



New Jersey Department of Environmental Protection

Water Monitoring and Standards

30 Years of Monitoring New Jersey's Waters

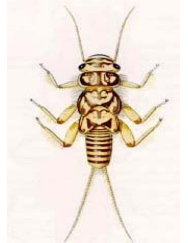
What types of monitoring do we do?

- ◆ Freshwater (rivers, streams)
- ◆ Marine Waters (bays, ocean) & Tidal Rivers
- ◆ Ambient Ground Water

What do we monitor these waters for?

- ◆ Sanitary Quality (indicators of human disease organisms)
- ◆ Phytoplankton (microscopic plants)
- ◆ Biological health (e.g., bottom-dwelling macroinvertebrate communities, fish populations)
- ◆ Chemical parameters (e.g., dissolved oxygen, pH, chlorophyll, nutrients, metals, pesticides, temperature, conductivity)
- ◆ Sediment quality & toxicity
- ◆ Aquatic-related habitat
- ◆ Shellfish contamination

Stonefly

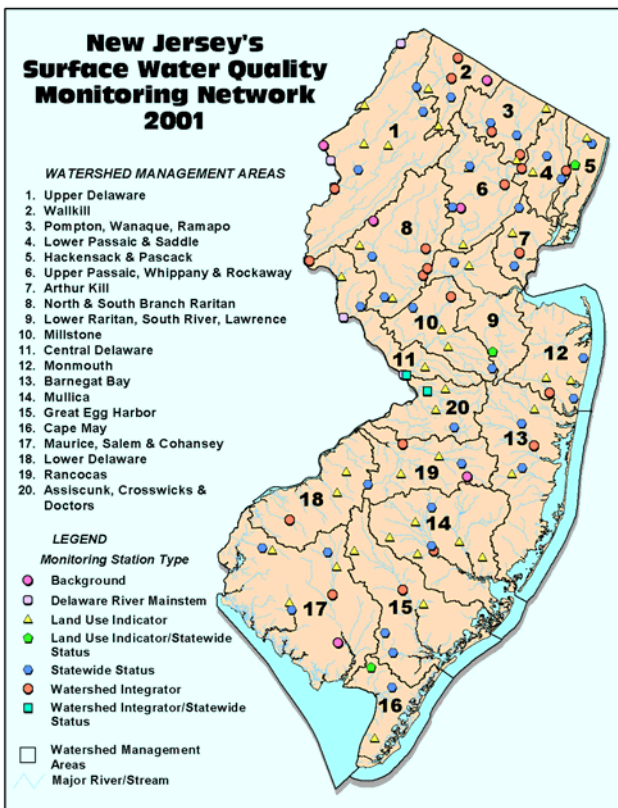


Leech



Monitoring Freshwater Quality

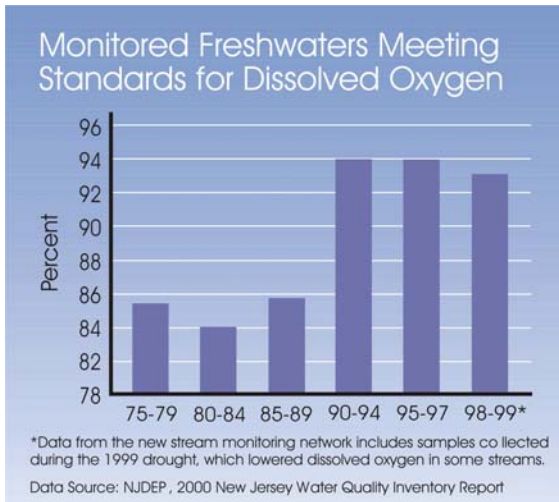
Where we have been...



Surface Water

In 1976, an Ambient Surface Water Monitoring Network (ASWM) was established to determine the status and trends of surface water quality in New Jersey. The original network consisted of 200 stations and included monitoring for major ions, nutrients, bacteria, and biochemical oxygen demand (BOD). Over the years, to increase efficiency and minimize costs, the network was reduced to 78 stations. The network, which is managed cooperatively by DEP and the US Geological Survey, was updated and redesigned in 1997. The current network includes 115 stations which are monitored quarterly for a wide range of conventional parameters, metals, bacterial indicators, pesticides/volatile organic contaminants (VOC's) in water and sediments (see map at left). This redesign of the network, including greater focus on land use impacts on water quality, has enhanced support of evolving water quality initiatives including integration of water chemistry and biological data,

development of water quality standards, as well as statewide assessments of surface water quality in New Jersey. This redesigned network received high praise during a recent USGS Headquarters review of the program.

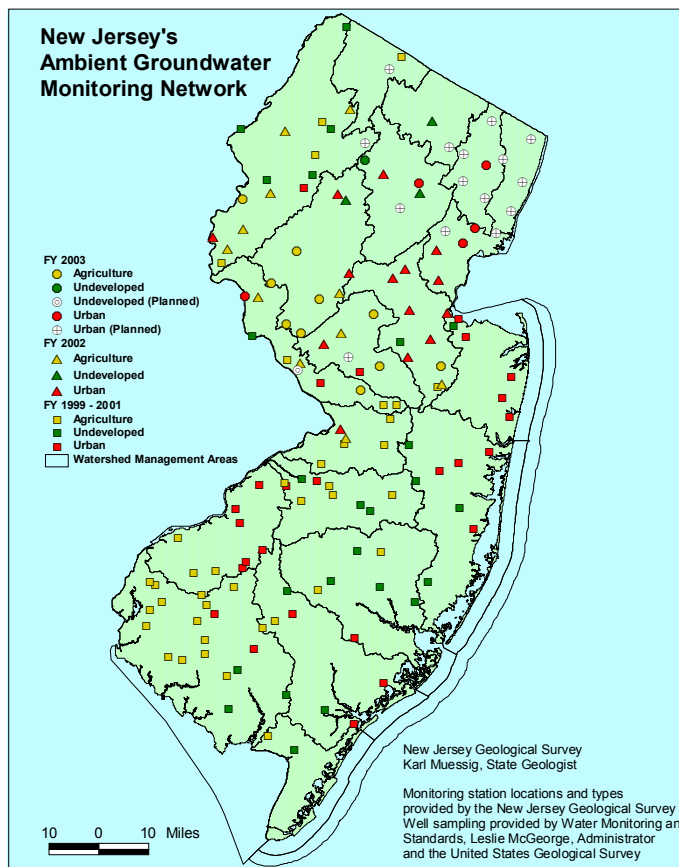


Over the years, the chemical/physical ASWM network has revealed trends in water quality in the state's rivers and streams. Substantial improvements have been observed for some parameters such as dissolved oxygen and ammonia; however, significant impairments remain for other contaminants such as animal/human waste (as indicated by fecal coliform and other microbial indicators). As the graph to the left indicates, the percentage of tested streams that met the dissolved oxygen standard has increased over time from approximately 85% in the late 1970's to approximately 93% in the late 1990's. Maintaining dissolved oxygen levels above standards in our rivers and streams is critical for healthy

aquatic life. Data from this network are available from the EPA STORET database.

Ground Water

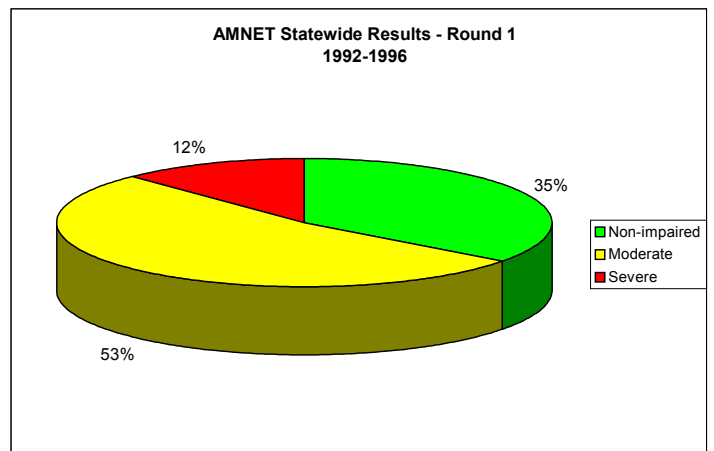
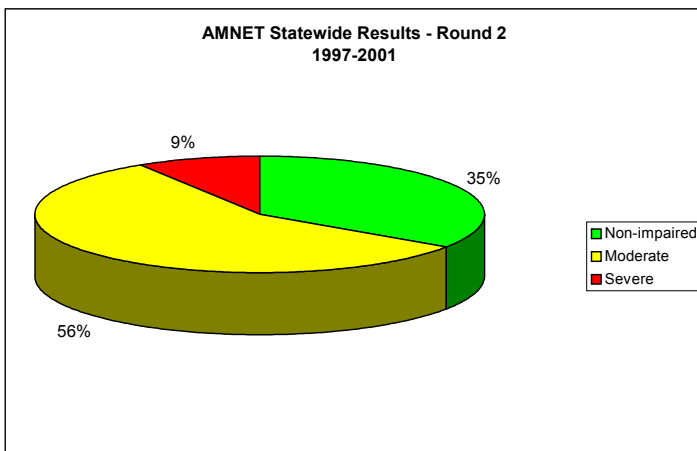
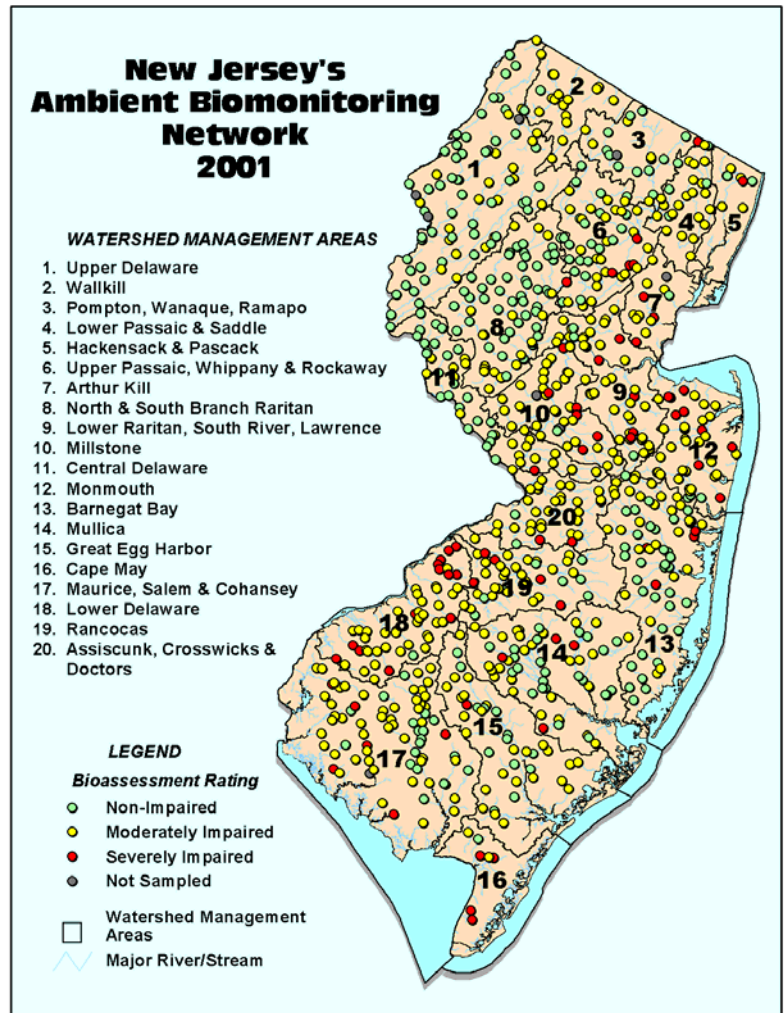
Recognizing the need for better information on the status of shallow ground water quality information, the state's Ambient Ground Water Quality Network was redesigned in 1999. Management of this revised statewide network is also a cooperative program between DEP and USGS. When complete, the revised network will consist of 150 water-table wells, randomly distributed within agricultural, urban/suburban and undeveloped lands throughout the state. Thirty wells are installed and sampled each year, with anticipated completion of the network by 2004. Parameters monitored for include: dissolved ions, nutrients, and metals, radioactivity, volatile organic compounds (VOCs) and pesticides. Current status of the network can be seen in the map at right.



Where we are....

In 1992, the Bureau of Freshwater & Biological Monitoring reactivated its *Ambient Biomonitoring Network (AMNET)*, which evaluates the health of in-stream benthic (bottom-dwelling) macroinvertebrate communities as a biological indicator of water quality. The old network, consisting of only 31 stations, was determined to be inadequate to support the Department's water quality inventory (305(b)) reports, impaired waterbodies listing (303(d)), and Watershed Programs. The new program established a statewide rotational sampling schedule (by Water Region) for 820 stations.

In 2001, the second round of statewide AMNET sampling was completed. The results show that, statewide, approximately 35% of the waters are "non-impaired", approximately 56% are "moderately impaired" and approximately 9% are "severely impaired" using this particular biological indicator (see map above). A comparison of results from both rounds of sampling is shown below.



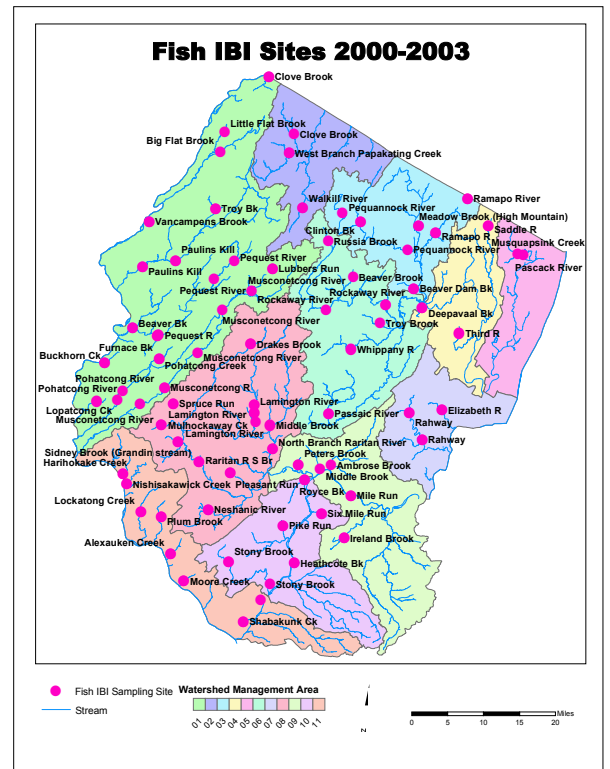


In order to provide better ecological assessment tools for NJ's waters, a more complete biological assessment is under development that will incorporate different "trophic" levels (e.g., benthic macroinvertebrates, fish communities, phytoplankton, periphyton). Additionally, research is ongoing to integrate all of this information into a more robust indicator of the biological health of streams.

Where we are going...

In order to continue to expand stream water quality assessment capabilities, a Fish Index of Biotic Integrity (IBI) sampling program was established in 2000. The IBI evaluates environmental conditions based on assessments of fish populations. Fish are good indicators of water quality because they are relatively long lived, mobile, easy to collect and identify to the species level, have a variety of pollution tolerances, and are at the top of the aquatic food chain as well as consumed by humans (making them also important for contamination assessment).

The current network consists of 78 sites in the northern part of the State only. Each year, approximately 20 new sites are added; the final network is expected to consist of 100 sites which will be sampled on a 1x/5year basis. At each site, fish are collected, identified, counted, examined for disease and anomalies, and recorded. These data are assessed and the site is given a rating of "excellent", "good", "fair" or "poor" (see map at right for 2000-2003 sites).



Exploration is underway to determine if a similar type of network can be developed in the southern portion of the state.



Fish IBI sampling

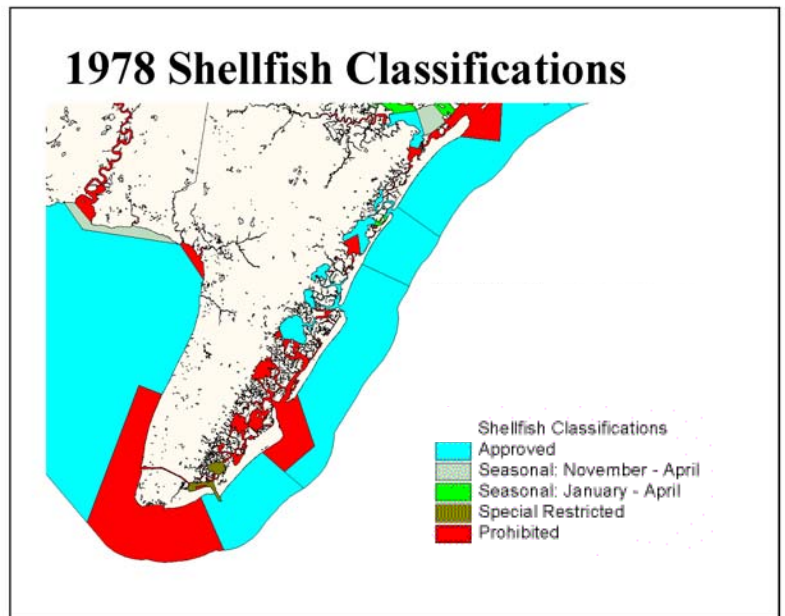
Did you know.....

- ◆ DEP established several freshwater monitoring programs which have served as national models (e.g., redesign of cooperative chemical monitoring network (w/ USGS) based on land use; one of the 1st states to develop the protocol for & incorporate clean metals methods into routine monitoring)
- ◆ Maintains one of the most extensive statewide ambient biological monitoring networks in the nation
- ◆ Maintains highly specialized laboratories performing: bacteriological and chemical analyses, aquatic biological, chemical and acute/chronic toxicological analyses for freshwaters
- ◆ Assists the Delaware River Basin Commission (DRBC) in monitoring the water quality conditions in the Delaware River

Monitoring Coastal Water Quality

Where we have been...

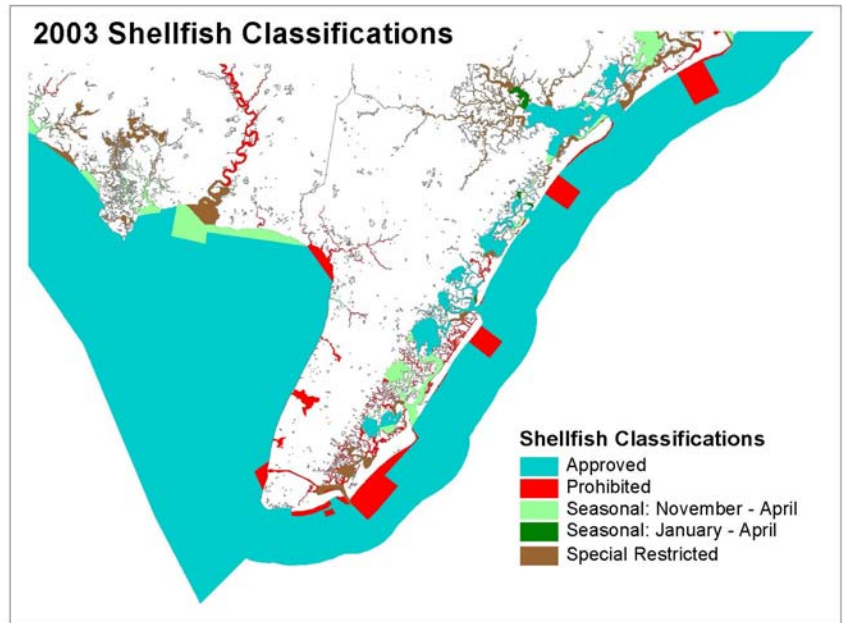
In the 1970's, significant portions of New Jersey's coastal waters were off limits to shellfish harvesting due to poor water quality. For example, the map to the right shows the conditions of the shellfish classifications in the vicinity of Cape May in the late- 1970's. At that time, factors negatively affecting coastal water quality were primarily wastewater discharges coming from treatment plants with a low level of treatment efficiency. Monitoring by DEP highlighted areas of impacted water quality and led to the closure of shellfish waters to protect the health of shellfish consumers.



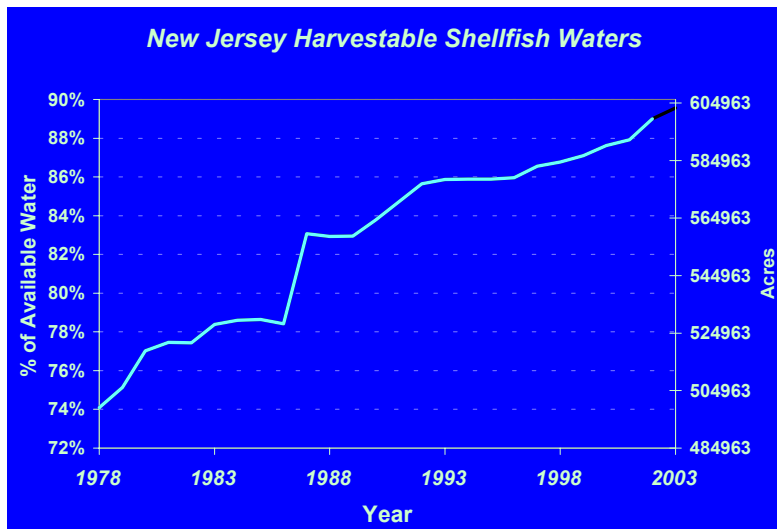
Where we are...

Conditions are now dramatically different with large areas of coastal waters upgraded to allow shellfish harvesting. In the 1970's, less than 75 percent of New Jersey's waters would support shellfish harvesting. DEP upgraded a significant number of acres of coastal waters for 2003. This upgrade continues the trend

that NJ has opened more coastal waters for shellfish harvest than any other state in the last 30 years. With the changes, 90 percent of the state's coastal waters support shellfish harvesting (see graph below).



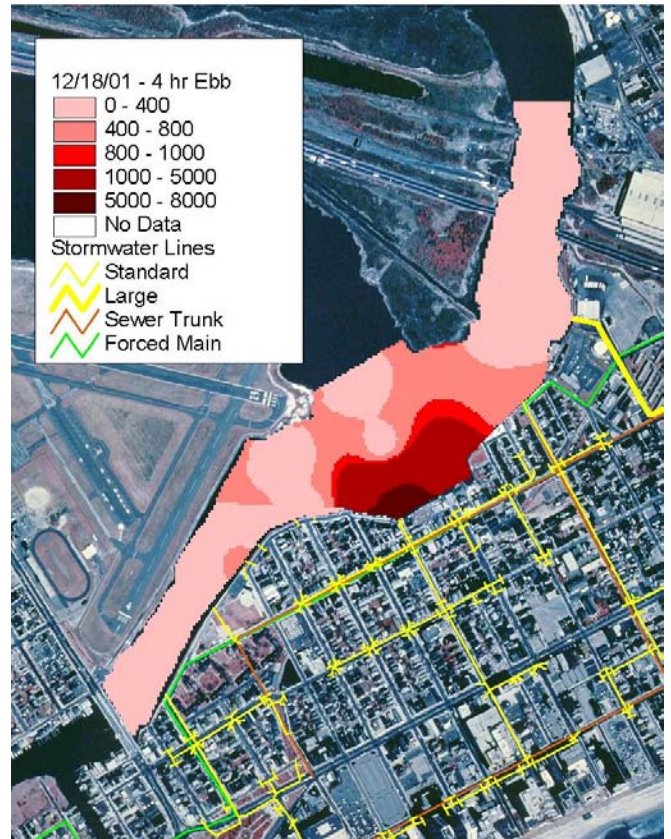
Since the 1970's, DEP has added monitoring for the ecological health of coastal waters to the public health-related monitoring of the shellfish water classifications. Basic measures of the ecological health that are now routinely monitored in New Jersey's coastal waters include dissolved oxygen, suspended solids, and phytoplankton (microscopic plants). Measurements also include basic water conditions such as temperature and salinity.



Where we are going...

In order to continue this trend of improving the sanitary quality of NJ's coastal waters as well as enhancing our understanding of these waters, DEP is currently working on new methods and technologies to measure the health of this valuable resource. New monitoring methods are allowing us to track down the sources of nonpoint source pollution along the coast. These methods will help State, county, and local governments target their resources most effectively to the sources of water quality problems.

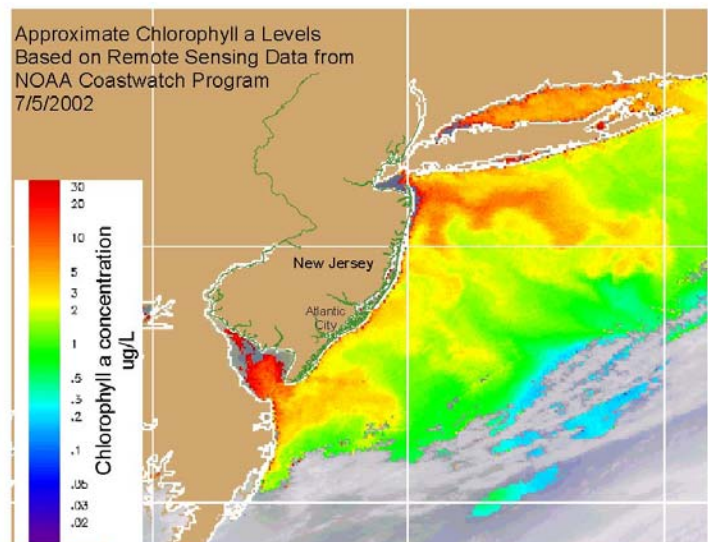
The Department has four continuous water quality monitoring devices in place in the state's coastal waters. These monitoring devices (see bottom left) continually provide up-to-date measurements of coastal water quality conditions to the public via the Internet. NJ is among the first states in the nation to use these devices for coastal water monitoring. The Department has started a new effort in cooperation with NOAA and NASA to use remote sensing from both satellites and aircraft to provide an even better picture of water quality along New Jersey coast (see bottom right). Remote sensing information is expected to be beneficial for tracking of algal blooms, certain forms of which can be harmful to human health and shellfish populations.



Bacterial levels emanating from a stormwater discharge.



Deployment of buoy for continuous monitoring of coastal water quality parameters



Obtained via Coastwatch, with permission from OrbImage

Did you know.....

- ◆ NJDEP collects approximately 15,000 marine and estuarine water samples yearly from a 2,500 station network to classify approximately 700,000 acres of bay & ocean waters for shellfish harvesting
- ◆ Maintains highly specialized laboratories performing: bacteriological and chemical analyses, analysis of coastal waters & shellfish tissue samples for public health concerns (e.g., *Vibrio*), and low level metals & nutrient analysis for marine waters
- ◆ Works cooperatively with EPA to monitor coastal waters for nutrients, phytoplankton and oxygen, among other parameters

Where can you get **additional information** (results/reports) about our monitoring activities?

(Fish IBI data/reports, AMNET reports, shellfish growing area reports, etc.)

- ◆ WM&S webpage: www.state.nj.us/dep/wmm
- ◆ Call WM&S: (609) 292-1623
- ◆ EPA STORET database: www.epa.gov/storet/dbtop.html



How can **you** participate in volunteer monitoring activities?

Become involved with the volunteer monitoring efforts which are coordinated by DEP's Watershed Management element. Additional information on volunteer monitoring may be found by visiting their website: www.state.nj.us/dep/watershedmgt/volunteer_monitoring.htm

Water Monitoring and Standards:

Leslie J. McGeorge, Administrator

Al Korndoerfer, Chief, Freshwater & Biological Monitoring

Bob Connell, Chief, Marine Water Monitoring

Debra Hammond, Chief, Water Quality Standards & Assessment