Delaware River

STATE OF THE BASIN REPORT

2008

SUMMARY

How clean are the water resources of the Delaware River, its tributaries and Bay?

Do we have enough water for drinking and commerce?

Is it safe to drink?

Are our waters "swimmable"?

Are fish abundant and safe to eat?

How are other living resources faring?

Is critical habitat being protected?

Are years of management and stewardship yielding good results?

Are we prepared to meet the issues we might face in the future?

Responding to these questions requires environmental managers to set goals for the protection and improvement of resources, to efficiently assess issues and trends, and to monitor the success of implemented management strategies—all of which require high-quality data, scientific information, and an effective feedback system. You can't manage what you don't measure.

The State of the Basin Report 2008 is designed to serve as a benchmark of current conditions. It also provides a platform for measuring and reporting future progress in water resource management, and a guide for adjusting monitoring and assessment programs. Finally, it is intended to communicate our understanding of the health of the basin, to increase public involvement in Delaware River Basin and Delaware Estuary Program activities, and to build consensus on a broad array of actions that can be taken to improve water quality, water availability, and enhance the living resources of the Delaware River Basin.

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DELAWARE RIVER NEAR HANCOCK, NY, D. SOETE

CATEGORY I • HYDROLOGY

INDICATOR	STATUS	PRESENT CONDITION	TREND
Flows at Trenton	○	**Good**: Flow target maintained 95% of the time	Stable
Salt Line Location	○	**Very good**: Drinking water intakes effectively protected; fluctuations within acceptable range	Stable
Water Use Efficiency	◐	**Fair**: Per capita use ranges from 90 to 190 gal. per capita per day	Stable
Water Use	○	**Good**: Human needs being met; instream needs being evaluated	Stable
Water Supply Sources	○	**Good**: Multiple potable supply sources available in many areas	Stable
Areas of Ground Water Stress	◐	**Fair**: Some new problem areas identified	Some improving; some worsening
Flood Damage	●	**Poor:** Increasing repetitive claims in recent years	Worsening

Compared to many other river systems, the Delaware Basin is blessed with a relative abundance of water, realizing over 45 inches of rainfall on average in a year. In a natural system, flows are variable, but uncontrolled and dependent on precipitation and ground water base flows. Flows on the river are an accumulation of flow from the tributaries; the Schuylkill and Lehigh rivers are the two greatest contributors to Delaware River flows. Generally, the contribution of each tributary is proportional to the land area it drains—its watershed—but the actual magnitude of flows is also determined by the geology, soils and land use of the watershed. Flow regimes, tracked as a hydrograph of flow volumes over time, reflect the effect of precipitation on streams.

Hydrographic Regions of the Delaware Basin

Hydrographic Regions of the Basin

The Delaware River Basin lies in two significantly different hydrologic regions which correspond to the two major physiographic divisions in the northeastern US: the Appalachian Highlands and the Atlantic Coastal Plain. These regions meet at the *fall line* which crosses the river at Trenton, N.J. While physiographic provinces do not follow watershed boundaries, they do help define the character of watersheds and influence flows and water quality. Local availability of drinking water is related in part to the characteristic soils and geology in these regions.

Hydrology Summary. Indicators selected for reporting cover a range of high and low flow factors, as well as source water conditions and water use. Overall, the hydrologic indicators are in good shape. We are meeting the low flow targets that are the foci of management efforts, meeting human demand for water, using resources with some degree of efficiency, managing areas of known stress, making headway in water use and protection, and working to reduce flood losses. Future challenges include meeting instream flows for aquatic habitat and adapting to the hydrologic effects of increased climatic variation.

Major Influences on Stream and River Quality -

- *Runoff and point-source discharges from agricultural and urban areas*
- *Persistent contaminants associated with past human activities: mining, industry, urban development and agriculture*
- *Impoundments and diversions of water*

Major influences on Ground Water Quality -

- *Use of pesticides, nutrients and volatile organic compounds in urban and agricultural areas*
- *Physical properties of soils and aquifers, and chemical properties of contaminants*
- *Naturally occurring radon and arsenic*

2004 USGS Circular #1227

Water Quality Summary. While impressive improvements have been made over time, current metrics indicate that water quality overall is *Fair*. Dissolved oxygen, nutrients and clarity appear to be good and generally meeting criteria in the tributaries and the river mainstem. However, toxics remain a problem, and nutrients and temperature are causing concern in some waters. Over a third of tributaries do not support their designated use, and impairments of the Delaware River include fish consumption and aquatic life support. Lack of criteria for some parameters make evaluation problematic, and deficiencies in monitoring hinder robust assessments of others. Future monitoring and reporting are likely to increase the focus on contaminants of emerging concern and their potential to affect human and aquatic ecosystem health.

R. LIMBECK, DRBC

Monitoring for macroinvertebrates.

INDICATOR	STATUS	PRESENT CONDITION	TREND
Nutrients	◐	**Fair**: Concentrations high compared to other systems, but harmful effects not evident	Stable
Dissolved Oxygen	○	**Good:** DRBC and state DO standards being met; upper basin DO is better than lower basin	Stable
Water Clarity	○	**Good**: Naturally turbid estuary; non-tidal river generally clear except after storm events	Stable
Copper	◐	**Fair**: Dissolved copper below but near water quality criteria	Stable
Fish Consumption	●	**Poor**: Advisories for at least one species on many tributaries and Del. River for mercury and/or PCBs	Not improving
Toxics: Pesticides	◐	**Fair**: Presence throughout basin, esp. historic agricultural use areas; atrazine concentrations below drinking water standard	Unknown
Toxics: PCBs	●	**Poor**: PCBs persist in water, sediments and fish tissue, esp. in the tidal river/estuary	Possibly improving
Support of Designated Use: Tributaries	◐	**Fair**: 37% of assessed tributary miles do not support designated uses	No trend
Tributary Water Quality Trends (DO, N, P, TSS)	○	**Good:** Upper and Central Regions **Fair:** Lower and Bay Regions	Mixed trends in watersheds
Support of Designated Use: Delaware River	◐	**Fair**: Conditions range from poor to good depending on use designation	No trend

CATEGORY III • LIVING RESOURCES

INDICATOR	STATUS	PRESENT CONDITION	TREND
Benthic Macro-invertebrates	◐	**Fair**: Conditions range from poor to very good. All regions show impacts	No trend
Freshwater Mussels	●	**Very poor:** More than 75% have special conservation status due to habitat and water quality degradation	No trend
Oysters	●	**Poor**: Populations are low but seed beds are being carefully managed	Improving
Horseshoe Crabs	◐	**Fair**: Egg densities affect shore birds	Breeding populations are increasing
Red Knot	●	**Very poor:** Vulnerable to loss of food source and climate impacts	Populations may be crashing
Louisiana Waterthrush	◐	**Fair**: Sensitive to polluted waters and loss of forested riparian habitat	Generally decreasing
Bald Eagle	○	**Good**	Generally increasing
Striped Bass	○	**Good:** Population restored	Recent declines
Weakfish	◐	**Fair**	Recent declines
Atlantic Sturgeon	●	**Poor**	Declining
Shad	◐	**Fair**: Improved with DO and fish passage	Recent declines evident
Brook Trout	●	**Poor**: Population extirpated or severely reduced in many watersheds	Declining

The past history of the river's anoxic (zero dissolved oxygen) zone, the introduction of water quality regulations, and subsequent improvements in water quality is a success story. The positive change is most dramatically evident in the restoration of living resources, especially fin fish populations and most notably shad.

Water quality criteria for the support of aquatic life have been adopted for a number of parameters, and are being considered for more. All of the waters of the basin are designated for the support of aquatic life. The key water parameter of concern has been dissolved oxygen (DO) because it is necessary for nearly every aquatic resource and is essential for overall ecosystem health. In addition to water quality, healthy living resources are affected by flow, temperature, natural predation, harvesting by humans, disease, and habitat loss. The results of management efforts are manifest in the condition of living resources in the basin.

Living Resources Summary. This category includes species of concern that are affected by changes in water quality and hydrology, e.g., the "endpoints" of changing biological, chemical and physical conditions in waterways and water-related landscapes. The overall condition assessment for this category is *Fair* with a significant number of indicators having a *Poor* rating. Selection of additional indicators may be advised for subsequent reports to include additional species that are of ecological or economic importance.

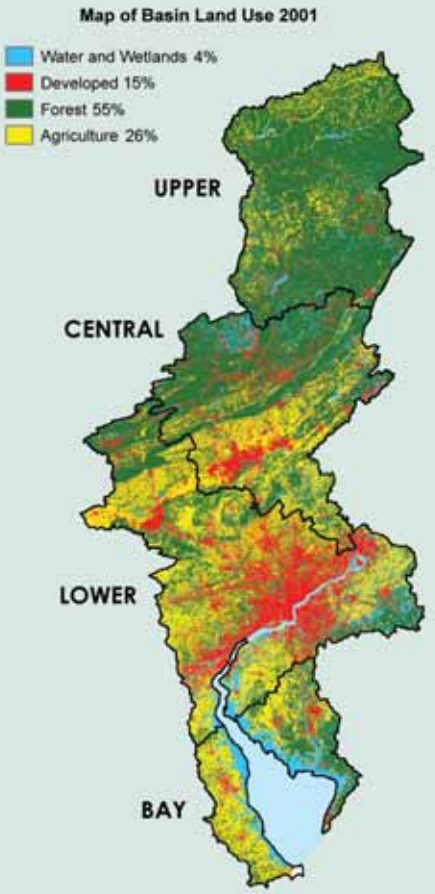
SOURCE: US DEPARTMENT OF AGRICULTURE

CATEGORY IV • LANDSCAPE

INDICATOR	STATUS	PRESENT CONDITION	TREND
Population Growth and Distribution	NR	Basin population 7.8 million	Population increased 6% (1990-2000)
Population Density	NR	Basin average is 603 people/mi^2; ranges from <10 to >2,000 people/mi^2	Generally increasing
Land Use 2001	NR	See the map below	Developed area increased by 71 mi^2 in 5 years at expense of forest and agricultural land
Land Consumption	●	**Poor**: Per capita rate of developed land has increased	Worsening
Dams	●	**Poor**: 1,550 tributary dams disrupt natural hydrology and fish passage	Increasing interest in dam removal
Forests	◐	**Fair:** Decreasing by the size of 1 football field every 2 hours. 48 mi^2 of forest lost in 5 years	Decreasing
Wetlands	◐	**Fair:** Assessment of functional integrity needed	Losses occurring at a slower rate
Tidal Wetland Buffers	●	**Poor to Fair** in Lower and Bay Regions	Likely worsening

Landscapes and Water Resources

Natural landscapes and human alteration of those landscapes—measured as land cover and land use—play a crucial role in water resource condition. Population increases and the concurrent use of land and changes to its physical state can be major factors in the alteration of ecological processes at both local and global scales. Many, if not most, physical and chemical changes in waterway systems are linked to land use, although some of the linkages are complex and difficult to quantify. Significant relationships exist between landscape condition and the health of aquatic communities. Landscape change has been identified as "lying at the heart of many environmental problems," and when compared to an array of known or perceived threats, land use change, in the view of experts, "produced by a wide margin the largest negative ecological and socioeconomic impacts.[1]"



Landscapes Summary. Indicators in the landscape category include factors that contribute to impacts in the other three categories. Important changes in land use include a substantial rate of forest loss and increase in the amount of land developed per person between 1995 and 2001. Improvements in data quality, availability and timeliness are essential for improving reporting capability. The functional linkages between landscape change and other indicators are not always well quantified nor well represented through indicators. Additional metrics to help bridge this gap will be considered for the next report.

[1] 2003 Final Report of the New Jersey Comparative Risk Project, NJDEP.

EVERYDAY Choices IMPACT OUR ENVIRONMENT

Regulatory efforts initially concentrated on major "point" sources of pollution (wastewater and industrial discharges). As these sources of pollution have been reduced, it has become clear that the collective individual actions of people add up to a major pollution source. Each individual action may not seem to have a major impact on the environment; but, when multiplied by the basin's nearly 15 million residents, the impact is significant. By making small changes in your lifestyle you can have a positive effect on the quality of our environment.

What You Can Do

- Think about the ultimate destination of rainwater on your property and neighborhood.
- Preserve the established trees in your neighborhood, which help minimize the damage caused by surface run-off.
- Plant and protect vegetation on slopes and areas adjacent to waterways.
- Get your soil tested; apply water, lawn chemicals, and fertilizers sparingly.
- Use organic fertilizers and pesticides: apply compost on flower beds and white vinegar to control weeds on driveways.
- Go native: native plants and shrubs can reduce lawn area and the need for pesticides and water.
- Wash your vehicles on the lawn to reduce runoff from the driveway and give the lawn a good soaking.
- Pick up litter to keep trash from ending up in storm drains.
- Do not feed waterfowl; waste from ducks and geese can cause serious water quality problems in lakes and estuaries.
- Properly dispose of pet waste, household chemicals, and car lubricants—don't pour them into household or storm drains.
- Maintain your septic system. Improper use can destroy the working bacteria and contaminate local ground water.
- Shorten your showers; fix leaky faucets; install water-saving fixtures.
- Conserve water whenever and wherever possible.

Indicators

An *indicator* is a measure of condition; an environmental indicator is a measurement, value or statistic that provides an approximate gauge of the state of the environment and may help evaluate the effectiveness of an environmental management program.

Reporting

In all, 37 indicators representing **hydrology**, **water quality**, **living resources** and **landscape** conditions have been reviewed in this report. Pertinent data, trend analysis, qualitative information, and professional judgment were brought to bear to assign graphic and narrative representation of condition for each individual indicator. Three landscape indicators—land use, population and population density—were reported, but not classified or rated. Although of supreme importance as stressors or causes of changes to water-related resources, they are essential statements of fact that do not warrant a rating.

To summarize each assessment, a simple categorical measure of condition was used; each indicator was assigned a rating of *Good*, *Fair* or *Poor*. The results are shown by indicator category in the tables.

For more information

The full report is available in PDF format on the Delaware River Basin Commission's website at http://www.nj.gov/drbc/SOTB/index.htm.

LEGEND STATUS: ○ = GOOD ◐ = FAIR ● = POOR NR = Not Rated