A New Look at Water Quality in the Chesapeake Bay

A Service of the Alliance for the Chesapeake Bay & Chesapeake Bay Program

What's Driving the Changes?

Chesapeake Bay 2000 Agreement Water Quality Commitment:

By 2010, correct the nutrient and sediment-related problems in the Chesapeake Bay and its tributaries sufficiently to remove the Bay and tidal portions of its tributaries from the list of impaired waters under the Clean Water Act.

What's the Timeline?

Draft Bay water quality criteria will go out for second round of public review, with their final publication sometime in summer 2002.

Basinwide load reductions for nutrients and sediment will be drafted for the Bay's nine major tributaries during spring 2002.

During fall 2002, states begin revising their tributary strategies to achieve and maintain the assigned loading goals.

For More Information

See *www.chesapeakebay.net* and *www.BayJournal.com* for further reading on the new water quality criteria, Chesapeake Bay watershed model, tributary strategies, and public participation opportunities.

INTRODUCTION

For more than fifteen years, the Chesapeake Bay Program has been identifying habitat requirements for the Bay's living resources, from ducks and underwater grasses to blue crabs and striped bass. These habitat requirements will soon be the basis of new water quality criteria for the Chesapeake Bay — criteria that will help to more clearly define a "clean" Chesapeake Bay.

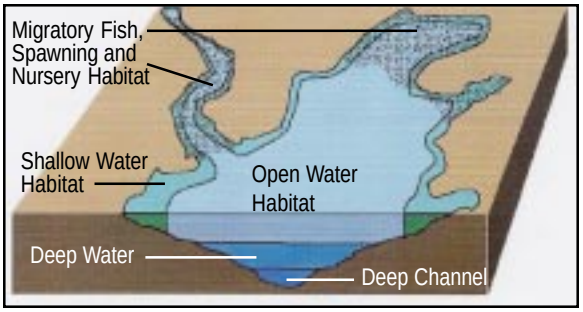
Standards for water clarity, dissolved oxygen, and chlorophyll *a* (a measure of algae) will be established for different parts of the Bay and for different times of the year, depending on the needs of key Bay resources.

Gone will be the historic, 40 percent reduction goal for nutrients that was set to gradually improve water quality but did little to provide specific, science-based outcomes for living resources. Nutrient and sediment reductions will still be needed, even more so in fact, but new reduction goals will be tailored to the water quality problems of each river and Bay inlet. The new approach is a monumental undertaking, weaving science, politics, and legal factors into strategies that will guide the Bay cleanup over the next ten years.

WHAT ARE THE NEW WATER QUALITY CRITERIA?

Estuaries are complex ecosystems, and the Chesapeake Bay is particularly diverse given its massive 64,000 square mile drainage area, large land to water ratio, and general shallowness. The new criteria take that diversity into account by essentially zoning the Bay, dividing the Bay and its tidal tributaries into five "designated uses" based on the types of species that inhabit a particular area.

Oblique View of the Chesapeake Bay and Tidal Tributaries



These habitat zones include 1) shallow water, 2) open water, 3) spawning and nursery areas, 4) deep water, and 5) deep channel.

Different criteria would be applied to each designated use or zone based on the species found there: grasses in shallow water, adult fish in open water, oysters in deep water, and so on. It's important to remember that no single criteria will apply Baywide. Instead, the numbers for the criteria will vary from place to place and sometimes from season to season. Secondly, the criteria recognize that natural factors limit the water quality that can be attained in some places. Tidal blackwater rivers would never attain water clarity at 2 meters, and chlorophyll levels naturally vary from place to place based on salinity and other factors.

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The draft criteria cover:

- **Water Clarity** — ensures that adequate sunlight for important underwater grasses can reach bottom in most shallow areas. Water clarity is critical to the survival and growth of Bay grasses, the vertical movements of zooplankton, and predator/prey relationships which involve visual feeding.

  Criteria would be applied to depths of 2 meters or less. Areas where SAV never occurred or where natural factors, such as currents, prevent its growth would be excluded. Surface light penetration numbers will be geared for both low and high salinity habitats.

- **Chlorophyll *a*** — aims to reduce blooms of harmful, water-clouding algae, while promoting the growth of beneficial algae that feed the Chesapeake's food chain.

  Measuring chlorophyll concentrations in water is a surrogate for an actual measurement of algae biomass, which is far more expensive and time consuming. Excessive amounts of algae indicate the presence of blooms, which typically consist of one species of algae that is not desirable for consumption of fish and other predators.

  *The criteria will identify seasonal chlorophyll **a** concentrations for different shallow water and open water areas of the Bay.*

- **Dissolved Oxygen** — ensures that enough oxygen is available — in the right places and at the right time of the year — to support everything from sensitive fish larvae to adult striped bass and oysters.

  The traditional, one-size- fits-all 5 mg/l dissolved oxygen criterion is based on 40-year old science. From a habitat standpoint, living resources in early life stages are often more sensitive to low oxygen levels than adults; therefore, a higher DO level of 6 mg/l may be needed at times in the spawning and nursery areas. During the summer, oxygen levels must be adequate in deep water (1.7 - 3.5 mg/l) to protect eggs and larvae of bay anchovy, one of the most abundant fish in the Chesapeake and a critical link in the food chain. In the deep channel, dissolved oxygen levels in the 1 - 3.5 mg/l range would be needed over summer months to protect worms and other bottom dwellers.

Preliminary estimates suggest that, in order to achieve the dissolved oxygen goals, the watershed will need to reduce the amount of nitrogen entering the Bay by more than 100 million pounds from the 300 million estimated to enter the Chesapeake today. By comparison, about 360 million pounds of nitrogen were entering the Bay annually when nutrient reduction efforts began in 1987.

Once the standards are achieved, the oxygen-depleted "dead zone," which can cover as much as a third of the Bay's bottom today, should cover no more than 5 percent of the bottom. The water should be clear enough for the return of grass beds to hundreds of thousands of acres; they now cover only about 69,000 acres.

HOW ARE WE GOING TO MEET THE NEW STANDARDS?

A big challenge for the Chesapeake Bay Program is matching up where and how we meet new chlorophyll, clarity, and oxygen criteria with what's achievable in terms of nutrient and sediment reductions. Helping to meet this challenge is the body of monitoring information and a rather sophisticated watershed model that will translate how the Bay should respond to different nutrient and sediment load controls.

The computer model will essentially map out water quality impacts in tidal waters from nutrients and sediment loads coming from different jurisdictions, basins, and subwatersheds throughout the entire Bay watershed. As a result, Bay Program partners will no longer face an across-the-board 40 percent reduction goal for nutrients but rather specific load reduction responsibilities. Nine major tributary basins will first receive load allocations; further allocations by individual jurisdictions will then be made for 37 subwatersheds.

The new criteria represent a number of "firsts" in watershed restoration -- EPA has never before entered into this type of hybrid process for cleaning up impaired waters, and no other estuarine or river restoration program has attempted assessing water quality by the response of living resources to the extent proposed by the Bay Program.

The new Bay water quality criteria will be published in equal standing with other national EPA water quality criteria and Bay Program officials hope to see Maryland, Virginia, Delaware, and the District of Columbia adopt them as enforceable state standards. Maximum allowable loads of nitrogen, phosphorus, and sediment may be allocated to animal feed lots, wastewater treatment plants, farms, and other sources of pollution. The non-tidal water states of Pennsylvania, West Virginia, and New York will be expected to develop tributary strategies that will likewise divvy up load reductions among its pollution sources to help attain improved water quality in the Bay.

The bottom line is that all jurisdictions will need to think outside the box — past approaches must be seriously evaluated and new technologies must be developed to accelerate our efforts to clean up the Chesapeake Bay. The challenge will be to balance science with the economics of meeting new goals.

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