

# Delaware River Basin Commission

## **Water Resources Program**

FY 2010-2015

July 14, 2010

## DRBC Water Resources Program FY 2010-2015

### Authorization

The Delaware River Basin Compact states:

*The commission shall annually adopt a water resources program, based upon the comprehensive plan, consisting of the projects and facilities which the commission proposes to be undertaken by the commission and other authorized governmental and private agencies, organizations and persons during the ensuing six years or such other reasonably foreseeable period as the commission may determine. (§ 3.2 DRB Compact, 1961)*

The Compact defines “project” as ...”any work, service, or activity which is separately planned, financed or identified by the commission . . . for the conservation, utilization, control development or management of water resources” (§1.2.(g)).

### Scope & Organization

The Water Resources Program (WRP) covers fiscal years (FY) 2010 through 2015 and is a strategic plan for DRBC program direction over the next six years. The architecture is based on the requirements of the Delaware River Basin Compact (Compact) and the goals of the Key Result Areas of the *Water Resources Plan for the Delaware River Basin* (Basin Plan 2004).

The Program is presented in two parts.

**Section I** describes conditions in the Basin, including hydrologic conditions, water use and sufficiency; overall assessment of water quality, landscape conditions and emerging issues that could affect long-range water resource planning in the Basin.

**Section II** notes the key issues that focus the Commission’s programs and summarizes by Key Result Area the initiatives the Commission plans to undertake over the next six years.

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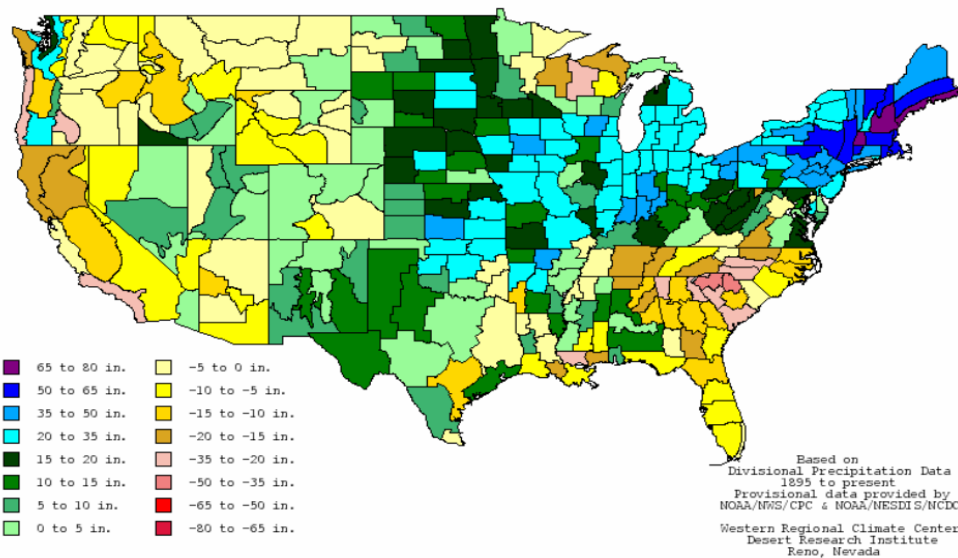
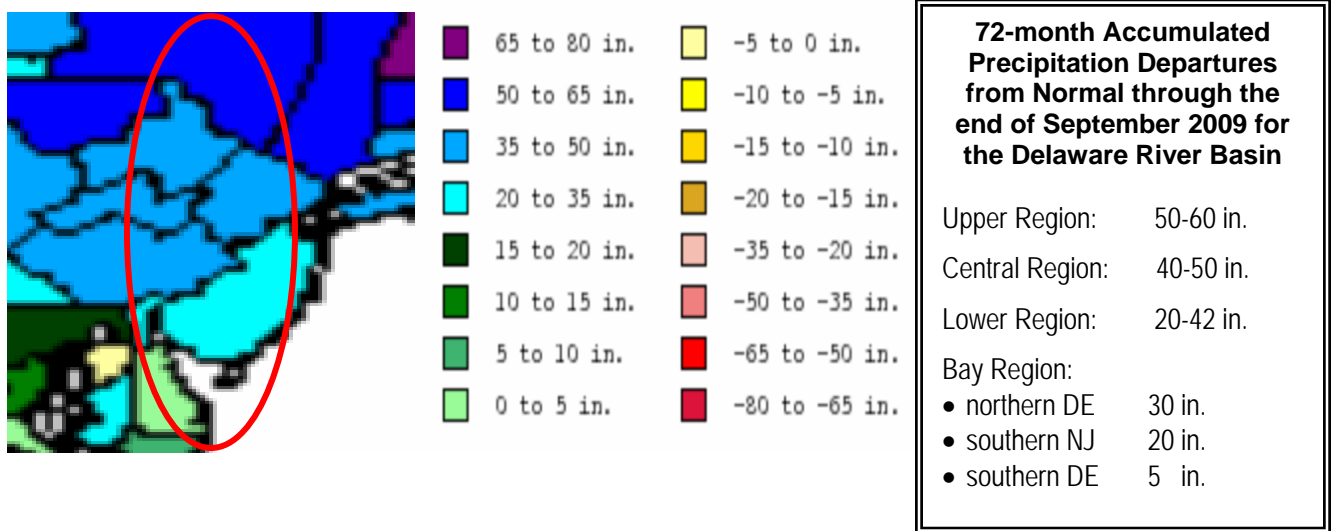
## I. GENERAL STATEMENT OF CONDITIONS IN THE BASIN

### A. HYDROLOGIC CONDITIONS 2009

Note: Annual reports on basin hydrologic conditions are available at: [www.nj.gov/drbc/hydro.htm](http://www.nj.gov/drbc/hydro.htm).

**Rainfall.** Compared to the rest of the continental US, the northeastern region experienced above-average precipitation with significant departures from normal reported for the 72-month period through September 2009 (see Figure 1). Conditions varied across the basin, ranging from roughly 5 inches above normal in the southern basin to 60 inches above normal in the north.

**Figure 1. 72-Month Accumulated Precipitation Departure Through September 2009**



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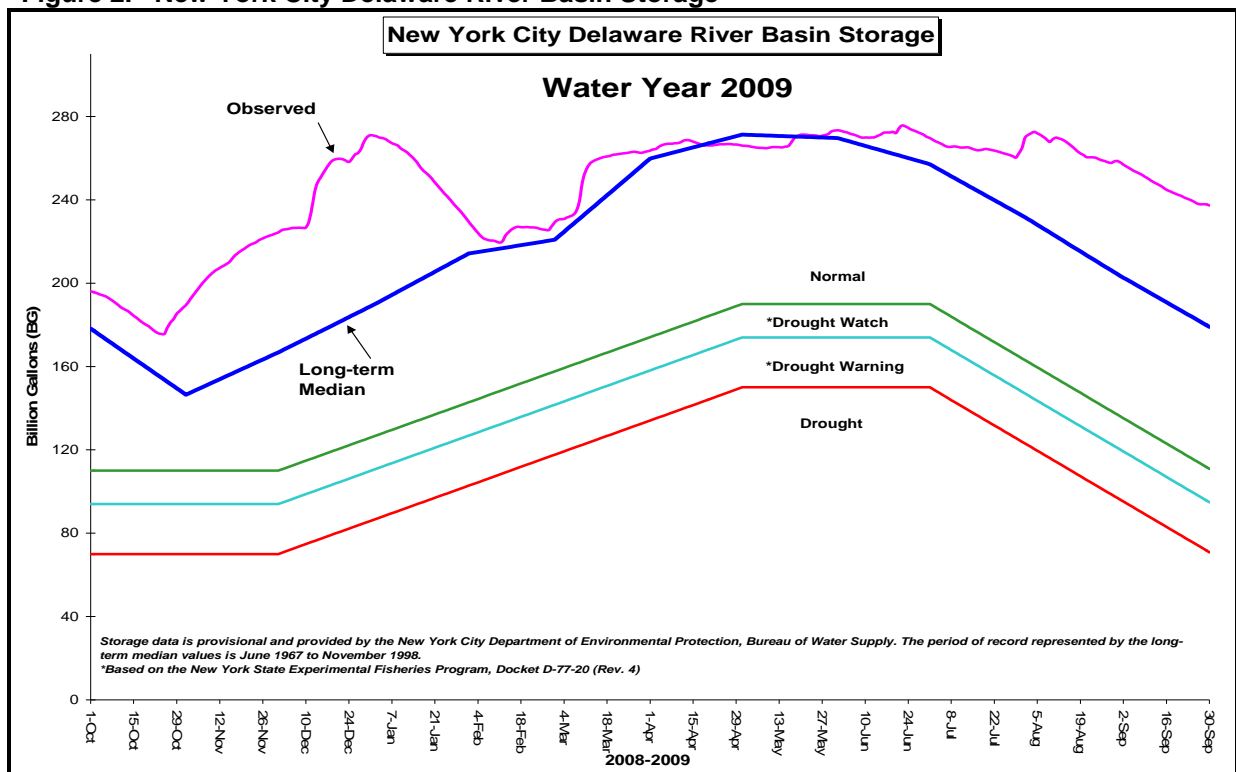
**Reservoir conditions and management.** During Water Year 2009 (October 1, 2008 through September 30, 2009), the three Upper Basin reservoirs were above long-term median storage for the majority of the year (see Figure 2). Storage dipped below the long-term median during a brief period from mid-April to mid-May 2009 but quickly rebounded to above-the-median after the Upper Basin experienced a wetter-than-normal May. Lower basin reservoirs generally maintained their normal pool levels throughout the year.

Streamflows remained normal to above-normal for much of this period and the Commission did not have to direct releases from Blue Marsh or Beltzville reservoirs to maintain the streamflow objective of 3,000 cubic feet per second (cfs) at Trenton, New Jersey.

Within the framework of the Flexible Flow Management Program (FFMP), releases from the Upper Basin (NYC) reservoirs were adapted early in water year 2009 for the Rondout West Branch Tunnel shutdown. A temporary release program was in effect as of October 1, 2008 to facilitate the release of excess water from Pepacton, Cannonsville, and Neversink Reservoirs while necessary underwater repair work was performed at a dewatering shaft of the Delaware Aqueduct. Excess releases from the three reservoirs were needed to maintain long-term median storage levels during the approximately 30-day period when NYC diversions from the Delaware reservoirs were suspended.

Also in accordance with the FFMP, a temporary supplemental release program was in effect as of September 1, 2009 to allow completion of underwater work on a dewatering shaft of the Rondout to West Branch Tunnel. Under this plan, supplemental releases to the FFMP would be made from Pepacton, Cannonsville, and Neversink reservoirs, the amount of which would be determined based upon each reservoir's water supply condition. Water supply conditions were determined using a combination of a) the National Weather Service's Advanced Hydrologic Prediction Service (AHPS) to simulate future hydro meteorological conditions and b) New York City Department of Environmental Protection's historical record of inflow to the reservoirs. The release program is scheduled to be in effect through May 31, 2010.

**Figure 2. New York City Delaware River Basin Storage**



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**Groundwater conditions.** Groundwater levels in the basin's southern region began below the seasonal average for water year (WY) 2009, but rebounded to levels slightly above average by September 2009. The average monthly groundwater level in eight reported USGS observation wells in the Pennsylvania portion of the basin remained below the long-term average throughout much of WY 2009 (Figure 3). Seasonal increases in late 2008 were thwarted by dry weather during the first three months of 2009 and groundwater levels declined during this time. A trend of above-average rainfall began in late spring 2009, prompting a steady recovery of groundwater. By the close of the water year, the average monthly groundwater level recovered to above average levels.

The Cumberland County NJ coastal plain well recorded levels below the normal range (25- to 75-percentile) throughout much of WY 2009 (Figure 4). Rainfall surpluses during late spring and summer 2009 caused groundwater levels to recover to within the normal range by August and above the long-term average by September. Monthly measurements of groundwater within the New Castle County DE coastal plain well recorded levels at or below the normal range (25- to 75-percentile) through May 2009 (Figure 5). A wetter-than-average summer recharged wells and the water year ended with groundwater levels above the long-term average.

Figure 3. Pennsylvania Groundwater

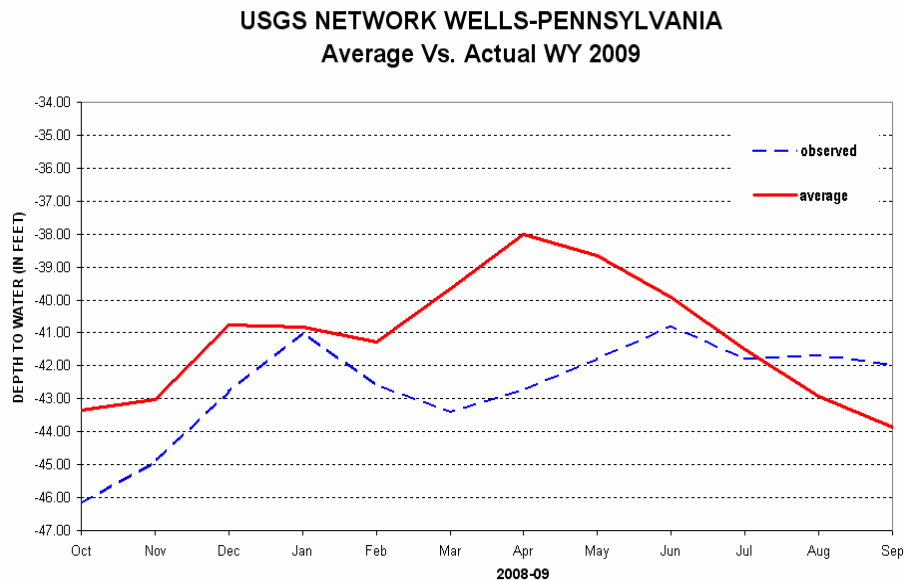


Figure 4. New Jersey Groundwater

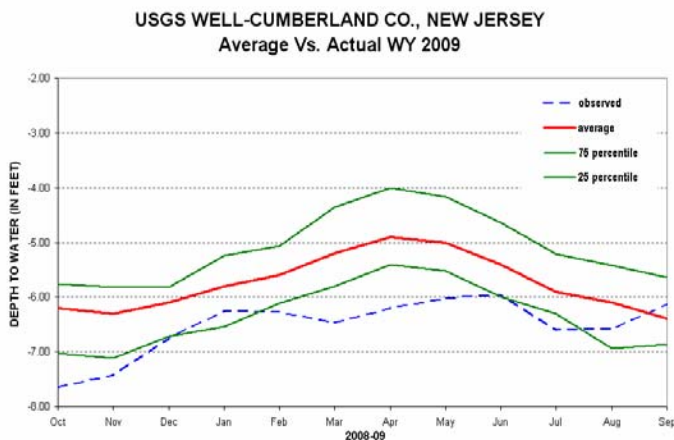
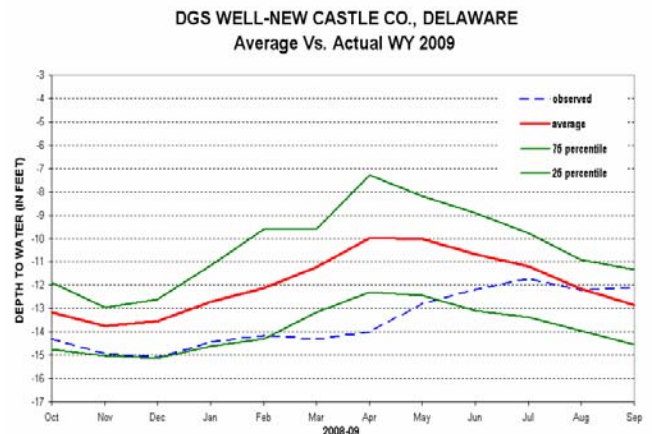


Figure 5. Delaware Groundwater

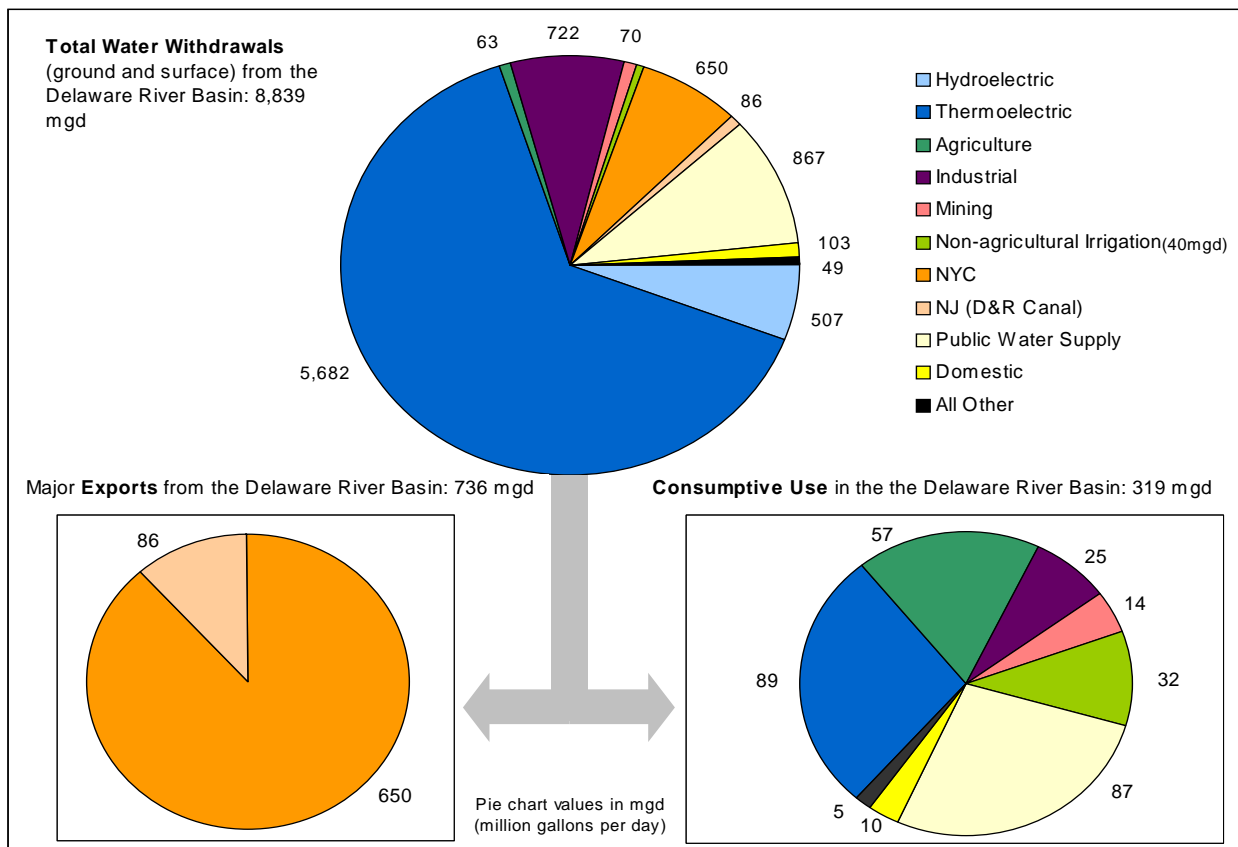


## B. WATER USE & SUFFICIENCY

**Water use.** Much work has been done in recent years to improve our understanding of water use and supply in the Basin and additional work is ongoing. Figure 6 shows the basin-wide picture of water withdrawals, exports and consumptive use as of 2003. Key water use facts:

- Approximately 15 million people rely on water from the Delaware River Basin for their daily water needs. Approximately 7.8 million people live in the Delaware River basin and the volume of exports to New York City and northeastern New Jersey provide the equivalent of supply to an additional 7 million people
- Over 90% of all water used in the Delaware River Basin is obtained from surface waters
- The dominant use sectors are power generation (thermoelectric), public water supply and industrial use. Collectively they account for approximately 90% of total withdrawals and total consumptive and depletive use in the Basin
- Demand for water for thermoelectric power generation has risen steadily in recent decades. However, a review of potential additional demand does not indicate significant growth in the near term. Increases in demand are more likely to occur 10 – 20 years from now, including new nuclear and fossil fuel facilities. New capacity is most certainly to be cooled using evaporative methods (e.g., cooling towers) thereby increasing consumptive water use
- Additional demand of water for use in energy exploration, e.g., natural gas drilling, is increasing, although the full effect of this demand sector has yet to be identified

**Figure 6. Withdrawals, Consumptive Use and Major Exports from the Delaware River Basin as of 2003**





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To improve our understanding of water use and supply, it is essential to collect current and comprehensive water use records that will enable the proper assessment, planning and management of water resources. In some cases, for example the agricultural sector, surrogate information and assumptions have been used to generate demand data for current reporting efforts. Better reporting and capture of data would enable a more accurate assessment and improvements in accounting for water used in allocation and water resource management decisions.

**Supply sufficiency.** Based on current and anticipated ground and surface water withdrawals there is, in general, an adequate supply of water to meet both demand in the Basin and permitted exports from the Basin. However, recent studies indicate the potential for supply sufficiency issues with regard to aquatic ecosystems in certain locations in the basin. (See instream flow discussion below.) Progress of state water supply planning efforts is reviewed in Section B.1.1.

**Instream flows.** Water supply planning in the basin generally has not taken into account the instream flow needs of aquatic communities. *Recent reviews of several DRBC water supply dockets indicate that flows in some surface waters could be substantially impacted should withdrawals increase to current allocation limits.* While scientific investigation continues across the basin to determine the flow needs of aquatic communities, changes to current allocations or the application of permit conditions may be warranted to maintain adequate flows in the tributaries and the River. New Jersey is including instream flows in supply planning and taking action to limit or refuse additional withdrawals from areas of the Kirkwood Cohansey aquifer system due to stream flow concerns (see below).

**Conditions in special management areas.** Two areas of the Basin are included in special management programs to mitigate historical supply deficits and prevent future stress. The Commission manages the Southeast Pennsylvania Ground Water Protected Area (GWPA) and Section II that follows reflects the Commission's effort to investigate conditions in the GWPA over the past year. NJDEP and USGS regularly monitor ground water levels in the affected aquifers of Critical Area 2 (CA2) in southern New Jersey and assessments indicate that while ground water levels have improved in general and appear to have stabilized, USGS synoptic data shows that some areas, just beyond CA2 boundaries, are showing declines.

**Potential areas of concern.** NJDEP reports that significant demands for additional Potomac Raritan Magothy (PRM) aquifer water have materialized south of CA2, and based upon anticipated demands the impacts of all proposed diversions could result in decreases in ground water levels and salt water intrusion—conditions that could warrant a Critical Area designation. Only limited allocations have been granted and further demands for potable water are being directed to the CA2 regional alternative while nonpotable demands should be met from reuse opportunities or sources other than the PRM<sup>1</sup>.

A second area of concern in New Jersey is the Maurice River basin. According to NJDEP, USGS Scientific Investigations Report (SIR) 2005-5105 indicates that low flows in the Maurice River show a downward trend. Due to concerns about increasing demands for water from the Kirkwood-Cohansey aquifer and declining low flows in the Maurice River, the NJDEP commissioned a USGS study. USGS SIR 2005-5258 indicated that if existing allocations from the Kirkwood-Cohansey aquifer were fully utilized, base flow in the Maurice River at Norma, N.J. would see significant reductions. New Jersey has been denying applications for additional allocation from the Kirkwood-Cohansey aquifer upstream of Union Lake as the safe yield of the aquifer would be exceeded, and additional diversions would cause adverse impacts to stream flow<sup>2</sup>.

Recent basin-wide analyses by the Commission and the Army Corps of Engineers (USACE) also indicate that several watersheds in the Basin might experience sufficiency problems during the planning horizon. These analyses are currently the subject of focused review by the Water Management Advisory Committee. Table 1 lists eight watersheds identified as having potential long-term sufficiency issues and

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<sup>1</sup> Communication from J. Gheen, NJDEP; Oct.23, 2008.

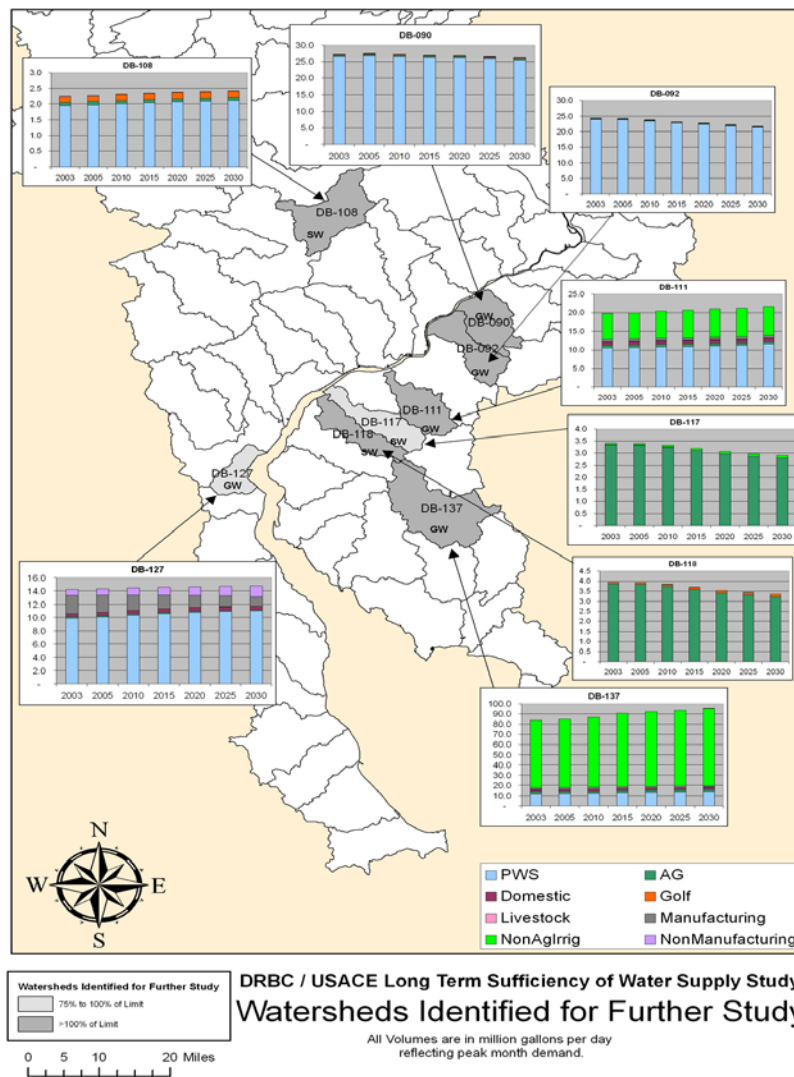
<sup>2</sup> Ibid.

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worthy of more detailed analysis. Figure 7 shows the location of these watersheds. Note that a watershed in the basin of the Maurice River has been identified as having a potential ground water issue related to non-agricultural irrigation and public supply. The USACE/DRBC study did not assess stream flows, but given the strong relationship between ground water and stream flows in the outer coastal plain<sup>3</sup>, the results of the USGS analyses (SIRs 2005-5105 and -5258) are not in conflict with the USACE/DRBC analysis.

The 2007 report of a multi-year investigation by the USACE concluded that ground water withdrawals in northern New Castle County, Delaware, are reducing local stream base flows and forming cones of depression. Pumping in Delaware is increasing ground water flow from Maryland and decreasing flow into New Jersey by about 10% each, and regional pumping has created overlapping cones of depression across the study area of the three states. This issue is currently being addressed by Delaware's Water Supply Coordinating Council (WSCC).

**Figure 7. Location of Watersheds Identified for Further Study**



<sup>3</sup> Ground water discharge can account for 89% of stream flow in New Jersey's Pinelands streams. See Rhodehamel, E.C. 1979. Geology of the Pine Barrens of New Jersey. In: *Pinelands: Ecosystems and Landscape*, R.T.T. Forman (Editor). Academic Press, NY, NY (pp147-167).

**Table 1. Watersheds Identified by DRBC and USACE as Having Potential Long-term Sufficiency Issues and Worthy of More Detailed Analysis.**

Watersheds Identified for Further Study	State	Potential Issue
DB 108 Perkiomen Creek below east branch	PA	SW – Public/Non-Ag irrigation
DB 090 Pennsauken/Pompeston Creek	NJ	GW - Public
DB 092 Cooper River	NJ	GW - Public
DB 111 Mantua Creek	NJ	GW - Public/Non-Ag irrigation
DB 117 Raccoon/ Birch Creek	NJ	SW – Agriculture (based on Ag census)
DB 118 Oldmans Creek	NJ	SW – Agriculture (based on Ag census)
DB 127 Army Creek/ Red Lion Creek/ Dragon Run	DE	GW - Public/Non-Manufacturing
DB 137 Maurice River above Sherman Ave bridge	NJ	GW - Non-Ag irrigation/Public

### C. WATER QUALITY

Water quality in the Delaware River Basin varies, with higher quality conditions generally in headwaters and non-tidal areas than in areas below the head of the tide.

High water quality is recognized in the 197-mile non-tidal Delaware River, from Hancock, NY to Trenton, NJ that have been designated by the Commission as Special Protection Waters (SPW), as well as in many tributaries incorporated into anti-degradation programs of the States of Delaware, New Jersey, New York and Pennsylvania. Traditional water quality criteria-based programs are focused in the tidal river and Delaware Bay (Zones 2 through 6).

**State of the Basin Report 2008.** The *State of the Delaware River Basin Report 2008* included an assessment of conditions and trends for 37 indicators in four categories, including 10 water quality indicators. Indicator ratings of *Good* (3), *Fair* (5) and *Poor* (2) resulted in an overall rating of *Fair* for water quality in basin waters. While measurements of most standard parameters are meeting criteria, toxics remain a problem. Accurate condition assessment of some basic parameters, such as dissolved oxygen, pH, and temperature, is hindered in the non-tidal portion of the Basin by a limited number of continuous monitors. Assessment of others, notably nutrients, is hindered by a lack of standards for comparison. Subcommittees of the DRBC Water Quality Advisory Committee (WQAC) have been assembled to address criteria for nutrients and biological communities. The WQAC is also addressing upgraded criteria for dissolved oxygen in the tidal waters.

**Integrated Assessment 2008.** The Integrated Assessment performed by DRBC is limited to the mainstem Delaware River and the tidal portion of its tributaries. Designated uses for the River include: Aquatic life, Drinking water, Recreation, Fish Consumption and Shellfishing, although not all uses are designated in all ten water quality zones. Assessments completed in 2008 to determine support of the designated uses of the Delaware River are reported in the *2008 Delaware River and Bay Integrated List - Water Quality Assessment*. Unfortunately, water quality does not currently support all designated uses in many of the river segments.

Figure 8 displays the DRBC WQM zones and final assessments. The non-tidal assessment units (au) include DRBC Water Quality Management (WQM) Zones 1A, 1B, 1C, 1D, and 1E. The designated uses assessed in Zones 1A through 1E include aquatic life, drinking water, primary recreation, and fish consumption. WQM Zones 2, 3, 4, and 5 make up the tidal estuary portion of the Delaware River. Fish consumption, aquatic life, and primary recreation apply to all the estuary zones. Drinking water use is only applicable to Zones 2 and 3. The Delaware Bay is designated as Zone 6. The assessed designated uses for the Bay include aquatic life, primary recreation, fish consumption, and shellfish consumption.

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The final assessments for 2008 by zone and designated use are shown in Table 2; the 2006 final assessment is included for comparison. The full report is available in .pdf format on the DRBC web site publications page. The following is a summary of the Integrated Assessment:

- Aquatic life is supported in Zones 3 and 6. Exceedances of pH (non-tidal zones) and temperature criteria (tidal zones) dominate the issues. Additionally, in Zone 5 approximately 17% of the samples assessed for DO did not meet the 24-hour average criteria
- Drinking water use is supported in all designated zones
- Primary contact recreation is supported in all applicable zones, except Zone 4 below RM 81.8 where there is insufficient data
- Fish consumption is not supported in any zone. In most instances, the contaminants are PCBs and mercury. New York did not issue any fish advisories for the Delaware River. However, fish advisories due to mercury are listed for the reservoirs feeding the Delaware River. Pennsylvania has issued advisories for mercury for all of Zone 1. Recently compiled dioxin/furan data from fish tissue collected in 2004 and 2005 also support fish advisories in the tidal river (Greene, 2008). PCBs remain the primary cancer risk driver, followed by dioxin and dioxin-like chemicals. Mercury levels in striped bass are moderately elevated and contribute to non-cancer health risks
- Support of shell fishing varies within Zone 6

**Table 2. 2008 Integrated Listing Category for DRBC WQM zones**

Zone	Aquatic Life	Drinking Water	Recreation	Fish Consumption	Shell Fishing	Final 2008 Assessment Category	Final 2006 Assessment Category
1A	NS	S	S	NS	NA	5	5
1B	ID	S	S	NS	NA	5	5
1C	ID	S	S	NS	NA	5	5
1D	ID	S	S	NS	NA	5	5
1E	NS	S	S	NS	NA	5	5
2	NS	S	S	NS	NA	5	5
3	S	S	S	NS	NA	4A	5
4	NS	NA	ID (below RM 81.8)/S	NS	NA	5	5
5	NS	NA	S	NS	NA	4A	5
6	S	NA	S	NS	S/SS/NS/ID	4A	5

S: The assessment unit supports the designated use.

SS: The assessment unit supports the designated use, but with special conditions.

NS: The assessment does not support the designated use.

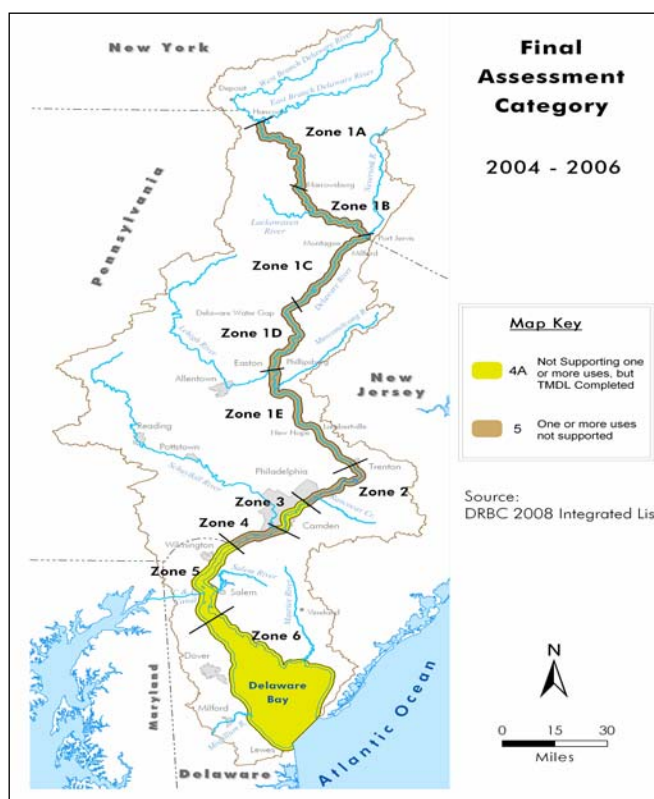
NA: DRBC WQR does not contain applicable criteria for a parameter in the AU.

ID: Insufficient or unreliable data is present.

4A: A TMDL to address a specific segment/pollutant combination has been approved or established.

5: Available data and/or information indicate that at least one designated use is not being supported or is threatened, and a TMDL is needed.

Figure 8. Final Assessment Category for Delaware River and Bay



**Additional issues of concern.** Anthropogenic increases in nutrient supply to streams and rivers have become a national focus since the late 1990s. With elevated nutrient levels in sections of both the non-tidal and tidal Delaware River, the DRBC and its advisory committees have begun an evaluation of the status and implications of the current nutrient loadings and concentrations within the system. Over the next several years, appropriate endpoints for nutrient levels are expected from this nutrient criteria process.

#### D. LANDSCAPES

Landscape conditions affect water resources. A landscape change analysis conducted for the *State of the Delaware River Basin Report 2008* based on NOAA satellite imagery shows the following land use/land cover for the basin as of 2001:

Table 3. Land Use/Land Cover 2001

Land Use/Cover	% of Basin	Change 1996-2001 in mile <sup>2</sup>	Change 1996-2001 in acres
Developed	14.5 %	+ 70.75	+ 45,283
Agriculture	26.0 %	- 18.41	- 11,781
Forest	54.8 %	- 48.29	- 30,909
Wetlands & Water	4.4 %	-3.48	- 2,230
Barren/Other	0.4 %	- 1.21	- 772
Source: NOAA Center for Coastal Services			

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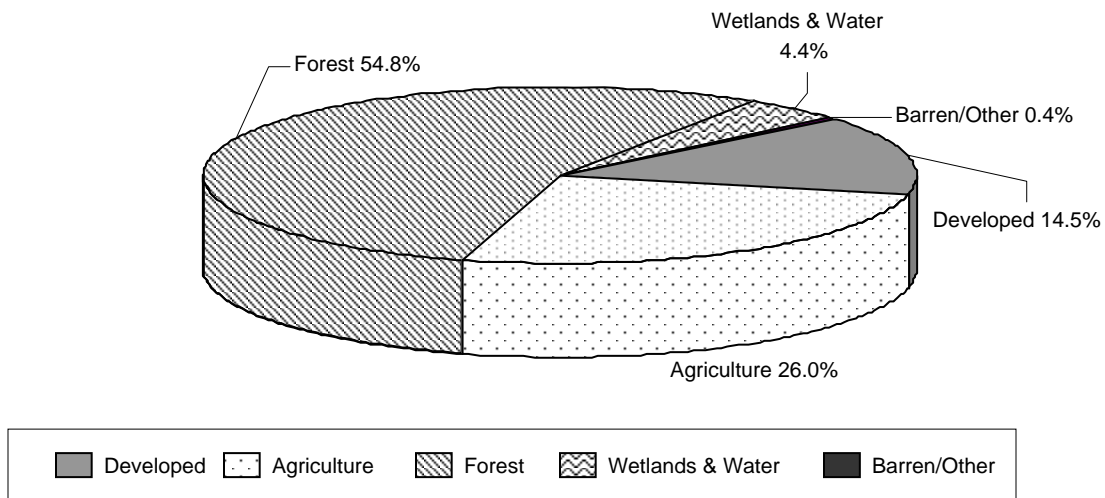
It is well documented that development and agricultural land uses can stress water quality and cause hydrologic disruption. Wetlands and forested areas provide essential services to stabilize stream flow, reduce pollutant loadings, and protect aquatic resources. The change analysis shows that:

- Wetlands loss continues, although at a rate greatly reduced from historic rates.
- Between 1996 and 2001 forests were being lost at a rate of one football field every 2 hours, apparently reversing a general trend of gains in forested area seen in previous decades.

Loss of forests and wetlands can have a deleterious effect on water resources. Goal 3.2 of the Basin Plan calls for maintenance and restoration of the integrity and function of high value water resource landscapes, such as forests and wetlands. Knowledge of the environmental service value of these landscapes – and which particular landscapes are of high value to the basin system - could support measures by state and local agencies with land use authority to curtail additional loss and water resource impairment.

The most recent threat to landscapes of the Delaware River Basin is development of natural gas well drilling in the upper basin. These activities, which are being planned and implemented in the drainage area to the Commission's Special Protection Waters, could adversely impact landscape conditions as well as water supply and water quality throughout the basin. See Sub-Section E below and the Water Resources Management Program (Section II) for activities related to water resources protection from natural gas drilling activity.

**Figure 9. Delaware River Basin Land Cover and Use 2001**



## E. EMERGING ISSUES

### ENERGY AND WATER RESOURCES

**Natural gas extraction in the Upper Basin.** Explorative and extractive drilling for natural gas in the Marcellus and other shale formations in New York and Pennsylvania are activities that could adversely affect or stress water resources. DRBC is reviewing extraction projects for potential impacts to Special Protection Waters. While natural gas is very important to national security and the economy, extraction must be conducted in a way to minimize impacts to water resources. Continued investigation of management options and coordination with the EPA and environmental offices of Pennsylvania and New York are priorities. Several permit applications have been submitted and action is expected during FY 2010-11.

**Energy requirements for water and wastewater treatment.** There will need to be more analysis of the water needs for energy projects and energy needs for water treatment as well as an evaluation of the carbon and water footprints.

**Other energy needs.** Energy generation and transmission also introduce potential stress to water resources in the basin. Among the projects that are under observation by DRBC are:

- Gas and power transmission lines proposed to cross the Delaware River Scenic and Recreational corridor
- An additional nuclear facility in the estuary that will require a substantial volume of water for evaporative cooling

**Changing climate.** There is potential for significant changes to water resources in the Basin due to changes in climate. At this point, however, uncertainty is high, and we cannot accurately predict the extent of prospective changes. While the science continues to evolve, several climate models predict that basin temperatures will increase, precipitation will stay the same or increase, and sea level will rise between 0.5m and 1m by 2100. Precipitation is predicted to occur in the form of fewer, more intense storms occurring in the winter months. This means a potential increase in flood events coupled with extended drought cycles. Increased temperatures will affect evapotranspiration rates and stream water quality. Turbidity levels will likely increase and dissolved oxygen levels decrease. Sea level rise may require increased river flows to repel salinity and/or costly modifications by water suppliers. Changes in seasonal flows, e.g., the timing of spring snow melt, could negatively affect migratory as well as resident species and increase opportunities for invasive species.

To improve our understanding of the impacts of climate change and develop an adaptive water management plan, we need:

- 1) the results of downscaled climate models
- 2) development of new extreme endpoints and uncertainty factors
- 3) assessment of needs through probability and sensitivity analysis of a variety of potential scenarios
- 4) information related to vulnerable biological communities in the Basin
- 5) models of flows and storage capacity for drought mitigation and salinity repulsion, and of additional void capacities to mitigate a potential increase in flooding
- 6) to assess potential climate change effects in light of other factors affecting the future of water resources in the Basin – land use changes, water demand, conservation, etc.
- 7) identification of reasonable alternative management scenarios

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When considering management options, we need to assess how much progress can realistically be made through behavioral change, e.g., conservation and demand reduction, alteration of development patterns, and protection of headwaters, stream corridors, and other critical landscapes. In a larger context we also need to address the causes of climate change and develop adaptive actions to the anticipated impacts.

**New contaminants of concern.** DRBC has been participating with other agencies to increase knowledge about the fate, transport and effects of several classes of unregulated chemicals that pose a potential threat to the health of humans and aquatic life. Pharmaceuticals, personal care products and perfluorinated compounds (PFCs) are among those being investigated. More information can be found in the water quality section of this Program.

**Instream flow needs, water allocation and water quality.** Maintenance of stream flows, especially stream base flows, is a critical juncture of water supply, water quality and aquatic ecosystem management. Traditionally, the three management spheres have not been integrated. In order to optimize outcomes, the flow requirements for aquatic ecosystems, for human withdrawals and for wastewater dilution need to be evaluated in an integrated manner to inform policy alternatives and identify areas ripe for regulatory reform.

**Integrated water resource management.** The wisdom of integrating the many aspects of water resource management becomes more evident as the impacts of past management practices emerge. One example from past wastewater management is the construction of large, cost efficient treatment plants far down in the watersheds without attention to water supply sources. The desired outcome of cleaner surface waters was achieved, but in some places it came at the cost of mining coastal aquifer systems or dewatering headwater streams. Another would be allocation of flows for human use without retaining adequate stream flows for aquatic ecosystems. There must be a stronger focus on placed-based management in order to integrate water supply, wastewater, instream flow needs and stormwater to protect and maintain hydrologic conditions in watersheds.

Improvements in our knowledge base should continue to inform changes in policy and the increased cross-discipline integration of water resource management. Existing territorial, economic, political and bureaucratic limitations that hinder the necessary integration must be addressed for substantial progress to be made. Continued interagency dialogue, collaborative partnerships and open public discourse on key issues are all a necessary part of this process.

**Development of a national water policy and strategy.** There is a growing national interest in interstate river basin management. DRBC can be a model for the nation.



**II. WATER RESOURCE MANAGEMENT PROGRAM:**  
**Summary of the activities and programs for FY 2010- 2015**

**A. KEY ISSUES**

In the evaluation of work priorities over the next six years there are several key issues and a series of strategic questions to be addressed. The Water Resources Program will be used to shape a more detailed annual work plan that will include the allocation of resources and priorities for funding opportunities to support forward momentum on these key issues.

1. Commission Priorities

a. Rulemaking Priorities

- Exploratory Wells – revise Executive Director Determination (EDD) to eliminate prior exclusion of exploratory wells
- Natural Gas Rule – basin-wide regulations, including water withdrawals, well pad sites and wastewater discharges for all natural gas wells in all formations
- Flexible Flow Management Plan (FFMP) – include in Water Code
- Water Quality Rules – revise rules for pH, Toxics (Zones 2-6), Stacked Waters and PCBs
- Floodplain Regulations – develop regulations considering FAC Recommendations
- Ecological Flows – develop approach in consultation with advisory committees

b. Planning, Assessment and Operations Priorities

- FFMP – analyses and reports to support flow management decisions
- Flood Mitigation – implementation of recommendations of Interstate Flood Mitigation Task Force
- Water Quality Monitoring – efforts to support anti-degradation and criteria-based programs
- Models and other Assessment Tools – to inform planning and management decisions for natural gas well drilling, ecological flows, etc.

c. Coordination

- On-going communication among Commissioners and through Advisory Committee Meetings
- Conduct one remote Commission Meeting per year

2. Key Technical Questions

a. Sustainable Supply

- Is additional storage needed in specific areas of the Basin to address future energy needs and provide adequate water supply from surface and ground water sources during low flow periods?
- How can we account for the uncertainty regarding impacts of climate change on supply availability and demand as that area of science evolves?
- Are allocation changes needed to maintain adequate instream flows during low flow conditions?

b. Suitable Quality

- What are the greatest threats to Special Protection Waters in the non-tidal Delaware and what programs are needed to address them?

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- Which impairments in shared waters pose the greatest risk to humans and the environment and how can they be managed?
  - Are the current water quality standards adequate? Should uniform criteria be developed?
  - What is the best way to manage the potential impacts of emerging contaminants?
- c. Flow Management
- What instream flow regimes are needed to support habitat needs and endangered species populations?
  - What seasonal flows are needed to support estuarine biological communities (e.g., oysters), maintain the salinity standard for drinking water intakes, and provide the minimum flow for wastewater assimilation?
  - What are the impacts of flow management policies on water supply, flooding, aquatic life, and recreation and how do we resolve conflicts?
  - How can we account for the uncertainty of climatic changes on flow regimes and their management?
- d. Flood Mitigation
- How can basin-wide flood mitigation best be accomplished? Is additional flood storage needed or can the existing mechanisms function with the addition of county and municipal hazard mitigation plans and their implementation?
  - Are stricter floodplain regulations needed?
- e. Integrated Resource Management & Collaborative Watershed Planning
- What conditions are most favorable for watershed integrity (e.g., forest cover, riparian corridor, high value landscapes, etc.) and how do we maintain or achieve these?
  - What watershed management policies can be put in place to protect human water needs and instream flow regimes on regulated and unregulated streams?
  - What are the best mechanisms for partnership with municipalities, counties and state entities to develop effective watershed programs?
- f. Intergovernmental Coordination
- How can the structure of cooperative agreements be improved to ensure the wise use of intergovernmental resources
  - What additional measures should be taken to reinforce DRBCs role in water resource management?

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### B. WATER RESOURCE MANAGEMENT PROGRAM

#### Section 1.0 ENSURING THE SUSTAINABLE SUPPLY OF SUITABLE QUALITY WATER

- 1.1 Water Supply: Availability & Demand Forecasting.
- 1.2 Multi-objective Flow Management
- 1.3 Determining Water Quality & Meeting Standards: Criteria-Based Programs, Anti-Degradation, Water Quality Administration
- 1.4 Prospective Changes to DRBC Program Rules and Regulations

#### 1.1 WATER SUPPLY: AVAILABILITY & DEMAND FORECASTING

**Water Supply Planning.** The DRBC and the Army Corps of Engineers have completed an assessment of water demand and supply Basin-wide. Estimates of current demand and projections of future water demand to the 2030 time horizon have been developed and compared to estimations of water availability. The study has identified several watersheds and locations on some of the Basin's larger rivers where demand is placing pressure on available supplies; many of these demands are anticipated to increase over the forecast period. DRBC will review and evaluate supply alternatives to meet existing or potential deficits and develop a strategy for implementation, which may include changes to the DRBC Comprehensive Plan. DRBC recently initiated an investigation of the effectiveness of the Southeastern Pennsylvania Ground Water Protected Area (SEPA GWPA) program. This builds upon a recent evaluation of 2003 calendar year water demands compared to the withdrawal limit for each of the GWPA's 76 sub-basins, which showed that, although the area as a whole has seen a reduction in water demand, some sub-basins are operating close to or above their potentially stressed limit. One of the purposes of the current study is to update the analysis with 2008 water demands and to assess the status of each sub-basin under a full-allocation scenario. The study utilizes the Commission's new integrated database which will assist in identifying data gaps, integrate project review and water use data and produce summary results for use in a GIS analysis. Water supply dockets will continue to be processed as applications are made. Applications for water supply are expected to increase over the next several years due to a surge of interest in natural gas well drilling in the upper basin. Assessment of cumulative impacts from natural gas drilling activities, including consumptive water use, will be undertaken by DRBC as funds become available.

**State Planning Efforts.** Water supply planning is ongoing in Delaware, New Jersey and Pennsylvania in addition to DRBC's own efforts. DRBC has worked closely with the states through the DRBC Water Management Advisory Committee and by serving on committees organized by the states.

Delaware took a regional approach to water supply planning, through its Water Supply Coordinating Council (WSCC), which initially focused on expanding water supplies in northern New Castle County. Ten projects were identified for development to help ensure demand would be met through 2020. This includes the 317 million gallon Newark Reservoir, the first in Delaware for over 70 years, which came online in 2006. Currently, eight projects have been completed with the remaining two underway. Once all projects are online, an additional 2 billion gallons of storage will be available for northern New Castle County. It is anticipated that this additional supply will resolve the potential sufficiency issue identified in Watershed DB-127 in Table 1. In 2003, legislation directed the WSCC to expand water supply planning to three other key areas of the state, southern New Castle County, central Kent County and coastal Sussex County. Planning work in these areas is currently underway and on schedule for completion by the end of 2009. As a result of recent legislation, the Delaware Geologic Survey is now developing updated water supply plans for the entire state. Results of a multi-year study of ground water availability conducted by the Army Corps of Engineers indicate that groundwater withdrawals in Delaware affect the aquifer systems in Maryland and New Jersey. The Delaware Geological Survey (DGS) is currently investigating the need for additional monitoring to address a lack of water resources data in a number of areas in the state. DRBC will continue to work with the WSCC and NJDEP/NJGS to recommend measures to monitor aquifer conditions and manage withdrawals as appropriate.

New Jersey is planning to release its latest Statewide Water Supply Plan in early 2010, which will incorporate recently available water use data for the period 2000-2007. New Jersey's assessment will

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include a comparison of consumptive and depletive water demands versus water availability using the low flow margin method (a measure based on September median flow minus 7Q10). The plan will also include an assessment of water demand versus infrastructure capacity. Two scenarios of future water demand have been developed, one is a projection to the year 2020 and the other is a 'full allocation' scenario, where water demand is modeled based on water allocation permit limits.

Act 220 legislation in Pennsylvania led to the creation of a new State Water Plan that was released in March 2009. At the heart of the plan is a GIS-based water budget assessment which evaluates the water balance at over 10,000 "pour points" across the state. Net water withdrawals (water withdrawn minus discharges) are compared to an availability threshold of 50% (30% in carbonate areas) of the 7Q10 value. A number of watersheds were identified statewide (six in the Delaware River Basin portion of the state) for closer scrutiny in the "final verification" phase. These watersheds were studied by DRBC for consideration as Critical Water Planning Areas (CWPA). As a result of this work, three watersheds (Brodhead Creek, Little Lehigh Creek and Neshaminy Creek) were selected by the Delaware Regional Committee for public review and consideration for CWPA designation by the Statewide Committee. Watersheds receiving such designation will require a Critical Area Resource Plan (CARP) to be developed, which will identify the exact nature of the supply-demand imbalance and will identify potential mitigation strategies. The first CWPA designations are likely to be made in the spring of 2010.

**Conservation and Water Efficiency.** In addition to implementing its ongoing water conservation program, the DRBC and its Water Management Advisory Committee (WMAC) developed an approach to deliver staged improvements in accounting for water loss in distribution system based on the methodology proposed by the American Water Works Association (AWWA). DRBC published changes to the water code through the rulemaking process and the new rule was adopted by the DRBC Commissioners in March 2009. According to the new rule, full implementation of changes to water loss accounting will be accomplished by 2013, with attention given to the role of the states and DRBC in receiving and assessing information from water suppliers. The Pennsylvania Public Utility Commission (PUC) has developed its own pilot program to implement the AWWA water loss accounting methodology; the Commission is working in partnership with the PUC on that pilot program and will be holding its own workshops in 2010 to promote the new methodology. Additional areas of study in coming years include compiling information on innovative water pricing structures which provide an incentive for water conservation yet provide stable revenues for water purveyors, and water reuse to provide additional tools for improving water use efficiency. See Supplemental Table A for a schedule of prospective changes to DRBC programs and regulations.

### DRBC WATER RESOURCES PROGRAM WATER AVAILABILITY & DEMAND FORECASTING

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Water Supply Planning	Review and evaluation of supply alternatives and development of strategy, including CP update	2009-2012	General Fund
Southeastern PA Ground Water Protected Area	Evaluation of water use in sub-basins of SEPA GWPA against allocation and supply limits	2009-2011	PA SEPA GWPA
Act 220	Support for PA state water plan, including data management and evaluation of potential CWPAs	2009-2011	PA Act 220
Act 220	Preparation of CARPs for CWPAs	2010-2012	PA Act 220 and/or PA CZM Program
Support of State Programs	Coordination and support of basin state water supply programs	2010-2015	General Fund
Water Conservation	Phase-in AWWA Water Accountability methodology	2010-2015	General Fund

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Natural Gas Development	Develop basin-wide regulations for all natural gas wells in all formations	2011 -12	General Fund
	Perform Cumulative Impact Analysis on water supply	2011 -12	Funding permitting
Water Supply Dockets	Review and processing of water supply dockets, including applications for water to be used for natural gas drilling activities.	2010-2015	Project Review Fees

### 1.2 MULTI-OBJECTIVE FLOW MANAGEMENT

The main stem of the Delaware River is the longest un-dammed river east of the Mississippi. However, there are dams on several large tributaries that store water in reservoirs and regulate flow to the river through conservation releases, and also provide flood control, water supply, and instream flow augmentation. Activities that affect instream flows include: releases, diversions and outflows from water supply and multipurpose reservoirs on tributaries, interbasin water transfers from tributaries and the river, and water withdrawals from interconnected ground water sources. Low flows may impact ecosystems and reduce the assimilative capacity of the river for wastewater discharges. High flows may cause loss of life and property as well as move sediment and alter the river morphology, riparian corridor and habitat for aquatic populations.

**Reservoir Operations.** In September 2007, the Decree Parties agreed to a Flexible Flow Management Program (FFMP), providing a framework to manage releases from New York City's Delaware Basin reservoirs. The intent of the FFMP is to use the Cannonsville, Pepacton, and Neversink reservoirs for multiple, competing uses, including water supply, drought mitigation, spill mitigation, protection of the tailwater fishery, habitat needs in the basin, and recreation. The FFMP provides for an adaptive management process to allow more flexible and timely adjustments of releases based upon real-time basin hydrologic conditions and new information from sources including, among others, annual reviews of FFMP implementation and modeling simulations. In 2008, the FFMP was adapted five times, twice to increase the controlled releases from New York City's Pepacton, Cannonsville, and Neversink Reservoirs while corrective maintenance and inspections were performed on portions of the Delaware Aqueduct, in February to March, 2008 and from October 1, 2008 to May 1, 2009. Extra releases were also negotiated in April 2008 to reduce or minimize spills in response to a predicted wet spring. Additional emergency releases for thermal mitigation were made on June 9-11, 2008 and a small bank was negotiated for use between July 1 and September 15, 2008. Details about changes to the FFMP can be found on the River Master's website at <http://water.usgs.gov/osw/odrm/>. In 2009, a temporary program was negotiated to increase the releases from Cannonsville Reservoir during the summer to reduce the need for a bank or emergency releases for thermal protection. Due to the likelihood of additional maintenance on the Delaware Aqueduct in the fall of 2009, a supplementary release program was developed to release up to 50 billion gallons of water that would otherwise have been diverted from the reservoirs for water supply.

The discharge mitigation component of the new Flexible Flow Management Program (FFMP) is intended to reduce the likelihood of spills from the three New York City reservoirs by considering the potential runoff contribution from the snow pack during the spring thaw. Specific void targets are not part of the program, since the intended purpose of the reservoirs is water supply. A Flood Analysis Model is being developed which will be used to assess impacts of reservoir operation on downstream flooding during the September 2004, April 2005, and June 2006 floods. The model for the basin above Trenton will likely be completed in the fall of 2009 and will be used to determine the extent to which changes to the storage levels in 13 major reservoirs (NYC and lower basin) can be used to mitigate flooding on the main stem. The OASIS model will also be used to analyze the impacts of changed storage levels on water supply and ecology. Any changes to the operation of NYC River Basin reservoirs will need unanimous consent of the decree parties.

**Ecological Flows.** The issues related to ecological flows in both the Delaware River and its tributaries remain a concern in the basin. Emphasis is being placed on improving the understanding of the natural

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flow regime of the river-to-bay and the ability of modeling tools to evaluate these issues. The Subcommittee of Ecological Flows (SEF) of the Regulated Flow Advisory Committee (RFAC) is a critical forum for providing the scientific foundation and the coordinated assessments to make progress with upper basin cold water fisheries. In addition, DRBC staff began an evaluation of both short-term and long-term options for updating the existing in-stream flow requirements of the Commission, with existing basin-state methodologies serving as potential option for short-term revision. The States have also pursued eco-regional analysis of cold and warm water tributary conditions and instream assemblages. USACE, USGS, USF&WS, and NPS are supporting work on the endangered Dwarf Wedgemussel (DWM), which is due to be completed in 2009. To the extent that study results identify the relative importance of flow regimes to the DWM health, such data may be useful for future instream habitat assessments by DRBC and the Decree Parties. Changes to the NYC Delaware Basin Reservoirs operations for ecological considerations are contained in the Reservoir Operation discussion above.

Freshwater inflow requirements for estuary populations, such as oysters, are a part of ongoing research by DRBC partners. For both instream and estuary flow needs, the seasonal components affecting both flow and temperature are currently the principal elements of concern. The Trenton flow objective was set to ensure adequate fresh water flows to protect drinking water intakes in the tidal river. Predictions indicate long-term diminution of snow pack and melt as a regional effect of climate change, which may have implications for flow management alternatives to meet the flow objective. The protection of instream flow needs may require adjustments to allocation and discharge permitting criteria, particularly if flow targets are adjusted.

**Flow Modeling.** An understanding of water supply, storage and flow regimes are essential for managing the water resources of the basin. DRBC continues to develop and use modeling tools to aid in the evaluation of water resources management and associated risks in the basin. In particular, the models are used to assess reservoir operations on water supply, flood control, power generation and recreation, the impacts of such operations on basin resources, the ability of reservoirs to meet intended and multiple objective uses, and the effectiveness of conservation releases. In 2009, DRBC will have the Flood Analysis Model developed by the US Geological Survey, US Army Corps of Engineers, and the National Oceanic and Atmospheric Administration /National Weather Service. See also Supplemental Table B for a summary of all proposed modeling activities.

### DRBC WATER RESOURCES PROGRAM MULTI-OBJECTIVE FLOW MANAGEMENT

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
FFMP	Analyses and Reports to support Decree Party decision-making	On-going	General Fund
Flood Analysis Model	Support for Flood Mitigation Task Force. Model to assess impacts of reservoir operations on flooding	2009-2010	State Contributions Federal Agency In-Kind
OASIS - incorporation of various improvements	Support for surface water supply studies	2010	WSF

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DSS Improvement	Support for FFMP assessments. Model links to evaluate impact of reservoir operations on habitats	2010-2012	USGS / NPS / USFWS
Dwarf Wedgemussel Study	Habitat requirements report	2010	PPL and USACE
Instream Flow Management	Pass-by flow policy	2010	General Fund

### 1.3 DETERMINING WATER QUALITY AND MEETING STANDARDS: CRITERIA-BASED PROGRAMS, ANTI-DEGRADATION, WATER QUALITY ADMINISTRATION

**Keeping the Clean Water Clean.** The Delaware River Basin is unique in having many miles of high quality waterways in the midst of the densely populated Mid-Atlantic metropolitan area. It provides an enormous benefit to the citizens and workers of the Basin and presents a management challenge to maintain existing water quality in a region of substantial population change. The Commission will continue to implement the Special Protection Waters (SPW) program to maintain existing water quality in the non-tidal river. Modeling and assessment efforts in SPW areas are expected to form a foundation for collaborative watershed management efforts, such as those for the Neversink River and the Lower Delaware described in Section 3.0. Applications for wastewater discharge are expected to increase over the next several years due to a surge of interest in natural gas well drilling in the upper basin. Assessment of cumulative impacts from natural gas drilling activities, including wastewater treatment and disposal, will be undertaken by DRBC as funds become available.

**Impaired Waters.** Significant reaches of the rivers and streams in the Basin are impacted by pollutants to the point where they do not support their designated uses. Causes and sources of impairment vary throughout the Basin (See Sec I.C, Table 2). The list of pollutants includes oxygen demanding materials, and toxics, such as organochlorines, PCBs and mercury that result in fish consumption advisories. The current priority is the clean-up of PCBs in the estuary and at upstream sites affecting the estuary.

DRBC will continue its central role in establishing and implementing TMDLs for toxic and conventional pollutants in the shared waters, and identifying major sources of the contaminants of concern. TMDLs have already been established for PCBs and two VOCs in the estuary. Commission staff is currently completing a Stage 2 TMDL for PCBs for Zones 2-6 that will be established by the U.S. EPA. Chlorinated pesticides including DDT and its metabolites, and metals have also been listed as causing impairments. Under its assimilative capacity regulations, DRBC also determined that the estuary has been impaired for dissolved oxygen (main cause of impairment is carbonaceous oxygen demand or CBOD and nitrogenous oxygen demand or NBOD), whole effluent toxicity (acute and chronic) and volatile organic compounds, and has established assimilative capacity for those parameters authorizing the Executive Director to issue allocations. DRBC will continue to work with the states to provide consistent information related to human health through fish tissue analysis that form the basis for state consumption advisories.

**Data Management.** The EPA's decision to migrate from the STORET data management system to WQX (Water Quality Exchange) may significantly impact the agency's data management and data sharing efforts. The new system will allow use of an agency's own data system and permit interface with EPA via XML generation tools. DRBC is currently using DE DNREC to upload its Boat Run data to WQX. DRBC will be working with NJDEP regarding use of a new monitoring data base to access WQX for other Commission data. Currently, there are many uncertainties, making it impossible to anticipate the magnitude of influence on DRBC data management & collaborative efforts for data sharing among states and EPA.

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**Project Review.** DRBC's regulatory activities remain important for both water supply and water quality management. Administrative agreements with state and federal agencies are undergoing review and revisions to eliminate unnecessary redundancy in the review system (See Section 4.0). DRBC expects to continue to support state partners in their permitting programs through data collection, assessment, mixing zone analysis, and other modeling; and to improve cooperative efforts to enforce DRBC standards to meet requirements in shared waters.

**Monitoring and Assessment.** DRBC monitoring and assessment programs will continue to focus efforts on the assessment of water quality, and support of project review, NPDES permitting and TMDL efforts. While traditional physical/chemical approaches will continue, increasing emphasis will be placed on establishing methodologies for assessing ecosystem health appropriate for the large river system. Specific species of concern will be addressed through other programs and activities (see Section 2.0). The development of biocriteria is an issue that will require resources for monitoring and assessment in coming years.

In the non-tidal river, the Scenic Rivers Monitoring Program will continue yearly until FY 2013. This effort will provide a 4 to 5 year data base for establishing Interstate Control Points and Boundary Control Points for the Upper Delaware and Middle Delaware portions of the Special Protection Waters. From 2009 to 2011, monitoring will be reinitiated in the Lower Delaware portion of the Special Protection Waters to assess any measurable change to existing water quality.

The long term monitoring program conducted by the Commission (Boat Run Survey) will continue with 8 surveys planned at 22 stations in the tidal river and bay. This program provides data to assess compliance with Commission water quality criteria, and also provides data on nutrient concentrations and potential effects. Staff recently completed development of a nutrient strategy for the tidal river and bay that calls for increasing monitoring of the phytoplankton community and development of a eutrophication model. In 2008 Delaware Bay was selected as one of three pilot sites to test and improve the National Monitoring Network for US coastal waters and tributaries. As a result of the gap analysis, \$100,000 in monitoring improvements in the estuary will be realized in FY 2009, including enhanced real-time and nutrient monitoring. These enhancements will continue contingent upon federal funding.

Monitoring for a suite of emerging contaminants will continue with sampling at 6 additional sites in the mainstem river or tributaries. In 2008 and 2009, six sites in the tidal river were sampled for PBDEs, perfluorinated chemicals, pharmaceuticals, steroids, carbamate pesticides and nonylphenol. Special studies are also planned to trackdown sources of codeine in Zone 5, and in 2010, sources of perfluorinated compounds in tributaries.

**Modeling.** In the non-tidal river, model development will also continue with the further calibration and validation of QUAL2K models for the Lower Delaware, Lehigh River and Tri-state Area in FY 2010 and 2011. A water quality model for the Neversink River was also developed in FY09 and 10 and was initially calibrated.

In the estuary, model development will focus on selection of a new hydrodynamic model to replace our current 1-dimensional model, PCB homolog models to support implementation of the Stage 2 TMDLs, eutrophication models to support the Commission's nutrient strategy. The new hydrodynamic model will also support oyster restoration and evaluations of salinity intrusion due to reservoir operations. See also Supplemental Table B for a summary of all ongoing and proposed modeling activities.

### DRBC WATER RESOURCES PROGRAM DETERMINING WATER QUALITY AND MEETING STANDARDS: CRITERIA-BASED PROGRAMS, ANTI-DEGRADATION, WATER QUALITY ADMINISTRATION

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Special Protection	Develop basin-wide regulations	2010 - 2011	General Fund



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<b>Program/Project</b>	<b>Products/Outputs</b>	<b>Fiscal Year</b>	<b>Funding Sources</b>
Waters	for all natural gas wells in all formations		
Water Quality Standards	General Review of water Quality Standards and Policy	2010 -2011	General Fund
	Determine Policy Direction and Implementation of Policies	2010 - 2012	General Fund
Scenic Rivers Monitoring Program	Data and report	2009 – 2011	Section 106 and NPS
	Report on changes to EWQ	2013	General Fund
Lower Delaware Model	Report on initial model setup and calibration	2009	Section 106 and General Fund
	Model refinement and calibration	2009-2010	Section 106, NPS and General Fund
Brodhead Model	Model refinement	2010	Project Review Fees / Gen. Fund
Neversink Model	Initial model evaluation and setup	2009	Project Review Fees / Gen. Fund
	Model calibration and validation	2009 - 2010	Project Review Fees / Gen. Fund
Lehigh River Model	Initial model setup and calibration	2009	General Fund
	Model refinement and validation	2010	General Fund
Boat Run Survey	Data in WQX	2010-2015	Section 106
	5 year report on conditions including living resources	2011	Section 106
Estuary monitoring	Improved nutrient & real-time monitoring to complement the objectives of the National Monitoring Network	2009, 2010	USGS
DelTrip	Bi-Annual report updated	2010, 2012, 2014	General Fund
Fish Tissue Monitoring	Data and report	2010, 2012, 2014	Section 106
PCB Homolog Models	Revised TMDLs for Zones 2 – 6 and supporting documentation	2010	General Fund and Section 104(b)
Water Quality Dockets	Review and processing of water quality dockets, including applications for wastewater discharge from natural gas drilling activities.	2010-2015	Project Review Fees
Emerging contaminant monitoring	Data from screening surveys	2009	Section 106
	Targeted surveys	2010-2014	Section 106
Eutrophication Model for Delaware Estuary	Model selection and setup for CBOD reallocation, NBOD allocation and nutrient parameters	2011	None identified

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Program/Project	Products/Outputs	Fiscal Year	Funding Sources
	Initial model calibration	2012	None identified
	Model refinement and validation	2013-2014	None identified

### 1.4 PROSPECTIVE CHANGES TO DRBC PROGRAM RULES AND REGULATIONS

In cooperation with its advisory committees and state partners, DRBC continued review of its existing water quality standards and has made progress on revising appropriate standards. Initial efforts continue on toxics criteria for aquatic life and human health, pH, and temperature. These parameters are expected to be ready for update in FY 2010. Parameters also being reviewed include bacteria, ammonia and DO criteria. Through the Biological Subcommittee to the Water Quality Advisory Committee, suitable approaches are being investigated for developing biological metrics and biocriteria. The Nutrient Subcommittee is investigating the issue of nutrient criteria and making recommendations to the WQAC for interim measures to protect estuarine waters followed by eventual adoption of standards. When reviews of the previously mentioned criteria are completed, a broad examination of other existing criteria will be performed to determine which should be targeted for re-evaluation. An evaluation of the overall architecture of the water quality regulations will also be performed to produce a more coherent and refined structure. Important policy decisions pertaining to criteria were made by the commissioners in FY 2009. These may lead to changes in the water quality regulations relative to interstate waters, toxics in Zones 1 and 6, basin-wide standards and facility regionalization. See Supplemental Table C for a more detailed schedule of activities related to updating water quality standards. See also Supplemental Table A for a summary of all prospective program rule and administrative changes.

**Section 2.0 WATERWAY CORRIDOR MANAGEMENT**

- 2.1 Flood Warning and Loss Reduction
- 2.2 Aquatic Life and Wildlife Habitat Improvement

**2.1 FLOOD WARNING AND LOSS REDUCTION**

Three major floods between mid-September 2004 and late June 2006 caused severe and repeated damage to thousands of structures, and disrupted the lives of tens of thousands of people along the main stem Delaware River and several tributaries. These flood events, the worst since the record flood of 1955, focused a significant amount of resources on flood mitigation, including warning system improvements, mapping and modeling. Climate change research indicates more extreme precipitation cycles in the Northeast and the potential for more severe droughts and flooding. Coupled with an expected rise in sea level, climate change may impact many more coastal and riverine properties. DRBC will maintain efforts to improve planning, management and regulatory programs to reduce flood losses.

Flood loss reduction is a shared responsibility among federal, state, and local agencies and organizations in the Delaware River Basin. The responsibilities are far reaching, involving both planning and operational functions. DRBC's Flood Advisory Committee (FAC) brings together various government and non-governmental stakeholders across jurisdictional boundaries with shared interests in the watershed and serves to coordinate the efforts of the agencies to improve the basin's flood warning systems and mitigate flood losses to reduce the damage/personal loss/rebuilding cycle in the floodplains where development has been previously allowed.

**Interstate Flood Mitigation.** As the result of pervasive flooding in 2004-2006, DRBC commissioners convened a Delaware River Basin Interstate Flood Mitigation Task Force. This Task Force produced an Action Agenda consisting of 45 consensus-based recommendations focusing on a more proactive and systematic approach to flood mitigation within the Delaware River Basin. DRBC is tracking and working towards implementation of those recommendations and an impressive number of activities are underway in the six priority management areas encompassed by the action agenda: reservoir operations, structural and non-structural mitigation, stormwater management, floodplain mapping, floodplain regulation, and flood warning. Notable projects for which DRBC is lead or co-sponsor are as follows:

- In conjunction with USGS, USACE and NOAA/NWS, development of Flood Analysis Model
- In conjunction with USACE and NOAA/NWS, development of digital Flood Inundation Maps
- In conjunction with NOAA/NWS, upgrade to the Delaware River Flood Warning System Improvements (\$235,000 in new federal funds; Sponsor: Dent, Holt, Lautenberg and Menendez)
- In conjunction with Nurture Nature Foundation, development of Flood Museum and Resource Center in Easton, PA
- In conjunction with the DRBC Flood Advisory Committee (FAC), evaluate subcommittee floodplain management recommendations for the Delaware River Basin
- In conjunction with Supreme Court Decree Parties, continue the development of a Flexible Flow Management Plan

**Flood Modeling.** A Flood Analysis Model is being developed which will be used to assess potential impacts of reservoir operation on downstream flooding during the September 2004, April 2005, and June 2006 floods. The model will likely be completed in the fall of 2009 and will be used to determine the extent to which changes to the storage levels in the 13 major reservoirs (NYC and lower basin) above Trenton could have been used to mitigate flooding on the main stem during the noted three recent floods. OASIS, the water supply planning model, will be used to analyze the impacts of changed operations on water supply and flows for ecological benefits. In the coming years, the DRBC will use the results from the aforementioned studies to evaluate the feasibility of providing additional mitigation in the basin without compromising other uses of the basin's reservoirs. Changes to the NYC Delaware Basin reservoirs operations for use in flood mitigation will need unanimous consent of the Decree Parties. See also Supplemental Table B for a summary of all ongoing and proposed modeling activities.

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The Flood Advisory Committee (FAC) and the Regulated Flow Advisory Committee (RFAC) will continue to be integral to the coordination of high-flow related initiatives. See Supplemental Table A for a schedule of prospective changes to DRBC program rules.

### DRBC WATER RESOURCES PROGRAM FLOOD WARNING AND LOSS REDUCTION

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
USACE Flood Forecast Inundation Maps	Flood Forecast Inundation Maps	On-going	USACE Sec. 22 (FY08)
NOAA-NWS Flood Warning Enhancements	Continue to implement Flood Warning recommendations of the Interstate Basin Task Force	2010-2013	NOAA Appropriation received September 2009
DRBC Floodplain Regulations	Evaluate and update current regulations based upon recommendations from the FAC	2010-2011	General Fund
Establish a Repetitive Loss Strategy (Priority Areas for Acquisition, Elevation, and Flood-proofing)	Support State, County and Municipal Mitigation Projects	2010-2013	General Fund
High Hazard Dam Emergency Action Plan (EAP) Documents	Coordinate and ensure that EAP documents for all large impoundments are available for emergency management purposes	2010	NOAA Appropriation General Fund
Flood Analysis Model	Quantify results of potential voids in the basin reservoirs	2009-2010	State Contribution, Federal Agency In-Kind
Reservoir Operating Plan	Develop a Reservoir Operating Plan that includes Potential Flood Mitigation by All Major Reservoirs	2010	General Fund
Coordination through DRBC Flood Advisory Committee (FAC)	Coordination among federal, state, regional and local agencies	2009 - 2015	General Fund, Agency In-Kind
Flood plain dockets	Review and processing of flood plain dockets	2010-2015	Project Review Fees
Education and Outreach	Develop a Coordinated Education, Outreach and Training Program aimed at County/Local Emergency Managers	2010-2015	NOAA Appropriation

## 2.2 AQUATIC LIFE AND WILDLIFE HABITAT IMPROVEMENT

**Ecosystem Needs.** National emphasis on improving water quality for the protection of aquatic and riparian habitat as well as specific species of concern necessitates increased efforts at DRBC to investigate the physical, biological and chemical conditions that contribute to the health of ecological communities. This emphasis is expected to increase, rather than to wane. An efficient use of public-private partnerships, such as that embodied in SEF, the RFAC's Subcommittee on Ecological Flows, and the Partnership for the Delaware Estuary will be the most effective way to leverage talent and funds to meet ecosystem protection goals. The groundbreaking work of SEF with both the USGS Decision Support System model and with the USF&WS Habitat Restoration Study will continue to facilitate

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adaptive management of ecological resources below New York City's Upper Basin reservoirs, particularly the federally-endangered Dwarf Wedgemussel. DRBC is also closely coordinating with the Partnership for the Delaware Estuary Program (PDE) on habitat identification and improvement efforts. DRBC will continue to be an active member of the Bi-state Oyster Revitalization Task Force and to support PDE efforts to improve habitat for specific species of concern, such as oysters, horseshoe crabs and anadromous fish, through collaborative efforts with the Fish & Wildlife Management Cooperative, the US Fish & Wildlife Service, and the Army Corps of Engineers. DRBC intends to remain involved in the development and expansion of creative funding opportunities, such as those offered through the National Fish & Wildlife Foundation.

DRBC will continue to increase understanding of ecosystem needs and habitat conditions in the basin through ambient water quality monitoring, fluvial geomorphologic assessments, and surveys for biocriteria development conducted in partnership with federal and state agencies. In the estuary and tidal reaches, increasing emphasis will be placed on establishing linkages among benthic, pelagic, and physical conditions & processes, consistent with the recommendations of the federal Ocean Action Plan and the Delaware Estuary Science Conference 2007. The newly-formed Biological Advisory Subcommittee to the WQAC will facilitate these coordinated monitoring efforts among agencies.

Additional efforts will be made to support partners' sub-basin scale initiatives that evaluate landscape function and natural resource services such as those provided by the estuarine wetlands fringe around Delaware Bay. More information about ecosystem condition and function is necessary to be able to protect and preserve the integrity of the basin's natural communities. Stressor identification through watershed evaluation may prove to be an important next step in this effort (see also section 3.0). DRBC participates when feasible in basin-wide or regional efforts to identify and manage non-native species that can stress ecosystem function. See Supplemental Table A for a summary of prospective changes to DRBC program rules and Supplemental Table C for a more detailed schedule of tasks related to the development of biocriteria and other prospective changes to water quality standards.

### DRBC WATER RESOURCES PROGRAM AQUATIC LIFE AND WILDLIFE HABITAT IMPROVEMENT

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Dwarf Wedgemussel Study Phase 2 - Univ. of Mass. Outputs	Final Habitat Requirements Report	2010	PPL, USACE Sec. 22 / In-kind
Delaware River Biocriteria	Biocriteria Strategy	2009 - 2010	\$106
Delaware River Biocriteria	Revised Biocriteria	2010 - 2012	\$106
Delaware River Fish and Wildlife Management Cooperative	Technical Support	2009 - 2014	General Fund

## **DRBC Water Resources Program FY 2010-2015**

### **Section 3.0 LINKING LAND AND WATER RESOURCE MANAGEMENT**

- 3.1 Integrated Resource Management and Collaborative Watershed Planning
- 3.2 Promoting Sound Practices

#### **3.1 INTEGRATED RESOURCE MANAGEMENT AND COLLABORATIVE WATERSHED PLANNING**

DRBC watershed management efforts include watersheds that involve two or more states as well as projects within a single basin state, typically as pilot programs for larger multi-jurisdictional management efforts. Staff is performing watershed management including collaborative partnerships in these watersheds:

- Christina basin (PA and DE)
- Watersheds draining to the Tri-State Bend within the Special Protection Waters program area (PA, NY, and NJ)
- Upper Wissahickon Creek (Montgomery County, PA), and
- Pocono Creek and Brodhead Creek watersheds (Monroe County, PA).

The Pocono Creek project is a water resources sustainability study performed with EPA-ORD to establish relationships between ground water and stream base flow, and to develop tools for sustainable water resource management at the local community level. The project is a collaborative effort with EPA-ORD, USGS and local partners to establish a scientific foundation for development of water resource policies that are transferred to local communities through social marketing techniques. The Final Report was submitted in FY 2009 and watershed management efforts are expected to be ongoing for many years. In addition, DRBC will remain an active partner with the Upper Delaware Council, the Middle Delaware Advisory Committee and the Schuylkill Action Network (SAN), among others.

#### **3.2 PROMOTING SOUND PRACTICES**

DRBC promotes sound practices of watershed management in the Basin (Compact §7.1). The Basin Plan's goals regarding watershed management include:

- Preserving and restoring natural hydrologic cycles through improved stormwater management
- Maintaining and restoring the function of valuable water resource landscapes, such as wetlands and aquifer recharge areas
- The integration of water resource considerations into land use planning and growth management

DRBC promotes sound watershed management practices, and has developed *Guidelines for Integrated Resource Planning* (IRP) as a tool for communities in the Ground Water Protected Area of southeast Pennsylvania to maintain water supply and stream flows in areas where aquifers have been subjected to depletion. The Swamp-Scioto Creek sub-watershed in the Perkiomen watershed was piloted for an IRP. This pilot IRP was completed in FY 2008. DRBC is the logical regional entity for performing basin and regional scale assessments and for providing tools to improve watershed management. Work at a number of watershed scales (see list of Collaborative Watershed Management projects above) has promoted sound land uses aimed at retaining or restoring the hydrologic integrity of the watershed.

Applications for natural gas well pads are expected to increase over the next several years due to a surge of interest in natural gas well drilling in the upper basin. Assessment of cumulative impacts from natural gas drilling activities, including landscape disturbances from development of natural gas well pads, will be undertaken by DRBC as funds become available.

**DRBC Water Resources Program FY 2010-2015**

**DRBC WATER RESOURCES PROGRAM  
LINKING LAND AND WATER RESOURCE MANAGEMENT**

<b>Program/Project</b>	<b>Products/Outputs</b>	<b>Fiscal Year</b>	<b>Funding Sources</b>
Christina Clean Water Partnership	Continued bi-state coordination and program development to meet Partnership's Long Term goal of restoring all streams' water quality to designated uses by 2015	2010-15	Apply for grants and migrate to more formal institutional process
Pocono Creek Framework for Sustainable Watershed Management	Development of partnership for Brodhead Watershed/Monroe County	2009 - 2010	General Fund
Cumulative impact on landscape from Natural Gas development	Cumulative Impact Analysis of gas well pad development	2011 -12	Funding permitting
Upper Wissahickon Creek Special Area Management Plan (SAMP)	Preparation of Implementation Plan for SAMP	2010 -11	PADEP – funding permitting

**Section 4.0 INTERGOVERNMENTAL RELATIONS**

- 4.1 Conflict Management
- 4.2 Facility Planning
- 4.3 Intergovernmental Coordination

**4.1 CONFLICT MANAGEMENT**

Perhaps the most unique of DRBC's many functions is support for the states, federal government, and parties to the 1954 Supreme Court Decree for the avoidance and resolution of jurisdictional conflicts. DRBC remains the forum for discussion and arbitration of inter-jurisdictional issues associated with the regulation of withdrawals and diversions, water allocation, flow management, pollution prevention, flood mitigation, and endangered species protection.

Of particular note is the DRBC staff role as facilitator of Flexible Flow Management negotiations among the Supreme Court Decree Parties, and as modeler of flow to support Decree Party assessment of alternative flow management operational schemes. The existing Flexible Flow Management Plan (FFMP) is scheduled to expire in May 2011 and all parties are focused on reservoir management designed to further the following objectives:

- a) Provide safe and reliable supplies of drinking water
- b) Help control temperatures in the tailwaters to help sustain cold water fisheries
- c) Assist in mitigating the impacts of flooding
- d) Provide flows in the mainstem and the Delaware Bay to protect ecological health
- e) Support withdrawal and non-withdrawal uses
- f) Repel salinity

**4.2 FACILITY PLANNING**

The Commission has considerable powers of oversight relating to major facilities and projects affecting water resources in the basin, and..."for the determination of project priorities, pursuant to the requirements of the comprehensive plan and [the] water resources program."

A major focus will be to review basin needs for additional storage based on:

- Instream flow needs, existing allocations and anticipated withdrawals
- Potential need to replace current flows should NYC reservoirs be fully utilized as permitted by 1954 Supreme Court Decree

A draft list of major projects, including reservoir enhancement options, has been assembled for evaluation against the current need for supply and regional flood control. One principal need for this is to be responsive to future flow augmentation needs as diversions from the upper basin are maximized (see below). A final list of facility needs will be incorporated to update the Comprehensive Plan.

DRBC also anticipates that an evaluation of wastewater needs through cooperative planning with the states and wastewater planning authorities will be started by 2013.



## DRBC Water Resources Program FY 2010-2015

### DRBC WATER RESOURCES PROGRAM FACILITY PLANNING

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
State Water Supply Plans	Water Conservation Options Identification of Critical Areas Identification of Interconnection Options	2009 - 2012	States
Comprehensive Plan – supply projects	Updated list and descriptions of Water Supply Enhancement Options Reconcile CP projects. Re-organize and complete CP text	2010-2012	General Fund
Comprehensive Plan – wastewater projects	Evaluation of regional wastewater needs	2013-2015	General Fund

#### 4.3 INTERGOVERNMENTAL COORDINATION

**Federal and State Intergovernmental Coordination.** It is important that the activities and authorities of the Commission and of the multiple Federal, state and local governmental agency efforts to manage the water resources of the basin are conducted in a coordinated and supportive fashion.

The Commission is involved in several federal/state initiatives that not only stimulate positive environmental outcomes in the basin, but also help shape water policy on regional and national scales. Current initiatives and needs include:

- Linking the Mid-Atlantic Coastal Ocean Observing Regional Association (MACOORA) and Governors' Mid-Atlantic Regional Council on Oceans (MARCO) initiative
- Working through Interstate Council on Water Policy (ICWP) to convene regional USGS roundtables on monitoring
- Convening Atlantic Coast Water Quality workshop focused on nutrients, dissolved oxygen, and harmful algal blooms; involve NOAA, EPA and USGS
- Working with the USACE on “Collaborating for a Sustainable Water Resources Future” to find ways that the federal government can better assist states in water planning and management. There is interest in establishing a national policy with emphasis on IWRM and transboundary river management

Collaboration among state and interstate agencies across basin boundaries encourages the exchange of information, ideas, and experience, and supports initiatives of benefit to member agencies and to water resources management generally. DRBC remains a partner in the Association of State & Interstate Water Pollution Control Administrators (ASIWPCA), the Interstate Council of Water Policy (ICWP), and the new Clean Water America Alliance (CWAA). As water resource management faces the growing challenges associated with a changing climate, a challenging fiscal future and infrastructure needs and shifting political environments, involvement with these partners will be of increasing benefit to DRBC. DRBC will continue to strengthen coordination with its sister agencies (SRBC, etc.) through collaboration and communication on projects, policies, funding and issues of common interest.

## DRBC Water Resources Program FY 2010-2015

### DRBC WATER RESOURCES PROGRAM FEDERAL AND STATE INTERGOVERNMENTAL COORDINATION

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
3 <sup>rd</sup> Federal Summit	Consensus on water resource priorities and collaborative agenda	2010	General Fund
MACOORA - Mid-Atlantic Coastal Ocean Observing Regional Association	Board member; local coastal inundation forecast; current maps for improved search and rescue; 3-D temperature for fisheries issues; circulation data for beaches; address low DO as component of an Integrated Coastal Observing System	Membership ongoing;  Products 2010-2014	General Fund
ICWP- Interstate Council on Water Policy	Contribute to discourse on national water policy, federal legislation and support for gauging infrastructure	2010	General Fund
Coastal Water Quality	Convene WQ workshop focused on DO, nutrients, Harmful algal blooms	2012	General Fund
National Collaborative Water Conference	Assist USACE on trans-boundary management discussions and building national water policy	2010	USACE/General Fund

**Intrabasin Coordination.** Much staff time is devoted to participating in partnership efforts for the estuary, for watershed initiatives, for National Park resource management, and for issues of regional and national importance. These efforts are often focused on linking the fiscal and administrative capacities of multiple partners on very specific environmental protection and improvement outcomes. Examples include the Upper Delaware Council, the Delaware Estuary Program, the Christina Clean Water Partnership, NJ Clean Water Council, the Fish and Wildlife Management Cooperative, the Schuylkill Action Network, the Delaware Greenway Partnership, and the Delaware Bay National Water Quality Pilot Program.

Commission and state staff have reviewed the relative and related statutory and regulatory authorities of the Commission and the state agencies, the review procedures being practiced by the Commission and the state agencies concerning projects subject to review by the Commission under section 3.8 of the Compact, and the coordination practices between the state agencies and the Commission in the review of these projects. These evaluations have been coordinated with the Water Quality and Water Management Advisory Committees. By 2010, revised agreements will be negotiated with each of the four states. Commission staff will continue to coordinate and seek the advice of the DRBC advisory committees (see Advisory Committees, below).

## DRBC Water Resources Program FY 2010-2015

### DRBC WATER RESOURCES PROGRAM INTRABASIN COORDINATION

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Upper Delaware Council	Ex-Officio Member; 6 meetings per year	Ongoing	General Fund
Common Waters, upper basin group associated with Pinchot Institute	Board Member; 6 meetings per year	Ongoing	General Fund
Delaware Estuary Program	Participate in multiple committees (Steering, EIC, STAC)	Ongoing	General Fund
Oyster Restoration Task Force	Plant 500,000 bushels of shell per year to enhance recruitment and habitat	Ongoing	General Fund
NJ Clean Water Council, permanent legislated member	Monthly meetings, periodic chairmanship, annual public hearing	Ongoing	General Fund
Christina Clean Water Partnership	See details in Sec. 3 Watershed Management	Ongoing	General Fund
Schuylkill Action Network	See details in Sec. 3 Watershed Management	Ongoing	General Fund
Delaware Greenway Partnership	Coordination with Lower Delaware Management Committee and SPW	Ongoing	General Fund
Revise/Update DRBC-State Administrative Agreements	4 Revised DRBC-State Administrative Agreements	2009-2010	General Fund
Fish & Wildlife Management Cooperative	Coordination, management plans	Ongoing	General Fund

**Internal Advisory Committees.** Six major advisory committees presently aid the Commission in policy and standards development. Committees for flow, flood, toxics, monitoring, water quality and water management meet quarterly, monthly or as needed. All administrative needs are met by DRBC staff, including the development of agendas, arrangement of venues, communicating with members, and processing formal meeting minutes. Staff also coordinates internally on issues that cut across the interests or expertise of more than one committee. Major focus issues for the Advisory Committees and subcommittees include:

**Water Quality Advisory Committee.** The WQAC will be focusing on a review of nutrient issues in the estuary, the development of biocriteria, and the review of criteria for DO, temperature and pH. Two subcommittees – Nutrient Management Subcommittee and Biological Advisory Subcommittee - have been formed to assist with the evaluation of nutrient and biological criteria development. The addition of an expert panel to consult on dissolved oxygen needs of estuarine aquatic communities is anticipated in 2010-2011 timeframe. (see also sections B.2.1.3 and B.2.1.4).

**Regulated Flows Advisory Committee.** The RFAC will continue to focus on reservoir operations, instream flow needs and other issues to support the Decree Parties in their work on the Flexible

## DRBC Water Resources Program FY 2010-2015

Flow management Plan. The Subcommittee on Ecological Flows (SEF) will continue its work on flow needs for cold water communities and extend research into warm water fisheries.

**Flood Advisory Committee.** The FAC will be focusing on the implementation of the 44 Interstate Flood Advisory Task Force recommendations for action on reservoir operations, structural and non-structural measures, stormwater, flood plain mapping, flood plain regulations, and flood warning.

**Monitoring Advisory Committee.** The MAC will be focusing on the coordination of monitoring and maintenance of monitoring systems in the basin for flows and water quality. Their work will also support the preparation of the 2011 Technical Report, which will be the foundation for the *State of the Estuary* and *State of the Basin* reports in 2012 and 2013, respectively.

**Toxics Advisory Committee.** The TAC will be focusing on the issue of extending toxics criteria into Water Quality Zones 1 and 6, the review of new and existing toxics criteria as appropriate,

**Water Management Advisory Committee.** The WMAC will be focusing on revisions to DRBC water conservation rules, water reuse, regionalization policy for water & wastewater, evaluation of consumptive use policy, intra-basin transfers, instream flows and supply sufficiency.

Supplemental Table A is an overview of prospective program rule changes that may involve Advisory Committee input. Supplemental Table C is a schedule of prospective changes to water quality standards and actions relevant to the toxics and water quality committees.

## DRBC Water Resources Program FY 2010-2015

### Section 5.0 EDUCATION AND OUTREACH FOR STEWARDSHIP

- 5.1 Reporting
- 5.2 Public Information
- 5.3 Technical Outreach
- 5.4 Promoting Stewardship

#### 5.1 REPORTING

Many DRBC projects and programs have individual reporting elements. These are included as products and outputs for the fiscal year of their scheduled delivery. There are also routine reporting activities that require more significant resources for coordination, integration, and production. Among these are:

**State of the Basin Report.** By resolution, DRBC is to compile an environmental goals and indicators report every five years. The second condition report will be compiled for publication in 2013 and will share portions of a Technical Report, scheduled for 2011, that is being compiled for the State of the Delaware Estuary Report to be published by the Partnership for the Delaware Estuary in 2012.

**Estuary Monitoring Report.** DRBC is working with the Partnership for the Delaware Estuary and other stakeholders to develop a Technical Report, which will be the basis for the next scheduled State of the Basin and State of the Estuary reports. This technical report will take the place of the Estuary Monitoring Report, which was previously developed every 5 years. DRBC will lead the development of the portions of the technical report dealing with Water Quality and Water Supply and coordinate the assessment of Land Use indicators.

**Integrated List.** DRBC biennially reports on the conditions of main stem river water quality relative to criteria in accordance with EPA guidelines for 305 (b) reporting. The next report is due in April 2010, and subsequent reports will be prepared in 2012 and 2014.

**Annual Hydrologic Report.** A summary of hydrologic conditions in the basin including precipitation, stream flow, reservoir storage, ground water levels and the river mile location of 7-day average 250 mg/l chloride concentration is prepared annually for each Water Year: October 1 – September 30. Reports are posted on the DRBC web site.

**DRBC Annual Report.** Required by the Compact, this report reviews programs, activities, products and milestones achieved during a calendar year.

**Water Resources Program & Annual Work Plan.** Based upon the mandate of the Compact and the goals of the Basin Plan, the Water Resources Program (WRP) notes the current conditions and needs of the basin, the scope of DRBC programs, and the expected milestones to be achieved for a six fiscal year time horizon. The Annual Work Plan (AWP) for each year, extracted from the WRP, explains in greater detail planned activities and allotment of resources necessary for those tasks.

#### 5.2 PUBLIC INFORMATION

DRBC staff responds in a timely manner to inquiries and requests from the general public, federal/state/local government officials, regulated community, students, educators, and the news media. This includes hosting visits by international delegations who wish to learn from Commission staff about water resource management at the river basin scale. DRBC also produces various publications and materials about the basin and water resource management issues.

The DRBC's expanding web site continues to be a major communications tool with its emphasis on providing information that is accurate, up-to-date, and presented in a user-friendly manner. The DRBC web site makes extensive use of links to external government and other sites where additional information is available. The importance of the DRBC web site as an information tool the public turns to in increasing numbers, is reflected in the amount of data transferred, which totaled nearly 270 billion bytes during FY 2009 compared to 96 billion bytes during FY 2006. Efforts are underway to redesign the web site for the first time since its debut in 1996.

## DRBC Water Resources Program FY 2010-2015

### 5.3 TECHNICAL OUTREACH

In order to keep current on technical issues and to share information with peers and various stakeholders, DRBC staff members attend and/or participate in regional, state, and national conferences and workshops throughout the year hosted by other government agencies, professional groups, or other organizations. DRBC also hosts workshops on timely issues, such as implementation of pollutant minimization plans (PMPs) for PCBs, revision of PCB criterion, and Special Protection Water regulations, to assist the regulated community to better understand commission programs and requirements. The DRBC web site also is used to supplement this information exchange.

### 5.4 PROMOTING STEWARDSHIP

Commission staff communicates information in various formats and participates in a variety of events throughout the basin to raise public awareness about water resource issues affecting the watershed and the need for stewardship. This includes participation at large-scale community environmental fairs attended by thousands of visitors and much smaller events, as well as workshops and conferences. DRBC continues to place a priority on reaching out to educators and students, as evidenced by staff participation in school events, teacher training workshops, World Water Monitoring Day, and continued development of *Ed. Web* on the commission's web site. DRBC continues to support the Delaware River Sojourn through its active membership on the steering committee.

#### DRBC WATER RESOURCES PROGRAM EDUCATION AND OUTREACH FOR STEWARDSHIP

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Technical Report for the State of the Delaware Estuary	Data collection & assessment	2011	General Fund
Integrated List Water Quality Assessment Report	Prepare assessment for states, coordinate; layman's report	2010, 2012, 2014	EPA 106 Grant/General Fund
Annual Hydrologic Report, Event Summaries	Report – post on web; limited paper copies	2010 - 2015	General Fund
State of the Basin Report	Report & electronic database	2013	General Fund
DRBC Annual Report	Report – post on web; limited paper copies	2010 - 2015	General Fund
Provide Timely Information to the Public	Clear, consistent message on water resources issues & DRBC activities; produce various handouts	2010 - 2015	General Fund
Media/External Relations	Clear, consistent message on water resources issues &	2010 - 2015	General Fund

**DRBC Water Resources Program FY 2010-2015**

<b>Program/Project</b>	<b>Products/Outputs</b>	<b>Fiscal Year</b>	<b>Funding Sources</b>
	DRBC activities; timely responses		
Web Site	Redesigned web site	2010-2011	General Fund
	New features, improvements, ongoing maintenance	2010 - 2015	General Fund
Host Foreign Delegation Visits	Information exchange	2010 - 2015	General Fund
Conference Attendance & Presentations	Information exchange	2010 - 2015	General Fund
Workshops	SPW workshops	2010	General Fund
	PCB PMP workshops	2010	General Fund
	PDE science conference	2011, 2013, 2015	General Fund
	WRA-DRB conference (DRBC co-host)	2010-2015	General Fund
	Flood mitigation workshop for emergency management officials	2010 (and subsequent years, if funded)	Congressional Appropriation
Community Events	Delaware River Sojourn, Bay Day, Coast Days, RiverFest, Shad Festival, HydroMania, EarthFest, World Water Monitoring Day, educator training, misc.	2010 - 2015	General Fund
Event Follow-up	Information on web site	2010 - 2015	General Fund

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## **SUPPLEMENTAL MATERIALS**

- Table A:**      **Summary of Prospective Changes to DRBC  
Programs and Regulations FY2010-2015**
- Table B:**      **Summary of Modeling Projects FY 2010-2015**
- Table C:**      **Schedule of DRBC Water Quality Revisions – 3 year plan  
CY 2009-2011**

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**SUPPLEMENTAL TABLE A: SUMMARY OF PROSPECTIVE CHANGES TO DRBC PROGRAMS AND REGULATIONS**

Management Topic	Program/Project	Products/Outputs	FY 2010	FY 2011 - 2012	FY 2013 - 2014
Water Supply	Water Conservation	Changes to WC Article 2: Conservation (§ 2.1.6) and Metering (§2.5)	Voluntary Implementation: Outreach	Voluntary, then Required Implementation	Required Implementation
Flow Management	Drought Operations	Changes to WC Article 2: Diversion Schedule (§ 2.5.3 et seq.) to support FFMP	Rule-making process	Rule Adoption	
	Pass-by flows/ conservation release	Update Water Code to include Passby and Instream Flow Requirements	Technical Review and Analysis	Rule-making process and Adoption	Further Rule-making process and Adoption
Natural Gas	Water Resources Mgmt (Withdrawals, well pads and discharges)	Revise Executive Director Determination (EDD) to include exploratory wells	Revised EDD		
		Update Water Code to control the impact on water resources from natural gas drilling	Draft Rules	Rule-making process and adoption	
Project Review Fees	Docket Review and Issuance	Update Commission procedures on applicant fees	Rule-making process and Adoption		
Water Quality  <i>See Table C for detailed schedule of prospective changes to Water Quality Standards</i>	SPW- Lower	Designation of Lower Delaware	Draft Guidance Manual	Final Guidance Manual and Workshops	Rule Implementation
	WQ Criteria	Revised PCB Criteria	Rule Adoption	Rule Implementation	
		Ammonia criteria	Rule Proposal		
		Bacteria	Criteria Development	Rule Proposal	
		Nutrients	Monitoring and Modeling	Criteria Development	Rule Proposal
		Biocriteria	Develop Biocriteria Strategy	Develop Biocriteria Strategy	Rule Proposal
		pH	Revise pH Criteria Rule Proposal	Rule Adoption	
		DO (Zone 5)	DO Criteria Review	Rule Proposal	
		Temperature	Temp. Criteria Review	Rule Proposal	
	Toxics	Revised aquatic life and human health criteria in Zones 2-5; extension to Zones 1 & 6.	Develop Revised Criteria	Rule Proposal and TAC Review	Rule Adoption
	Uniform Standards for "Shared"	Consistent standards for shared waters	Rule Proposal	Rule Adoption	

Management Topic	Program/Project	Products/Outputs	FY 2010	FY 2011 - 2012	FY 2013 - 2014
	Interstate Waters				
	"Stacked" Interstate Waters	Review and eliminate, as appropriate	Draft Rule	Rule Proposal and Adoption	
	Regionalization	Promote "scale-appropriate" systems	Review of water and wastewater systems	Rule Proposal	
	Basin-wide Standards	Implement Policy determinations	Policy Options	Proposal & WQAC Review	
Flood Mitigation	Flood Plain Regulations	Changes to WC Article 2: Flood Damage Reduction (§ 2.100) AM Art. 6: FP Regulations	Develop & Review Policy Options, FAC review	Proposals & FAC Review	Rule Proposal and Adoption
Enforcement & Penalties	All Relevant Programs	Revisions to Rules of Practice & Procedure; Amendments to WQ Regulations	Policy Options	Rule-making process and Adoption	
Administrative Updates	Water Code	Structural Changes	Draft	Final	
	Water Supply Charges	Changes to Administrative Manual Article 5	Rule-making process	Rule Adoption	

**SUPPLEMENTAL TABLE B: SUMMARY OF MODELING PROJECTS**

<b>Program/Project</b>	<b>Products/Outputs</b>	<b>Fiscal Year</b>	<b>Funding Sources</b>
Regulated Flow Management	Use of and incorporation of various upgrades into OASIS model, to support the evaluation of water supply management options, chloride intrusion, and support Decree Party negotiations	as needed	General Fund
Decision Support System (DSS)	Desired DSS model Improvements – support evaluation of impacts of reservoir operations on habitats	2011-12	None identified (possibly USACE Sec. 22)
Flow Management – FFMP Support	Flood Analysis Model - to assess impacts of reservoir operations on flooding	2010	State Contributions Federal Agency In-Kind
Emergency Response	Real time one-dimensional flow and transport model	Yearly (as needed)	General Fund
SPW - Lower Delaware Model	Report on initial model setup and calibration. Permit review tool.	2009	Section 106 and General Fund
	Model refinement and validation	2009-2010	Section 106 and General Fund
SPW -Tri-State Model	Model calibration report	2010	Section 106 and General Fund
Brodhead Model	Model refinement	2009	Project Review Fees / General Fund
Neversink Model	Initial model evaluation and setup	2009	Project Review Fees / General Fund
	Model refinement and validation	2010 -	Project Review Fees / General Fund
Lehigh River Model	Initial model setup and calibration	2009	None identified
	Model refinement and validation	2010-2011	None identified
PCB Homolog Modeling	Revised TMDLs for Zones 2 – 6 and supporting documentation.	2010	General Fund and Section 104(b)
Eutrophication Model for Delaware Estuary	Model selection and setup for CBOD reallocation, NBOD allocation and nutrient parameters	2011	None identified
	Initial model calibration	2012	None identified
	Model refinement and validation	2013-2014	Project Review Fees/General Fund
CORMIX mixing zone models	Project Review and NPDES permit support	Yearly	Project Review Fees

Supplemental Table C: Schedule of DRBC Water Quality Revisions – 3 Year Plan (Revised 7/14/09)

REGULATION AREA	POLICY/ CRITERIA	ACTION	PARTICIPANTS	FFY 2009				FFY 2010				FFY 2011				FFY 2012	
				1st Q CY2009	2nd Q CY2009	3rd Q CY2009	4th Q CY2009	1st Q CY2010	2nd Q CY2010	3rd Q CY2010	4th Q CY2010	1st Q CY2011	2nd Q CY2011	3rd Q CY2011	4th Q CY2011	Beyond CY2011	
Special Protection Waters	Antidegradation	SRMP BCP/ICP Data Collection	DRBC, NPS														
		Data Assessment (for EWQ)	DRBC														
		BDT review	DRBC, WQAC														
Nutrient Strategy	Nutrients	Nutrient Monitoring & Modeling	Nutrient Subcommittee, DRBC														
		Sub-Committee recommends nutrient criteria to advisory committees	DRBC														
	PCBs	Develop Water Quality Standards Implementation Plan	DRBC, EPA														
		Propose WQSIP for Adoption	DRBC														
	Toxics	Revise Human Health and Aquatic Life Toxics Criteria	DRBC, TAC														
		Advisory Committee recommends revised toxics criteria for adoption	DRBC														
	pH	Review / Revise pH Criteria	DRBC, WQAC														
		Advisory Committee recommends revised pH criteria for adoption	DRBC														
	Temperature	Develop Strategy and Revise Temperature Criteria	DRBC, WQAC														
		Advisory Committee recommends revised temperature criteria for adoption	DRBC														
	Ammonia	Develop Ammonia Aquatic Life Criteria (Acute/Chronic)	DRBC, TAC														
		Advisory Committee recommends revised ammonia criteria for adoption	DRBC														
	Bacteria	Develop Bacterial Criteria	DRBC, WQAC														
		Advisory Committee recommends revised bacterial criteria for adoption	DRBC														
	DO	Review / Revise Uses & DO Criteria	DRBC, WQAC														
		Advisory Committee recommends revised DO Criteria for adoption	DRBC														
	Biocriteria	Develop Biocriteria	DRBC, WQAC, Bio Subcommittee														
		Advisory Committee recommends biocriteria for adoption	DRBC														
	WQS	General Review of Water Quality Standards & Policies	DRBC, WQAC, TAC														
		Prioritization for revision of other water quality standards	DRBC														
Water Quality Policy Decisions	Basin-wide Standards	Determine policy direction	DRBC														
	Stacked Tributaries																
	Extension of Toxics Criteria (Zones 1 & 6)																
	Shared Waters																
	Regionalization																
	Basin-wide Standards	Implementation of policies	DRBC														
	Stacked Tributaries																
	Extension of Toxics Criteria (Zones 1 & 6)																
	Shared Waters																
	Regionalization																