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**WATER QUALITY CRITERIA AND
STANDARDS PLAN -- *Priorities for the
Future***

INTERIM FINAL

FOREWORD

I am pleased to release the **Water Quality Criteria and Standards Plan -- *Priorities for the Future***. The Plan sets out EPA's commitments to develop and enhance important scientific and technical tools that will strengthen and modernize the water quality criteria and standards program. The Plan defines key objectives and activities to be undertaken over the next decade. A number of these activities build upon ongoing efforts, while others are new and yet to be started.

I encourage you to take the time to carefully review the Plan, and provide us feedback on the priorities, objectives and activities for the water quality criteria and standards program for the next ten years. We are especially interested in your thoughts on how best to achieve the ambitious number of activities described for each priority area. We will be interested in receiving feedback through the end of August, 1998. Based on the feedback we receive, we will make changes and additions to the Plan to ensure that it thoroughly reflects the priorities and needs of the Nation.

As progress is made in achieving the goal of restoring the integrity of the Nation's waters, the Plan will be reviewed and revised to address new water quality challenges. I also encourage your participation in this long-term process.

/s/

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Water Quality Criteria and Standards Plan
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WATER QUALITY CRITERIA AND STANDARDS PLAN -- *Priorities for the Future*

I. EXECUTIVE SUMMARY

The U.S. EPA, Office of Science and Technology in the Office of Water developed this Plan to identify and communicate key scientific and technical priorities the Agency plans to pursue together with the States and Tribes to enhance and improve water quality criteria and standards programs across the country.

This Plan is designed to support the *Clean Water Action Plan* announced by President Clinton in February 1998. Many of the action items in the *Action Plan* that will be accomplished over the next several years rely on improvements in the technical and scientific underpinnings of the water quality standards program. Improvements need to be made, and new initiatives undertaken, to strengthen the national water quality standards program.

The **Water Quality Criteria and Standards Plan--*Priorities for the Future***, describes seven new criteria and standards program initiatives that EPA will take over the next decade.

The Plan presents a “vision” and strategy for meeting these important new initiatives and improvements. The Plan will guide EPA and the States and Tribes in the development and implementation of criteria and standards and will provide a basis for enhancements to the Total Maximum Daily Load (TMDL) program, National Pollutant Discharge Elimination System (NPDES) permitting, nonpoint source control, wetlands protection and other water resources management efforts.

PRIORITY AREAS FOR THE WATER QUALITY CRITERIA AND STANDARDS PROGRAM:

The Office of Water will emphasize and focus on the following priority areas for the Criteria and Standards Program over the next decade:

- Maintaining and strengthening the existing **Ambient Water Quality Criteria** for water and sediments.*
- Developing **Nutrient Criteria** and assessment methods to better protect aquatic life and human health.*
- Developing criteria for **Microbial Pathogens** to better protect human health during water recreation.*
- Completing the development of **Biocriteria** as an improved basis for aquatic life protection.*
- Developing improved methods for **TMDLs and Modeling** to better translate water quality standards into implementable control strategies.*
- Evaluating possible criteria initiatives for **Sedimentation, Flow, and Wildlife**.*
- Ensuring **Implementation** of these new initiatives and improvements by EPA in partnership with the States and Tribes.*

The “Vision” of the Plan--

The water quality criteria and standards program will fully integrate biocriteria, nutrient criteria and microbial pathogen control with improved chemical-specific criteria, whole effluent toxicity methods and possible sedimentation, flow and wildlife criteria, into criteria and standards programs to better support watershed management for the protection of human health and the maintenance and improvement of the chemical, physical and biological integrity of the Nation’s waters. Future criteria initiatives for excessive sedimentation, flow and wildlife will be investigated.

The national surface water quality protection program is at an important juncture. The initiatives described in the Plan are needed to better protect aquatic life and the recreational uses of the Nation’s waters. Over the past two decades, State and Tribal water quality standards and water quality-based management approaches have relied upon aquatic life use designations and protective criteria based primarily upon narrative, chemical-specific and whole effluent toxicity methodologies. Using these approaches, outstanding progress has been made. However, not all of the Nation’s waters have achieved the Clean Water Act goal of “fishable and swimmable”, and significant water pollution problems still exist. Approximately 40 percent of the Nation’s assessed waters still do not meet water quality goals and about half of the Nation’s 2000 major watersheds have water quality problems.

Given these facts, there is a critical need for improved water quality standards and a set of tools to implement those standards. Adding nutrient criteria and biological criteria to the water quality criteria and standards program ensures further improvements in maintaining and restoring aquatic life. Improved human health criteria will better protect against bioaccumulative pollutants and new microbial pathogen controls will better protect human health (especially that of children) during water related recreation. Better tools also are needed for controlling excessive sedimentation, flow alterations and for protecting wildlife. The new initiatives discussed in the Plan also will help to promote water resources management on a watershed basis in support of the *Clean Water Action Plan*.

The Plan briefly describes the water quality issues and concerns that the new criteria initiatives will address. For each initiative, the Plan explains the key objective(s) to be accomplished and the critical activities EPA is planning to take to achieve these objectives.

II. INTRODUCTION

1. WHAT IS THIS PLAN?

The **Water Quality Criteria and Standards Plan** presents a “vision” and strategy for important new initiatives and improvements that should be made to the water quality criteria and standards program to better protect human health and enhance and maintain the quality of the Nation’s waterbodies.

This plan will guide EPA and the States and Tribes in their development and implementation of criteria and standards over the next decade and will enhance the effectiveness of clean water programs, including the National Pollutant Discharge Elimination System (NPDES) permitting, nonpoint source control, Total Maximum Daily Loads (TMDL) derivations, wetlands protection, water quality certifications and other water resources management efforts.

This Plan does not, however, substitute for the Clean Water Act or EPA’s regulations; nor is it a regulation itself. Thus, it cannot impose legally binding requirements on EPA, States, or the regulated community and may not apply to a particular situation based on the circumstances. EPA retains the discretion to adopt approaches on a case-by-case basis that differ from the approaches discussed in this Plan, where appropriate. EPA may change this Plan in the future.

2. OBJECTIVE OF THIS PLAN

This Plan communicates the new initiatives and improvements that will be taken by EPA over the next decade to better equip the States and Tribes to implement a more fully integrated water quality criteria and standards program.

The Plan lays out a vision and a strategy for the next decade that includes new initiatives such as developing nutrient criteria and standards and new microbiological pathogen tools and developing biocriteria for use in water quality standards. The Plan also describes the possibility of three additional initiatives to investigate water quality criteria for sedimentation, flow, and wildlife protection.

At the same time, the Plan identifies refinements that will help to maintain and improve the predictive and quantitative capabilities associated with existing chemical-specific and whole effluent toxicity criteria that have been used for water quality protection for the past two decades. The Plan also outlines a strategy for improving TMDL modeling techniques and for working with State and Tribal partners to implement the new criteria and improvements into water quality standards.

EPA recognizes that there are existing water quality standards program requirements that create an ongoing workload for States and Tribes, and that addressing these requirements and resolving related issues will present significant challenges for States and Tribes over the coming

years. Examples include, application of antidegradation requirements to regulated activities, completion and periodic public review of use attainability analyses, resolution of issues stemming from new State water quality laws, adoption of minimally-acceptable water quality standards on tribal lands, and other important core program activities mandated by CWA section 303(c) and EPA's implementing regulations.

The Criteria and Standards Plan describes activities that are in addition to these existing demands facing States, Tribes and EPA over the next ten years. Although some of the improvements envisioned by the Plan will help resolve some of the pending issues, EPA recognizes that the Plan describes an ambitious agenda for the next decade, not only for EPA, but also for the States and Tribes. Because of this, EPA encourages the States, Tribes, stakeholders and other interested parties to seek innovative and efficient ways to make the Plan a reality.

3. WHY IS THIS PLAN NEEDED?

The national surface water quality protection program is at an important juncture. Improvements to the water quality criteria and standards program need to be made to better protect aquatic life and human health and communicate this information to the public.

To date, State and Tribal water quality standards and water quality-based management approaches have successfully relied upon beneficial use designations and protective criteria based primarily upon narrative, chemical-specific, and whole effluent toxicity methodologies. These approaches and methodologies have worked well for controlling individual sources of pollution discharged by industry and sewage treatment plants, and will continue to remain as valuable tools, where applicable. However, if the Nation is to finish the job of restoring and protecting water quality and fulfill the Clean Water Act goal of "fishable and swimmable" waters, improvements and enhancements must be made to the water quality criteria and standards program.

Given the remaining sources of water quality impairments, there is an essential need for nutrient criteria, biocriteria and improved human health and microbiological criteria to ensure further improvements in maintaining and restoring water quality. Better protection of human health during water related recreation, enhanced management of wet weather flows, and water resources management on a watershed basis is also needed. Likewise, better tools should be developed for controlling excessive sedimentation, flow alterations and for protecting wildlife.

"The challenge is to enhance the water quality criteria and standards program so that it can accommodate both watershed-wide management and/or site-specific decision-making, facilitate more effective control of multiple stressors and measure the complete health of the entire waterbody."

4. BACKGROUND

What Are Water Quality Standards and Criteria?

Water quality standards are laws or regulations that the States and Indian Tribes adopt to enhance and maintain water quality and to protect public health. Water quality standards provide the foundation for accomplishing the goals and objectives of the Clean Water Act. More specifically, water quality standards help to:

- *Restore and maintain the chemical, physical and biological integrity of the Nation's waters; and,*
- *Where attainable, achieve water quality that promotes protection and propagation of fish, shellfish and wildlife and provide for recreation in and on the water. This goal is commonly known by the expression "fishable and swimmable"; and,*
- *Prohibit the discharge of toxic pollutants in toxic amounts; and,*
- *Eliminate the discharge of pollutants to navigable waters.*

Water quality standards apply to surface waters of the United States, including rivers, streams, lakes, oceans, estuaries and wetlands. Water quality standards consist, at a minimum, of three elements: 1) the "designated beneficial use" or "uses" of a waterbody or segment of a waterbody; 2) the water quality "criteria" necessary to protect the uses of that particular waterbody; and 3) an antidegradation policy. Typical designated beneficial uses of waterbodies include public water supply, propagation of fish and wildlife, recreation, agricultural water use, industrial water use and navigation.

Water quality criteria describe the quality of water that will support a given designated use. Under authority of section 304 of the Clean Water Act, EPA publishes, on an advisory basis, water quality "criteria" that reflect available scientific information on the maximum acceptable concentration levels of specific chemicals in water that will protect aquatic life or human health. These criteria are intended to provide protection for all surface waters on a national basis and may be used by the States and Tribes for developing enforceable water quality criteria that protect the designated use as a part of their water quality standards. When properly selected criteria are met, they are expected to protect the designated use with a margin of safety. The antidegradation policy ensures that existing water quality is maintained and protected.

States and Tribes use criteria developed by EPA under section 304 to adopt enforceable maximum acceptable concentration levels of a pollutant in ambient waters. The water quality criteria adopted into a State or Tribal water quality standard may or may not be the same number published by EPA under section 304. States and Tribes have the discretion to adjust the section

304 criteria to reflect local environmental conditions and human exposure patterns or to derive a criterion from an independent methodology as long as it is scientifically defensible. Water quality criteria can also be expressed in either numeric form or narrative form by the States and Tribes in their water quality standards. EPA reviews and approves State and Tribal water quality standards every three years.

To date, virtually all States have narrative and numeric water quality standards that protect human health and aquatic life from exposure to some chemicals and conditions in the water, including toxic and bioaccumulative pollutants. However, few States or Tribes have adopted numeric criteria for biological integrity, excessive nutrient enrichment, excessive sedimentation, wildlife protection or flow control.

Why Are New Water Quality Criteria and Improvements to the Existing Water Quality Standards Program Needed?

Important problems and concerns still exist with the Nation's water quality which warrant the need for changes and improvements to the water quality criteria and standards program over the next decade.

Although major successes have been achieved through implementation of technology-based and water quality-based controls on specific pollutants, studies reveal that there still exist significant threats to water quality including nutrient imbalances, adverse human health effects, polluted runoff, excessive wet weather flows, habitat degradation, and severe temperature and other flow alterations, such as too little water. New and improved criteria and standards tools are needed to address these remaining water quality problems.

Excessive Nutrient Enrichment

Nutrients are essential to the health and diversity of our surface waters. However, in excess amounts they can lead to hypereutrophication, resulting in over-growth of primary producers and decline of the biological community as well as potential human health risks most recently manifested in the *Pfiesteria* outbreaks in the Gulf and East Coasts.

Many federal agencies, including EPA, U.S. Department of Agriculture, U.S. Geological Society, National Oceanic and Atmospheric Administration, and U.S. Fish and Wildlife Service have ongoing nutrient investigation and abatement projects which can be coordinated. The national response to the nutrient problem has been limited. However, recent advances in the approach to pollution management emphasizing a watershed approach and community involvement now make it possible to address this threat.

Microbial Contamination

Current EPA criteria for protection against pathogenic microorganisms in recreational waters rely on the use of *E. coli* and enterococci as indicators of potential risk from acute

gastrointestinal disease. Since these indicators require a 24-48 hour period from sampling until the analysis is completed, the ability of public health officials to alert beach goers or to post or close beaches when pollution problems arise is impaired. Modifications to current indicator methods or development of new methods will provide "real time" indications of pathogen risk.

The current microbial pathogen indicators are not designed to indicate the presence of other pathogenic organisms which may cause throat, skin, eye, ear, and respiratory tract infections. Additional indicators are needed to rapidly detect the presence and quantity of other pathogens in polluted water that can lead to infectious disease risks. The current monitoring strategy is limited to routine weekly monitoring at a single point at a beach and do not factor in meteorological or pollution events which can cause increased short-term risks of disease. Better monitoring approaches would help public health officials determine when beach conditions are acceptable and would include assessments of water quality at various distances, depths, and locations.

There also is a need to use new criteria to protect human health. EPA now uses the National Academy of Science risk assessment paradigm for toxic chemicals (and versions thereof) for performing microbiological risk assessments. However, there are a number of shortcomings in the use of this approach. A risk assessment approach that accounts for all of the unique characteristics of microbial pathogens and human infection that cannot be dealt with directly in the chemical risk assessment model is essential for performing microbiological risk assessments.

Wet Weather Flows

Excess storm water flows, habitat degradation and alterations to temperature all have potentially serious consequences on the biota of a receiving waterbody. The high volumes and velocities of storm water flows into streams and small rivers can result in stream bank erosion, excessive turbidity and extreme sedimentation which severely damage local habitat. With these chronic impacts, healthy biological life cannot exist.

To help address wet weather flows, the 1994 EPA Combined Sewer Overflow (CSO) policy presumes that States and Tribes will re-examine their water quality standards on affected waters. More effective tools, such as biocriteria, habitat assessments and possibly sedimentation and flow criteria, will help States and Tribes better assess and deal with wet weather overflows.

The introduction of biological criteria and assessment techniques will provide EPA and the States and Tribes better tools for addressing the impacts of wet weather flows. Biological assessment methods are potentially the best methods to directly detect the separate or cumulative impacts of chemical, physical and other stressors in the aquatic environment. Biocriteria and assessment methods also provide a tool for more specific or refined aquatic life use designations and more accuracy in detecting aquatic life use impairments. The aquatic life use refinements will enable the States and Tribes to develop chemical-specific criteria at the waterbody or watershed level and to more effectively prioritize and target control actions.

At the same time, existing tools such as chemical-specific criteria for the protection of aquatic life and human health, whole effluent toxicity criteria and methods must be maintained and strengthened to prevent erosion of the progress made to date. Chemical-specific and whole effluent toxicity criteria will remain an essential feature to control the sources of chemical stressors, however, some of EPA's criteria guidance are over ten years old. Some criteria guidance need updating and new criteria, especially for sediment quality, should be developed.

III. RELATIONSHIP TO THE *CLEAN WATER ACTION PLAN*, APPLICABLE AGENCY GOALS AND OTHER INITIATIVES

1. *THE CLEAN WATER ACTION PLAN*

The Criteria and Standards Plan is intended to fully support the *Clean Water Action Plan* announced by President Clinton in February 1998. Water quality standards in States and Tribal lands are an essential foundation for implementing many of the key actions described in the *Action Plan*. Numerous goals, principles and key actions described in the *Action Plan* will be accomplished through strengthened water quality standards and criteria.

For example, reducing nutrient enrichment and controlling Pfiesteria outbreaks will depend heavily on the development and implementation of nutrient criteria in all State and Tribal water quality standards. The more effective control of mercury contamination will be achieved partly through promulgation of an updated mercury water quality criterion. Assuring beaches are safe for swimming will depend on better microbial pathogen control, including revised criteria. Better protection of wetlands and coastal waters can be achieved partially through development and implementation of wetlands, estuarine and near coastal waters biocriteria. Improved storm water management and control of polluted nonpoint source runoff can be achieved through the use of sediment controls, flow controls, biocriteria and habitat monitoring.

Successful watershed management, especially that aimed at restoring healthy aquatic systems, will depend on watershed managers having a strong and comprehensive set of water quality standards, including up-to-date chemical criteria, whole effluent toxicity criteria and newly developed biocriteria and habitat assessment tools.

The Criteria and Standards Plan is a blueprint that identifies the necessary scientific and technical activities and commitments EPA will undertake over the next decade to strengthen and improve the water quality criteria and standards program. By making these improvements, a stronger foundation for water quality management will be created upon which the goals and key actions of the *Clean Water Action Plan* can be achieved.

2. *GOVERNMENT PERFORMANCE RESULTS ACT (GPRA)*

The Criteria and Standards Plan is also designed to help achieve the Water Goals established by the Agency under the Government Performance Results Act (GPRA) as described below in this section.

Goal 2: Clean and Safe Water

Objective 1: By 2005, protect *human health* so that 95% of the population served by community water systems will receive water that meets drinking water standards,

consumption of contaminated fish and shellfish will be reduced, and exposure to contamination in waters used for recreation will be reduced.

Subobjective 1b: By 2005, standards that establish protective levels for an additional 10 high-risk contaminants (e.g., disinfection by-products, arsenic, radon) will be issued.

Subobjective 1f: By 2005, consumption of contaminated fish and shellfish will be reduced and the percentage of waters attaining designated uses protecting the consumption of fish and shellfish will increase.

Subobjective 1g: By 2005, exposure to microbial and other forms of contamination in waters used for recreation will be reduced and the percentage of waters attaining the designated recreational uses will increase.

Objective 2: Conserve and enhance *ecological health* of the Nation's waters and aquatic ecosystems so that 75% will support healthy aquatic communities by 2005.

Subobjective 2a: By 2005, restore and protect watersheds so that 75% of waters support healthy aquatic communities as shown by comprehensive assessments.

Subobjective 2c: By 2005, provide means to identify, assess and manage aquatic stressors, including contaminated sediments.

Objective 3: By 2005, pollutant discharges from key *point sources and nonpoint source runoff* will be reduced by at least 20% from 1992 levels. Air deposition of key pollutants impacting waterbodies will be reduced.

Subobjective 3a: By 2005, annual point source loadings from CSOs, POTWs and industrial sources will be reduced by 30% from 1992 levels.

Subobjective 3b: By 2005, nonpoint sediment and nutrient loads to rivers and streams will be reduced. Erosion from cropland, used as an indicator of success in controlling sediment delivery to surface waters, will be reduced by 20% from 1992 levels.

Subobjective 3c: By 2006, reduce releases of targeted persistent toxic pollutants that contribute to air deposition by 50-75%, reducing deposition of nitrogen by 10-15% from 1992 levels.

3. ADVANCE NOTICE OF PROPOSED RULEMAKING (ANPRM) FOR THE WATER QUALITY STANDARDS REGULATIONS AT 40 CFR PART 131

It is helpful to understand the relationship between the ANPRM and the Criteria and Standards Plan. The ANPRM solicits public comment on potential revisions to the basic water

quality standards program regulation governing State adoption and EPA approval of water quality standards under section 303(c) of the Clean Water Act. The ANPRM also requests comments and suggestions on any improvements or refinements that would make implementation of the standards program more effective in, a) protecting water quality, b) supporting a watershed management approach, and c) integrating new criteria and assessment science into standards programs.

The Criteria and Standards Plan highlights the ongoing and new scientific and technical initiatives that need to be taken by EPA, in partnership with the States and Tribes, to improve the water quality criteria program. The ANPRM solicits comments on how these might be best implemented in water quality standards by the States and Tribes.

The ANPRM emphasizes improving and refining designated uses and tailoring criteria to match those uses. The Plan identifies the necessary new criteria tools that are essential to improving and refining the designated uses. The ANPRM discusses and takes public comment on each of these new criteria tools regarding how and when these new criteria should be implemented, i.e.; whether the water quality standards regulation should be amended to require, or merely recognize, these additional forms of criteria. Once ANPRM comments are received and reviewed, EPA will consider relevant comments for future revisions or amendments to this Plan.

EPA acknowledges that efforts to improve and refine the water quality standards program could encounter significant resource constraints in some States and Tribes. In order for a new, data-intensive, watershed-specific approach to succeed, it must be manageable for the States and Tribes that will be in the position of implementation. The ANPRM also highlights the potential resource challenges for States and Tribes and requests comment regarding concerns over resource constraints and ideas for how to address them.

IV. THE FOUNDATION OF THE PLAN

To improve and enhance the effectiveness of water quality management efforts in the United States, the U.S. EPA, Office of Water establishes the Water Quality Criteria and Standards Plan for the future of the water quality criteria and standards program. The vision of the Plan provides an overarching objective.

1. A “VISION” FOR THE 21ST CENTURY

The “Vision” of the Plan--

The water quality criteria and standards program will fully integrate biocriteria, nutrient criteria and microbial pathogen control with improved chemical-specific criteria, whole effluent toxicity methods and possible sedimentation, flow and wildlife criteria, into criteria and standards programs to better support watershed management for the protection of human health and the maintenance and improvement of the chemical, physical and biological integrity of the Nation’s waters. Future criteria initiatives for excessive sedimentation, flow and wildlife will be investigated.

2. OVERALL GOALS OF THE PLAN

EPA will strive to achieve the following goals when implementing this Plan:

- Improve the scientific basis of all water quality criteria and the implementing tools, such as models, to support better decisions about appropriate stressor management.
- Provide necessary technical and policy guidance and training to support the new criteria and assessment methodologies. Improve delivery of technical assistance/outreach to the States and Tribes.
- Support the States and Tribes with programmatic resources to implement these new initiatives, encourage innovation through program flexibility, and ensure equity between different State and Tribal programs.
- Improve communication of the policy and technical bases for water quality criteria to stakeholders and the general public.
- Better communicate the quality and uses of the Nation’s waters to the public in a manner that enables the public to better understand and more effectively participate in water quality management decisions.

- Help to achieve, in a timely fashion, the applicable water goals defined for EPA under the Government Performance Results Act (GPRA).

3. GUIDING PRINCIPLES

EPA will adhere to the following guiding principles during the implementation of the Plan.

- EPA will continue to support the lead role States and Tribes play in restoring and maintaining the chemical, physical and biological integrity of the Nation's waters.
- EPA will provide current, high quality, peer reviewed science as the foundation for the criteria and standards program.
- EPA will maintain the scientific integrity of the historical chemical-specific and effluent toxicity parameters and will develop the necessary scientific and policy tools to fully integrate biological criteria and assessments into the suite of water quality tools.
- EPA will actively involve States and Tribes in the criteria development process by making published methods and the data used in those methods more accessible.
- EPA will continue to support the national program model based on generally applicable national or regional criteria and use of site-specific local data and analysis, as necessary, for needed improvements on a watershed or eco-region basis.
- EPA will communicate to local governments, the regulated and environmental communities and the public the science and processes used for implementing the activities identified in this Plan.

4. PRIORITY AREAS OF THE PLAN

The Office of Water will emphasize and focus on the following priority areas for the Criteria and Standards Program over the next decade.

PRIORITY AREAS FOR THE WATER QUALITY CRITERIA AND STANDARDS PROGRAM

- ◆ *Maintain and strengthen the existing **Ambient Water Quality Criteria** for water and sediments.*

- ◆ *Develop **Nutrient Criteria** and assessment methods to better protect aquatic life and human health.*

- ◆ *Develop criteria for **Microbial Pathogens** to better protect human health.*

- ◆ *Complete the development of **Biocriteria** to better protect aquatic life.*

- ◆ *Develop improved methods for **TMDLs and Modeling** to better translate water quality standards into implementable control strategies.*

- ◆ *Evaluate possible criteria initiatives for **Sedimentation, Flow and Wildlife**.*

- ◆ *Ensure **Implementation** of these new initiatives and improvements by EPA in partnership with the States and Tribes.*

V. KEY PROGRAM OBJECTIVES AND ACTIVITIES OF THE PLAN

1. AMBIENT WATER QUALITY CRITERIA

EPA's ambient water quality criteria program began with the enactment of the Clean Water Act (CWA). The CWA requires the Administrator of the Environmental Protection Agency to publish criteria for water quality that accurately incorporates the latest scientific knowledge on the kind and extent of all identifiable effects on health and welfare resulting from the presence of pollutants in any body of water, including ground water. Aquatic life and human health water quality criteria establish water column chemical concentrations that protect aquatic life health (water column organism) and human health.

EPA first published water quality criteria guidance in 1972 in the "Blue Book." More criteria guidances were published in 1976 in the "Red Book." In 1980, EPA issued a methodology and guidelines for deriving water quality criteria along with a series of water quality criteria guidance documents for 64 pollutants/pollutant classes. The criteria guidance documents provided two types of information: 1) discussions of available scientific data on the effects of the pollutants on public health and welfare, aquatic life, and recreation; and 2) quantitative concentrations or qualitative assessments of the levels of pollutants in water which, if not exceeded, will generally ensure adequate water quality for a specified water use. Many of the previously published EPA criteria guidances and some new criteria guidances were summarized in the "Gold Book" which was published in 1986. Ambient water quality criteria are based on data and scientific judgments on the relationship between pollutant concentrations and environmental and human health effects. The criteria do not reflect consideration of economic impacts or the technological feasibility of meeting the chemical concentrations in ambient water. The criteria guidances are used by States and Tribes to establish water quality standards, and ultimately provide a basis for controlling discharges or releases of pollutants.

To date, aquatic life and human health criteria form the foundation of the ambient water quality program. However, over the years it has been recognized that to fulfill all the goals of the CWA, EPA would have to address more than just specific chemical pollution. The Agency developed a variety of tools in addition to aquatic life and human health chemical-specific criteria guidance to provide a more holistic approach to aquatic resource protection. For example, whole effluent toxicity testing was developed and

AMBIENT WATER QUALITY CRITERIA

--Key Objectives:

- 1. Existing chemical criteria and criteria methodologies and whole effluent toxicity methods for the protection of aquatic life will be maintained, updated and improved, where necessary.***
- 2. Existing human health criteria will be maintained, updated and improved, where necessary.***

chemical criteria were expanded to include some wildlife criteria (for the Great Lakes). In addition, national sediment criteria guidances were proposed for the protection of benthic organisms. To continue this progress in ambient water quality criteria development, this portion of the Plan lays out the key objectives of the ambient water quality criteria program for the next several years.

--AQUATIC LIFE - Key Activities:

Aquatic life criteria guidance are derived to be protective of most aquatic species. The protective value is derived from a strict standard set of toxicity data collected for at least one species of aquatic organism (usually the most sensitive life stages) in at least eight different taxonomic families. Criteria also consider such things as water hardness which may impact the bioavailability of the chemical. There are also adjustments that can be made to provide for site-specific conditions. Because the final chronic value of the aquatic life criterion is protective of both water column and benthic organisms (when tested in water only tests; no sediment) it is the protective value used in the derivation of sediment quality criteria for the protection of benthic organisms. The calculation of sediment quality criteria also includes the organic carbon content or acid volatile sulfide content of the sediment and the octanol/water partitioning coefficient of the chemical of concern. The numeric values derived for aquatic life and sediment quality can then be incorporated into a State's water quality standards and be used for developing total maximum daily loads and wasteload allocations which may lead to permit limitations on point source discharges and other controls on non-point sources.

Though EPA developed its aquatic life and sediment quality criteria based on a rigorous data standard, many of the aquatic life criteria have not been updated in several years and the sediment quality criteria program is just getting underway. In order to achieve the goals of the CWA it is imperative that the base program keep pace with advancing science and incorporate new approaches and insights. To promote a sound science foundation, a variety of maintenance, improvement, and re-engineering efforts must be undertaken.

To meet the ambient water quality criteria objectives for aquatic life, a number of key activities need to be carried out. First, EPA must update the existing aquatic life criteria derivation methodology. The current methodology was written in 1985. Since that time there have been a number of advances in aquatic fate and transport modeling and improved knowledge of modes of action of many chemicals. This information needs to be incorporated into the criteria derivation methodology. The goal is to derive criteria that are appropriately protective. The criteria should not be under protective, nor should they be over protective when the tools are available to accurately evaluate the unique system or contaminant under consideration.

- **EPA will collect the latest scientific data and other information for aquatic life criteria development and revisions, on an ongoing basis.**
- **EPA will update the aquatic life criteria derivation methodology to reflect new science and modeling capabilities:**
 - **Review the need for adjustments to frequency and duration components of existing guidelines by the end of 2000.**

It has long been EPA's goal to implement a watershed/ecorisk-based ambient water quality program. In fact, this was the intent of some of the earliest water quality control efforts. In those early years, the state of the science, the laws, and program design were inadequate to meet such a challenge and the effort reverted to a chemical-specific, command and control program. Though simpler to implement, and certainly short of the recognized needs, this basic program brought the Nation a quality of water that is the envy of most countries in the world. During the 20 years of designing and implementing the base program the science has evolved and program design has been improved. Most now believe that the existing program should be re-energized; that a new paradigm is needed if the country is to fully achieve the goal of the CWA and to do so with the best use of limited resources.

EPA is working on a variety of fronts to integrate the different types of water quality criteria. How to design ecological risk-based criteria and implement a watershed-based water quality protection program are two of the largest challenges. EPA is participating in and supporting a workshop to investigate and define possible approaches to developing ecorisk-based criteria. At the same time the Agency has been supporting a cooperative effort with a number of universities to investigate the fate, transport, and bioavailability of metals in aquatic systems. The goal of this effort is to develop an integrated approach that will be both state of the art and technically uncomplicated to assess and control metals .

- **EPA will initiate an effort to re-engineer the criteria program to ensure the latest science and modeling capabilities are being used to protect aquatic life and aquatic dependent wildlife by:**
 - **Participating in and evaluating the proceedings of (and implementing when/where appropriate) a SETAC sponsored workshop in 1998 that will focus on the science needed to support a watershed/ecorisk based criteria program in 2010 and beyond.**
 - **Developing a PC-based dynamic modeling software for site-specific metals criteria derivation for implementation in 2000.**
- **EPA will make improvements to the whole effluent toxicity testing methodologies and implementation procedures, where necessary.**

At the same time that EPA embarks on new initiatives to meet the goals of the CWA, the chemical-specific criteria that form the foundation of the program cannot be left to languish. Thus, EPA initiated in 1997 a process to revise and update existing aquatic life criteria. Updates for the following criteria were initiated in 1997 and are being completed in 1998: nonylphenol, diazinon, tributyltin, atrazine. In 1998/99 updates will be initiated for more criteria.

- **EPA will propose 2 - 5 aquatic life water quality criteria each year for revision or new criteria derivation.**
- **In 1998/99 initiate updates for copper, lead, aluminum, atrazine metabolites, silver.**

There are a number of existing aquatic life criteria guidances that are in need of updated data. These criteria guidances need to benefit from the most current science. These criteria include (but are not limited to): selenium, saltwater dissolved oxygen, and ammonia. Revisions of these criteria require a significant level of effort and are scheduled only one or two at a time.

It has also been a goal of the Agency to provide tools and information to the end user in the most efficient manner possible. To do so, the Agency is preparing a Criteria Table which will provide the most recent criteria guidance for use by States, Tribes, Regions, Industry and other groups and individuals performing assessments or determining limitations to discharges.

- **By the end of 1998, EPA will update high priority chemical-specific criteria for ammonia, selenium and saltwater dissolved oxygen.**
- **Starting in 1998, EPA will publish a Criteria Table on the Internet and update it annually.**

In July 1990, EPA published guidance on the level of achievement expected of States and Tribes by the end of fiscal year 1993 in the development of wetland water quality standards. Although most States and Tribes have incorporated wetlands into their definition of State/Tribal waters, currently only a few States or Tribes have developed comprehensive wetland-specific standards. Water quality standards for wetlands are necessary to ensure that, under the provisions of the Clean Water Act, wetlands are afforded the same level of protection as other waters.

- **Between 1998 and 1999, EPA will work with all States to designate specific beneficial uses for their wetlands.**
- **EPA will work with the States and Tribes to adopt narrative and numeric criteria specifically for wetlands, or to adjust existing criteria to appropriately reflect conditions in wetlands by the end of 1999.**

--*SEDIMENT QUALITY PROTECTION* - Key Activities:

As successful as the aquatic life criteria have been in improving the quality of the Nation's waters, many waterbodies are not yet "fishable and swimmable." Though the water column criteria may be met or the discharges to a waterbody are meeting limitations, the waterbody may not meet designated uses because of sediment contamination which is causing benthic community impacts, impacting water quality, and/ or contributing to fish consumption advisories. Water column criteria are not designed to account for the complexities of the bioavailability of contaminants in bedded sediments.

For several years EPA has been investigating the bioavailability of contaminants in sediments to benthic organisms and has published for comment and peer review a number of guidance documents designed to help States, Tribes, Regions, and others make accurate sediment assessments and sound risk management decisions for sediment protection and remediation. A

number of these guidance documents are or will be final in 1998. These include: the Inland Testing Manual for Dredged Material Management, the National Sediment Quality Survey Report to Congress, the Agency-wide Contaminated Sediment Management Strategy, the Technical Basis Document for the Derivation of Sediment Quality Criteria for Nonionic Organic Chemicals Using Equilibrium Partitioning for the Protection of Benthic Organisms, Sediment Quality Criteria for the Protection of Benthic Organisms: Dieldrin and Endrin, and Site-Specific Modification of Sediment Quality Criteria. There will also be a number of draft guidance documents available for review, including the user's manual for sediment quality criteria.

With the basic guidance for sediment assessment nearing completion, EPA's attention is focussing on helping stakeholders target and prioritize contaminated areas for prevention, control, and remediation actions. Attention also is being given to the integration of the sediment program into the larger water quality program by incorporating it into the TMDL process and eventually into the permits of dischargers whose effluent carries chemicals likely to accumulate in sediments and cause adverse impacts.

It is important to ensure that criteria are derived and published in a form that is ecologically relevant. To do this, EPA is preparing draft sediment quality guidance for PAH mixtures and metals mixtures. Both of these contaminant types are rarely, if ever, found as single contaminants but rather as mixtures of a number of PAH's or a number of metals whose toxicities interact or whose bioavailabilities are interdependent.

- **EPA will improve management of contaminated sediments in order to meet the GPRA goals of reducing fish and shellfish contamination and increasing the number of water bodies with healthy, diverse biota by:**
 - **Implementing the Agency-wide Contaminated Sediment Management Strategy in 1998.**
 - **Updating the National Sediment Quality Survey Report to Congress biennially.**
 - **Developing scientifically defensible sediment assessment methods.**
 - **Expanding water column aquatic life and human health criteria to include bed sediment criteria.**
 - **Developing a sediment modeling toolkit for TMDLs by the end of 1999.**
 - **Developing sediment quality guidance on mixtures of polycyclic aromatic hydrocarbons and mixtures of metals. Draft in 1998, final by 2001.**
 - **Conducting contaminated sediment recovery demonstration projects in five watershed selected from those identified in the National Sediment Quality Survey. Initiate first study in 1999 and remaining four by 2000.**

--HUMAN HEALTH PROTECTION - Key Activities:

EPA's water quality criteria for the protection of human health are developed pursuant to section 304(a)(1) of the Clean Water Act which requires EPA to develop and publish (and to revise from time to time thereafter) criteria guidance for water quality that will protect against all identifiable effects on health and welfare which may be expected from the presence of pollutants in any body of water, including ground water.

The 1980 EPA guidelines for developing criteria for the protection of human health addressed three types of endpoints: noncancer, cancer, and organoleptic (taste and odor) effects. Criteria values for the protection against noncancer and cancer effects were estimated by using risk assessment-based procedures, including extrapolation from animal toxicity or human epidemiological studies. Basic human exposure assumptions were also applied, including body weight, freshwater and estuarine fish/shellfish intake, and drinking water intake.

EPA is now in the process of updating the 1980 guidelines to reflect advances in science and policy, and to develop consistency between risk assessments performed in support of the CWA and the Safe Drinking Water Act (SDWA). EPA has developed both a draft *Federal Register* Notice and a Technical Support Document (TSD). The TSD includes more technical detail and is supplemented by three proposed criteria guidance documents (acrylonitrile, 1,2-dichloropropene, and hexachlorobutadiene) which were developed using the revised methodology. Publication of the revised methodology in the *Federal Register* is expected by July 1998 and will include a public comment period. Concurrent with the comment period, EPA will have the methodology guidelines peer reviewed and conduct a public stakeholders meeting.

- **EPA will collect the latest scientific data and other information for human health criteria development and revisions, on an ongoing basis.**
- **EPA will integrate the latest available, peer reviewed science into the ambient human health criteria methodology on an ongoing basis.**
- **By the end of 1999, EPA will develop a BAF field guidance document for use with deriving new criteria.**
- **EPA will publish three human health criteria guidance documents in 1998 and expects these to become final in 1999:**
 - Acrylonitrile
 - 1,3-dichloropropene
 - Hexachlorobutadiene

The revised methodology will provide more flexibility for decision-making at the State, Tribal and local level. The methodology will result in more stringent criteria guidance for pollutants that bioaccumulate [due to the use of bioaccumulation factors (BAFs) instead of bioconcentration factors (BCFs)]. For non-bioaccumulative pollutants, the revised methodology will produce criteria that may be higher or lower than the criteria produced by the existing methodology, depending on factors unique to the particular chemical. EPA believes that its existing criteria guidance continue to represent protective values until EPA re-evaluates a chemical and publishes revised criteria guidance.

With the revised methodology, EPA anticipates developing several "example" criteria (i.e., the three discussed above) and following up with a phased approach where EPA will develop several criteria at one time, initially focusing on highly bioaccumulative chemicals. EPA's Office of Water is exploring ways to expedite the criteria updating process. In addition, EPA is currently developing BAFs for 29 chemicals selected based on toxicity, occurrence and levels in fish tissue, and bioaccumulation potential.

- **EPA will update high priority chemical-specific criteria guidance:**
 - **Dioxin- to be initiated following completion of Agency reassessment.**
 - **PCBs- publish updated human health criteria guidance in 1999.**
 - **Mercury- publish updated human health criteria guidance in 1999.**

EPA, in consultation with the States and Tribes, will select future chemicals for criteria derivation based on documented risk characterizations for each chemical. In this process, EPA will consider pollutants from the SDWA Contaminant List and Office of Pesticide Programs risk analyses. EPA will publish annually in the *Federal Register* a list of contaminants planned for development/revision and the status of new criteria/revisions in progress or recently completed. EPA is also considering a web site that would provide the information and status for the criteria developed and in progress.

EPA is promoting a larger role for States/Tribes and other stakeholders in developing criteria. States and Tribes will become decision-makers by: making risk assessment decisions (e.g., factoring in uncertainty and variability in decisions); adapting criteria to local conditions; and conducting peer review on their criteria/standards to enhance scientific defensibility. EPA will review State/Tribe deviations from recommended criteria guidance values through existing water quality standards reviews. The pollutants selected for criteria development will be selected from multiple sources, including the list of bioaccumulatives below.

- EPA will propose three to five human health criteria guidances annually, including those from the following list.

-Benz(a)-Anthracene	-4,4'-DDD
-Benzo(a)-Pyrene	-Dieldrin
-4-Bromo-phenyl Phenyl-Ether	-Endrin
-4-Chloro-phenyl Phenyl Ether	-Heptachlor
-Dibenzo(a,h)Anthracene	-Heptachlor Epoxide
-Di-n-Butyl Phthalate	-Mirex/dechlorane
-Hexachloro-benzene	-Octachlorostyrene
-Hexachloro-butadiene	-Pentachlorobenzene
-Aldrin	-Photomirex
-Hexachlorocyclohexane	-1,2,3,4-Tetrachlorobenzene
-Alpha-BHC	-1,2,3,5-Tetrachlorobenzene
-Beta-BHC	-Toxaphene
-Gamma-BHC	
-Delta-BHC	
-Chlordane	
-4,4'-DDT	
-4,4'-DDE	

2. NUTRIENT CRITERIA

The term nutrient is used to describe a compound that is necessary for metabolism. Nitrogen (N) and phosphorus (P) are required in relatively large amounts by cells and are called macronutrients, as opposed to micronutrients such as iron or molybdenum. Nutrients, in the appropriate amounts, are essential to the health and continued functioning of natural ecosystems. However, depending upon a variety of factors, nutrients can be present in waterbodies in excessive amounts.

When nutrient inputs exceed the assimilative capacity of a waterbody, the waterbody progresses toward hypereutrophic conditions. Symptoms include an overabundance of primary producers (vascular plants and algae), algal blooms (some toxic), low dissolved oxygen, episodic anoxia, loss of vascular plant life, and fish kills and ultimately decreased biological diversity. Investigations have shown that the key causative factors are excessive concentrations of the primary nutrients phosphorus and nitrogen. Excessive nutrients have been implicated with both the large hypoxic zone in the Gulf of Mexico, hypoxia observed in several East Coast States, and *Pfiesteria*-induced fish kills and human health problems in the coastal waters of several East Coast and Gulf States.

Sources of excessive nutrients are fertilizers, sewage treatment plants, detergents, septic systems, combined sewer overflows, sediment mobilization, animal manure, atmospheric deposition and internal nutrient recycling from sediments. Other factors that can influence overenrichment are light attenuation, land-use practices, and imbalance of primary, secondary, and tertiary producers and consumers (plankton, macrophytes, epiphytes, grazers, predators, and decomposers).

According to the U.S. Environmental Protection Agency's (EPA's) *National Water Quality Inventory: 1994 Report to Congress* excessive nutrient enrichment is one of the leading causes of impairment in surveyed rivers and streams. Twenty-three percent of the rivers were impaired due to nutrient enrichment; 43 percent of the surveyed lakes and 47 percent of the surveyed estuaries were similarly affected. States reported that agriculture is the most widespread source of these impairments, followed by municipal sewage treatment plants, urban runoff and storm sewers, and other unspecified nonpoint pollution sources.

Nutrients

--Key Objectives:

- 1. EPA will develop the necessary scientific and technical tools so that all States and Tribes can develop water quality criteria for nutrients to provide a basis for the reduction and control of excessive nutrient enrichment.**

While chemical-specific and whole effluent toxicity criteria are essential to a water quality management program, the addition of nutrient criteria will augment this program and address a specific problem that often causes waterbodies to fail to meet the existing water quality standards. Presently, the only national water quality criteria in existence are for nitrate nitrogen and phosphorus. In 1976, in EPA's publication entitled *Quality Criteria for Water* (also known as the Red Book), EPA presented ambient water quality criteria for nitrates, nitrites and phosphorus. The criterion for nitrate nitrogen was 10 mg/L for the protection of domestic water supplies. The nitrate criteria were intended to prevent overenrichment and to protect human and animal health. The phosphorus criterion was 0.10 ug/L elemental phosphorus for the protection of marine and estuarine waters. This criterion was based on a conservative estimate to protect against the toxic effects of the bioconcentration of elemental phosphorus to estuarine and marine organisms, and not on the potential to cause eutrophication.

--NUTRIENTS - Key Activities:

In order to better address nutrient enrichment in the Nation's waterbodies, EPA is developing a national nutrient strategy, which was announced in the *Clean Water Action Plan* in February 1998. The development of nutrient criteria is a key component of this strategy.

- **By mid 1998, EPA will publish a national Nutrient Strategy. This Strategy will explain the need to develop waterbody-type guidance and techniques for developing regional nutrient criteria.**
- **EPA will maintain and enhance existing federal nutrient programs to support criteria and standards development. Ongoing.**

There is a great deal of variability in nutrient levels and nutrient response throughout the country. This natural variability is due to differences in geology, climate and waterbody type. For these reasons, EPA's custom of developing water quality criteria guidance in the form of single numbers for nationwide application is not appropriate for nutrients. EPA believes that distinct geographic regions and types of aquatic ecosystems need to be evaluated differently and that criteria specific to those regions and ecosystems need to be developed. Consequently, this involves the development of further EPA guidance on how to establish nutrient criteria at a regional or local level rather than at the national level. An essential technical element of this strategy will be waterbody-type guidance documents describing the techniques for assessing the trophic state of a waterbody and methodologies for developing regional nutrient criteria.

In addition, each guidance document will provide section 304(a) criteria in the form of numerical target ranges for phosphorus, nitrogen, and other nutrient endpoints, which EPA expects States and Tribes to use as a basis for regional nutrient criteria and standards in the absence of more site-specifically developed criteria and standards. EPA intends to use State databases, supplemented with new regional case studies and demonstration projects, to provide additional information.

- **By the end of 2000, EPA will publish nutrient guidance documents explaining methodologies that can be used to calculate nutrient criteria by waterbody type (lakes, reservoirs, streams and rivers, wetlands and estuaries) and ecoregions of the country, and nutrient criteria (expressed as target ranges) for use by the States and Tribes.**

As technical guidance is developed and regional nutrient ranges are established, EPA expects States and Tribes to adopt water quality standards based on the appropriate regional nutrient criteria by waterbody type. Once adopted as part of State or Tribal water quality standards, the nutrient values would become the basis for making many management decisions to reduce the overenrichment of our Nation's waters, e.g., TMDLs and NPDES permitting process. These values used together with best management practices (BMPs) and other management techniques should form the basis of a State management program for nutrients.

To expedite and facilitate nutrient criteria development for all regions of the country, EPA will identify States that have made the greatest progress and will determine whether their criteria can be used by adjacent States which contain similar ecoregions. EPA expects all States and Tribes to adopt and implement numerical nutrient criteria into their water quality standards. EPA expects States and Tribes to accomplish this by developing their own regional values in ecoregions where adequate data are available or by using the EPA default nutrient ranges. Once submitted to EPA, EPA will review the new or revised standards under section 303(c)(3) of the Clean Water Act. If EPA disapproves the new standard submitted by a State or Tribe (e.g., because EPA determines that it is not scientifically defensible), or if EPA determines that a new or revised nutrients standard is necessary for a State or Tribe (e.g., because EPA determines that the State or Tribe has not demonstrated reasonable progress toward developing numerical nutrient standards), EPA will initiate rulemaking to promulgate nutrient criteria values appropriate to the region and waterbody types. Any resulting water quality standard would apply until the State or Tribe adopts, and EPA approves, a revised standard.

Once regulatory controls are in place, EPA and the States/Tribes will need to evaluate their effectiveness. The databases and monitoring systems, together with the derived criteria, will be used to assess actual progress toward eliminating overenrichment conditions.

- **Between 2000 and 2003, EPA will work with the States and Tribes as they adopt and implement numerical nutrient criteria into water quality standards by developing their own criteria or using default EPA nutrient ranges applicable to their ecoregion(s).**

3. MICROBIAL PATHOGENS

EPA's continued effort to protect the public against exposure to disease-causing microorganisms in the Nation's recreational waters is manifested in the Beaches Environmental Assessment Closure and Health (BEACH) Program. This program is an integral component of the Clean Water Action Plan to address our Nation's most serious water quality problems. The goal of the BEACH program is to significantly reduce the risk of infection to users of the Nation's recreational waters through improvements in recreational water programs, communication, and scientific advances. A wide range of activities will be conducted under this program. This portion of the Plan lays out the key objectives and activities for completing the goal of the BEACH program.

MICROBIAL PATHOGENS

--Key Objective:

1. Significantly reduce the risk of infections to users of the Nation's recreational waters.

--MICROBIAL PATHOGENS - Key Activities:

Current approaches for the determination of the safety of recreational water typically relies on a single sample on weekly intervals. This approach is naive in that the water quality at a beach may differ considerably over time given the location and depth of a sample. The current approach does not consider event driven changes in pollution potentials such as rainfall events and CSOs. An improved strategy is needed so that local beach operators and public health officials can make realistic assessments of beach water quality.

- **EPA will provide support for the development of improved monitoring strategies for recreational water, by:**
 - **Conducting studies to determine appropriate sampling strategies to use at fresh, estuarine, and marine recreational areas to provide an accurate assessment of microbial contamination for all users during 1998-2000.**
 - **Sponsor an international workshop with the World Health Organization on beach monitoring requirements during 1999.**

In 1984, the Environmental Protection Agency made and distributed a video entitled "Enumeration Methods for *E. coli* and Enterococci." At that time, the recommended recreational water quality indicators were changed from the fecal coliform group to the Enterococci group for both marine and fresh waters and *Escherichia coli* bacterium for fresh water. The purpose of the

video was to present the new recreational water quality indicators and the new enumeration methods for these indicators. Since then, two new media have been developed that are faster (24 hours) and easier (one step) to use than the two introduced in 1984.

- **EPA will develop new risk assessment method training for the Regions, States and Tribes, by:**
 - **Developing a course manual, a guidance manual and training module for use by Regions, and the States and Tribes by 1999.**
 - **Providing assistance and training to the States and Regions from 1999-2002.**

Current microbial indicators of pathogen occurrence in various water media that EPA either regulates or provides health criteria for have been demonstrated to have deficiencies in providing an accurate assessment of pathogen occurrence. This is because these methods: do not differentiate between human and animal sources of fecal contamination; are not “real-time”, requiring 24 hours for test results; are indicative of only gastrointestinal disease; are unable to detect the presence of viruses and protozoa that may cause serious and chronic diseases, and have limited value in non-temperate (tropical) areas. It is desirable to have improved indicator methods that provide an expanded capability to uniformly determine the complete range of pathogens and associated occurrence levels in various water matrices, e.g., drinking water; recreational and shellfish growing water; wastewater and sludge biosolids.

- **EPA will provide support for the development of improved indicators for recreational waters, by:**
 - **Conducting studies to differentiate human from animal sources of fecal contamination in recreational waters. 1998-2000.**
 - **Conducting studies to develop and validate the efficacy of inexpensive, easy to use, "real time" indicators/methods (including fecally derived chemicals) of pollution events in recreational waters. 1998-2000.**
 - **Conducting studies to develop and validate the efficacy of alternative risk based indicators/methods of infectious disease for skin, respiratory tract, eye, ear, and throat for recreational water. 1999-2001.**
 - **Performing studies to refine and expand the capabilities of fecal pathogen indicators to cover the presence of viruses and protozoa that may cause serious and chronic disease. 1999-2001.**
 - **Developing or validating indicators for pathogens in tropical waters such as Clostridium perfringens and coliphage. 1999-2001.**

Currently, risk assessments of the potential human health effects associated with exposure to pathogens utilize the conceptual framework that was developed to assess risks associated with chemical exposures. However, the applicability of the chemical framework is problematic due to many issues unique to assessing risks associated with pathogens. These risks include, but are not limited to, an assessment of pathogen/host interactions, consideration of secondary spread, consideration of short- and long-term immunity, and an assessment of conditions that allow the microorganism to propagate. A conceptual framework was developed to assess the risks of human disease associated with exposure to pathogenic microorganisms. The framework consists of three phases: problem formulation, analysis (which includes characterization of exposure and human health effects), and risk characterization. The framework emphasizes the dynamic and interactive nature of the risk assessment process, and allows wide latitude for planning and conducting risk assessments in diverse situations, each based on the common principles discussed in the framework.

- **EPA will provide support to further develop this risk assessment approach by:**
 - **Completing SAB peer review of the microbiological pathogen risk assessment framework. 1998-1999.**
 - **Address peer review issues; establish framework validation process and develop a methodology approach. 1999-2000.**
- **EPA will develop a new generation of microbiological criteria for use in State and Tribal water quality standards by 2003.**

4. BIOCRITERIA

EPA's bioassessment and biocriteria program began in 1988 to help fulfill the Clean Water Act objective to “restore and maintain the physical, chemical, and biological integrity of the Nation's waters.” Much has been accomplished since the start of the program - EPA’s Rapid Bioassessment Protocols for Use in Streams and Rivers (EPA/440/4-89/001) have become widely accepted monitoring methods that most States now use to assess the biological health of streams and small rivers. However, further progress is necessary over the next decade to realize the full potential of bioassessments and biocriteria for managing water quality and protecting aquatic life in all water bodies. This portion of the Plan lays out the key objectives and activities for completing the development and implementation of bioassessments and biocriteria for use in State and Tribal water quality standards programs.

Bioassessment data are the foundation for developing biocriteria. They are direct measurements that assess the overall condition of an aquatic community in surface waters such as streams, rivers, lakes, estuaries and wetlands. Bioassessments evaluate the biological health of a waterbody by using biological surveys of indicator species that are, or should be, in the waterbody if pollution or other problems are not causing stress on the biological community. Most often, the fish population, the bottom dwelling insects and other invertebrates (insects, etc.) and plants or attached algae are evaluated in a bioassessment. Using the data collected from bioassessments, a State or Tribe can determine whether the biological health of the waterbody is what would be expected if pollution and other water quality stressors were not causing an effect.

Biocriteria are narrative descriptions or numerical values adopted into State or Tribal water quality standards that are used to quantitatively describe an existing “healthy” condition for the aquatic life in waters with a designated aquatic life use. Biocriteria are developed by biologists and other natural resource scientists using scientifically designed bioassessments to characterize the eco-region reference conditions for the different water bodies found within a State or Tribal nation. Once determined, the eco-region reference condition sets the biological goals for a particular waterbody within the

BIOCRITERIA

--Key Objectives:

- 1. Develop bioassessment methods and biocriteria technical guidance for all waterbody types, e.g. lakes, rivers, wetlands, etc., for use by State and Tribal water quality programs for improving aquatic life use designations, assessing attainment of those uses and for making better decisions in water quality protection and restoration.***
- 2. Support the States and Tribes in their adoption of bioassessments and biocriteria as key components of their water quality programs.***

eco-region. Biocriteria can then be used in a variety of ways by water quality managers to restore and maintain the biological integrity of the State or Tribal waters.

Bioassessments and biocriteria permit direct, quantitative evaluation of the extent to which aquatic life uses are, or are not, attained. These biological techniques have tremendous potential for providing new types of information essential for managing water quality on a watershed basis. Biological techniques complement chemical-specific and whole effluent toxicity approaches to provide a more holistic water quality program. In addition, biological techniques provide a platform for communicating more effectively to the public the condition of the Nation's waters so that the public will better understand the importance of participating in and supporting water quality standards decision making.

--BIOCRITERIA - Key Activities:

A number of key activities are necessary to meet the biocriteria objectives. First, EPA must complete the issuance of a series of biocriteria technical guidance manuals. These manuals provide States and Tribes with scientific information and procedures used to conduct bioassessments and develop biocriteria. Biocriteria are developed by the States and Tribes by applying these methods to the eco-region found within each State or Tribal nation. EPA has published the manual for developing biocriteria for streams and small rivers. Manuals covering other waterbody types are in preparation.

- **EPA will complete technical guidance documents for development of biological assessment methods and criteria for all water bodies:**
 - **Lakes and reservoirs (1998)**
 - **Estuaries and near coastal waters (1999)**
 - **Streams and wadeable rivers update (2000)**
 - **Statistical guidance on biological data analysis (2001)**
 - **Coral reefs (2001)**
 - **Large rivers (2002)**
 - **Wetlands (2002)**

Once the biocriteria technical guidance documents are complete, States and Tribes will need additional resources and expertise to derive biocriteria specific to each eco-region and to incorporate biocriteria into their water quality standards. EPA will assist the States and Tribes in doing this.

- **EPA will build Regional biological technical capabilities to support State/Tribal programs throughout 1998-2005, by:**
 - **Identifying basic core expertise needed in each Region, including regional biological assessment & criteria leaders (1998).**
 - **Supporting development of Regional workplans to build and maintain biological assessment and criteria technical programs (1998).**
 - **Providing funding to Regions to help implement the biological assessment and criteria workplan (1998 - on).**
 - **Providing funding support to the States and Tribes, where necessary to pilot the use of biocriteria and bioassessments in water quality standards (1998-2003).**
- **EPA will provide technical training for the Regions, States and Tribes on the derivation and implementation of biocriteria for different waterbodies as technical guidance manuals become available (1998-2005).**

Pol

icy, programmatic and legal issues or questions often arise as States and Tribes develop the scientific and technical capabilities to implement biocriteria. EPA will assist the States and Tribes with the programmatic and policy aspects of biocriteria implementation.

- **EPA will develop a nationally consistent approach for developing and establishing numeric biocriteria in State water quality standards and for integrating biological assessment and criteria into the TMDL and NPDES permit programs, by:**
 - **Forming an Agency Biocriteria Implementation Steering Committee to identify key elements of a successful program and to make recommendations on program integration in 1998.**
 - **Publishing biocriteria implementation guidance.**
 - Draft document in 1999
 - Final document in 2000
 - **Preparing case study summaries demonstrating the applications, costs, and benefits of biological assessment information and criteria in water quality programs (1998 - 2005).**
 - **Identifying specific institutional barriers to biocriteria usage and developing solutions and recommendations.**
 - Institutional barriers identified and prioritized in 1996 workshop
 - Develop solutions and begin to implement (1998 - 2005)

Once biocriteria are adopted into water quality standards, States and Tribes will be able to use biocriteria and bioassessments for a variety of applications in their water quality management efforts. One important application is determining which water bodies are impaired by sources of pollution, hydrological modifications or other stressors. Bioassessments are ideal for revealing

the cumulative impacts of all stressors within a waterbody and should be integrated with traditional chemical and toxicity assessments. EPA will help States in using bioassessment data in this fashion.

- **EPA will develop technical guidance and other informational materials on the use of biological assessments and criteria to evaluate aquatic life use support on an integrated basis with other water quality data, including:**
 - **Case studies/pilot projects to test integrated approach, first phase (1998)**
 - **Guidance on full support (1998)**
 - **Reassessment of Policy on Independent Application as it applies to 305(b) (1998)**
 - **Guidance on evaluating impairment using a weight of evidence approach, second phase (draft- 1999)**

In some situations, States and Tribes may identify aquatic life use impairments by analyzing bioassessment data. Where impairments are found in water bodies with only one source of pollution, identifying the cause is straight-forward. However, in many water bodies there may be numerous potential causes of biological impairment. Investigating and diagnosing the primary source of the impairment or the relative contribution of all sources can be challenging. EPA will assist the States and Tribes in identifying causes of biological impairment in complex water bodies (those with more than one source of impairment).

- **EPA will develop technical guidance documents on the identification of stressors once biological impairment is determined. Two documents will be produced:**
 - **A Common Sense, Pragmatic Approach to Diagnosing Stressors (2000)**
 - **Scientific Investigations for Identifying Complex Mixtures of Stressors (2002)**

EPA envisions that biocriteria and bioassessments will be valuable in managing urban storm water runoff and other wet weather flows. Storm water discharge pollutant monitoring data indicates that pollutant concentrations in storm water runoff can fluctuate drastically from storm to storm. With high variabilities in pollutant concentrations it can be difficult to assess storm water discharge compliance with water quality standards using traditional steady-state chemical criteria. Biocriteria and bioassessments will help to identify the cumulative impact of storm water discharges over time. Using biocriteria and bioassessments, storm water managers will have a more useful management endpoint to determine if the storm water discharges are causing aquatic life impairments and to determine if storm water controls and pollution prevention efforts are effective. Bioassessments and biocriteria are being successfully used in a number of innovative

applications for storm water management. EPA will assist Regions and the States and Tribes in using biocriteria and bioassessments more routinely in storm water management efforts.

- **EPA will develop guidance on the use of biocriteria, bioassessments and habitat assessments for identifying and controlling the detrimental impacts of the high flows of storm water discharges and the application to excessive sediment transport and habitat damage by 2003.**

As with any new initiative, EPA realizes the importance of outreach and education to affected stakeholders. It is important for stakeholders to understand the reasons for the initiative, the ways the initiative will be implemented and the implications of the initiative on their interests.

- **EPA will build customer/stakeholder/public partnerships, advocacy and support through:**
 - **Public and Stakeholder Outreach (1998-on)**
 - **Tribal Liaisons - build Tribal participation (1998-on)**
 - **Network Communications/Tracking Issues (newsletters, listserver) (1998-on)**
 - **Educational/outreach information and technical training programs (1998-on)**
 - **Seminars, technical training, Water Quality Standards Academy sessions, Regional/State meetings (1998-on)**

5. TOTAL MAXIMUM DAILY LOADS (TMDLs) AND MODELING

The establishment of Total Maximum Daily Loads (TMDLs) is linked to the development and promulgation of improved water quality standards and criteria. Section 303(d) of the Clean Water Act requires States to identify waters not meeting standards and establish TMDLs. TMDLs specify the amount of any pollutant which a waterbody can absorb and still meet water quality standards. Based on the calculation of the total load for a specific pollutant, TMDLs recommend wasteload allocations for individual point sources and load allocations for nonpoint sources and include a margin of safety to account for uncertainty. TMDLs typically specify the amount of pollution that must be reduced to meet water quality standards, allocate pollution control among sources in a watershed, and provide a scientific and policy basis for taking actions needed to restore a waterbody. States identify specific waters where problems exist or are expected, set priorities and then allocate pollutant loadings among point and nonpoint sources. If States do not identify waters and establish TMDLs, section 303(d) requires that EPA identify waters and establish TMDLs.

TMDLs AND MODELING

--Key Objective:

- 1. Improve the establishment of TMDLs through improved water quality criteria and modeling techniques.***

-- TMDLs - Key Activities:

Establishment of TMDLs by States, and EPA, if necessary, is dependent upon water quality standards which identify a full range of designated uses and incorporate narrative and numeric criteria for as many pollutants as possible. Key activities in the Criteria and Standards Plan which support the establishment of TMDLs include new and revised chemical criteria for point source discharges. These new chemical criteria will provide States and EPA with better, scientifically sound criteria upon which to base TMDLs. Continuing improvement of chemical criteria is a crucial step in the establishment of TMDLs.

- EPA will establish new chemical water quality criteria and improve existing criteria as described in the section on ambient water quality criteria to better support the development of TMDLs.**

States have also identified waters impaired by nutrients and clean sediment. Currently, most TMDLs are established for these pollutants on the basis of site-specific end points derived to ensure that narrative water quality criteria and designated uses are attained. This Plan initiates an important first step by proposing the establishment of methodologies designed to result in site-specific criteria for nutrients. These methodologies will provide approaches applicable in a variety of water quality situations and landscapes. Established TMDLs will depend upon these methods to help establish the endpoint or condition representing attainment of water quality standards. An important part of the overall approach to developing site-specific nutrient criteria is to provide training and technical assistance to Regions and States in the application of these site-specific methodologies for TMDL establishment.

- **EPA will establish methodologies for developing nutrient criteria as described in the section on nutrient criteria to support the development of TMDLs for nutrients.**
- **EPA will develop training on the use of nutrient criteria in the derivation of TMDLs by 2000.**

States have identified excessive sedimentation as a leading cause of impairment. The Criteria and Standards Plan recognizes the significance of these impairments, but technical issues and resource constraints prevent the establishment of site-specific criteria at this time. States and EPA will continue to develop site-specific approaches to impairments resulting from excessive sediment. As with nutrients, training and technical assistance for Regions and States is crucial as increasing numbers of TMDLs for sediment must be developed.

- **EPA will continue to provide ongoing technical assistance to the States in the establishment of specific sediment TMDLs and is exploring ways of providing additional technical assistance for the establishment of sediment TMDLs nationally.**
- **EPA will establish a TMDL modeling hotline to answer questions about the program by 1999.**
- **EPA will develop and provide technical training on TMDL modeling (1998-on).**

Finally, establishment of TMDLs depends upon water quality models and provision of training and technical assistance on the use of those models. It is expected that many established TMDLs will rely upon the application of improved water quality models.

-- MODELING - Key Activities:

BASINS Version 2.0, a water quality modeling tool, facilitates development of TMDLs for both point and nonpoint sources by making it easy for TMDL practitioners to delineate sub-watersheds of virtually any size and to run continuous simulations, estimating day by day in-stream concentrations, for the pollutants of concern. Necessary reductions in loadings are then determined for point and nonpoint sources. Additional models, to be added to BASINS, will allow TMDL practitioners to evaluate the potential of different combinations of BMPs to achieve the required loading reductions; to better simulate the nutrient eutrophication process in run-of-the-river reservoirs; and to model movement and deposition of both “clean” and contaminated sediment.

- **EPA will provide BASINS enhancements including BMP effectiveness, clean and contaminated sediment transport, lake and estuary two-dimensional for (1998-on)**

Irrespective of whether NPDES permits are written on a facility-by-facility basis or developed on a watershed basis, near-field modeling often is necessary to ensure attainment of water quality standards. The ease of operation and utility of the mixing zone model, CORMIX, is being improved by replacing the DOS-based Expert System user interface with an Expert System interface that operates in the Windows 95 environment and fully utilizes the advantages of the newer operating system. Another mixing zone model, WISP, also used extensively in the permitting program, is being re-written. EPA is considering including both the new CORMIX and the new Wisp within BASINS. EPA is also considering packaging the new CORMIX and WISP in a separate GIS-based system that houses only those features of BASINS which will benefit these mixing zone models.

- **EPA will provide mixing zone model enhancements in 1998.**

AQUATOX is the only general ecological risk model that represents the combined environmental fate and effects of conventional pollutants, such as nutrients and sediments, and toxic chemicals in aquatic ecosystems. It considers several trophic levels, including attached and planktonic algae and submerged aquatic vegetation, invertebrates, and forage, bottom-feeding, and game fish; it also represents associated organic toxicants and mercury. It has been implemented for streams, ponds, lakes, and reservoirs.

The fate portion of the model, which is applicable especially to organic toxicants, includes: partitioning among organisms, suspended and sedimented detritus, suspended and sedimented inorganic sediments, and water; volatilization; hydrolysis; photolysis; ionization; and microbial degradation. The effects portion of the model includes: acute toxicity to the various organisms modeled; and indirect effects such as release of grazing and predation pressure, increase in detritus and recycling of nutrients from killed organisms, dissolved oxygen sag due to increased decomposition, and loss of food base for animals.

- **EPA will provide food chain model development (1998-on)**

As the level of analysis in the water program becomes increasingly sophisticated, increased levels of technical assistance are needed. The staff of the TMDL hotline will answer questions, including but not limited to, what models are appropriate for site-specific situations; how to design monitoring programs for model calibration; how to apply the models and interpret their results. The hotline staff will also provide technical support for BASINS.

Training and technical assistance for the modeling tool users is necessary to ensure proper and effective use of these modeling tools. Training includes not only the BASINS course but also courses for specific models used in the program. Beyond the BASINS training, there is a high demand for instruction in Basics of Water Quality Modeling, HSPF, WASP, SWMM, and QUAL2E. While not every Region will need to take each of these courses in any given year, course offerings will be extensive.

The second form of training is hands-on technical assistance to States and Tribes in applying BASINS, and other models, to do TMDLs on their listed waters. This assistance and guidance helps them more effectively and efficiently develop TMDLs.

These efforts will assist States with the process of applying BASINS to develop TMDLs. Technical support from EPA contractors will be provided to guide the TMDL practitioners on TMDL development for a watershed. These efforts will not be applied uniformly across the Nation; rather, the resources will be used to assist particular States on an as needed basis.

6. SEDIMENTATION, FLOW AND WILDLIFE

Throughout the early years of EPA's water quality program, the Nation witnessed significant improvements in the quality of its surface waters, the health of aquatic life, and reduced risks to human health and some limited improvement in the health and survival of select wildlife. These advancements were recognized through the implementation of a variety of water protection requirements starting with technology-based requirements and secondary treatment and continuing with water quality-based toxics control using chemical-specific criteria and whole effluent toxicity testing.

In more recent years it has been observed that water quality and aquatic life health improvements have plateaued and in some cases are losing ground. Though some of these problems arise from continued inputs of toxic chemicals and metals from both point and non-point sources as well as from waterborne pathogenic microorganisms, many are occurring because of sedimentation and flow alterations within surface waters. Other than banning or limiting the use of a few pesticides that carry significant risk to birds, little has been done to protect aquatic dependent wildlife from the toxic chemicals in water and their prey or from the loss of habitat due to sedimentation, flow alteration, and other land use activities. Except in the Great Lakes, no consistent, systematic effort has been made to ensure that the Nation's waters are a fit source of drinking water and food for wildlife.

Excessive sedimentation occurs principally as the result of the way the land surrounding a waterbody is used. Land development on the banks of, or near streams, rivers, lakes and coastal areas has intensified and the resulting runoff from construction, roads, parking lots, etc. significantly increases the sediment load entering these waters. The vast increase in the acres of developed land with impervious surfaces leads to excessive runoff during storms which causes rapid water rises in streams and rivers and strong flows resulting in increased bank erosion and sedimentation down stream. Erosion from cultivated lands not using best management practices is also a concern.

SEDIMENTATION, FLOW AND WILDLIFE

--Key Objective:

- 1. Evaluate possible water quality criteria initiatives for excessive sedimentation,, flow alterations and wildlife protection.***

Flow alterations, particularly reduced flows, are caused by land development and agricultural irrigation as well as by damming rivers for drinking water supply or channeling and concreting rivers for flood control.

Sedimentation and flow alterations cause loss of aquatic habitat which impacts the types and numbers of aquatic species and wildlife that can live in a particular area. Habitat loss keeps our waters from meeting the physical and biological integrity goals of the CWA.

--EXCESSIVE SEDIMENTATION - Key Activities:

Though excessive sedimentation is a significant cause of habitat loss in the Nation's waters, there has not been extensive analysis and evaluation of how it should be quantified or controlled. Methods for determining thresholds between naturally occurring sedimentation and detrimental, human induced excess sedimentation also needs further development. These issues need to be examined closely if we are to make continued improvements in water quality and aquatic and wildlife health and survival.

- **EPA will sponsor a workshop of national experts on sedimentation in 1998-1999. The purpose is to:**
 - **Scope the issue of excessive sedimentation and viability of developing water quality criteria.**
 - **Explore the extent of existing knowledge and limitations.**
 - **Develop a literature base.**
 - **Identify possible sedimentation end points and methods for sedimentation criteria or risk levels.**
 - **Define the relationship between biological criteria, bioassessments, habitat assessments and sedimentation.**
 - **Develop recommendations for future actions.**

The proceedings of the meeting will be published and from the proceedings, the Office of Water will develop a research strategy that will outline the additional investigations needed to develop sedimentation endpoints and criteria or risk levels over the next decade.

- **EPA will publish the proceedings of the national expert meeting in 1999 and develop a strategy for further investigation and development of appropriate sedimentation end points, criteria or risk levels to occur over the following decade.**

To ensure that the sedimentation strategy is integrated with the other priority water criteria and standards activities, the Water Quality Criteria and Standards Plan will be amended to include the activities and milestones of the strategy.

--FLOW ALTERATIONS - Key Activities:

As described earlier in this section, flow alterations have a significant impact on both water quality and aquatic life and wildlife health and survival. Flow alterations are a significant contributor to habitat loss and water quality degradation. Extreme high flows from wet weather runoff cause turbidity, sedimentation, and habitat destruction. Low flows due to excessive water withdrawal for industrial use, agriculture, drinking water, or other uses, cause increases in water temperature, reduce available habitat, and reduce pollutant dilution volumes. Controlled flows from dam releases can cause a drown or drought situation. EPA needs to evaluate the need for flow guidance and how best to provide guidance to the user community.

- **EPA will investigate the need for optimum flow guidance, criteria, management targets or other measures to protect against impairments of waterbody designated uses due primarily to flow alterations, including excessive flows from wet weather runoff and lack of base flows due to excessive water usages (2000-2002).**
- **EPA will investigate the relationships of biocriteria and biological assessments to identifying and managing the impairments caused by flow alterations (2000-2002).**

The Agency will need to make its findings public and, if appropriate based on the findings, outline a strategy to meet the needs of this emerging area.

- **EPA will publish its findings and, if necessary, will prepare a flow alteration strategy and incorporate the key objectives, activities and milestones recommended in the strategy into this Plan (by 2002).**

--WILDLIFE CRITERIA - Key Activities:

EPA recognizes that the existing chemical-specific water quality criteria, with few exceptions, are not intended to be protective of wildlife. Though by protecting the health of aquatic organisms, wildlife may be incidentally protected, a systematic evaluation has not been conducted to determine if this is true. For many chemicals, those that are bioaccumulative or those for which wildlife are more sensitive than fish, the potential exists that the aquatic life criterion may not be protective. For the Great Lakes Water Quality Initiative, a methodology was developed for deriving water quality criteria for the protection of wildlife. EPA needs to determine how many and which chemicals may put wildlife at risk and determine the feasibility of developing and implementing wildlife criteria. By doing so, EPA may close the loop on ensuring that the Nation's waters fully support their intended uses by all organisms.

- **EPA will investigate the need for, and feasibility of, an initiative to develop and implement wildlife criteria, on a national level, using the wildlife criteria development methodology employed in the Great Lakes Initiative (2000-2003).**
- **EPA will publish its findings and, if necessary, will prepare a wildlife criteria strategy and incorporate the key objectives, activities and milestones recommended in the strategy into this Plan (by 2003).**

VI. IMPLEMENTATION OF THE PLAN

In the past 25 years, EPA and the States and Tribes have made progress in improving the Nation's overall water quality, but many problems remain. With this Plan, EPA seeks to make necessary improvements in the water quality standards program to better protect aquatic life and human health. As future water quality improvements are made, the water quality standards program will face closer scrutiny and challenges. To ensure that the initiatives of the Plan are effectively implemented, EPA will support the initiatives with an optimum of stakeholder involvement through improved procedures and supporting documentation, outreach activities, and refinements of internal mechanisms.

EPA has set several objectives that will help facilitate the goals of this plan. As the water quality standards program progresses, EPA will work to facilitate the transition from a chemical concentration and point source control approach to a multiple stressor and watershed management approach. In the oversight of these programs, EPA recognizes the need to develop a nationally consistent approach for water quality standards approvals and disapprovals and uniform procedures for their implementation. Also, focus will be placed on a nationally consistent approach to use designations and levels of protection for waterbodies in the next several years. In addition to developing uniform procedures for the implementation of the standards programs, having a system in place with publicly accessible supporting documents will allow stakeholders to play a larger role.

IMPLEMENTATION OF THE PLAN

--Key Objectives:

- 1. By 2005, EPA will complete the scientific, technical and other activities necessary to accomplish the Plan's vision and objectives.***

--IMPLEMENTATION - Key Activities:

Increased outreach, communication to the public and education about water quality standards will facilitate the public's understanding of water quality standards and criteria as well as enable the public to take a more active role in the water quality standards process. Through providing increased access to information and opportunities for the public to learn about water quality standards and criteria, more effective and meaningful public contributions to the process should occur.

EPA also will work to fulfill its oversight role in the management of the program. For the components outlined in the Plan to be effective, States must adopt consistent and scientifically defensible program provisions. If States do not adopt water quality standards that are determined to be protective of human health and the environment, EPA will promulgate those standards.

To strengthen and modernize the water quality standards program, EPA will:

- **In 1998, publish the Advance Notice of Proposed Rule Making (ANPRM), a document that will help EPA identify and evaluate ways that States, Tribes and the public have addressed water quality-related problems, including the use of new water quality criteria and assessment science and the use of the watershed management approach to water quality protection. This document also supports the Criteria and Standards Plan by recognizing that regulatory changes may be necessary to strengthen and modernize the water quality standards regulation to meet the Plan's objectives.**
- **In 1998, request comment through the ANPRM on EPA's current thinking on possible regulation and policy changes to strengthen and modernize the water quality standards regulation, including:**
 - **Designated uses,**
 - **Antidegradation,**
 - **Criteria,**
 - **Mixing zones,**
 - **Independent application**

The effective implementation of this Plan depends, in part, on effective, ongoing communication with program stakeholders. Key activities of the Plan will be highlighted as elements of annual national water program guidance documents. This ongoing process enables EPA to place the goals of this Plan in the context of the State and Tribal programs.

- **EPA will annually communicate the objectives and applicable activities of this Plan to the States and Tribes through:**
 - **An Annual Memorandum from EPA on criteria and standards priorities;**
 - **Performance Partnership Agreements with States which establish the mutually agreed upon expectations for the coming year;**
 - **Promulgation of water quality standards, as necessary.**

To facilitate the implementation of the Plan, it will be necessary to work with the different interests of the State and Tribal government, stakeholders, and the public. Effective communication will ensure that the objectives of the Plan will be met by the target year 2005.

- **Throughout the next ten years, EPA will build State/Tribe/stakeholder/public partnerships and advocacy through:**
 - **Multi-Regional meetings on criteria, standards and implementation;**
 - **Public meetings on criteria and standards issues outlined in ANPRM;**
 - **Water Quality Standards Academies;**
 - **Tribal outreach and technical assistance including guidance and Water Quality Standards Academy(ies) specifically for Tribes;**
 - **TMDL modeling training**
 - **Fish consumption advisory programs training**
 - **Performance Partnership Agreements with States**

States and Tribes are required to adopt antidegradation policies to protect existing levels of water quality. This requirement, however, has not been defined by EPA in detail, and many States have not developed procedures to ensure compliance with this regulation. Consistent antidegradation policies among the States and Tribes that adequately protect the Nation's waters are important in meeting the Plan's goal of maintaining and improving water quality.

- **By 1999, EPA will develop guidance that more specifically defines expectations and procedures for States to follow in fully implementing antidegradation policies related to polluted runoff.**

Currently, States and Tribes are required to adopt designated uses for all waters. However, the availability of this information has been limited to date due to changes in uses that may occur when States and Tribes revise their standards, differences in uses within the same waterbody and the absence of centralization of this information.

- **By the end of 1998, EPA will finish a survey of State/Tribal designated uses.**
- **Over the next three years, EPA will create a national database of georeferenced designated uses. After that, EPA intends to add criteria to this database.**

To reduce the risk from bioaccumulation of toxic chemicals in fish and shellfish and meet the Plan's goal of better protecting human health, EPA will initiate pollution prevention source controls and sediment remediation activities.

- **During 1998-2005, EPA will work with States and Tribes to reduce human health risks associated with exposure to contaminated fish and shellfish by:**
 - **Ensuring that State and Tribal fish advisory programs are in place to protect public health during the transition period in which pollution prevention source controls and sediment remediation activities have not resulted in eliminating the contamination.**
 - **Issue fish advisories where States and Tribes fail to do so.**
 - **Update and add national guidance on how to monitor fish, assess risks of fish consumption, develop protective advisories and communicate risks to the public.**
 - **Update and maintain national right to know database on fish advisories.**
 - **Provide outreach and technical assistance to States, Tribes and the public.**
 - **Conduct national studies of fish contamination.**

EPA will incorporate new beach protection initiatives in conjunction with criteria development to further reduce the human health risks associated with exposure to microbial contamination in the water at bathing beaches. Public outreach and development of wet weather modeling techniques should assist State and local officials in protecting public health and reduce exposure to microbial contamination at local beaches.

- **During 1998-2005, EPA will work with the States and Tribes to reduce the human health risks associated with exposure to microbial contamination in the water at bathing beaches by:**
 - **Publishing a BEACH Action Plan describing priority actions for Federal, State, Tribal and local implementation of beach monitoring and notification programs.**
 - **Maintain and update and Internet-based database of beach advisories and closing in the U.S., including local beach monitoring program information.**
 - **Develop wet weather modeling techniques for use by local beach officials to predict when beach closures may occur due to potential stormwater and CSO overflows.**
 - **Provide outreach and technical assistance to States, Tribes and the public.**

VII. CHRONOLOGICAL SUMMARY OF KEY ACTIVITIES

1. AMBIENT WATER QUALITY CRITERIA

--AQUATIC LIFE - Key Activities:

- EPA will collect the latest scientific data and other information for aquatic life criteria development and revisions. Ongoing.
- EPA will update the aquatic life criteria derivation methodology to reflect new science and modeling capabilities:
 - Review the need for adjustments to frequency and duration components of existing guidelines by the end of 2000.
- EPA will initiate an effort to re-engineer the criteria program to ensure the latest science and modeling capabilities are being used to protect aquatic life and aquatic dependent wildlife by:
 - Participating in and evaluating the proceedings of (and implementing when/where appropriate) a SETAC sponsored workshop in 1998 that will focus on the science needed to support a watershed/ecorisk based criteria program in 2010 and beyond.
 - Developing a PC-based dynamic modeling software for site-specific metals criteria derivation for implementation in 2000.
- EPA will make improvements to the whole effluent toxicity testing methodologies and implementation procedures, where necessary.
- EPA will propose 2 - 5 aquatic life water quality criteria each year for revision or new criteria derivation.
- In 1998/99 initiate updates for copper, lead, aluminum, atrazine metabolites, silver.
- By the end of 1998, EPA will update high priority chemical-specific criteria for ammonia, selenium and saltwater dissolved oxygen.
- Starting in 1998, EPA will publish a Criteria Table on the Internet and update it annually.
- Between 1998 and 1999, EPA will work with all States to designate specific beneficial uses for their wetlands.
- EPA will work with the States and Tribes to adopt narrative and numeric criteria specifically for wetlands, or to adjust existing criteria to appropriately reflect conditions in wetlands by the end of 1999.

--SEDIMENT QUALITY PROTECTION - Key Activities:

- EPA will improve management of contaminated sediments in order to meet the GPRA goals of reducing fish and shellfish contamination and increasing the number of water bodies with healthy, diverse biota by:

- Implementing the Agency-wide Contaminated Sediment Management Strategy in 1998.
- Updating the National Sediment Quality Survey Report to Congress biennially.
- Developing scientifically defensible sediment assessment methods.
- Expanding water column aquatic life and human health criteria to include bed sediment criteria.
- Developing a sediment modeling toolkit for TMDLs by the end of 1999.
- Developing sediment quality guidance on mixtures of polycyclic aromatic hydrocarbons and mixtures of metals. Draft in 1998, final by 2001.
- Conducting contaminated sediment recovery demonstration projects in five watershed selected from those identified in the National Sediment Quality Survey. Initiate first study in 1999 and remaining four by 2000.

--HUMAN HEALTH PROTECTION - Key Activities:

- EPA will collect the latest scientific data and other information for human health criteria development and revisions.
- EPA will integrate the latest available, peer reviewed science into the ambient human health criteria methodology on an ongoing basis.
- By the end of 1999, EPA will develop a BAF field guidance document for use with deriving new criteria.
- EPA will publish three human health criteria guidance documents in 1998 and expects these to become final in 1999:
 - Acrylonitrile
 - 1,3-dichloropropene
 - Hexachlorobutadiene
- EPA will update high priority chemical-specific criteria guidance:
 - Dioxin- to be initiated following completion of Agency reassessment.
 - PCBs- publish updated human health criterion in 1999.
 - Mercury- publish updated human health criteria guidance in 1999.
- EPA will propose three to five human health criteria guidances annually, including those from the following list.

-Benz(a)-Anthracene	-Delta-BHC
-Benzo(a)-Pyrene	-Chlordane
-4-Bromo-phenyl Phenyl-Ether	-4,4'-DDT
-4-Chloro-phenyl Phenyl Ether	-4,4'-DDE
-Dibenzo(a,h)Anthracene	
-Di-n-Butyl Phthalate	
-Hexachloro-benzene	
-Hexachloro-butadiene	
-Aldrin	
-Hexachlorocyclohexane	
-Alpha-BHC	
-Beta-BHC	
-Gamma-BHC	

- 4,4'-DDD
- Dieldrin
- Endrin
- Heptachlor
- Heptachlor Epoxide
- Mirex/dechlorane
- Octachlorostyrene
- Pentachlorobenzene
- Photomirex
- 1,2,3,4-Tetrachlorobenzene
- 1,2,3,5-Tetrachlorobenzene
- Toxaphene

2. NUTRIENT CRITERIA

--NUTRIENTS - Key Activities:

- By mid 1998, EPA will publish a national Nutrient Strategy. This Strategy will explain the need to develop waterbody-type guidance and techniques for developing regional nutrient criteria.
- EPA will maintain and enhance existing federal nutrient programs to support criteria and standards development. Ongoing.
- By the end of 2000, EPA intends to publish nutrient guidance documents explaining methodologies that can be used to calculate nutrient criteria by waterbody type (lakes, reservoirs, streams and rivers, wetlands and estuaries) and ecoregions of the country, and nutrient criteria (expressed as target ranges) for use by the States and Tribes.
- Between 2000 and 2003, EPA will work with the States and Tribes as they adopt and implement numerical nutrient criteria into water quality standards by developing their own criteria or using default EPA nutrient ranges applicable to their ecoregion(s).

3. MICROBIAL PATHOGENS

--MICROBIAL PATHOGENS - Key Activities:

- EPA will provide support for the development of improved monitoring strategies for recreational water, by:
 - Conducting studies to determine appropriate sampling strategies to use at fresh, estuarine, and marine recreational areas to provide an accurate assessment of microbial contamination for all users during 1998-2000.
 - Sponsor an international workshop with the World Health Organization on beach monitoring requirements during 1999.

- EPA will develop new risk assessment method training for the Regions, States and Tribes, by:
 - Developing a course manual, a guidance manual and training module for use by Regions, and the States and Tribes by 1999.
 - Providing assistance and training to the States and Regions from 1999-2002.
- EPA will provide support for the development of improved indicators for recreational waters, by:
 - Conducting studies to differentiate human from animal sources of fecal contamination in recreational waters. 1998-2000.
 - Conducting studies to develop and validate the efficacy of inexpensive, easy to use, "real time" indicators/methods (including fecally derived chemicals) of pollution events in recreational waters. 1998-2000.
 - Conducting studies to develop and validate the efficacy of alternative risk based indicators/methods of infectious disease for skin, respiratory tract, eye, ear, and throat for recreational water. 1999-2001.
 - Performing studies to refine and expand the capabilities of fecal pathogen indicators to cover the presence of viruses and protozoa that may cause serious and chronic disease. 1999-2001.
 - Developing or validating indicators for pathogens in tropical waters such as Clostridium perfringens and coliphage. 1999-2001.
- EPA will provide support to further develop this risk assessment approach by:
 - Completing SAB peer review of the microbiological pathogen risk assessment framework. 1998-1999.
 - Address peer review issues; establish framework validation process and develop a methodology approach. 1999-2000.
- EPA will develop a new generation of microbiological criteria for use in State and Tribal water quality standards, by 2003.

4. BIOCRITERIA

--BIOCRITERIA - Key Activities:

- EPA will complete technical guidance documents for development of biological assessment methods and criteria for all water bodies:
 - Lakes and reservoirs (1998)
 - Estuaries and near coastal waters (1999)
 - Streams and wadeable rivers update (2000)
 - Statistical guidance on biological data analysis (2001)
 - Coral reefs (2001)
 - Large rivers (2002)

- Wetlands (2002)
- EPA will develop technical guidance and other informational materials on the use of biological assessments and criteria to evaluate aquatic life use support on an integrated basis with other water quality data, including:
 - Case studies/pilot projects to test integrated approach, first phase (1998)
 - Guidance on full support (1998)
 - Reassessment of Policy on Independent Application as it applies to 305(b) (1998)
 - Guidance on evaluating impairment using a weight of evidence approach, second phase (draft- 1999)
- EPA will build Regional biological technical capabilities to support State/Tribal programs throughout 1998-2005, by:
 - Identifying basic core expertise needed in each Region, including regional biological assessment & criteria leaders (1998).
 - Supporting development of Regional workplans to build and maintain biological assessment and criteria technical programs (1998).
 - Providing funding to Regions to help implement the biological assessment and criteria workplan (1998 - on).
 - Providing funding support to the States and Tribes, where necessary to pilot the use of biocriteria and bioassessments in water quality standards (1998-2003).
- EPA will develop a nationally consistent approach for developing and establishing numeric biocriteria in State water quality standards and for integrating biological assessment and criteria into the TMDL and NPDES permit programs, by:
 - Forming an Agency Biocriteria Implementation Steering Committee to identify key elements of a successful program and to make recommendations on program integration in 1998.
 - Publishing biocriteria implementation guidance.
 - Draft document in 1999
 - Final document in 2000
 - Preparing case study summaries demonstrating the applications, costs, and benefits of biological assessment information and criteria in water quality programs (1998 - 2005).
 - Identifying specific institutional barriers to biocriteria usage and developing solutions and recommendations.
 - Institutional barriers identified and prioritized in 1996 workshop
 - Develop solutions and begin to implement (1998 - 2005)
- EPA will build customer/stakeholder/public partnerships, advocacy and support through:
 - Public and Stakeholder Outreach (1998-on)
 - Tribal Liaisons - build Tribal participation (1998-on)
 - Network Communications/Tracking Issues (newsletters, listserver) (1998-on)
 - Educational/outreach information and technical training programs (1998-on)
 - Seminars, technical classes, Water Quality Standards Academy sessions, Regional/State meetings (1998-on)
- EPA will provide technical training for the Regions, States and Tribes on the derivation and implementation of biocriteria for different waterbodies as technical guidance manuals become available (1998-2005).

- EPA will develop technical guidance documents on the identification of stressors once biological impairment is determined. Two documents will be produced:
 - A Common Sense, Pragmatic Approach to Diagnosing Stressors (2000)
 - Scientific Investigations for Identifying Complex Mixtures of Stressors (2002)
- EPA will develop guidance on the use of biocriteria, bioassessments and habitat assessments for identifying and controlling the detrimental impacts of the high flows of storm water discharges and the application to excessive sediment transport and habitat damage by 2003.

5. TOTAL MAXIMUM DAILY LOADS (TMDLs) AND MODELING

-- TMDLs - Key Activities:

- EPA will establish new chemical water quality criteria and improve existing criteria as described in the section on ambient water quality criteria to better support the development of TMDLs.
- EPA will establish methodologies for developing nutrient criteria as described in the section on nutrient criteria to support the development of TMDLs for nutrients.
- EPA will develop training on the use of nutrient criteria in the derivation of TMDLs by 2000.
- EPA will continue to provide ongoing technical assistance to the States in the establishment of specific sediment TMDLs and is exploring ways of providing additional technical assistance for the establishment of sediment TMDLs nationally.

-- MODELING - Key Activities:

- EPA will provide mixing zone model enhancements in 1998.
- EPA will establish a TMDL modeling hotline to answer questions about the program by 1999.
- EPA will provide food chain model development (1998-on)
- EPA will develop and provide technical training on TMDL modeling (1998-on).
- EPA will provide BASINS enhancements including BMP effectiveness, clean and contaminated sediment transport, lake and estuary two-dimensional for (1998-on)

6. SEDIMENTATION, FLOW AND WILDLIFE

--EXCESSIVE SEDIMENTATION - Key Activities:

- EPA will sponsor a workshop of national experts on sedimentation in 1998-1999. The purpose is to:
 - Scope the issue of excessive sedimentation and viability of developing water quality criteria.

- Explore the extent of existing knowledge and limitations.
 - Develop a literature base.
 - Identify possible sedimentation end points and methods for sedimentation criteria or risk levels.
 - Define the relationship between biological criteria, bioassessments, habitat assessments and sedimentation.
 - Develop recommendations for future actions.
- EPA will publish the proceedings of the national expert meeting in 1999 and develop a strategy for further investigation and development of appropriate sedimentation end points, criteria or risk levels to occur over the following decade.

--FLOW ALTERATIONS - Key Activities:

- EPA will investigate the need for optimum flow guidance, criteria, management targets or other measures to protect against impairments of waterbody designated uses due primarily to flow alterations, including excessive flows from wet weather runoff and lack of base flows due to excessive water usages (2000-2002).
- EPA will investigate the relationships of biocriteria and biological assessments to identifying and managing the impairments caused by flow alterations (2000-2002).
- EPA will publish its findings and, if necessary, will prepare a flow alteration strategy and incorporate the key objectives, activities and milestones recommended in the strategy into this Plan (by 2002).

--WILDLIFE CRITERIA - Key Activities:

- EPA will investigate the need for, and feasibility of, an initiative to develop and implement wildlife criteria, on a national level, using the wildlife criteria development methodology employed in the Great Lakes Initiative (2000-2003).
- EPA will publish its findings and, if necessary, will prepare a wildlife criteria strategy and incorporate the key objectives, activities and milestones recommended in the strategy into this Plan (by 2003).

VI. IMPLEMENTATION OF THE PLAN

--IMPLEMENTATION - Key Activities:

To strengthen and modernize the water quality standards program, EPA will:

- In 1998, publish the Advance Notice of Proposed Rule Making (ANPRM), a document that will help EPA identify and evaluate ways that States, Tribes and the public have addressed water quality-related problems, including the use of new water quality criteria and assessment science and the use of the watershed management approach to water quality protection. This document also supports the Criteria and Standards Plan by recognizing that regulatory changes may be necessary to strengthen and modernize the water quality standards regulation to meet the Plan's objectives.
- In 1998, request comment through the ANPRM on EPA's current thinking on possible regulation and policy changes to strengthen and modernize the water quality standards regulation, including:

- Designated uses,
 - Antidegradation,
 - Criteria,
 - Mixing zones,
 - Independent application
- By the end of 1998, EPA will finish a survey of State/Tribal designated uses and associated criteria and, over the next three years, create a national relational database system for designated uses.
 - By 1999, EPA will develop guidance that more specifically defines expectations and procedures for States to follow in fully implementing antidegradation policies related to polluted runoff.
 - EPA will annually communicate the objectives and applicable activities of this Plan to the States and Tribes through:
 - An Annual Memorandum from EPA on criteria and standards priorities;
 - Performance Partnership Agreements with States which establish the mutually agreed upon expectations for the coming year;
 - Promulgation of water quality standards, as necessary.
 - Throughout the next ten years, EPA will build State/Tribe/stakeholder/public partnerships and advocacy through:
 - Multi-Regional meetings on criteria, standards and implementation;
 - Public meetings on criteria and standards issues outlined in ANPRM;
 - Water Quality Standards Academies;
 - Tribal outreach and technical assistance including guidance and Water Quality Standards Academy(ies) specifically for Tribes;
 - TMDL modeling training
 - Fish consumption advisory programs training
 - Performance Partnership Agreements with States
 - During 1998-2005, EPA will work with States and Tribes to reduce human health risks associated with exposure to contaminated fish and shellfish by:
 - Ensuring that State and Tribal fish advisory programs are in place to protect public health during the transition period in which pollution prevention source controls and sediment remediation activities have not resulted in eliminating the contamination.
 - Issue fish advisories where States and Tribes fail to do so.
 - Update and add national guidance on how to monitor fish, assess risks of fish consumption, develop protective advisories and communicate risks to the public.
 - Update and maintain national right to know database on fish advisories.
 - Provide outreach and technical assistance to States, Tribes and the public.
 - Conduct national studies of fish contamination.
 - During 1998-2005, EPA will work with the States and Tribes to reduce the human health risks associated with exposure to microbial contamination in the water at bathing beaches by:
 - Publishing a BEACH Action Plan describing priority actions for Federal, State, Tribal and local implementation of beach monitoring and notification programs.

- Maintain and update an Internet-based database of beach advisories and closing in the U.S., including local beach monitoring program information.
- Develop wet weather modeling techniques for use by local beach officials to predict when beach closures may occur due to potential stormwater and CSO overflows.
- Provide outreach and technical assistance to States, Tribes and the public.