So, What Can Be Done to Fix These Problems?

1 First, environmental managers can review existing environmental management programs. Do they protect all living organisms and provide a sustainable environment? If there is compliance with environmental permits, but living organisms are stressed, something additional may be needed.

2 Environmental managers need to rank the stressors. Cause-effect relationships between the factors causing stresses and the biological/ecological endpoints that relate to society's needs and desires (e.g., food to eat, housing, clean water, streams with fish, birds and animals to watch, large continuous forested watersheds) must be determined. Then, human needs must be balanced with the stressors that cause the highest ecological damage.

3 Environmental managers need to manage the environment in a more integrated way. Managing on a pollutant-by-pollutant, or media-by-media (e.g., water, air, solid waste) basis is not enough anymore. Flexible, integrated environmental management programs, similar to those in the Chesapeake Bay watershed (Figure 6), also need to be implemented in the Highlands and throughout the Region.

Figure 6. Integrated environmental management has been implemented by the EPA Chesapeake Bay Program and its federal, state, and local partners through "Chesapeake 2000."

4 Finally, environmental managers need to present information in a way that is clear and understandable to the public and decision makers. Sound, understandable information can contribute to decisions on the effects of urban sprawl, where to put transportation corridors, and how to protect large, continuous stands of forests from being cut into small patches. Clearly, everyone–government at all levels, civic organizations, schools, the private sector, and individuals–needs to be involved in these solutions if a better place for our children to live is to be the result.

The Goal

EPA's goal is to manage for a healthy and sustainable environment for humans and other living organisms. The Lessons Learned through the EPA's Mid-Atlantic Integrated Assessment initiative will help move us toward that goal. The facts and conclusions presented above are based on the peer reviewed publications cited and the management recommendations were developed by EPA Region 3.

The Mid-Atlantic Integrated Assessment (MAIA) is an interagency, multi-disciplinary research, monitoring and assessment program to develop high-quality scientific information on the region's natural resources: current condition, stressors, trends, and vulnerabilities. MAIA results and information are intended to satisfy a broad group of stakeholders' needs, convey important information relevant to their assessment questions and issues, and be useful in making management decisions.

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EPA United States Environmental Protection Agency

What is the State of the Environment in the Mid-Atlantic Region?

The state of the environment in the Mid-Atlantic region is improving; it just hasn't reached a healthy and sustainable state!

Wait a minute!
What kind of double talk is this?

State of the environment - Improving? Yes!

Healthy and Sustainable?
No - Not Yet!

Results from physical and chemical monitoring indicate that the state of the environment in the Mid-Atlantic has improved: municipal and industrial discharge water quality has improved; best management practices are being implemented to control runoff; and wetlands are being restored. But, these monitoring methods are not adequate to identify when the goal of a healthy and sustainable environment for humans and other living organisms has been reached. Sustainable is defined as a method of harvesting or using a resource so that the resource is not depleted or permanently damaged.

MAIA Region Map

Over the past 10 years, a new way of monitoring has been taking place in the U.S. Environmental Protection Agency's Mid-Atlantic Integrated Assessment (MAIA). Instead of just measuring physical and chemical indicators in hand-picked locations in forests, streams and estuaries, the condition of living organisms and physical and chemical indicators has been measured in a way that can be related to the condition of the environment for the entire region. In addition, new approaches have been developed for using and evaluating satellite pictures to assess environmental condition.

Lessons Learned

Seven of the lessons learned over the past 10 years from these new ways of monitoring are:

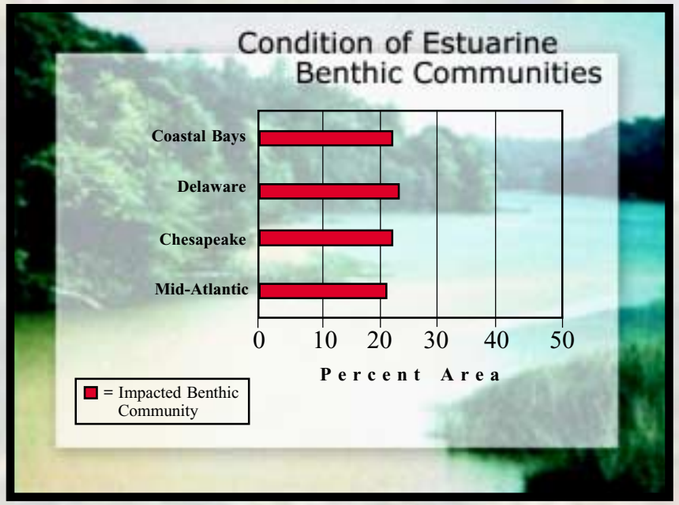

Figure 1. Over 20% of the Mid-Atlantic estuarine area has benthic communities which are impacted (EPA/600/R-98/147, November 1998).

Biological organisms—fish, birds, insects, trees—**are stressed throughout the region**. Estuarine bottom organisms, stream fishes, and bird communities all show signs of being stressed (Figure 1). It doesn't matter if we look at the region as a whole, on a watershed by watershed basis, or look at individual states, the condition is the same—biological organisms are stressed!

Birds, ecological condition, and land use and land cover are all linked (Figure 2). The types of birds found in an area indicate the ecological condition of that area. Bird communities and ecological condition are also linked to land cover. As the land cover of an area changes, so do the types of birds in that area.

Figure 2. Bird community index scores for the Mid-Atlantic Highlands indicate that over 50% of the area is ranked in fair to poor condition (EPA/620/R-00/003, June 2000).

Living organisms integrate chemical, physical habitat, pathogenic and other effects around them and **provide a cumulative** or longer-term **record of what has been going on in the environment**. Chemical spills, stormwater discharges of pollutants, or other short-term events can be missed if only chemical or physical indicators are measured. Living organisms provide a more complete picture of the condition of the place in which they live.

Chemical and physical indicators do not provide a complete picture of environmental condition, which is the flip-side of Lesson 3. Yet, many monitoring programs only measure chemical and physical indicators. We need to invest more in measuring biological indicators. We need a better, more complete picture.

Habitat loss and degradation is a major problem throughout the Mid-Atlantic region. In the eastern half of the region, urban sprawl is contributing to this loss and degradation (Figure 3). In the western half of the region, resource extraction—from timber harvesting to mining—contributes to this loss and degradation. Forest fragmentation—cutting swaths and patches out of the forest—contributes to habitat degradation.

Figure 3. Urban sprawl leads to more area that is impervious to rainfall and increases runoff of pollutants. When the impervious cover is over 2%, brook trout disappear from streams, when it is above 15%, stream health is never rated good, and when impervious cover is over 25%, only a few species can live in the stream (EPA/903/R-99/023, December 1999).

Forest fragmentation is widespread throughout the region (Figure 4). The forests in the Mid-Atlantic region are a world-renowned resource. There is only one other place in the world that has as much continuous mid-latitude forest. The Mid-Atlantic forest is rapidly being reduced from large continuous stands to smaller, non-contiguous stands that do not provide sufficient habitat for many species. These species, from migratory birds to black bears, require large blocks of continuous forest to sustain their populations.

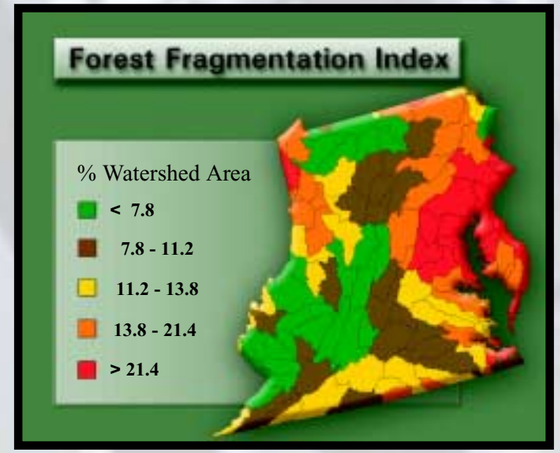

Figure 4. An index of forest fragmentation shows the greatest fragmentation (red) occurs in areas around major metropolitan areas and areas undergoing rapid growth. There are still areas where forest fragmentation is low (green) (EPA/600/R-97/130, November 1997).

Non-native and exotic species have invaded the Mid-Atlantic region and are a major problem. These species range from pathogens to plants to fish to birds and can out-compete native species because their natural enemies are not present. Combining habitat loss with the introduction of non-native species results in the loss—in many cases permanent—of native species.

What is Stressing the Living Organisms in the Mid-Atlantic?

There are many factors that contribute to the stress observed in living organisms. It's difficult to identify any one thing—stressors are interrelated and overlapping. For example, some streams are clearly dominated by a single stressor, but most suffer from the cumulative, combined effects of multiple stressors.

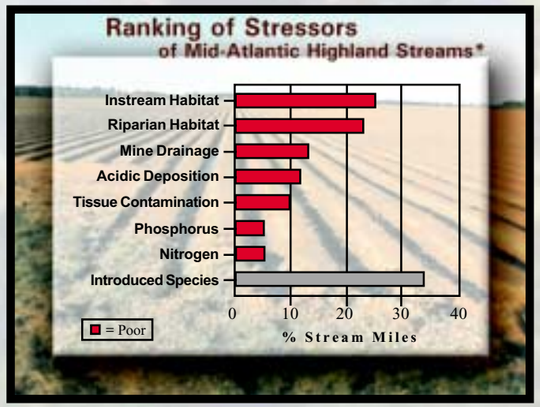

Figure 5. Habitat degradation—both from sedimentation in the stream bed (instream) and erosion along its banks (riparian)—is the stressor that has damaged the most miles of streams in the Mid-Atlantic Highlands. Introduced species (gray bar above) are found in over 30% of the stream miles and include brown and rainbow trout, introduced by the states as game/sport fish (EPA/903/R-00/015, August 2000).

* *The Mid-Atlantic Highlands study region includes the area from the Blue Ridge Mountains in the east to the Ohio River in the west and from the Catskill Mountains in the north to the Virginia—North Carolina/Tennessee border in the south.*