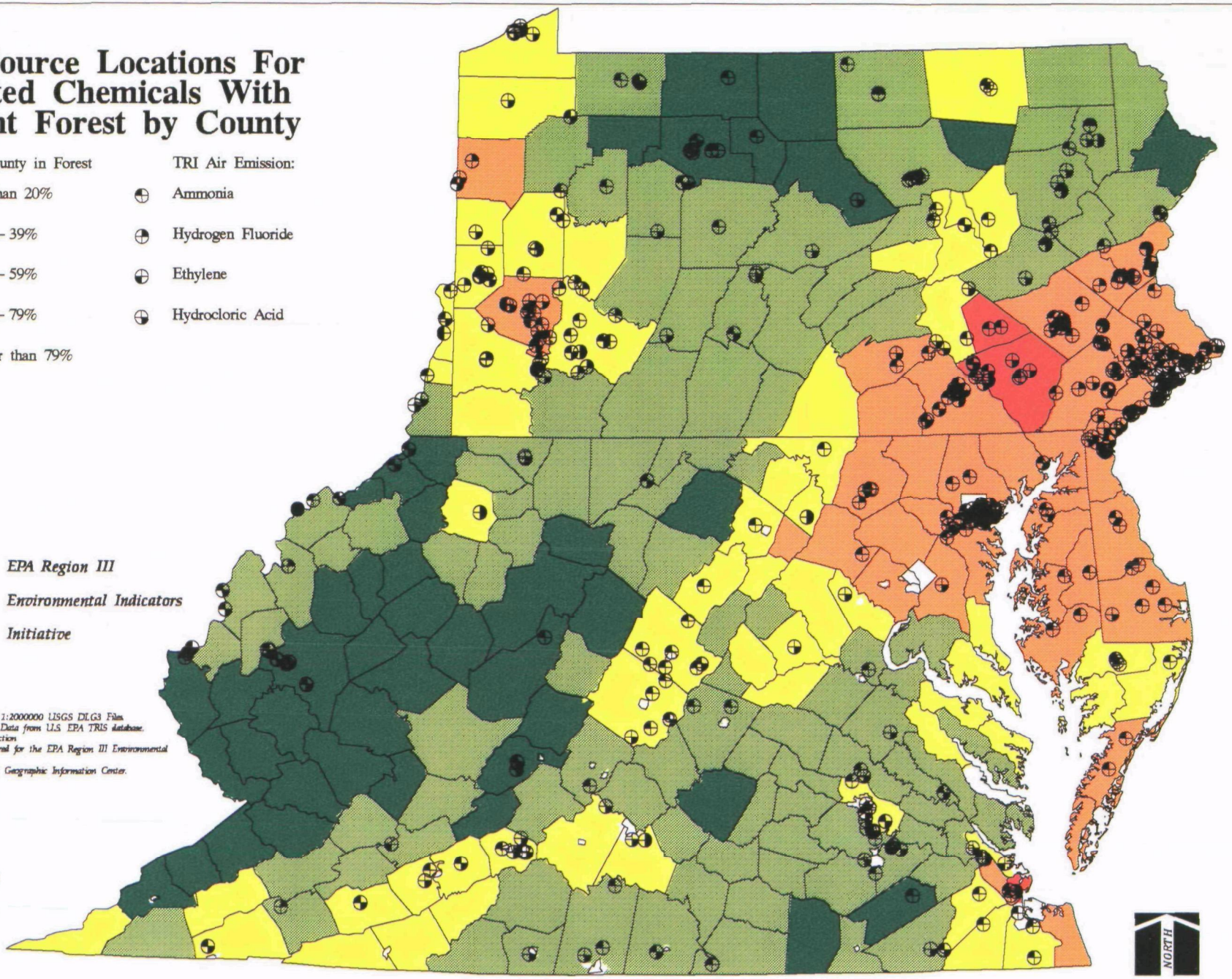
* Research results support an indirect link between high elevation forest decline, acid deposition, and poorly buffered soils.

Management Recommendations:

* Support long-term monitoring and research on long-term acid deposition effects on forest soils.

* Promote energy conservation programs, alternative transportation, and other strategies to reduce acid precipitation emissions.

TRI Source Locations For Selected Chemicals With Percent Forest by County



OZONE

Ozone is widely considered to cause more damage to vegetation than any other air pollutant. Most forests in eastern North America are exposed to ozone and there are indications that ozone is a Region-wide, background stress on forest health.

Findings:

* Ozone levels exceed the National Ambient Air Quality Standard (NAAQS) throughout much of Region III.

* The US Forest Service red line threshold values are exceeded in most major metropolitan areas, as well as in some rural, forested areas where monitors exist.

* Species sensitive to ozone include some of Region III's dominant forest trees: white pine, black cherry, tulip poplar, red spruce, red maple.

* There has been limited ozone monitoring in the higher-elevation, forested portions of Region III.

* Region III is impacted by the transport of ozone and its precursors from adjoining EPA Regions.

Management Recommendations:

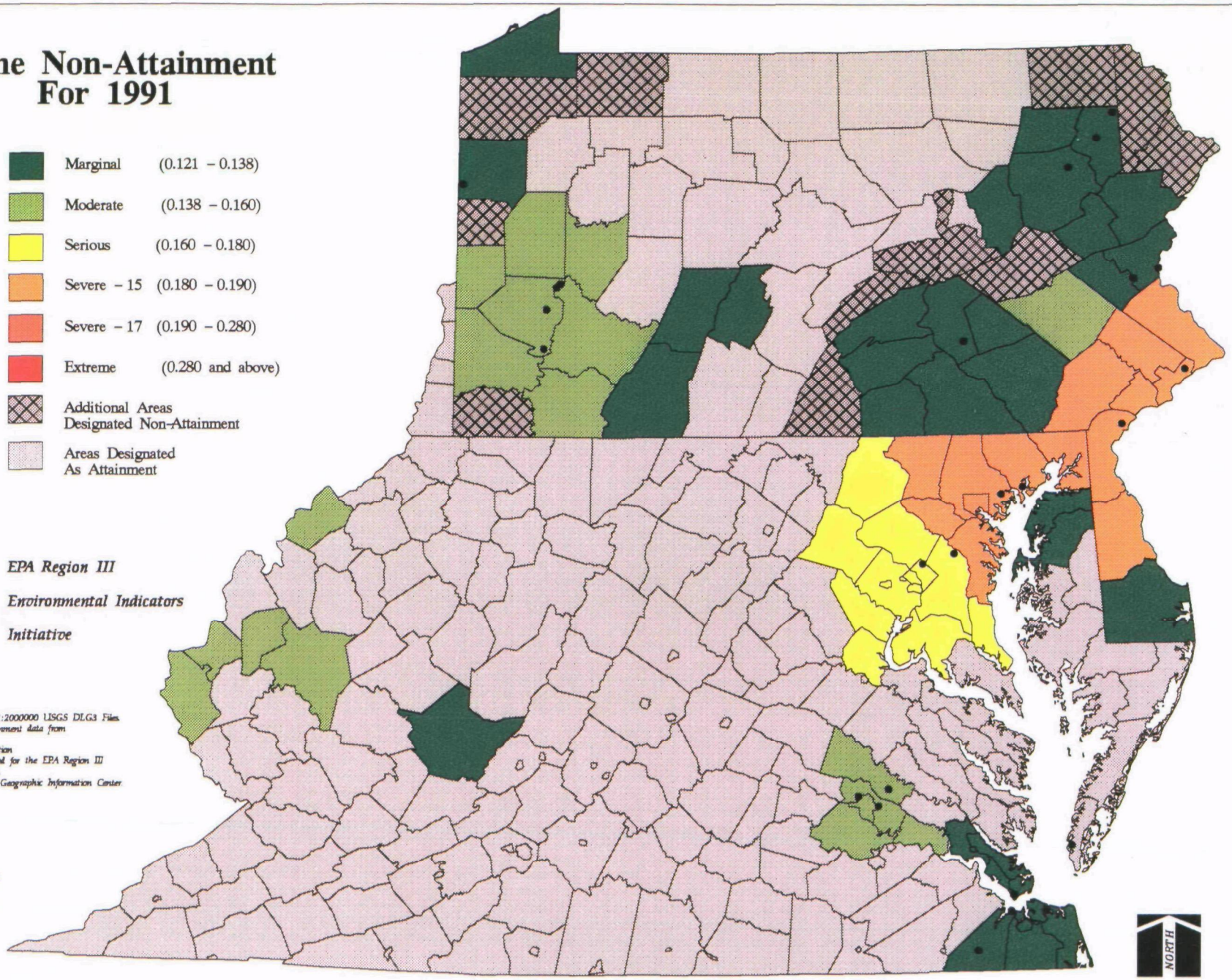
* Increase ozone monitoring of rural, forested, high-elevation sites.

* Encourage the participation of the states of PA and WV in the Forest Health Monitoring Program for Region III.

* Identify sources or causes of ozone non-attainment in heavily forested counties and take specific action to reduce emissions.

* Work cooperatively with other EPA Regions to reduce source emissions of ozone precursors in other states which are impacting Region III through long-range transport.

Ozone Non-Attainment For 1991



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Ozone Attainment/Non-Attainment data from U.S. EPA AIRS database.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center
Date: March 10, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

PERCENT FOREST BY COUNTY WITH OZONE NONATTAINMENT

A number of the heavily forested counties in Region III are designated in nonattainment for Ozone.

Findings:

* Ozone levels have exceeded both EPA's National Ambient Air Quality Standard (120 ppb) and the Forest Service Redline Value (120 ppb) in the following forested counties: WV: Greenbrier, Kanawha, Putnam, Cabell, Wayne and Wood; Stafford, VA: Chesterfield, Hanover, Charles City and James City; MD: Charles; PA: Fayette, Somerset, Cambria, Blair, Warren, Susquehanna, Wayne, Pike, Wyoming, Monroe, Carbon, Schuylkill, Juniata and Perry.

* The US Forest Service, the National Park Service and TVA operate air pollution monitoring stations in selected forests of the Region. Still, there has been limited ozone monitoring in the higher-elevation, forested portions of Region III.

* Sensitive species include some of Region III's dominant forest trees: white pine, black cherry, tulip poplar, red spruce, red maple.

* Region III is impacted by the transport of ozone and its precursors from adjoining EPA Regions.

Management Recommendations:

* Increase ozone monitoring of rural, forested, high-elevation sites.

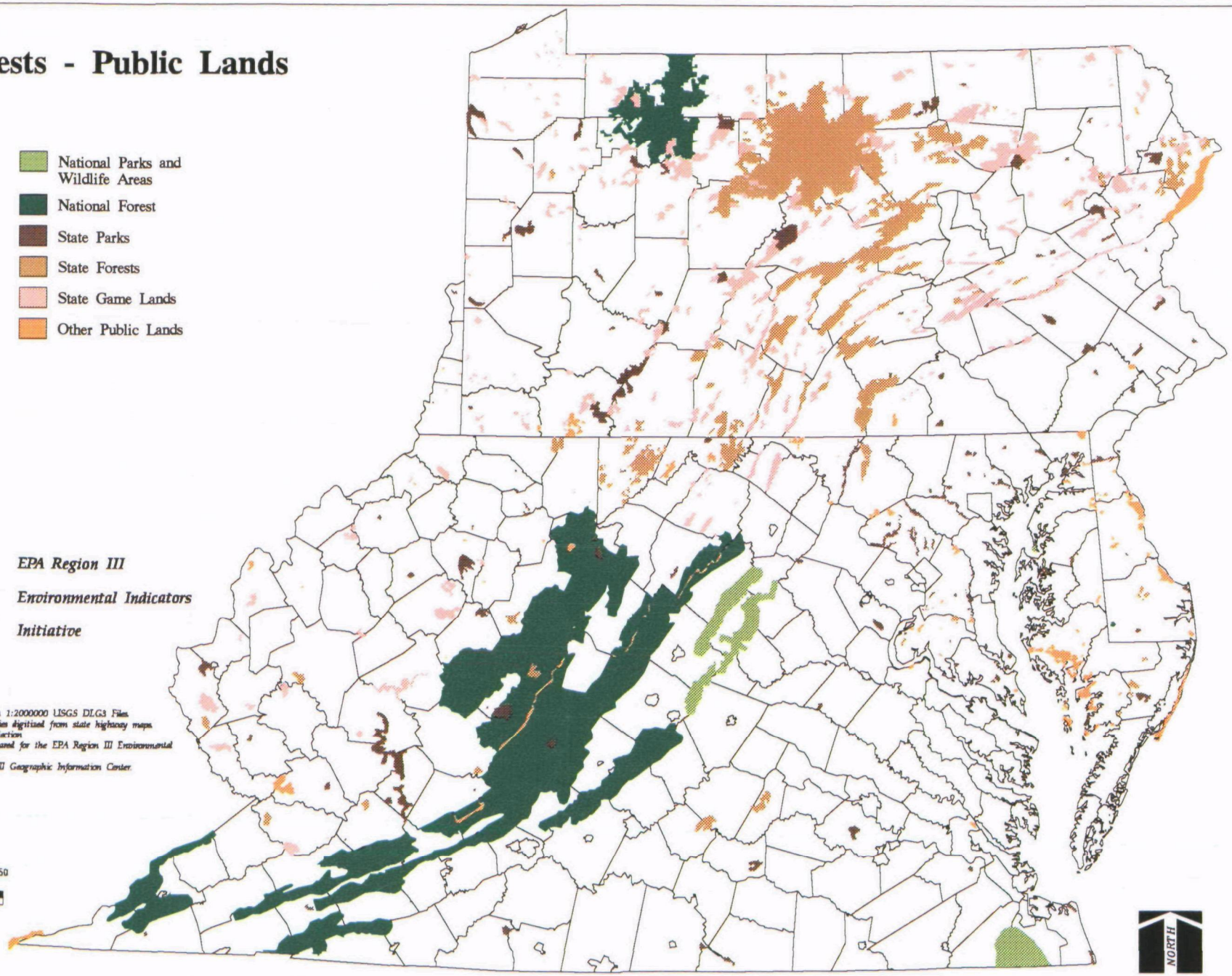
* Encourage the participation of the states of PA and WV in the Forest Health Monitoring Program for Region III.

* Identify sources or causes of ozone non-attainment in heavily forested counties.

* Work cooperatively with other EPA Regions to reduce source emissions of ozone precursors in other states which are impacting Region III through long-range transport.

* Coordinate data collection of Forest Service, National Park Service and TVA with the existing EPA AIRS database.

Forests - Public Lands



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Park boundaries digitized from state highway maps.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 16, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

SAWTIMBER
(Forest Maturity)

Sawtimber stands are forested areas with a significant proportion of hardwood trees greater than 11 inches in diameter, or softwoods greater than 9 inches in diameter. As such, sawtimber stands represent the Region's more mature forests. These stands are more economically valuable than younger forests. They also tend to be more ecologically valuable, because they are more structurally diverse and can support a wider range of biodiversity, than younger forest stands.

Findings:

* Sawtimber stands are mapped for PA, DE, MD, and WVA.

* The Region's highest concentration of mature stands is in WVA.

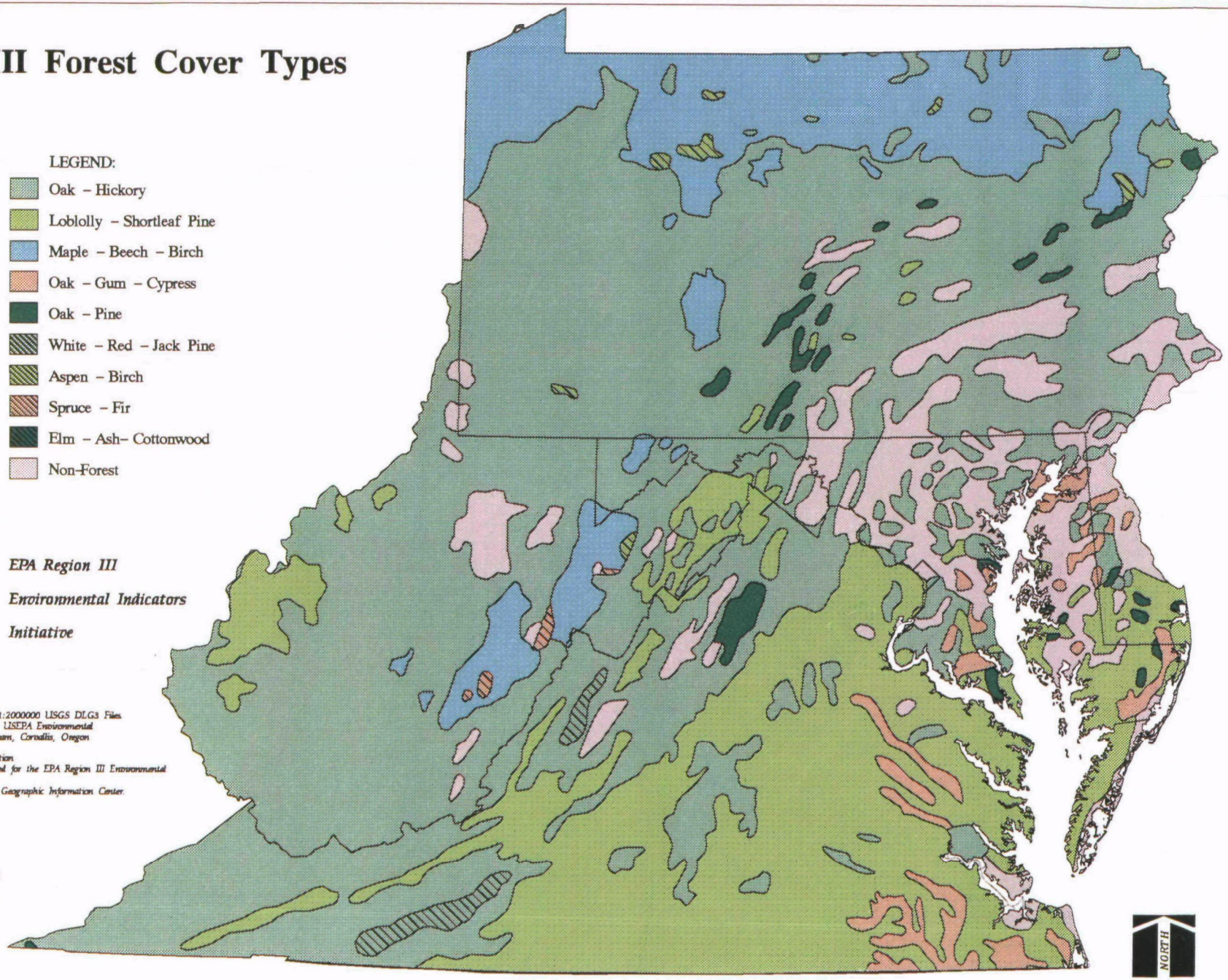
* The metropolitan areas around Philadelphia, Baltimore, Washington, and Pittsburgh generally have the Region's lowest concentrations of mature forests.

Management Recommendations:

* Use EPA grants and the NEPA review process to encourage innovative land use planning which promotes stewardship of large tracts of mature forests.

* Work closely with the U.S. Forest Service to improve best management practices and encourage stewardship on privately owned forests.

Region III Forest Cover Types



LEGEND:

- Oak - Hickory
- Loblolly - Shortleaf Pine
- Maple - Beech - Birch
- Oak - Gum - Cypress
- Oak - Pine
- White - Red - Jack Pine
- Aspen - Birch
- Spruce - Fir
- Elm - Ash- Cottonwood
- Non-Forest

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Forest Cover Data Digitized by USEPA Environmental Research Lab - Forest Ozone Team, Corvallis, Oregon 1989.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: February 10, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

BIODIVERSITY

Genetic and species diversity, as elements of biological diversity, contribute to the overall functioning and health of forests. In order to better understand the status of our forests and the potential for adverse effects, exploring aspects of biological diversity is essential.

Findings:

* There currently is no comprehensive dataset which describes our Region's biodiversity

* The best information available is limited to rare, threatened and endangered species or plant communities; This provides an incomplete picture of the Region's biodiversity.

* Some forest dependent species are doing well, including deer, resident songbirds, small mammals.

* Some forest dependent species are in trouble including Neotropical migratory songbirds, large predators, and amphibians; forest fragmentation, air pollution, pesticide use are implicated in these declines.

Management Recommendations:

* Enhance existing information (threatened and endangered species) through the following means:

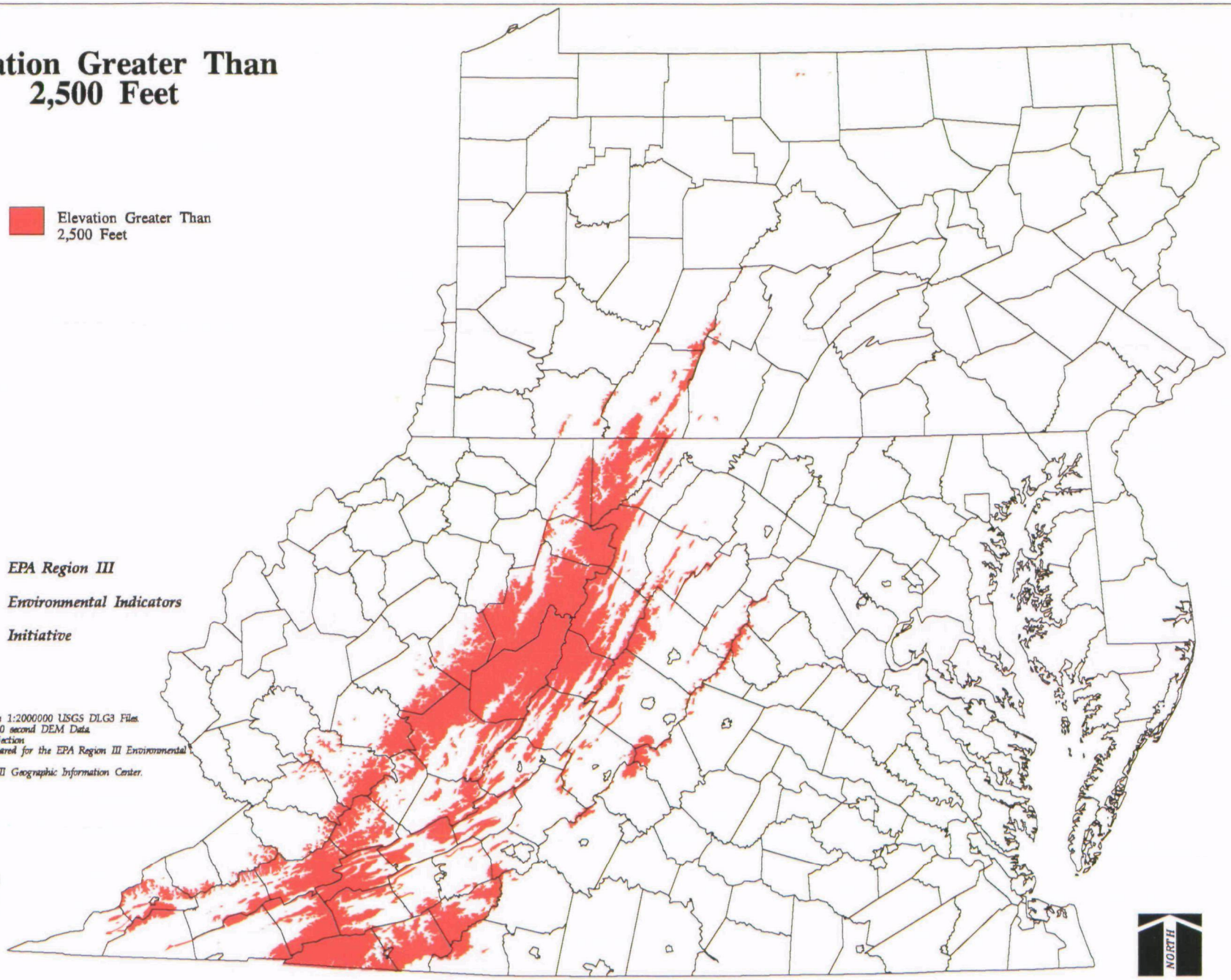
  Support EPA's National Biodiversity Assessment Program with Regional input

  Support US Fish and Wildlife Service's Gap Analysis Program

* Implement EPA's Habitat Strategy (see technical support documents)

* Leverage existing programs to reduce potential risks (air pollution, habitat fragmentation) to forest biodiversity.

Elevation Greater Than 2,500 Feet



EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Elevation Data From USGS 30 second DEM Data.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 28, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

BREEDING BIRDS (Breeding Bird Survey and other related data)

Birds and bird communities represent elements of our Region's biodiversity, of which many species are forest dependent. Often a sign of a healthy ecosystem lies in its ability to provide the necessary habitat and life history requirements (territory size, foraging areas, etc.) to support wildlife populations. To date, the Breeding Bird Survey represents the only longterm monitoring program of nongame avian population trends. Other avian datasets, including state Breeding Bird Atlases and Christmas Bird Counts, can supplement our knowledge of avian population status, trends and distribution.

The use of birds as indicators of environmental change can provide additional insight to the effects of change (or stress) when complemented with other similar kinds of information.

Findings:

* Declining populations of several migratory bird species have captured the attention of both scientists and land managers at all levels of government. The analysis of the Breeding Bird Survey (BBS) trend data provided the first warning signs that certain Neotropical Migratory songbirds were in decline. Many of these species are area-dependent forest interior species (i.e. these birds require large tracts of unfragmented forest to successfully breed).

* Although deforestation of the tropical rainforest (wintering grounds) was initially perceived as the major causal factor of songbird population declines, there is sufficient evidence pointing to habitat alteration (fragmentation) and degradation (pesticide use, etc.) on the temperate North American breeding grounds as contributing to the decline of our songbird populations.

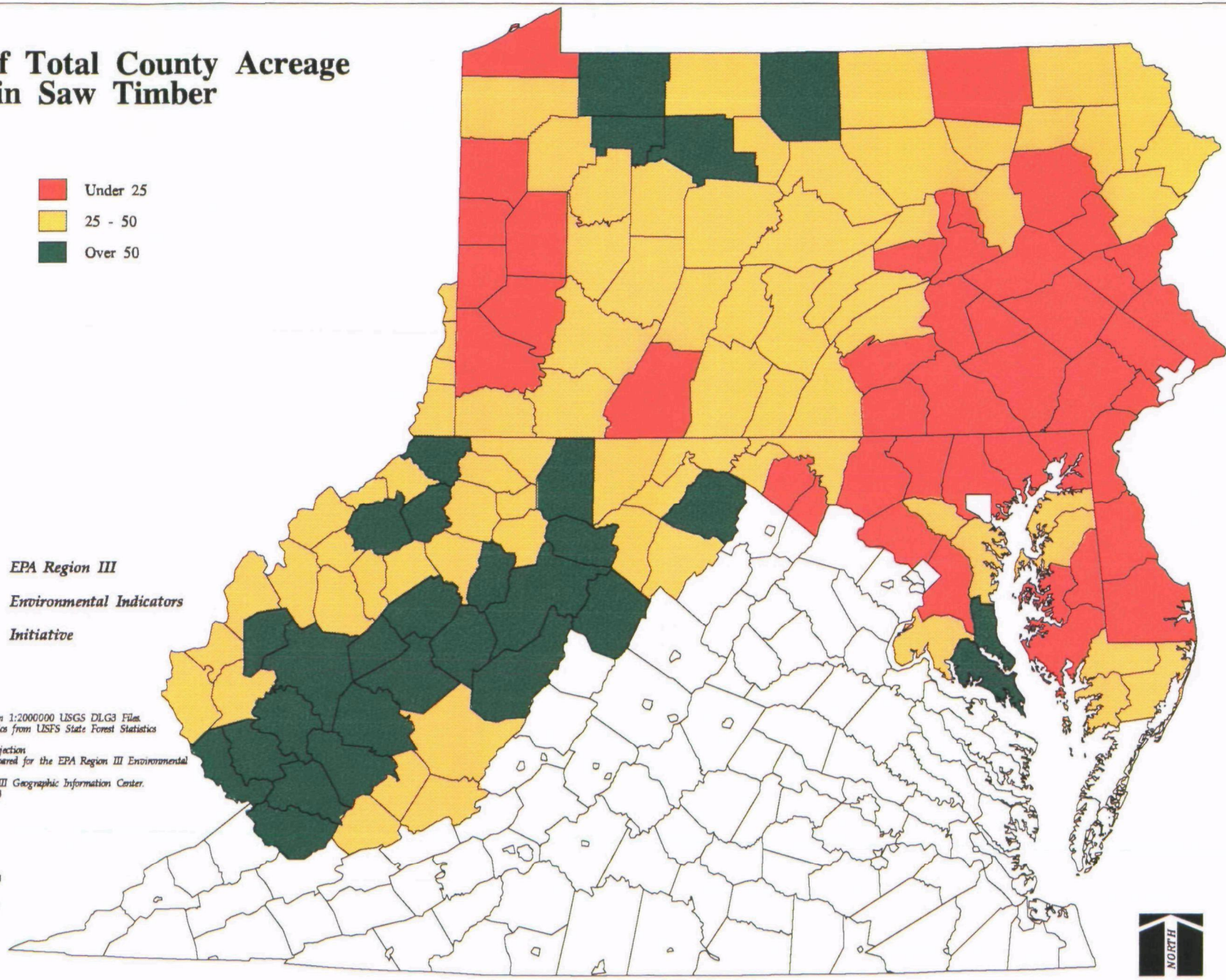
Management Recommendations:

* Support US FWS Gap Analsysis and other techniques to define areas of high biodiversity and associated stressors; Develop a means to offset the effect of stressors.

* Develop and use an avian indicator to monitor changes in forest habitat quantity and quality.

* Support more fully EPA's participation in Partners in Flight, an international, interagency conservation program for neotropical migratory birds.

Percent of Total County Acreage in Saw Timber



EPA Region III

Environmental Indicators

Initiative

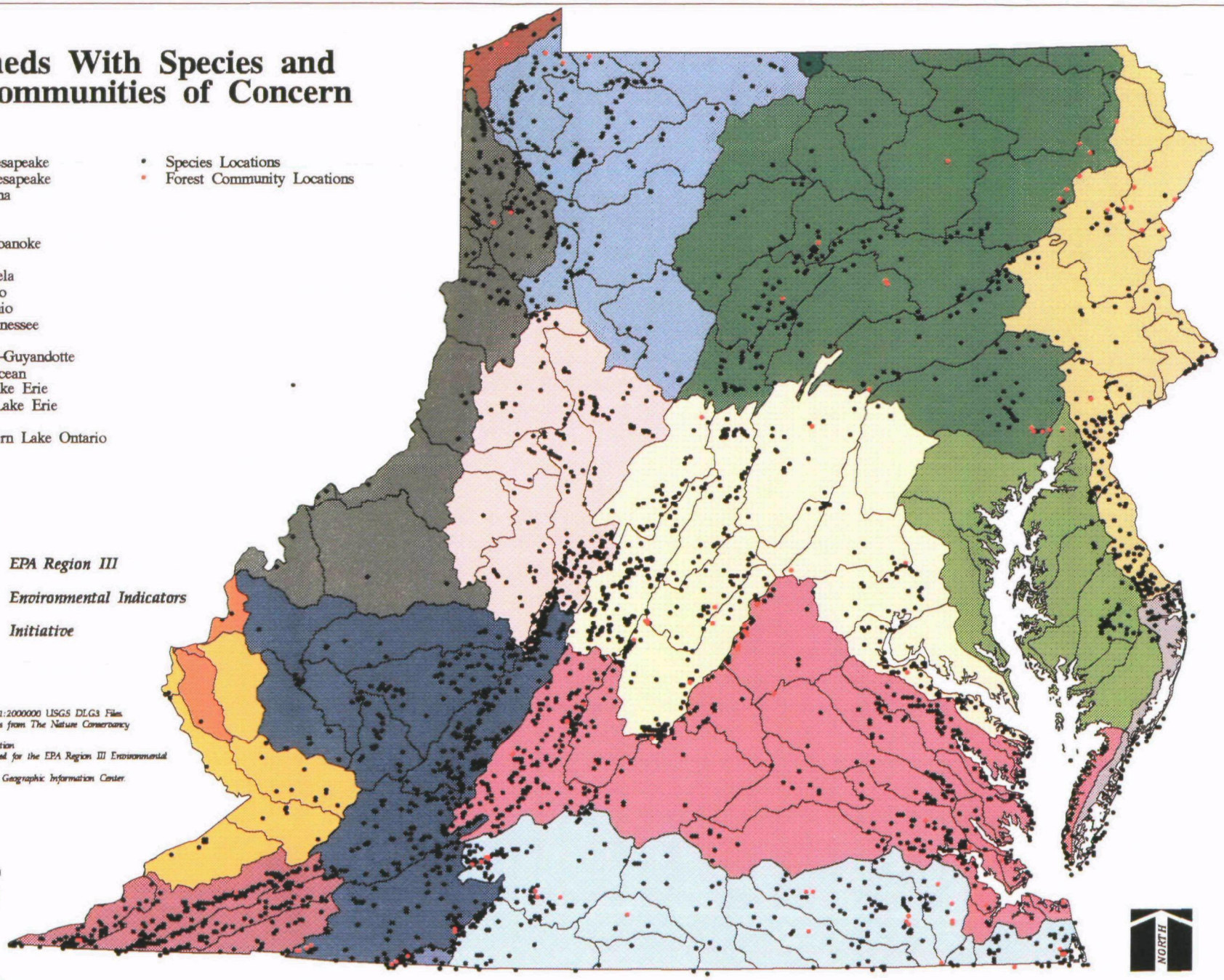
Source: *County Boundaries from 1:2000000 USGS DLG3 Files.*
Forest statistics from USFS State Forest Statistics Reports.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 19, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

Watersheds With Species and Forest Communities of Concern



SPECIES AND FOREST COMMUNITIES OF SPECIAL CONCERN

The protection of rare and endangered species and communities is the front line in the battle to preserve biodiversity.

Findings:

* The inventory of rare and endangered species and communities is an ongoing process conducted by several different agencies and organizations, thus any data set must be considered incomplete.

* Rare and endangered species and communities occur throughout Region III, with concentrations along the Appalachian Mountain range and in a number of sub-watersheds.

* Region III has lost many species since human settlement such as the wood bison, elk, timber wolf, mountain lion: all large predators which require large areas of undisturbed habitat.

* Most rare forest communities are associated with extreme environmental conditions such as high elevations or saturated conditions.

* Bioreserves represent a new approach by The Nature Conservancy to identify and protect areas that harbor concentrations of rare species and communities and/or exhibit a high level of species biodiversity, and that require a landscape or ecosystem level of protection.

Management Recommendations:

* Enhance existing data and state of knowledge through the following means:

  Support/promote EMAP monitoring in high elevation forests and/or areas of high biodiversity.

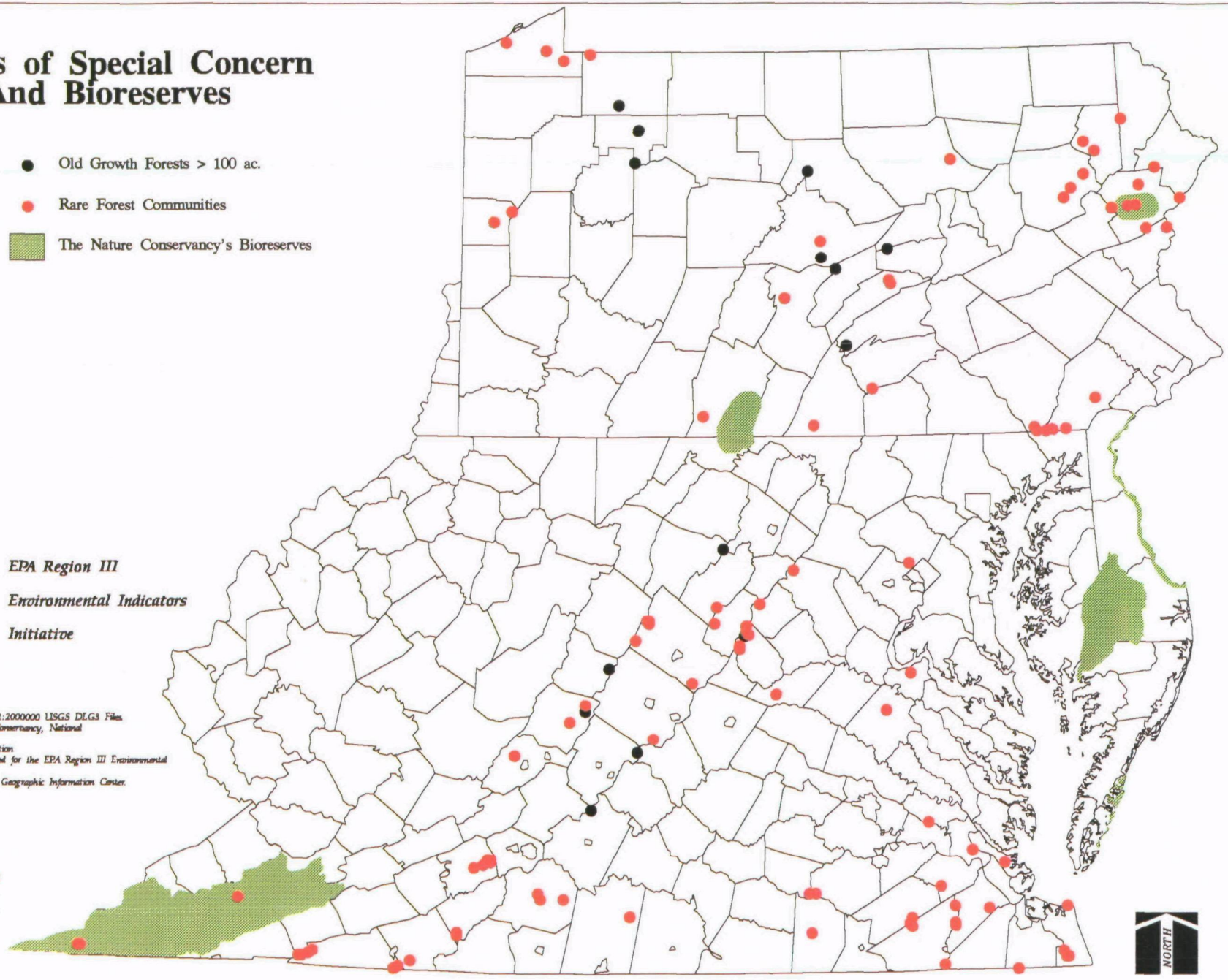
  Negotiate data sharing agreements w/State Heritage Programs & U.S. Fish and Wildlife Service on Region-wide basis. Include "candidate" species listed under the Endangered Species Act, during regulatory reviews.

  Consider candidate as well as listed species under the Endangered Species Act when implementing EPA Programs (i.e. CWA reviews, Superfund R.A., NEPA, etc.).

* Target bioreserves and other watersheds w/high biodiversity for special educational, enforcement & pollution prevention initiatives.

* Form partnerships with The Nature Conservancy and other NGO's to set goals and develop innovative conservation and restoration programs.

Forests of Special Concern And Bioreserves



EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Forest data from The Nature Conservancy, National Heritage Programs.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: February 8, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

AIR TOXICS

The selected toxic air pollutants (hydrogen fluoride, hydrogen chloride, ethylene and ammonia) are known to cause acute, catastrophic injury to vegetation close to the emission sources. While the effects of these toxic compounds are typically localized, there are many sources of these compounds in Region III, including in rural, forested counties.

Findings:

* Hydrogen fluoride interferes in the metabolic processes of leaf tissue resulting in loss of chlorophyll, tissue death or necrosis, leaf deformation and discoloration. HF-susceptible species occurring in Region III include members of the following groups: pine, fir, ash, aspen, poplar, maple, spruce, birch, elm, willow. Facilities emitting HF occur in heavily forested counties of PA and WV.

* Ethylene induces senescence, abscission, epinasty or leaf curling, inhibition of flowering, promotion of flowering, etc.The largest source of ambient ethylene is automobile emissions.

* Hydrogen chloride causes marginal or interveinal chlorosis and necrosis of plant tissue. HCl-susceptible species occurring in Region III include species of cherry and maple. There are numerous facilities emitting HCl in Region III. Many are in heavily forested counties.

* Ammonia causes foliar tissue collapse and eventual necrosis. There are numerous facilities emitting ammonia throughout Region III.

Management Recommendations:

* Compare emissions w/sensitive forest areas; target sources for enforcement, P2, and public outreach.

* There is currently no monitoring for ambient concentrations of toxics. An ambient air monitoring program should be considered if foliar injury is found consistently near sources.

* The location of new sources of these toxics should be carefully reviewed when in proximity to forested or other sensitive areas.

HUMAN HEALTH TEAM: (left to right): Nancy Rios (co-leader), Lorna Rosenberg (co-leader), Alice Chow, Bruce Smith, Carol Ann Gross, John Noble, Jeff Burke, Debra Forman, (missing: Jack Kelly, Ghassan Khaled).

Human Health Team

HUMAN BEINGS OF REGION III - THE RECEPTORS

The receptors of the Human Health Group are the human inhabitants of Region III. Based on the 1990 US Census, the approximate total population of our five states, Pennsylvania, Delaware, Maryland, Virginia, West Virginia and the District of Columbia is 25.8 million, which is about 10% of the total national population. In describing human health, often the very young and the elderly are considered to be sensitive population groups to exposure from environmental pollutants. In Region III there are approximately 2 million children under the age of 5 years and 4 million residents over 65 years of age, a combined total of 23% of the entire population. The median age is 33.3 years.

* Approximately 48% of our population is male and 51% female, with a racial configuration of 81% white, 15% black and 4% hispanic and other.

* People live all across the region in cities, suburbs and rural areas. Most of the population however is clustered around our metropolitan areas, consisting of a central city and surrounding suburbs. These urban areas are the residence of choice for 70% of Region III's population with the remaining 30% in rural areas.

* Human health is impacted by many different factors. The systems that now exist for collecting health data on a regional/national basis are inconsistent and difficult to assess. Most significant is their lack of exposure information between the pollutant and the human body; and about the dose of a pollutant or its metabolites that enter the body.

* Cancer occurrence is one measure of the quality of public health. Research reports that diet, use of tobacco and lifestyle choices account for over 70% of these cancer occurrences. Although linkages of cancer in the United States from environmental sources have been postulated, exposure to these stressors has not been defined with an acceptable level of certainty. The Human Health Team reviewed data sets of cancer mortality from lung, liver, kidney and leukemia as those cancers most closely linked with exposure from environmental pollutants. Incidence data for the occurrence of these cancers with environmental exposures was not feasible to collect within the time frame allotted to this project.

* Environmental pollutants are known to have non-cancer effects on the human body as well. Information on non-cancer effects is not centralized, but may be available from individual hospital records. Gathering this data on a regional basis would be significant undertaking. Since the cause and effect relationships of environmental pollutants and human health is uncertain, we have focused our investigation on the potential of stressors to influence health quality.

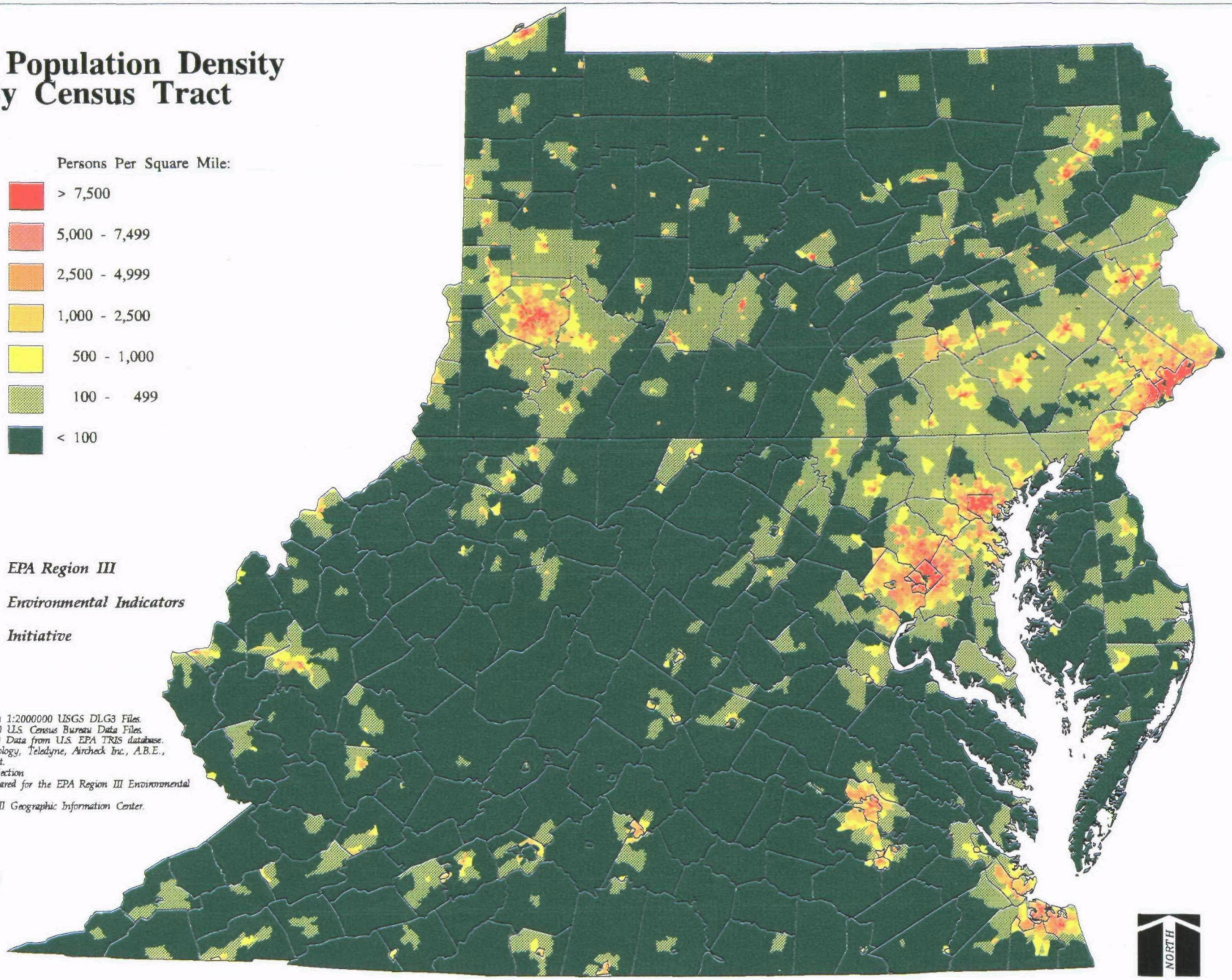
Specifically, we selected the following stressors based on data availability and the fact that their influence is potentially far reaching. Also, they were chosen because we believe and that the Agency's involvement in regulation, abatement, outreach, or education could possibly reduce their impact on human health in Region III.

* Toxic air emissions from point sources
* Ground - level Ozone
* Threats to Public Drinking Water
* Lead
* Radon
* Contaminants in indoor air
* Pesticides

1990 Population Density By Census Tract

Persons Per Square Mile:

- > 7,500
- 5,000 - 7,499
- 2,500 - 4,999
- 1,000 - 2,500
- 500 - 1,000
- 100 - 499
- < 100



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Demographic Data from 1990 U.S. Census Bureau Data Files.
Toxic Release Inventory (TRI) Data from U.S. EPA TRIS database.
Radon Data from Key Technology, Teledyne, Airtech Inc., A.B.E., U.S.T., and the Radon Project.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: February 8, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

Minority Distribution
Region III

Percent Minority Population

- 95 - 100% Minority
- 90 - 94.9% Minority
- 75 - 89.9% Minority
- 50 - 74.9% Minority
- 25 - 49.9% Minority
- 10 - 24.9% Minority
- 5 - 9.9% Minority
- 0 - 4.9% Minority

EPA Region III

Environmental Indicators

Initiative

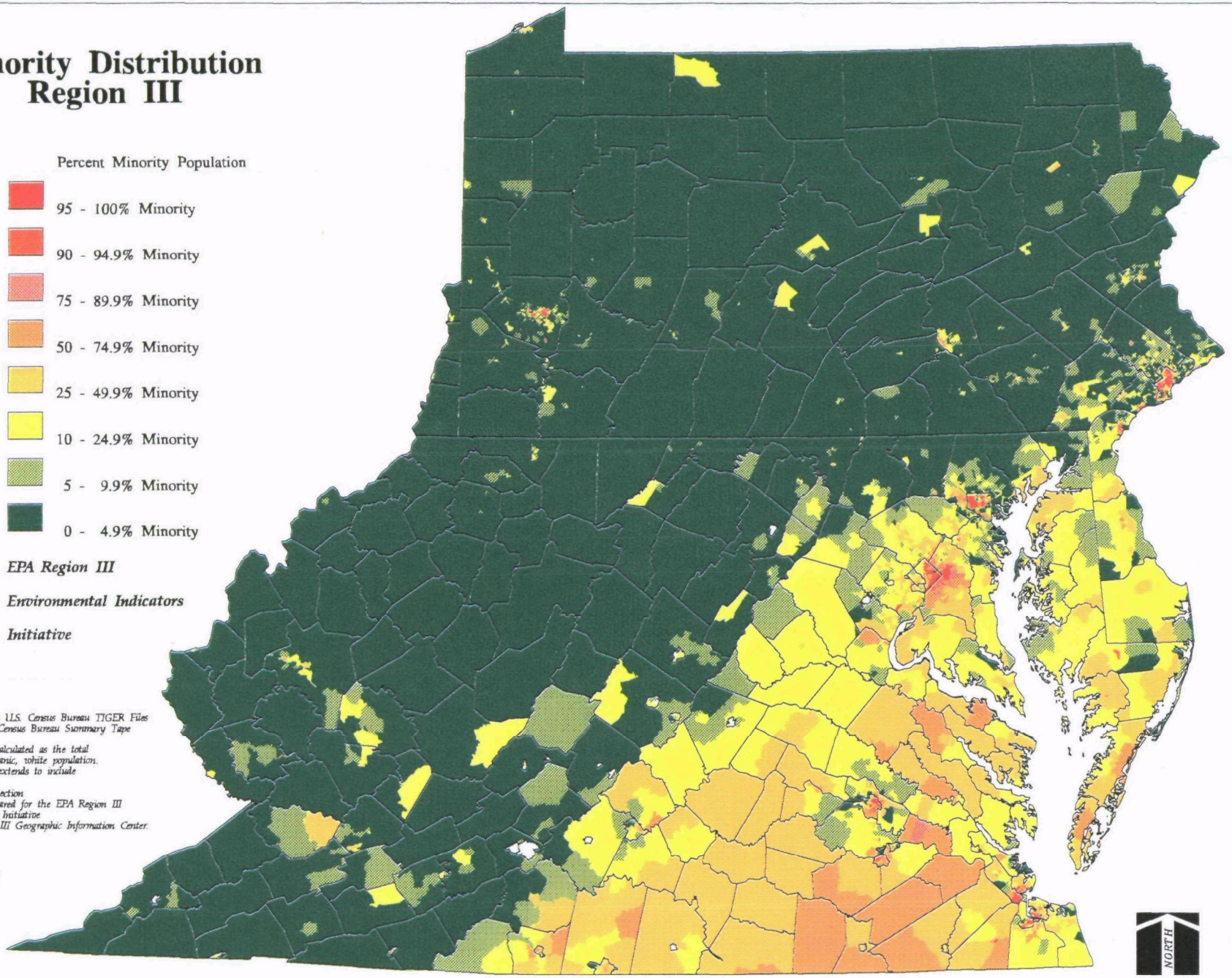
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Source: Census Tract Data from U.S. Census Bureau TIGER Files
Demographic Data from U.S. Census Bureau Summary Tape File - 3A (STF-3A).
Notes: Minority Population is calculated as the total population minus the non-hispanic, white population. Therefore, the term minority extends to include the Hispanic population.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Initiative
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 10, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000



NORTH

Poverty Distribution Region III

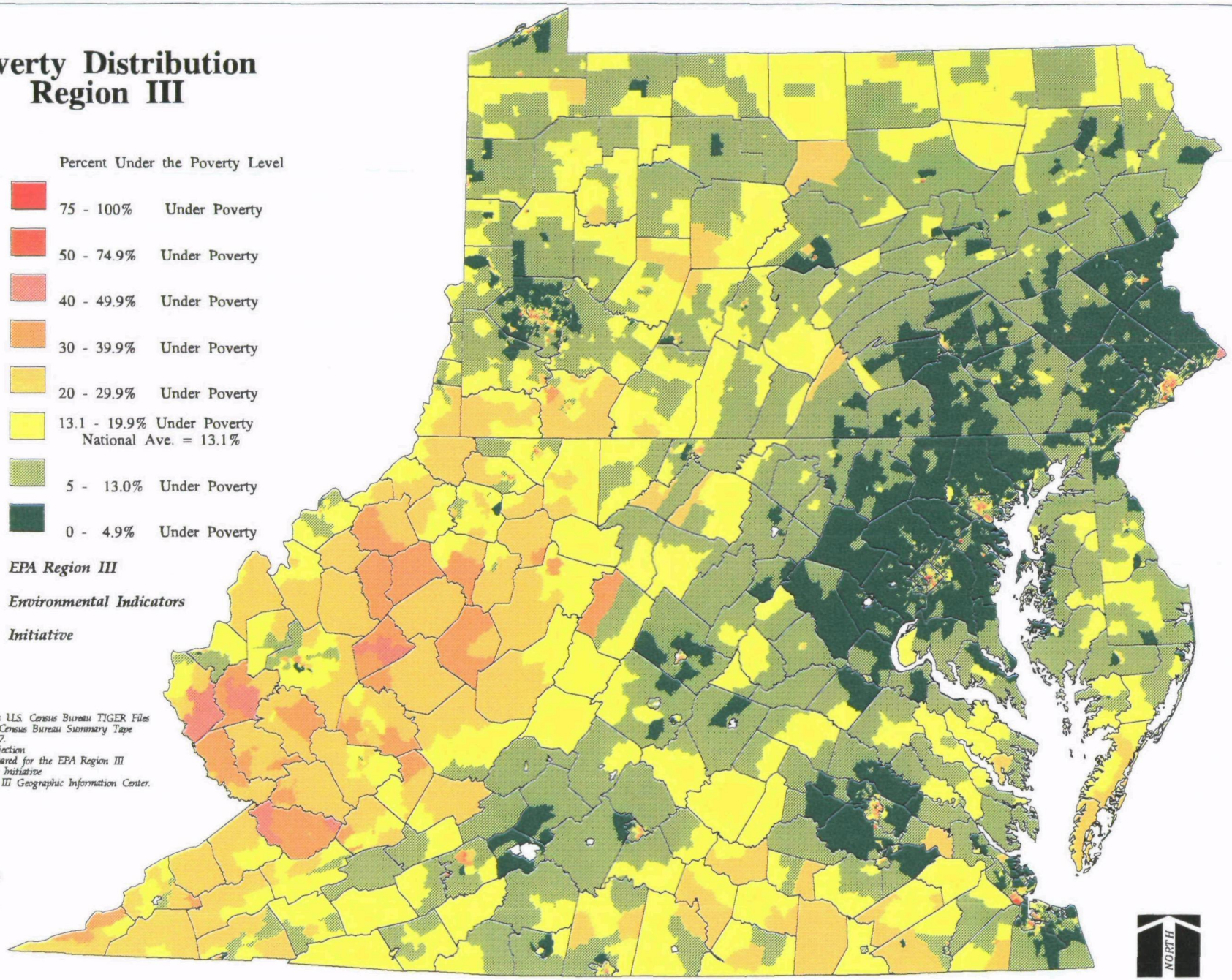
Percent Under the Poverty Level

- 75 - 100% Under Poverty
- 50 - 74.9% Under Poverty
- 40 - 49.9% Under Poverty
- 30 - 39.9% Under Poverty
- 20 - 29.9% Under Poverty
- 13.1 - 19.9% Under Poverty
  National Ave. = 13.1%
- 5 - 13.0% Under Poverty
- 0 - 4.9% Under Poverty

EPA Region III

Environmental Indicators

Initiative



Source: Census Tract Data from U.S. Census Bureau TIGER Files
Demographic Data from U.S. Census Bureau Summary Tape File - 3A (STF-3A) Table P117.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Initiative
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 10, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

NORTH

OVERVIEW OF CANCER IN REGION III

Cancer mortality data from the National Center for Health Statistics is collected by EPA's ORD and converted to rate by county. The data is categorized by white male, white female, nonwhite male and nonwhite female. Data is currently available for the decades of the 1950s, '60s, and '70s; '80s data will become available in the near future. For the Environmental Indicators project, 1970s data for lung, liver, kidney and leukemia for white males and females were evaluated, since these cancers are potentially associated with environmental exposures. The nonwhite rates have not been corrected for statistically small populations in some counties. This could result in a false high or false low, (zero), value. ORD has developed a methodology for correcting for this phenomena with the '80s data. A composite map, based on the ordinal rankings for each of these four cancers, was also generated.

Findings:

* Cancer mortality rates for white males are generally higher than for white females. This is especially evident in the lung cancer maps, where the female rates are in the lowest range, while the male rates are across the board. This may be due to non-environmental factors, such as diet, stress, and smoking.

* Counties with high composite cancer rates tend to be in the southern part of the Region.

* The following counties are have high rates (top three categories) for both white males and females: Surry, VA; Queen Annes, MD; Calvert, MD; Rappahannock, VA; Craig, VA; Wise, VA; Lincoln, WV; and Logan, WV.

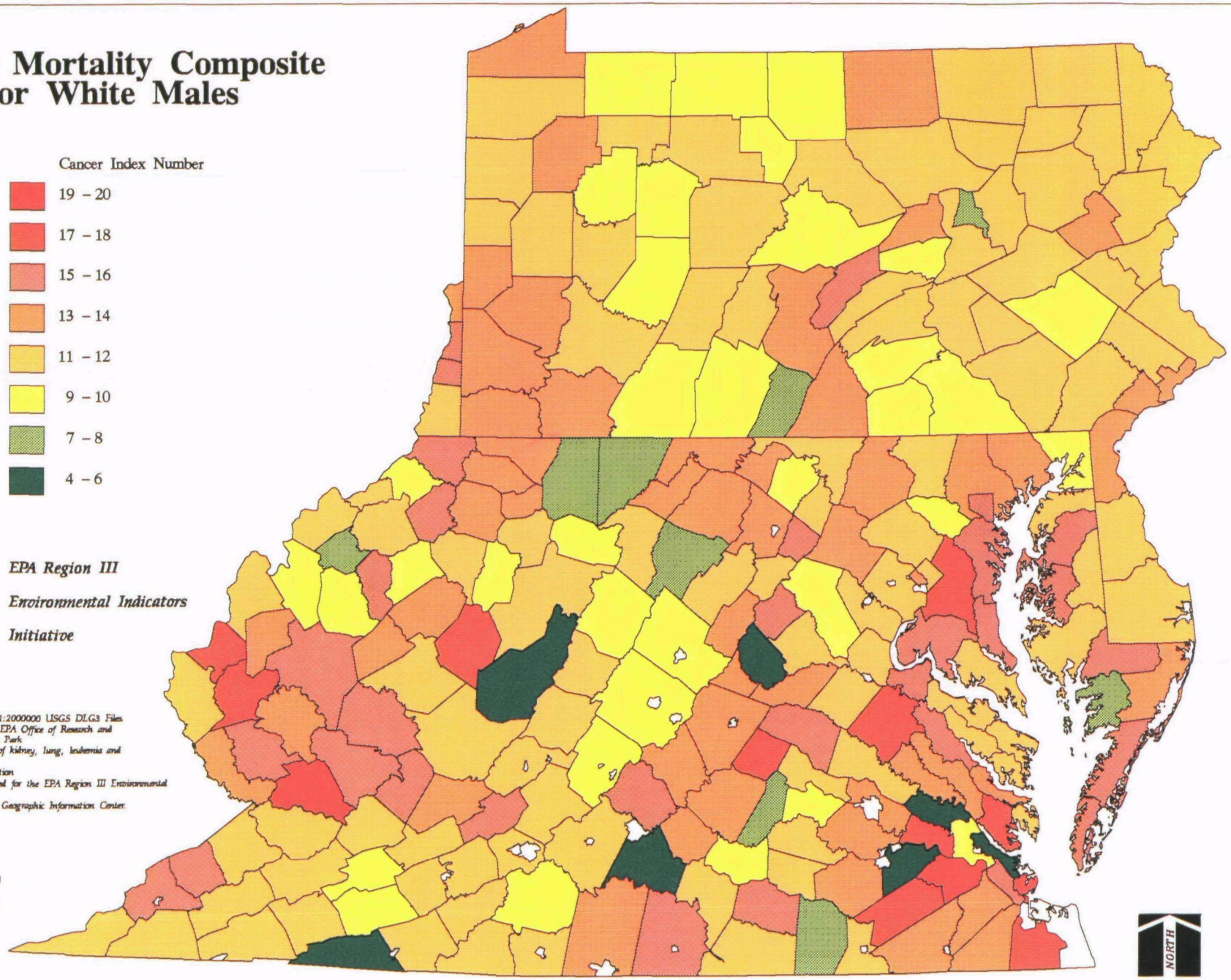
Management Recommendations:

* Counties with high composite cancer mortality rates should be considered under stress and should be considered sensitive. EPA should make sure that activities regulated by EPA in these areas do not add to this stressed situation.

* When available, the 1980s cancer mortality data should be evaluated to determine if there are any significant findings with respect to nonwhites or significant changes for whites.

* For those counties with high rates for males and females, the programs should investigate the possibility of a link to environmental causes.

Cancer Mortality Composite For White Males



Lung Cancer Mortality Rate
White Males

- > 1000
- 901 to 1000
- 801 to 900
- 701 to 800
- 601 to 700
- 501 to 600
- 401 to 500
- < 400
- Data Not Available

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

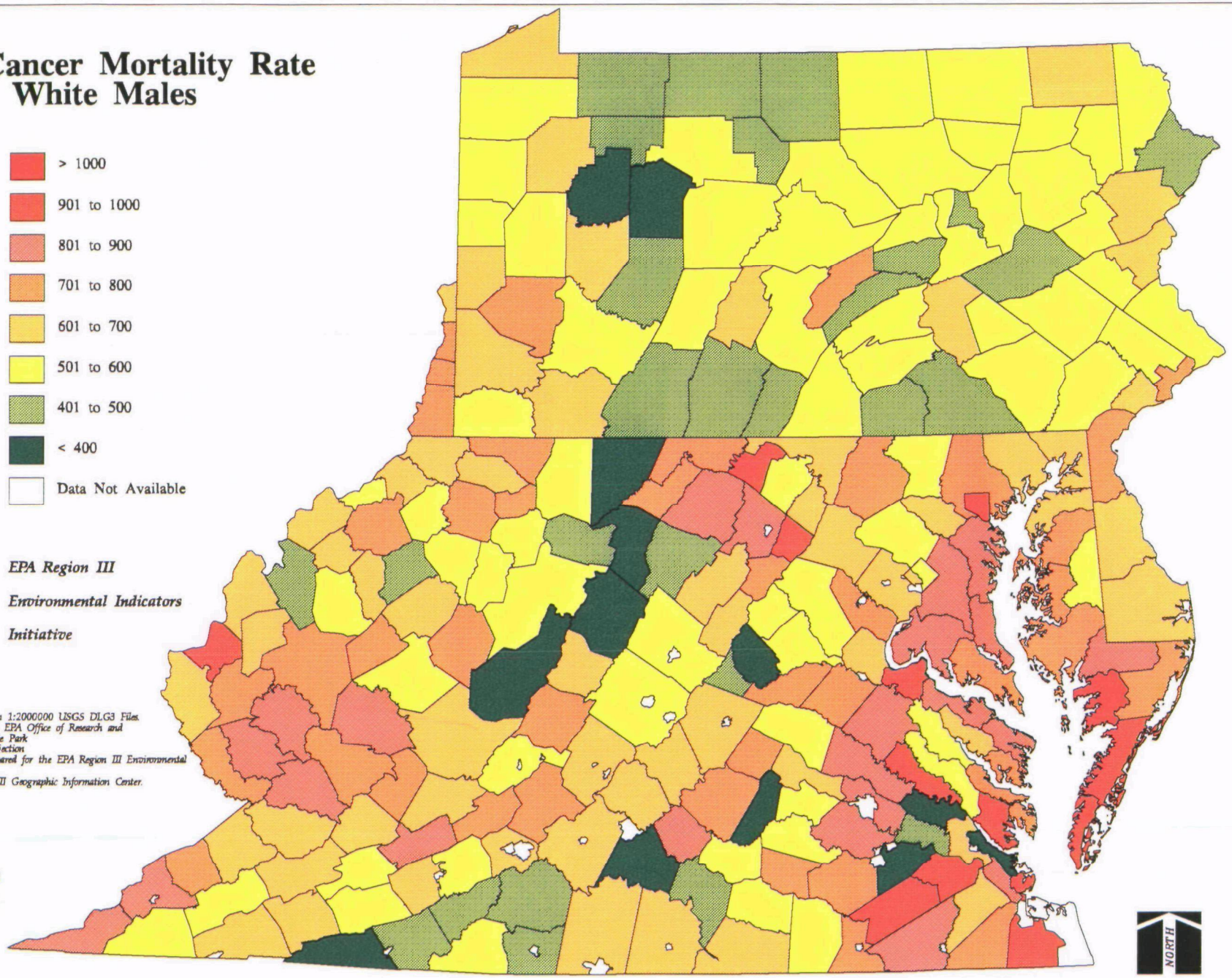
Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Cancer Mortality Data for US EPA Office of Research and Development, Research Triangle Park
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 25, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000



NORTH

Lung Cancer Mortality Rate
White Females

- > 1000
- 901 to 1000
- 801 to 900
- 701 to 800
- 601 to 700
- 501 to 600
- 401 to 500
- < 400
- Data Not Available

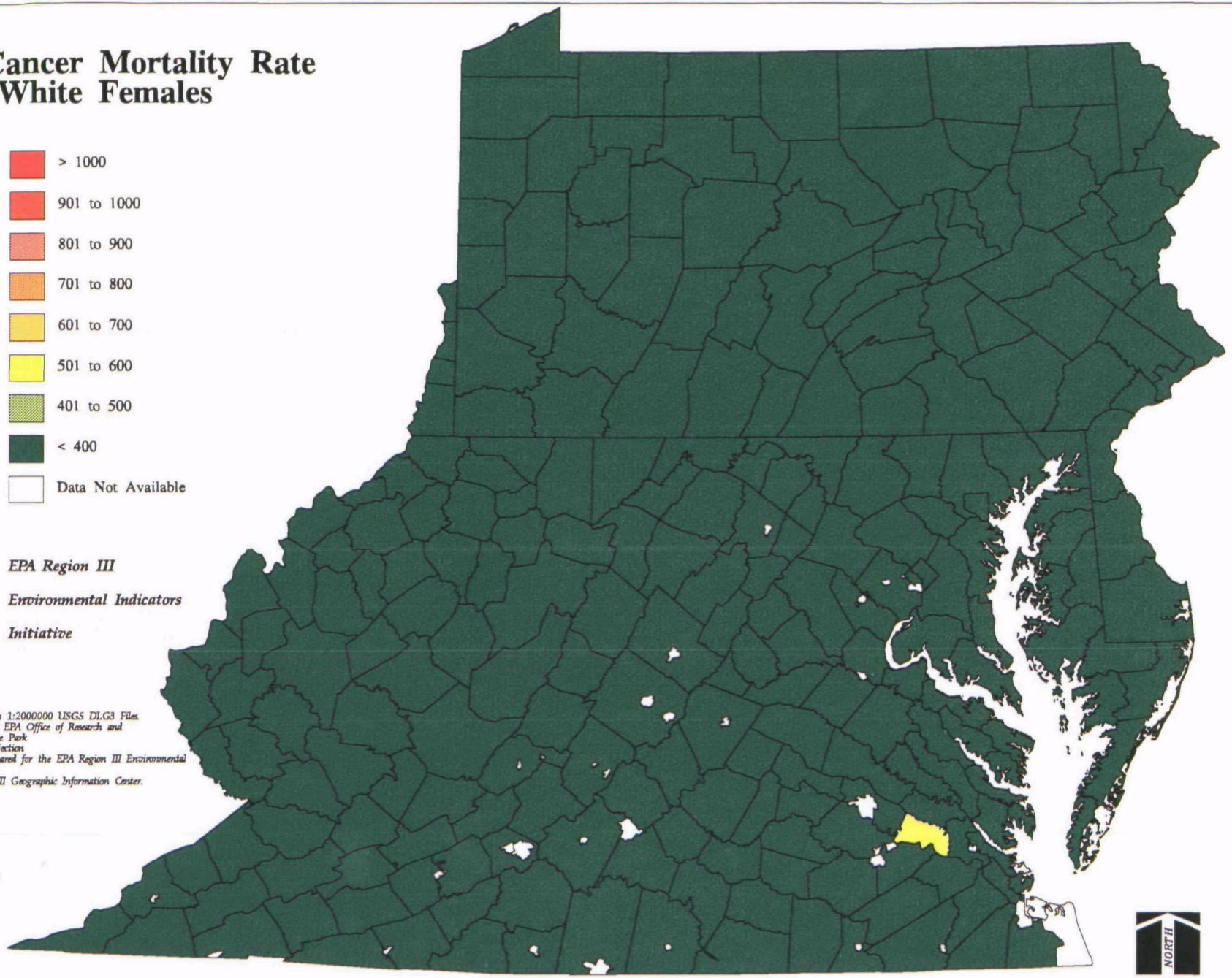
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Cancer Mortality Data for US EPA Office of Research and Development, Research Triangle Park
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 25, 1993



0 10 20 30 40 50

MILES

Scale 1 : 3500000

NORTH

Cancer Mortality Composite For White Females

Cancer Index Number

- 11
- 10
- 9
- 8
- 7
- 6
- 5
- 4

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Cancer Mortality Data for US EPA Office of Research and Development, Research Triangle Park.
Composite values are the sum of kidney, lung, leukemia and liver cancers.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: April 5, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

NORTH

TRI AIR RELEASES - CANCER WEIGHTED

The Toxics Release Inventory contains a substantial amount of environmental release data for all media. This data is reported in pounds of chemical released per year, based on estimates. In order to relate these releases to one another, chemical-specific toxicological information, cancer and non-cancer, is multiplied by the amount of the release. This results in a risk-based (human health) value that can be compared across facilities and counties.

Findings:

* The counties which are in the highest category of total release but at least two categories lower of cancer (C) or non-cancer (NC) weighted releases are: York, PA(C); Frederick, VA(C)(NC); Henry, VA(C)(NC); Wood, WV(C)(NC); and Giles, VA(NC). The counties which are in the highest category of cancer (C) or non-cancer (NC) weighted releases but are at least two categories lower for total releases are: Crawford, PA(C)(NC); Lebanon, PA(C)(NC); Cabell, WV(C)(NC); Suffolk, VA(C); Carbon, PA(NC); Mercer, PA(NC); and Montour,PA(NC).

* The highest cancer-weighted air releases are in the urban areas of Philadelphia; Pittsburgh; Erie; Baltimore; and Charleston, WV. In addition, high cancer-weighted releases are found in the counties of Allegany, MD; York, VA; Suffolk, VA; Marshall, WV; Cabell, WV; and Jefferson, WV.

* The highest non-cancer-weighted air releases are in urban areas of Philadelphia; Pittsburgh; Erie; and Baltimore. In addition, high non-cancer-weighted releases are found in the counties of Allegany, MD; Carbon, PA; Lycoming, PA; Montour, PA; York, PA; and Cabell, WV.

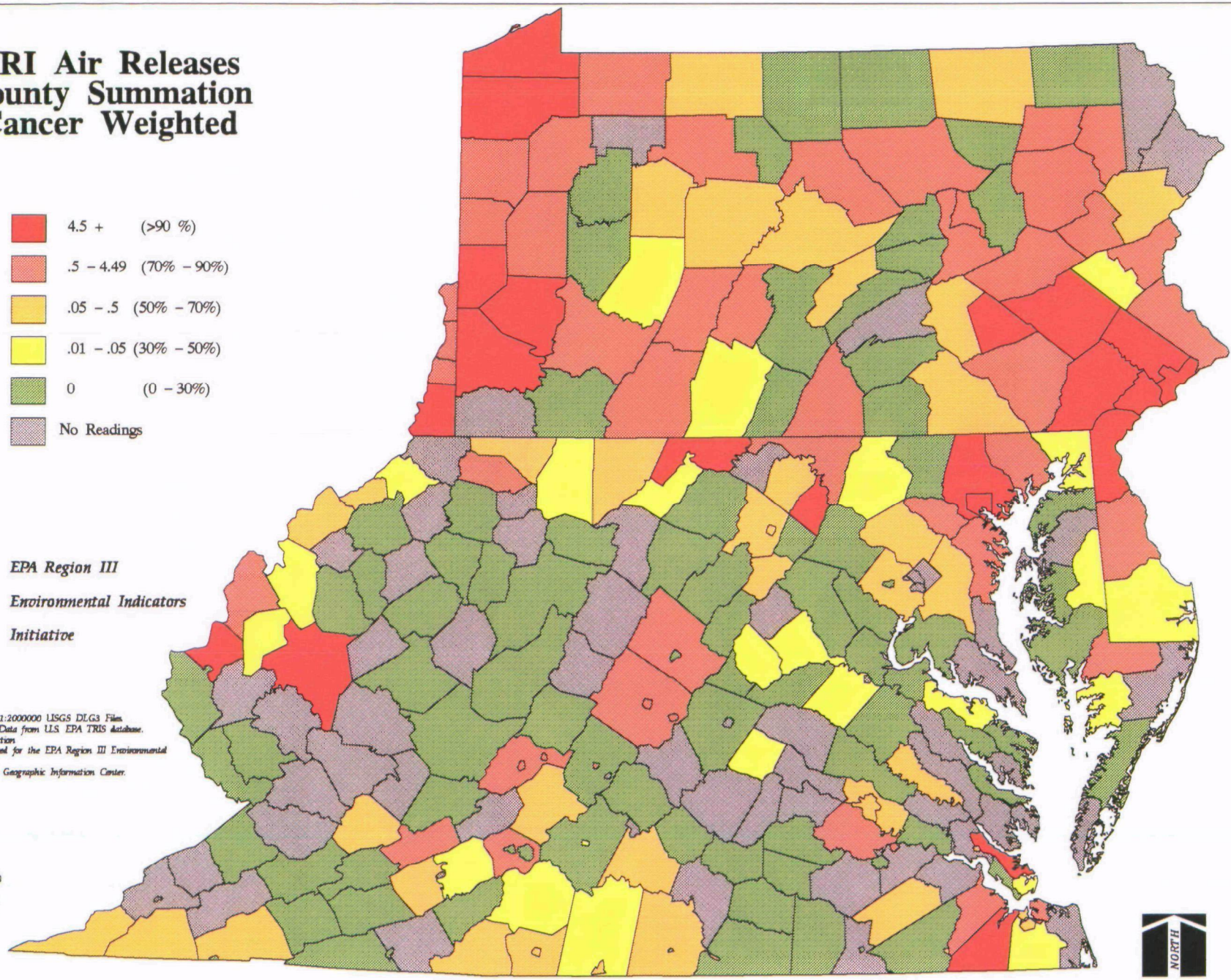
* The counties with high cancer-weighted air releases and high composite (liver, lung, kidney and leukemia) cancer (white males - 1970s) are Cabell, WV; Kanawha, WV; and Baltimore City.

Management Recommendations:

* Counties with high releases should be evaluated for opportunities to reduce the emissions, such as pollution prevention, enforcement, and outreach. The "worst" facilities within each county should be targeted first.

* Further investigation should be conducted to determine the strength of the association between TRI cancer-weighted releases and cancer mortality, using 1980s data.

TRI Air Releases County Summation Cancer Weighted



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

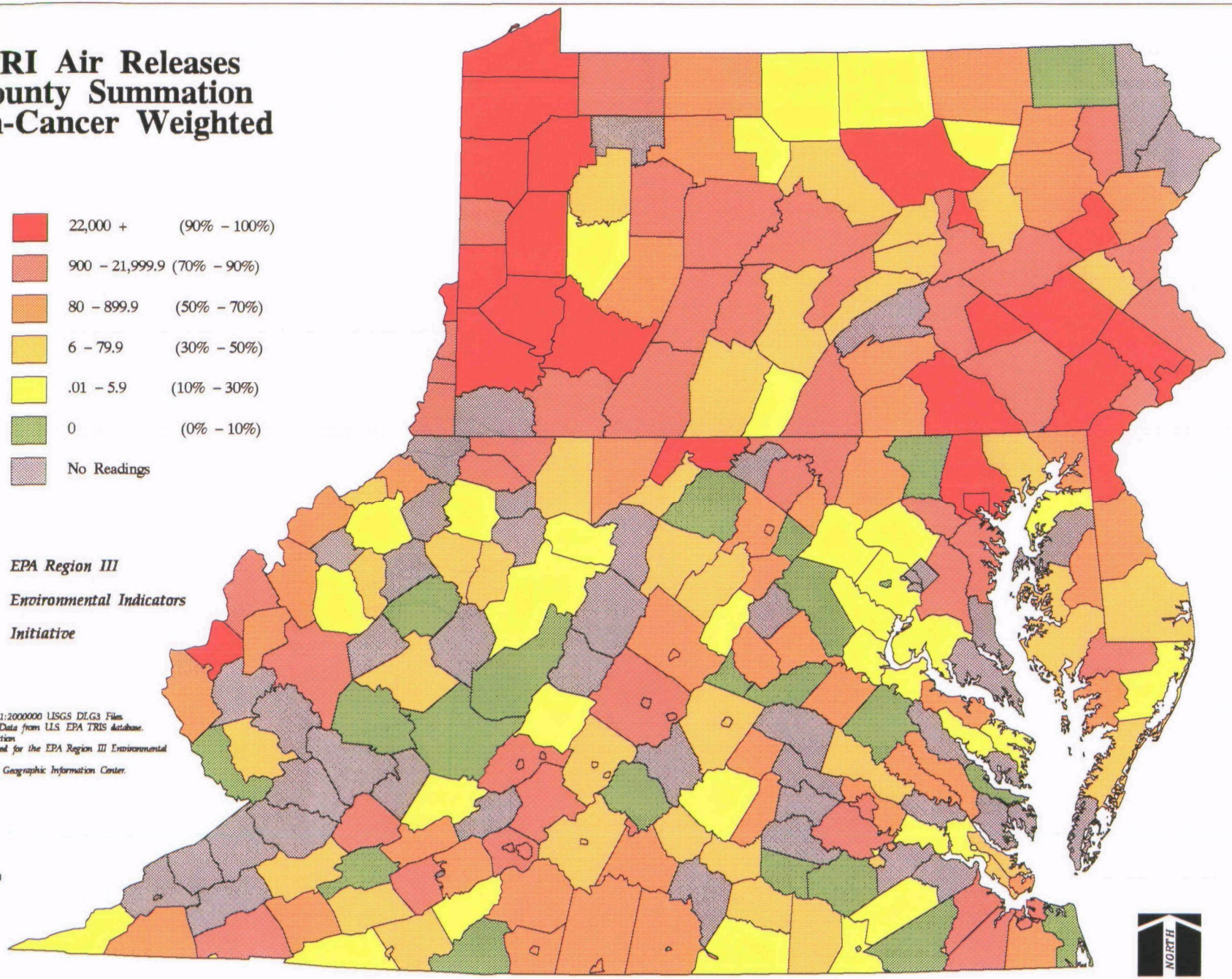
Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Toxic Release Inventory (TRI) Data from U.S. EPA TRIS database.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: February 23, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

TRI Air Releases
County Summation
Non-Cancer Weighted



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Toxic Release Inventory (TRI) Data from U.S. EPA TRIS database.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: February 23, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

RISK FROM INDOOR RADON

The risk of lung cancer due to exposure to radon and its decay products is well documented. The Surgeon General has identified radon as the second leading cause of lung cancer in the United States. The Environmental Protection Agency (EPA) has classified radon as a Group A carcinogen.

Findings:

* EPA Region III has developed a regional database of indoor radon concentrations. A graphical representation of this database identifies regional areas which have indoor radon concentrations in excess of 4 pCi/L.

* The regional map has identified residences in the Reading Prong area as having the greatest evaluated indoor radon concentrations. The Reading Prong is a geologic formation containing granite enriched with uranium which emits radon. Elevated radon readings have been confirmed throughout the Reading Prong which extends under north central Maryland, eastern Pennsylvania, northern New Jersey, and southern New York.

* The map also shows indoor radon concentrations outside of the Reading Prong. High, moderate, or low indoor radon concentrations exist throughout Pennsylvania and Maryland. Delaware and the District of Columbia have are moderate to low.

* The map has identified some areas in Virginia and West Virginia as having high to moderate indoor radon concentrations. The total extent of radon in these two states can not be determined because of insufficient data.

Management Recommendations:

* Region III should attempt to convince the municipalities and townships in high radon potential areas to adopt EPA's new "Model Standards and Techniques for Control of Radon in New Homes and Buildings" in their building codes.

* Region III should supplement the Agency's manuals on mitigation techniques for pre-existing family dwellings with quarterly classroom instructions and/or an instructional video to ensure that radon reduction systems are properly installed.

* Region III should investigate the possibility of a joint federal/utility incentive for the mitigation of radon in pre-existing homes.

* Region III should encourage school superintendents and school building managers to test and mitigate their school buildings.

Percentage of Radon Readings Above 4 pCi/l

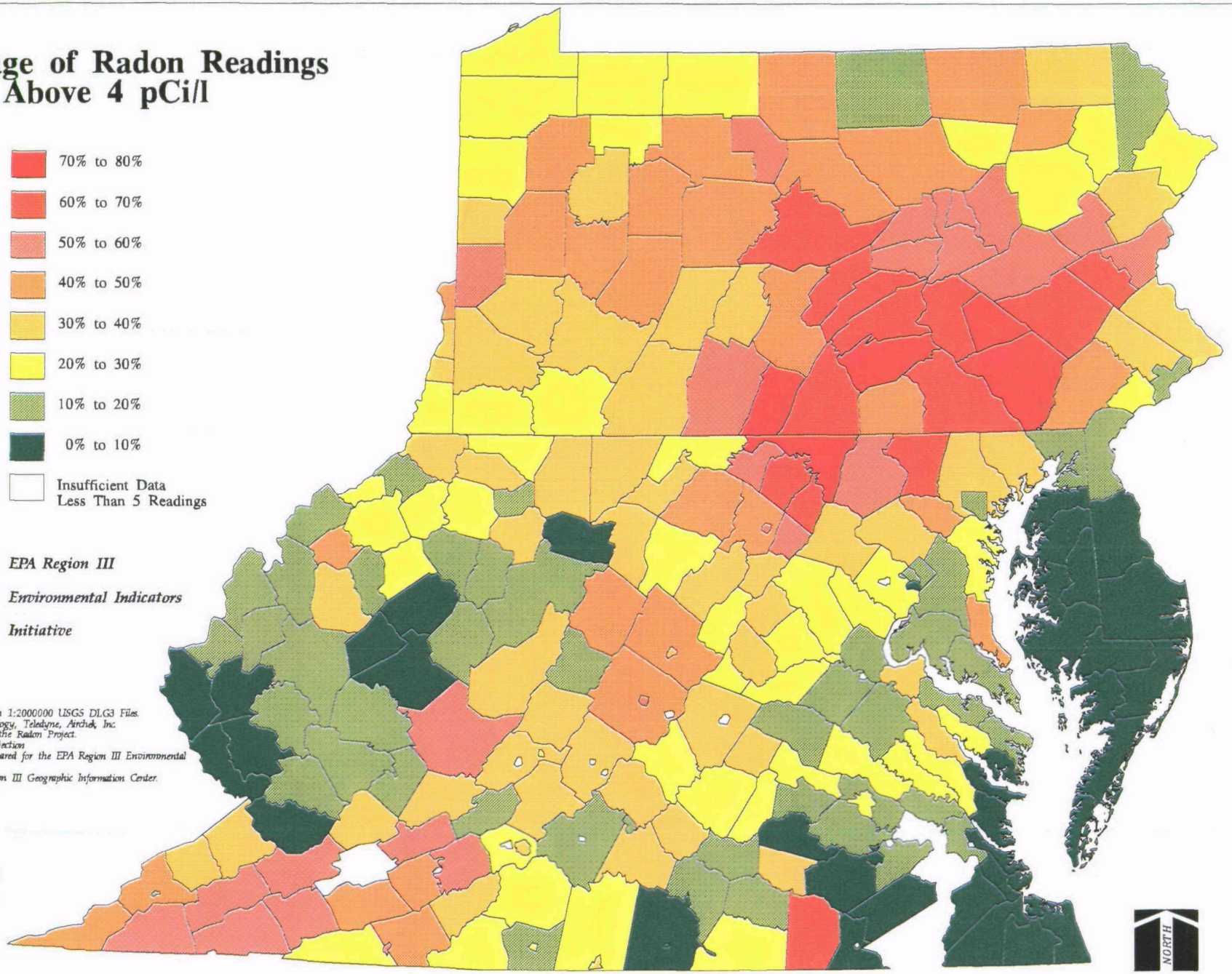
- 70% to 80%
- 60% to 70%
- 50% to 60%
- 40% to 50%
- 30% to 40%
- 20% to 30%
- 10% to 20%
- 0% to 10%
- Insufficient Data Less Than 5 Readings

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative



Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Radon Data from Key Technology, Teledyne, Airchek, Inc.
A.B.E., D.M.A., U.S.T., and the Radon Project.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 5, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

RISK FROM INDOOR AIR

Indoor air quality problems can present a significant health problem to the majority of our population because people spend about 90% of their time indoors, and there are some very nasty pollutants, both carcinogens and non-carcinogens, commonly associated with the indoor air environment.

Findings:

* Although the health effects of various indoor air pollutants are known, there is insufficient data to determine the exposure levels at which these effects would occur, and/or exposure information is insufficient for quantitative risk determination.

* There is no health related data that would enable us to quantify the extent or seriousness of IAQ problems in Region III; however, there is no reason to believe that people living in Region III are less immune to IAQ problems than in other areas of the country. In fact, IAQ problems may be more significant in Region III because of the climate and population density.

* Many if not most indoor air problems are easily remedied; (e.g., increase ventilation, remove the source) once it is determined that IAQ problems exist.

* Many if not most businesses have become knowledgeable about IAQ problems and solutions in the office. The reason: IAQ problems have cost American business some 60 billion dollars a year in lost productivity due to absenteeism.

* The uninformed public; i.e., the homeowner is probably at greatest risk from IAQ problems.

Recommendations:

* Region III already conducts some outreach related to indoor air problems; however, resources for this are limited. Given the potential for significant risk due to the amount of time spent indoors and the toxicity of various pollutants in the indoor air environment, such outreach should be given a higher priority by Region III and its States, and receive more resources.

* An IAQ outreach strategy should be developed that has the uninformed public; i.e., the homeowner as the principle target (refer to the technical support document for specific outreach recommendations).

* IAQ outreach should be incorporated into the urban risk program.

RISK FROM PESTICIDES

There are over 50,000 pesticides on the market today. Of those it has investigated, EPA has identified at least 60 pesticide chemicals as possible carcinogens. Risk from pesticides is generally associated with pesticides in food, pesticides in drinking water, indoor air problems and other instances of misapplication.

Findings:

* Although a survey indicated that 82% of Americans viewed pesticide residues on food as a serious hazard, data collected by FDA on both domestically grown and imported food indicates that pesticide residues on food are at very low levels and do not pose a risk to human health.

* A national survey of drinking water systems conducted by EPA in 1991 found very few instances where health based levels for pesticides were exceeded in drinking water wells.

* Inspections conducted by Region III States over a five year period of both agricultural and non-agricultural uses of pesticides resulted in a fairly low percentage of actionable violations.

* When misused, pesticides may pose a risk to public health; however, it would appear that pesticide handlers under the watchful eye of federal and State regulatory agencies are using pesticides responsibly.

* The possible exception to responsible users of pesticides may be the uninformed homeowner. Market studies indicate that greater quantities of pesticides are used in the home and yard than on our nation's farmlands.

Recommendations:

* Region III already conducts outreach related to pesticides; however, resources for this are limited. Given the potential for significant risk due to pesticide misuse, such outreach should be given a higher priority by Region III and its States, and receive more resources. The homeowner should be the principle target of this outreach.

* Pesticide outreach should be incorporated into the urban risk program.

LEAD IN REGION III

Lead is a ubiquitous pollutant found extensively throughout Region III. It is a heavy metal that can cause serious health consequences from even small exposure. Particularly at risk are fetuses and children under six years who come in contact with lead. Approximately 70% of elevated blood lead levels in children are believed to come from dust and flakes of degrading lead based paint, 23% from drinking water and 7% from lead in soil and other sources. Lead based paint has been used extensively in homes built prior to 1978 when it's sale to consumers was banned. Over half of the children in Region III live in homes where lead paint is found, a population at risk of over 1.0 million.

Findings:

* US Census data reports age of housing information in 10 year increments, so housing data prior to 1970 gives a most inclusive picture of homes with lead. In Region III greater than half the population live in housing which was built prior to 1970. This amounts to almost 17 million people, of which approximately 1.3 million are children under 6yrs.

* Regional information on blood leads is sporadic. Extensive data exists for children in Baltimore, Washington,DC and Philadelphia. This data confirms that children living in older homes in dilapidated conditions have blood lead levels over 10 ug/dL in excess of the national standard.

Management Recommendations:

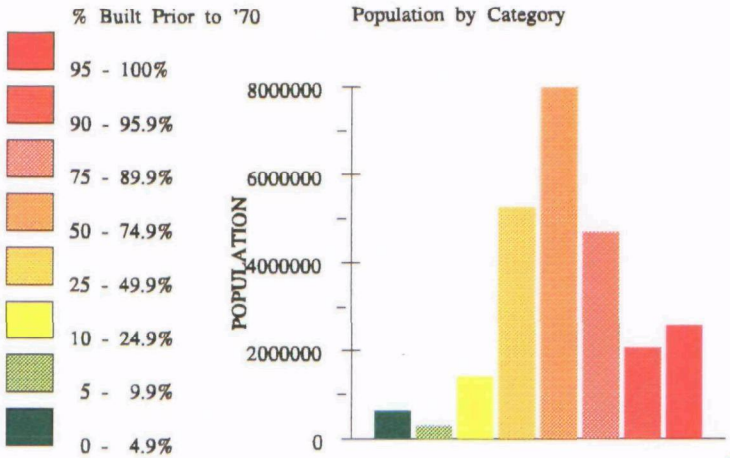
* The Region must reinforce its relationships with all federal, local and private agencies working on reducing exposure to lead such as providing grant funding or research dollars. Investigate lead exposure in a rural area with a high percentage of older homes and provide appropriate outreach.

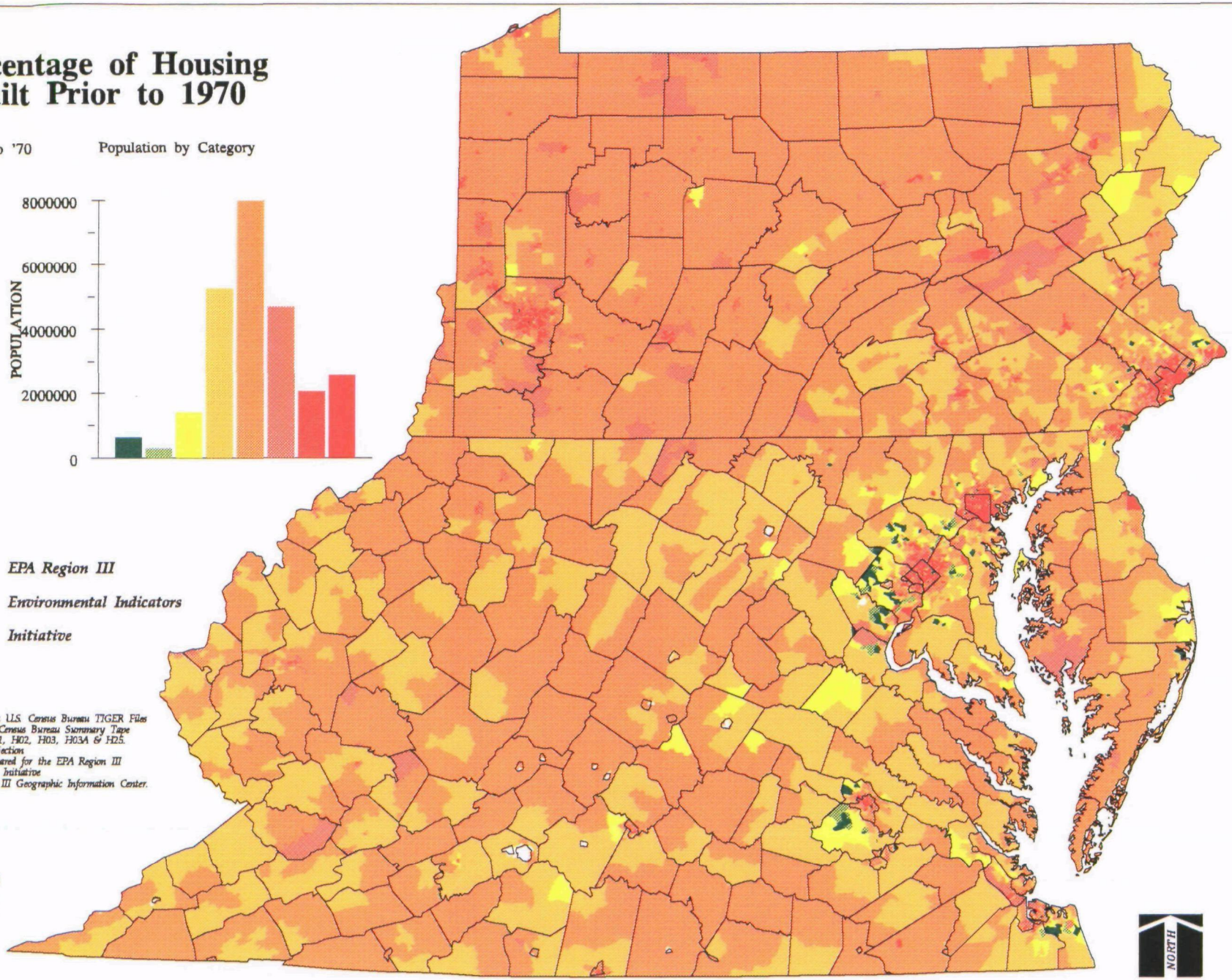
* Increased staff education, referral and innovative outreach to the public to emphasize the hazards and prevention of lead contamination.

* Promote testing of all children for blood lead.

* Formulate a Regional multi-media task force to address lead issues, including those involved in Title X lead paint abatement effort, the Lead and Copper Rule of the Safe Drinking Water Act and clean-up of lead Superfund sites.

Percentage of Housing Built Prior to 1970





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: Census Tract Data from U.S. Census Bureau TIGER Files
Demographic Data from U.S. Census Bureau Summary Tape File - 3A (STF-3A) Tables H01, H02, H03, H03A & H25.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Initiative
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: March 10, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

VOC EMISSIONS IN OZONE NON-ATTAINMENT AREAS

Volatile organic compounds (VOCs) are emitted from a myriad of sources, which include stationary, or "point" sources (refineries, chemical plants, etc.), area sources (dry cleaners, gas stations, etc.), and mobile sources (motorized vehicles, airplanes, etc.). VOCs are significant both as a precursor to ozone (which contribute to adverse respiratory impacts) and as an indicator of toxic air pollutants (50% of toxic air pollutants are VOCs).

Findings:

* In non-attainment areas, the 1987-88 VOC emissions data indicate that point sources are a relatively small contributor to total VOC emissions. The major contributors of VOC emissions are area and mobile sources.

* The 14% VOC emissions from point sources are the remains of a massive effort of control over the last 20 years. But, even if VOC emissions from point sources are reduced to zero, the collective impact of area and mobile sources may still result in ozone non-attainment and substantial loadings of toxic air pollutants.

* While the percentages of total VOC emissions will vary for specific areas of concern, substantial reductions in VOCs cannot occur without addressing area and mobile sources.

* Traditional regulatory efforts alone will not be enough to curb VOC emissions because much of the mobile and area source emissions are caused by individual actions.

Management Recommendations:

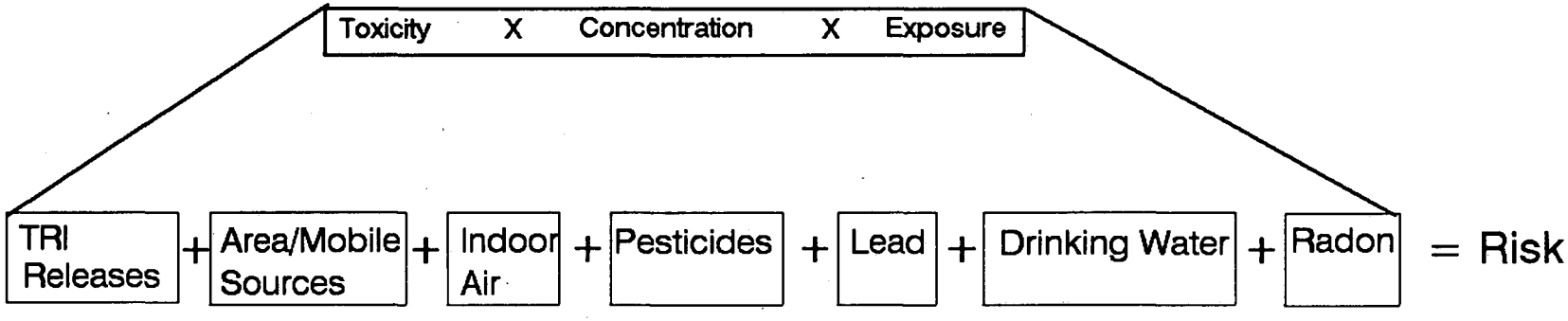
* Extensive outreach should be conducted to educate the public on how their actions affect and how changes in their actions can reduce VOC emissions, and the effect of these emissions on human and ecological health.

* Region III should continue to participate in or lead national initiatives to reduce VOC loadings.

* Region III should explore possible new regional initiatives to address area and mobile source contributions to VOC loading and should continue to participate in existing actions such as transportation initiatives--i.e., trip reduction program, transit subsidy, etc. Active sponsorship or promotion of alternative fuels or cars is an important and visible role that the Region might undertake.

Indexing/Forecasting System

------- *Proposed Approach* -------



Prototype TRI Indexing System

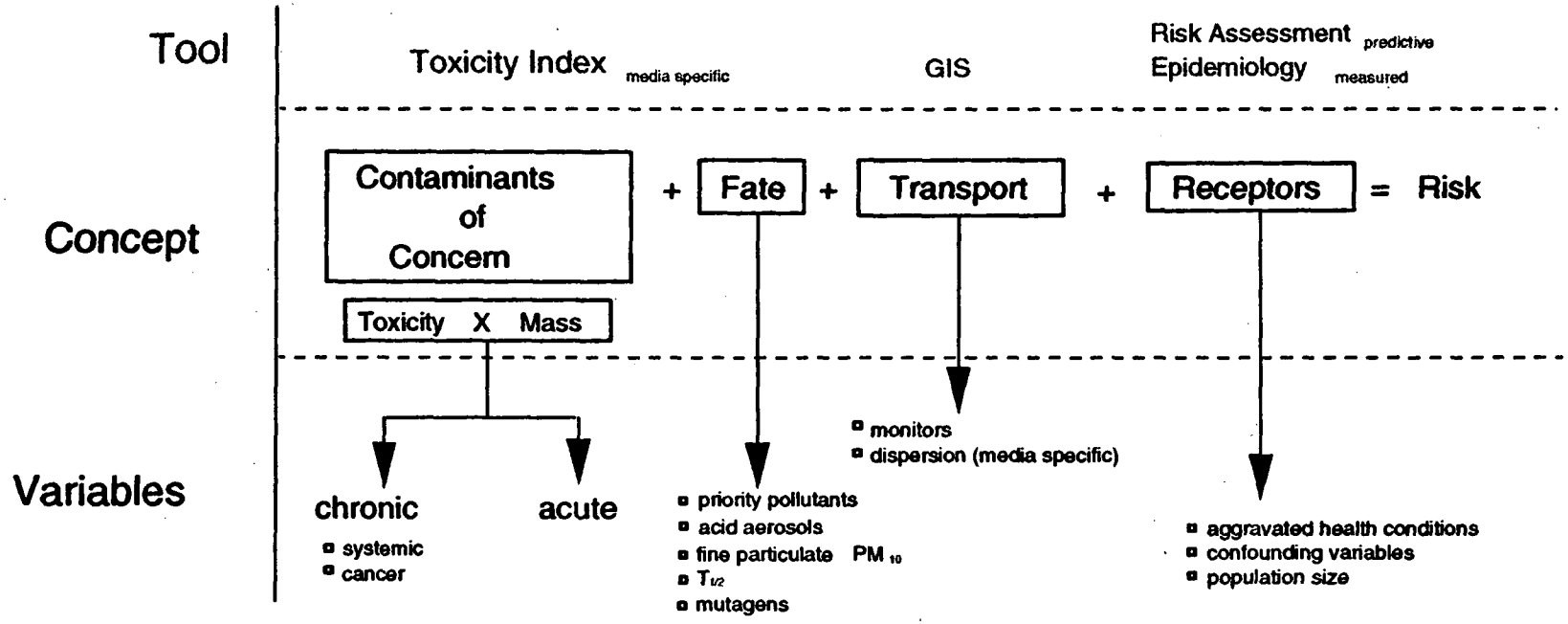
Maryland State: 1990

------- *Proposed Approach* -------

prepared by Dr. Debra L. Forman 3/1/93

Phase I | *Phase II*

Toxicity	X	Concentration	X	Exposure	=	Risk



INDEXING/FORECASTING SYSTEM

A Prototype Indexing System is under development which ranks TRI releases in terms of their relative toxicity. Phase I includes development of the Index system, Phase II includes characterization and evaluation of potential receptors. The Index System utilizes approved toxicity factors from the IRIS database and incorporates both noncarcinogenic and carcinogenic toxicity and their weight of evidence classifications, thus retaining sensitivitity to the original toxicity values. Because the IRIS database is endorsed by the EPA and is nationally recognized, this approach serves to support actions which might be based on the results of the Indexing procedure.

Findings:

* The Prototype Index System is media-specific and multi-component, including a Chronic Index, an Acute Index and a Fate Index.

* An Index value is reported for each releasing facility which allows the identification of major contributors of the most toxic compounds.

* The results of the Chronic Index of the Prototype for RY1990 TRI releases to the air medium for the State of Maryland are presented in the technical report document. This methodology may reveal primary contributors in areas other than urban, highly populated regions.

* The Prototype TRI Index System is intended to be included as part of a forecasting effort to evaluate the impact of TRI releases on human health risk.

Recommendations:

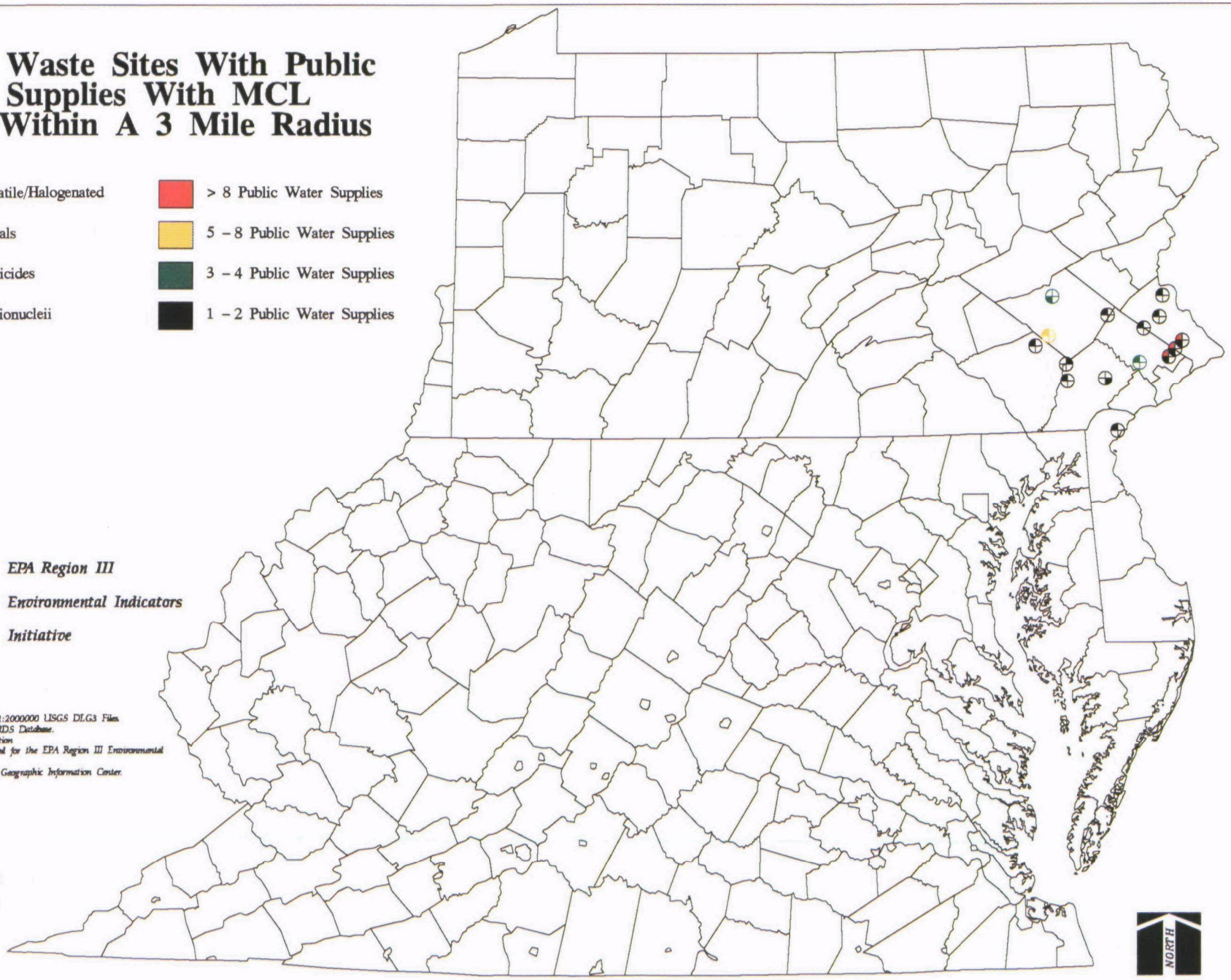
* Other sources identified by our group as key contributors to human health risk include Area/Mobile sources, Pesticides, Indoor Air, Lead, Radon and Groundwater as a source of drinking water. These sources may be mathematically evaluated in terms of their relative toxicity indices to determine the comparative risk index of each variable.

* Appropriate resources should be dedicated to evaluating suitable chemical lists, toxicity values and exposure information for the key contributors: TRI, Area/Mobile Sources, Pesticides, Indoor Air, Lead, Radon and Groundwater as a source of drinking water.

Hazardous Waste Sites With Public Water Supplies With MCL Violations Within A 3 Mile Radius

- Volatile/Halogenated
- Metals
- Pesticides
- Radionucleii

- > 8 Public Water Supplies
- 5 – 8 Public Water Supplies
- 3 – 4 Public Water Supplies
- 1 – 2 Public Water Supplies



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Violation data from U.S.EPA FRDS Database.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: April 7, 1993

0 10 20 30 40 50

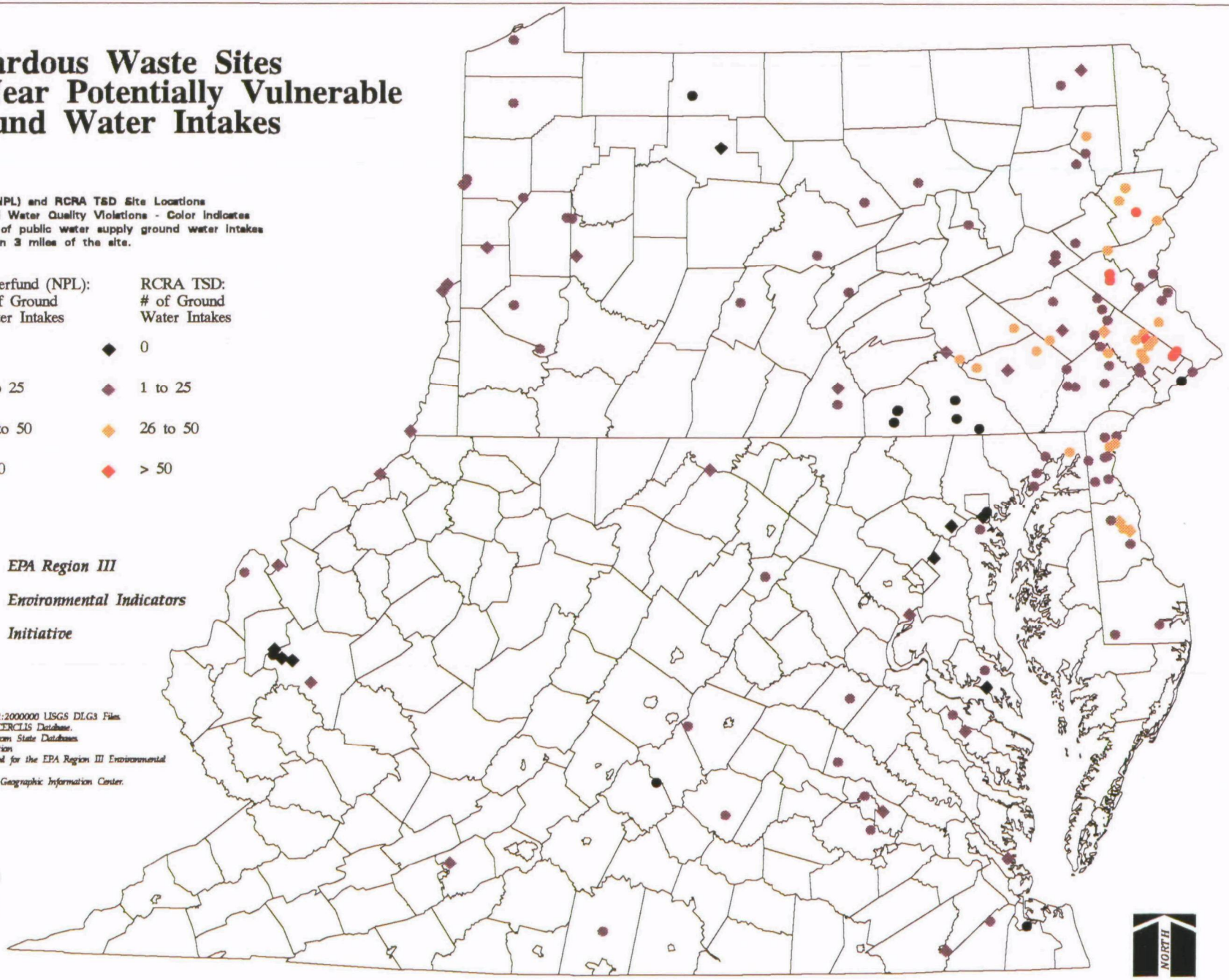
MILES

Scale 1 : 3500000

Hazardous Waste Sites Located Near Potentially Vulnerable Ground Water Intakes

Superfund (NPL) and RCRA TSD Site Locations With Ground Water Quality Violations - Color indicates the number of public water supply ground water intakes located within 3 miles of the site.

Superfund (NPL): # of Ground Water Intakes	RCRA TSD: # of Ground Water Intakes
0	0
1 to 25	1 to 25
26 to 50	26 to 50
> 50	> 50



EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
NPL Site Locations for EPA's CERCLIS Database.
GroundWater Intake Locations from State Databases.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: April 5, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

Hazardous Waste Sites with Public Water Supplies with MCL Violations within a 3 Mile Radius

Hazardous waste sites represent a significant source of ground water pollution to both private and public sources of potable water. Public water supplies (PWSs) in the vicinity of hazardous waste sites are at particular risk. The presence of maximum contaminant level (MCL) violations at PWSs located near hazardous waste sites may be an indicator of ground water supplies that are already contaminated by hazardous waste sites (as opposed to at risk of contamination). This map locates hazardous waste sites that are within a 3 mile radius of one or more ground water intakes used by PWSs that have MCL violations of industrial type contaminants. Information regarding MCL violations for PWSs are contained in FRDS II (Federal Reporting Data System).

Findings:

* Inorganic (e.g.,metals), organics (e.g.,halogenated organics; pesticides), radionuclides (e.g.,gross alpha and beta; combined radium 226/228) represent a small percentage of MCL violations. Pennsylvania was found to have the highest number of MCL violations due to these parameters, which present a potential for adverse health effects.

* Based on the data from FRDS between 1988-1992, ground water based PWSs in Bucks and Montgomery counties in southeastern Pennsylvania, which lie within a 3-mile radius of a hazardous waste site with known ground water contamination, had MCL violations of industrial-type contaminants.

* This analysis includes only 54% of the PWSs with MCL violations due to data gaps in FRDS regarding latitudinal and longitudinal coordinates for the location of PWSs. This map is therefore expected to be under inclusive of the sites meeting the criteria. However, it is not likely to affect the data distribution throughout the Region and results significantly.

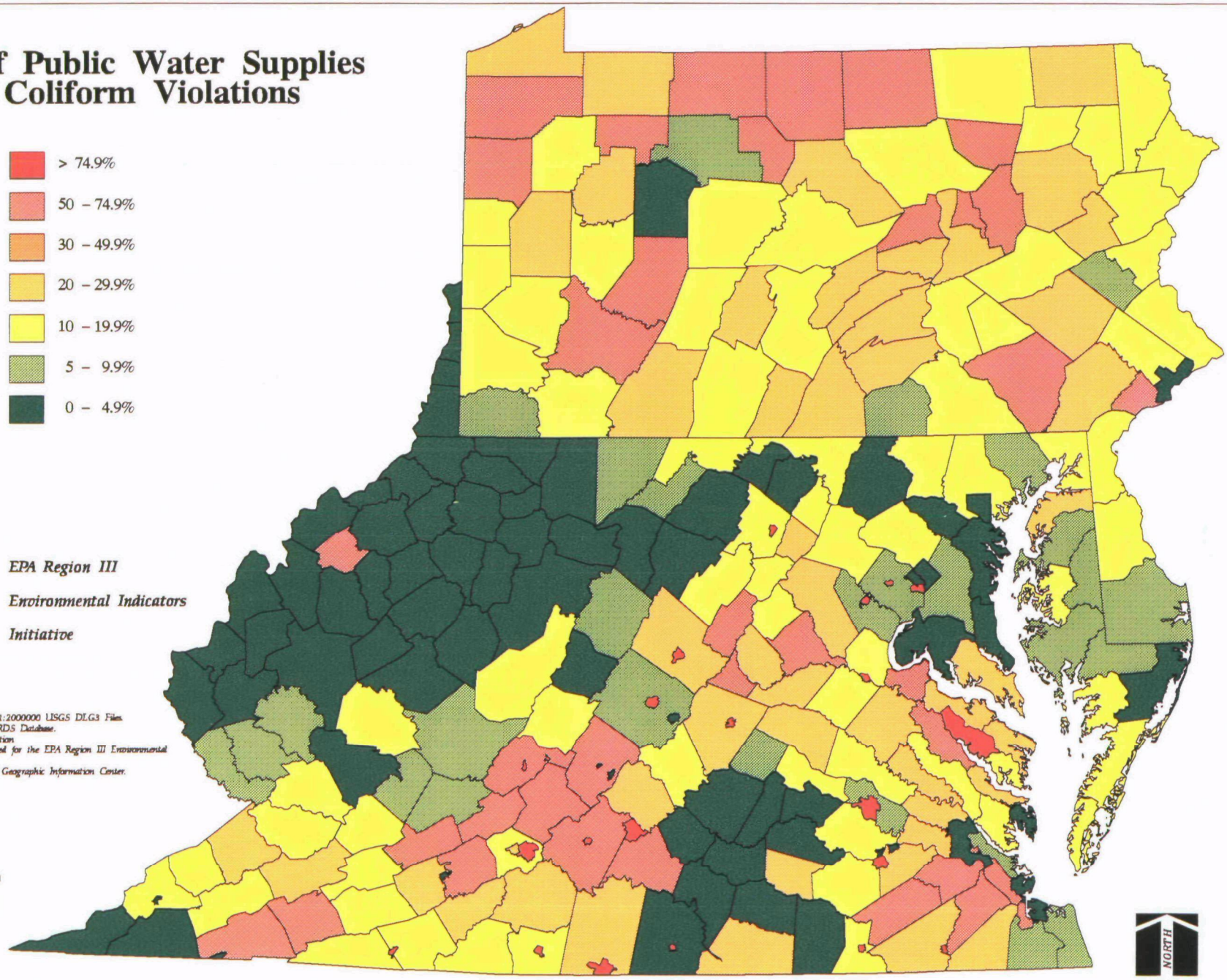
Management Recommendations:

* Analyze contaminant trends over time using existing data in FRDS for PWSs; then target activities to achieve compliance through treatment, or through remediation of hazardous waste sites or both.

* Prioritize hazardous waste site clean-up based on vulnerability of potentially exposed PWSs; consider a search for additional sites in most vulnerable areas with known ground water contamination problems.

* Consider a search for additional, as yet undiscovered hazardous waste sites in the most vulnerable areas with known ground water contamination problems (as potentially demonstrated by consistent MCL violations).

Percent of Public Water Supplies With Coliform Violations



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Violation data from U.S.EPA FRDS Database.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: April 7, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

Hazardous Waste Sites Located Near Potentially Vulnerable Ground Water Intakes:

Hazardous waste sites represent a significant source of ground water pollution to both private and public sources of potable water. Hazardous waste sites located near potentially vulnerable ground water intake wells may lead to significant contamination of public water supplies (PWSs) and private wells. Identification of ground water intakes in the vicinity of existing hazardous waste sites with known ground water contamination may give some insight to the location of potentially vulnerable ground water intakes in this Region.

Findings:

* There are very little drinking water quality data for private wells. What is available is limited and/or not centralized in a database for use in this Study.

* Pennsylvania and Delaware both have a significant number of vulnerable ground water intake wells, based on the total number of ground water intake wells used for PWSs within a 3 mile radius of a hazardous waste site with known ground water contamination.

* This analysis includes PWSs ground water intake wells for community and non-transient/non-community water supplies for the entire Region.

Management Recommendations:

* Encourage states to consider well-head protection programs for high risk public and private well clusters. Use existing data, e.g., CERCLA/RCRA sites paper files, to assist in locating private wells in known stressed areas.

* Encourage states and loan agencies to require testing and follow-up of private wells when real estate is transferred.

* Include in prioritization of hazardous waste site cleanups potential for impact on ground water supplies of drinking water.

Percent of Public Water Supplies with Coliform Violations

Human health concerns related to public and private sources of drinking water supplies with contamination from waterborne diseases is a concern to all residents of Region III. Historically the quality of drinking water has been a factor in determining human welfare. Waterborne diseases have for the most part been well-controlled in this country compared to others but there still is continuous violations of the coliform standard. The Maximum Contaminant Level (MCL) is an indicator of drinking water quality. Contaminant levels in drinking water above the MCL may represent a potential human health and environmental concern. Information regarding MCL violations for public water supplies (PWSs) are contained in FRDS II (Federal Reporting Data System II).

Findings

* MCL violations for coliform were wide-spread in the Region. Pennsylvania and Virginia were found to have the most violations of the coliform standard for fiscal years 1988-1992. Counties with the highest percent of PWSs with MCL violations of coliform were primarily in rural areas. There is a potential for adverse health effects for persons consuming water that exceeds MCLs for coliform.

* This analysis includes only 54% of the PWSs with MCL violations due to data gaps in FRDS regarding latitudinal and longitudinal coordinates for the location of PWSs. However, it is not likely to affect the data distribution throughout the Region and results significantly.

Management Recommendations

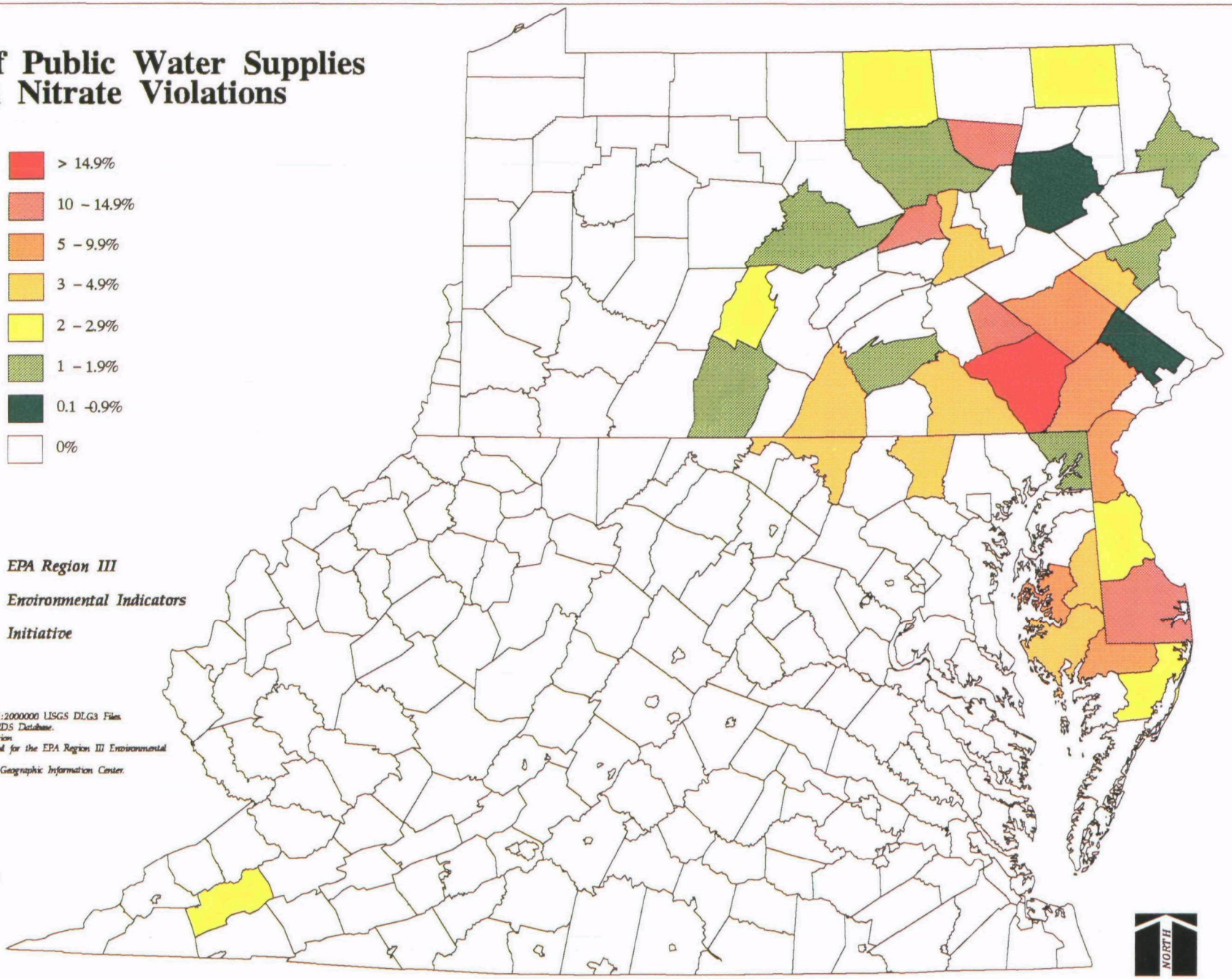
* Target activities to achieve compliance by use of appropriate treatment technologies and/or innovative funding approaches for vulnerable PWSs that may have difficulties achieving compliance, e.g., small PWSs.

* Control sources of coliform in drinking water by construction of sewage treatment plants in highly stressed areas and/or regulation of the construction of septic systems in these areas.

* Have all affected programs work together (with other state and federal agencies) to control agricultural run-off in areas with the greatest frequency of coliform violations.

Percent of Public Water Supplies With Nitrate Violations

- > 14.9%
- 10 – 14.9%
- 5 – 9.9%
- 3 – 4.9%
- 2 – 2.9%
- 1 – 1.9%
- 0.1 -0.9%
- 0%



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Violation data from U.S.EPA FRDS Database.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: April 7, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

PERCENT OF PUBLIC WATER SUPPLIES WITH MCL VIOLATIONS AND POPULATION AFFECTED FISCAL YEAR 1992*

	Surface Water Source		Ground Water Source		Total	
State	Percent of Supplies	Population (%)	Percent of Supplies	Population (%)	Percent of Supplies	Population (%)
DE	0	0	12.6	9.6	11.0	2.3
MD	6.8	0.36	4.5	3.4	4.7	0.8
PA	4.2	2.7	8.4	8.5	7.4	3.9
VA	6.0	1.2	18.2	1.4	16.0	3.6
WV	9.4	2.7	6.0	3.5	7.4	2.9

*Percent of population affected are presented for each State based on the percent of the population served by PWSs with MCL violations for each State.

Percent of Public Water Supplies with Nitrate Violations

Nitrate contamination of public and private drinking water supplies is a concern to many residents of Region III, but presents a particular significant risk to newborns. Newborns exposed to levels of nitrate above the MCL may be at potential risk of toxic effects. Nitrate in surface water may pose an additional risk to the environment. The Maximum Contaminant Level (MCL) is an indicator of drinking water quality. Contaminant levels in drinking water above the MCL may represent a potential human health and environmental concern through discharge of contaminated ground water to surface water. Information regarding MCL violations for public water supplies (PWSs) are contained in FRDS II (Federal Reporting Data System II).

Findings:

* MCL violations for nitrate were detected primarily in Delaware and Pennsylvania in this Region for fiscal years 1988-1992. Lancaster county was found to have the highest percent (greater than 14.9%) of PWSs with MCL violations of nitrate for ground water based PWSs. Other counties with a high percent of PWSs (ground water source) with MCL violations of nitrate Lebanon, Sullivan and Union counties in PA and Sussex county in DE.

* The nitrate levels reported above the MCL may pose a significant risk to newborns.

* This analysis includes only 54% of the PWSs due to data gaps in FRDS regarding the latitudinal and longitudinal coordinates for the location of PWSs. However, it is not likely to affect the data distribution throughout the Region and results significantly.

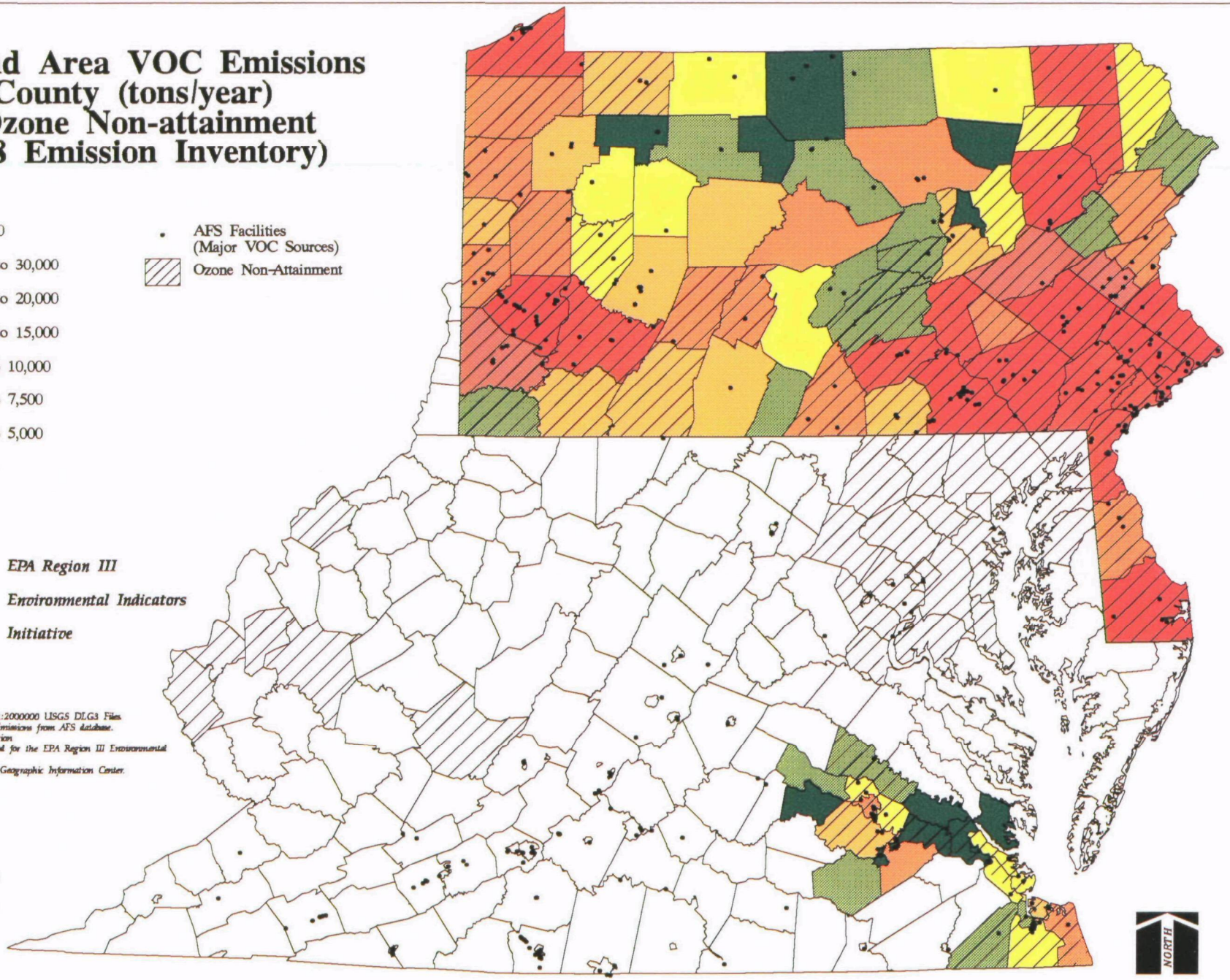
Management Recommendations:

* Target activities to achieve compliance by use of appropriate treatment technologies and/or innovative funding strategies for vulnerable PWSs that may have difficulties achieving compliance, e.g., small PWSs.

* Identify and control sources of nitrate in drinking water by outreach to farmers on the proper disposal of agricultural waste, and outreach to both farmers and homeowners on the proper use of agricultural chemicals, including fertilizer.

* Eliminate existing data gaps in FRDS with respect to the locational information of PWSs by providing resources to the States to determine the latitudinal and longitudinal coordinates for the location of PWSs so that we can have a complete geographic data base for targeting EPA and state activities in all program activities that affect drinking water supplies.

Mobile and Area VOC Emissions by County (tons/year) with Ozone Non-attainment (1987-88 Emission Inventory)



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA Region III

Environmental Indicators

Initiative

Source: County Boundaries from 1:2000000 USGS DLG3 Files.
Facilities Locations with VOC Emissions from AFS database.
Projection: Albers Equal Area Projection
Project: Data and Mapping Prepared for the EPA Region III Environmental Indicators Project.
Prepared By: U.S. EPA Region III Geographic Information Center.
Date: February 8, 1993

0 10 20 30 40 50

MILES

Scale 1 : 3500000

Percent of Ground Water and Surface Water Based Public Water Supplies with MCL Violations and Population Affected in Fiscal Year 1992

Ground water and surface water are natural resources of potable water. Ground water is the water source for approximately 94% of PWSs, which serve approximately 25% of the population using PWSs. Surface water is the water source for approximately 6% of PWSs, which serve approximately 75% of the population using PWSs. Privates wells are primarily served by ground water sources and serves approximately 19% of the population. Drinking water quality is regulated by the Safe Drinking Water Act (SDWA) passed by Congress in 1974 and amended most recently in 1986. The goal of the SDWA is to assure the provision of safe drinking water to Americans by setting drinking water quality standards, and requiring regular testing for regulated and unregulated contaminants. The Maximum Contaminant Levels (MCLs) are the enforceable standards that are used to assess drinking water quality.

Findings:

* In fiscal year 1992, there were up to 16.0 % of ground water and surface water based PWSs with MCL violations in each of the states which may have affected up to 3.9% of the population in each of the states. The percent of ground water and surface water based PWSs with MCL violations was greatest for the State of Virginia. The total population affected by ground water and surface water based PWSs with MCL violations was similar for all of the states (2.3-3.9%) except Maryland (0.8%).

* Ground Water contamination is likely to be more chronic than surface water contamination; the percent of PWSs with MCL violations is greater for ground water than for surface water in fiscal year 1992.

* Overall, the population at risk in fiscal year 1992 was greatest for ground water based PWSs. Although the population served by surface water based PWSs is greater than for ground water, the population at risk due to MCL violations is greater for ground water based PWSs.

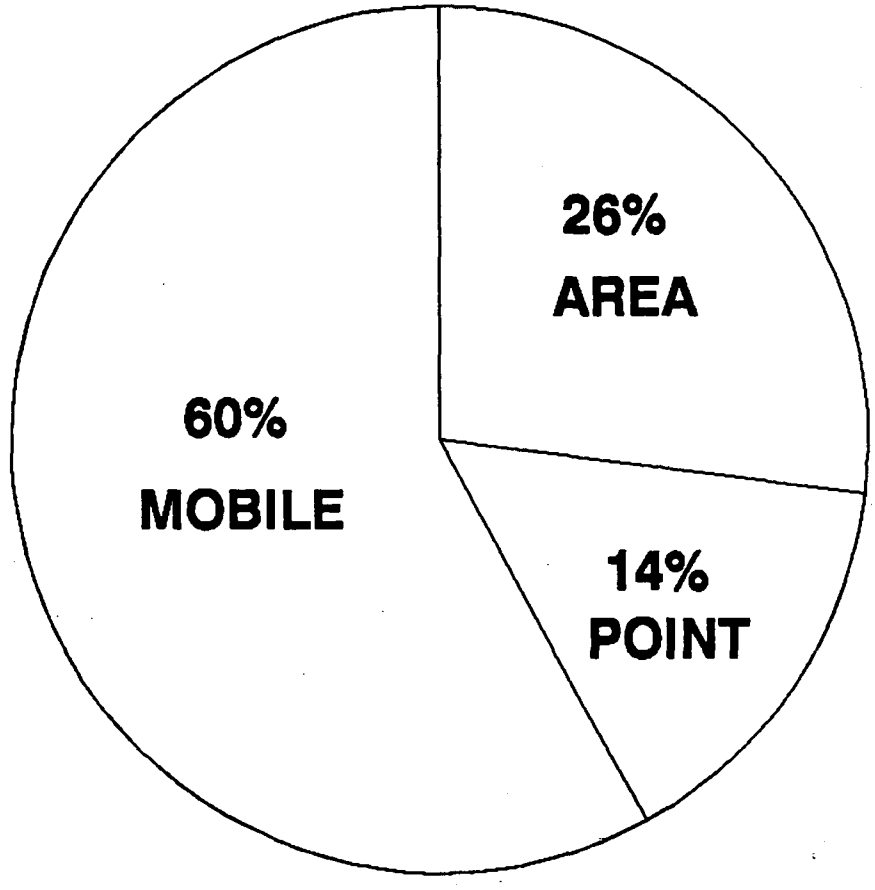
Management Recommendation:

* Prioritize compliance activities at the most chronic violators.

* Consider innovative funding approaches for vulnerable PWSs that may have difficulties achieving compliance, e.g., small PWSs which typically use ground water sources.

Figure 1

SOURCES OF VOC EMISSIONS FROM OZONE NON-ATTAINMENT AREAS *



* FROM 1987-1988 EMISSION INVENTORY

AREA AND MOBILE SOURCES; A SIGNIFICAN CONTRIBUTOR TO AIR POLLUTION IN REGION III

VOC loadings are a good indicator of potential environmental threat because they encompass approximately 50% of the toxic air emissions and are also precursors to ozone, which has known human health and ecological impacts. This map displays the VOC emissions of area and mobile sources (it does not include point sources) compared with areas of ozone non-attainment in Region III.

Findings:

* Even when the contribution from point sources is eliminated, substantial VOC emissions still exist throughout the region.

* Preliminary results indicate that relatively high emissions of VOCs exist in areas not commonly considered a problem (i.e., that are not in areas of ozone non attainment).

* The exposure of people and ecological systems to toxic air pollutants and to ozone is widespread in the region.

Management Recommendations:

* Region III should complete the emission picture and evaluate VOC emission data using 1990 emission inventories.

* Ambient air toxic information or development of models to estimate public exposure is needed.