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# RARITAN BASIN WATERSHED MANAGEMENT PLAN

## Summary

The Raritan Basin Watershed Management Plan (Raritan Plan) was developed by stakeholder participants from the Raritan River Basin, including the North & South Branch Raritan Watershed Management Area (WMA 8), the Lower Raritan WMA (WMA 9) and the Millstone River WMA (WMA 10). The New Jersey Water Supply Authority provided staff and project management services to the stakeholders under a Memorandum of Agreement with the New Jersey Department of Environmental Protection, with funding provided by both State agencies. This agreement was developed in response to requests by region stakeholders for Department assistance in protecting water resources of the Raritan River Basin. Hundreds of stakeholder participants from a very wide variety of governmental and non-governmental interests played a major role in developing the Raritan Plan. The Plan received an award from the New Jersey Planning Officials in May 2003.

The plan includes the following major components:

- Vision Statement and rationale
- Goals that drive the Raritan Plan to address the vision statement and the issues identified through the characterization and assessment process (see Attachment A).
- Measurable objectives that will lead to achievement of the goals
- Implementation Strategies (see Attachment B) that will achieve the objectives. Each includes a detailed action plan with responsible parties, funding needs and a schedule for implementation.

The following list briefly summarizes the major changes planned for the Raritan River Basin:

- **Protection and preservation of lands** that play a critical role in the protection of Raritan Basin water resources, including headwaters streams.
- **Maintenance and restoration of ground water recharge** to ensure sufficient supplies for dry weather stream flow and public use, and to minimize stormwater runoff.
- **Improved control of stormwater** through watershed-based management plans, improved site design techniques and attention to stormwater impacts on stream stability and flooding.
- **Management of water supply resources** on a subwatershed, watershed and regional basis so that sustainable levels of resources use are not exceeded, ensuring adequate water for both human and ecosystem uses.
- **Restoration of streams and riparian areas** that have been physically damaged by harmful land uses and stormwater management practices, and protection of high-quality streams and riparian areas.
- **Restoration and protection of ground and surface waters** that are currently or prospectively impaired by excessive pollutant loads, through a combination of regulatory and non-regulatory programs affecting both point and nonpoint sources of pollutants.

## Vision Statement

The Raritan Plan envisions a Raritan River Basin in which the following occurs as quickly as possible but no later than within a generation:

- **Overcoming the Past:** The impacts of existing and former land and water uses and pollutant discharges are remedied so that water quality, water supplies, flood plains, aquatic habitats and, indeed, the total capacity of Raritan River Basin as a water resource are restored to health.
- **Managing the Future:** Future land uses, pollutant discharges and water uses are carefully managed and remain within the long-term sustainable resource levels. Land uses and people are not placed at risk from flooding and other natural disasters. Land preservation efforts protect the vital water resources of the Raritan River Basin.
- **Taking Responsibility:** All individuals living and working in the Raritan River Basin understand and take responsibility for the impacts of their actions on the Raritan River Basin, and for being part of the solution.
- **Maintaining Vigilance:** Decision makers in the public, private and non-profit sectors learn from the past, anticipate the future, understand the dynamics of our complex region, and act in concert to protect the vital natural resources of the Raritan River Basin.

## Characterization and Assessment of Key Issues

The Raritan Basin Watershed Management Project produced seven technical reports and two background reports, written to characterize and assess the condition of the Raritan River Basin. The characterization and assessment reports are a collection of findings about the Basin and a foundation for the development of the watershed management plan. A complete summary of the characterization and assessment reports is found in “Portrait of a Watershed: the Raritan River Basin.” Full details are provided in the seven technical reports and two background reports at [www.raritanbasin.org/technical\\_reports.htm](http://www.raritanbasin.org/technical_reports.htm).

Six major issues (along with many other lower priority issues) were identified through the characterization and assessment process. See Attachment A for additional information.

- Surface Water Pollution
- Loss of Riparian Areas
- Biological Impairment of Streams
- Loss of Ground Water Recharge
- Water Supply Limitations
- Stormwater Impacts

## Implementing the Raritan Basin Watershed Management Plan

Raritan stakeholder participants envision that most plan implementation will occur through existing organizations and new partnerships. Successful Raritan Plan implementation will require coordinated effort. Therefore, the Raritan stakeholders propose that a coordinating body should be established – the Raritan Basin Watershed Alliance, which would perform the following functions, *with the caveat that the Basin-wide structure should not duplicate or preempt the work or capabilities of others, nor disrupt funding for them*:

1. Keep the Raritan Plan current and continually improving – track progress, update, adapt, ensure that the strategies are scientifically defensible, and react to new circumstances, policy changes and environmental conditions

2. Create public and official support for Plan implementation
3. Create coalitions/partnerships for Plan implementation and assist with acquisition of financial and other resources where requested
4. Encourage and support implementation efforts and assist with project planning
5. Maintain and enhance technical knowledge and capabilities of the Basin and ensure dissemination to those who need it
6. Do the above with the minimum resources necessary

## Summary of Implementation Challenges & Recommendations

### Institutional Capacity Issues

There are many organizations, agencies, governments and private institutions capable of implementing aspects of the Raritan Plan. However, **no entities, individually or in combination, can successfully implement the entire Plan at their current level of staffing, capital funding and, in some cases, statutory authority.** NJDEP regulatory mandates can achieve a great deal, but cannot possibly achieve all, especially with regard to land acquisition, existing land uses and stream impairment. The capital costs are high for land acquisition, stormwater system retrofits, increased water protection measures in new development and redevelopment, etc. Organizational costs (both public and non-governmental) will also be high. **It would not be unreasonable to estimate total costs over two to three decades in the hundreds of millions of dollars.**

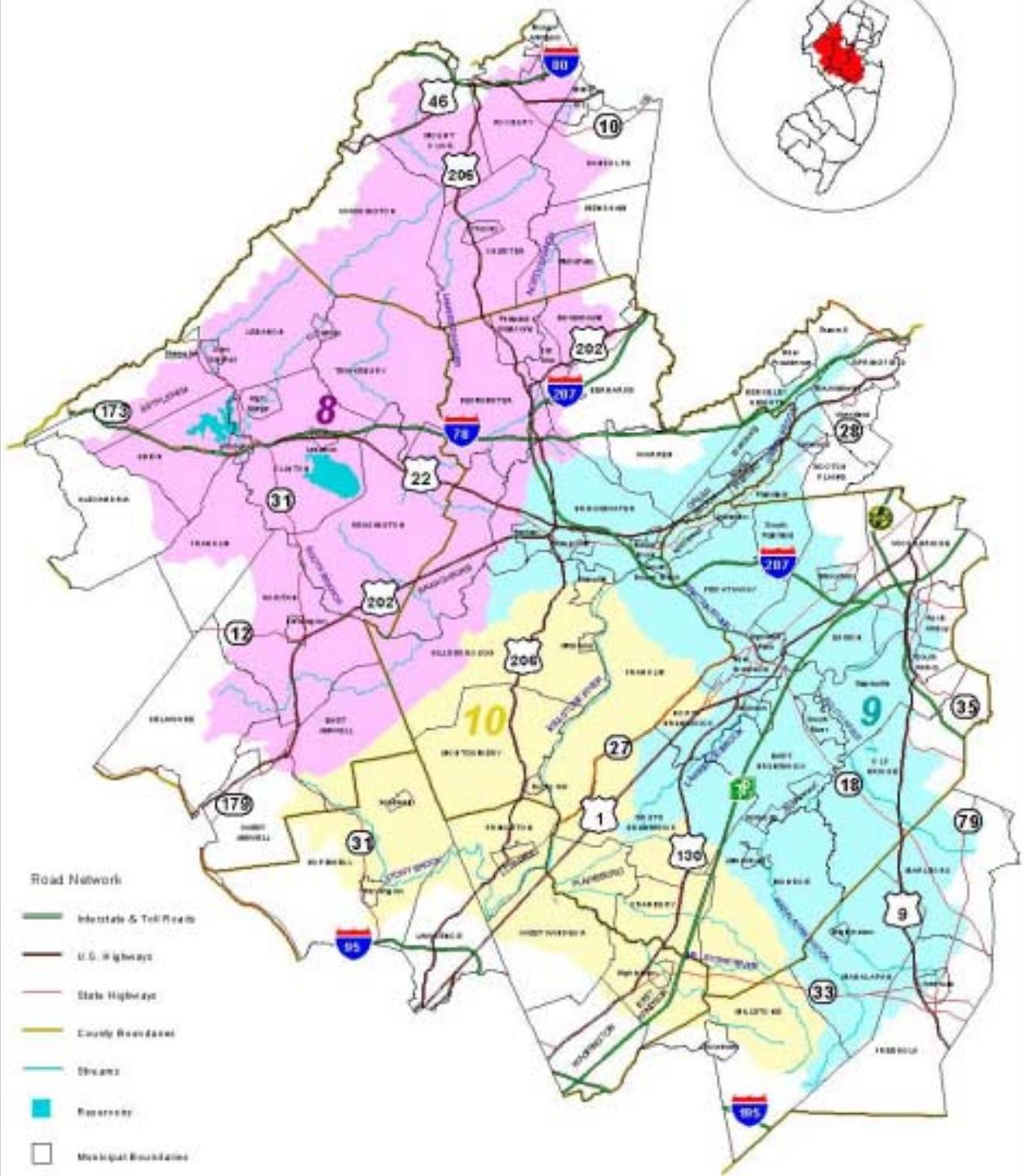
Resources are currently available to cover some of these costs (e.g. land acquisition, developer compliance with permits, utility costs), but certainly not all. **The largest unmet costs of the Raritan Plan will involve improved management of existing land uses.** Funding will be needed to improve agricultural management practices, management of urban and suburban land uses (e.g., lawns and streets), retrofit of stormwater systems, ground water recharge restoration, monitoring and assessment, public education, etc. In addition, there are costs involved in improving land use planning and development controls that cannot be charged to developers; municipalities, counties and other watershed partners will need to raise resources – either internally or externally – to cover these necessary costs.

### Legal and Regulatory Issues

The Raritan Plan identifies needs for new or modified statutory authorities to assist plan implementation:

- Authorizing municipalities and counties to establish stormwater management programs funded by “user fees” that are assessed on the basis of impervious cover and are dedicated to stormwater management activities through government departments or stormwater utilities.
- New Jersey’s system of water laws can have unintended results, as they were adopted over a period of decades and have never been fully integrated. The land use laws, especially the Municipal Land Use Law, often provide insufficient guidance with regard to water resources impacts. Over time, better integration of the existing laws is needed.

# Municipalities and Road Network within the Raritan Basin



- Road Network**
- Interstate & Toll Roads
  - U.S. Highways
  - State Highways
  - County Roadways
  - Streams
  - Reservoirs
  - Municipal Boundaries

- Watershed Management Areas**
- Upper Raritan
  - Lower Raritan
  - Middlesex



Scale = 1 : 300,000



## Attachment A – Characterization and Assessment of Key Issues

The six major issues (along with others) identified through the characterization and assessment process are:

- **Surface Water Pollution** -- The Raritan Basin has surface water pollution problems. Two key problems are high levels of phosphorus and fecal coliform bacteria. Nonpoint sources are the sole cause in approximately one-third of the Basin, and will be the sole focus of water pollution control plans there. However, in the remaining watersheds such plans must address both point and nonpoint sources; control of point sources alone will likely be sufficient to correct problems across all flows. NJDEP will be developing TMDLs over time, but management measures can be initiated now based on the characterization and assessment results and local knowledge of land uses and riparian corridor quality. The Raritan Basin has widespread stream ecosystem impairment, usually moderate but sometimes severe. A few pesticides have been found at levels that can harm human health and aquatic life.
- **Loss of Riparian Areas** – Riparian areas historically covered roughly one third of the Raritan Basin. Losses within specific subwatersheds range from minimal to over 80 percent as of 1995, with average losses of 32 percent in the Upper Raritan, 31 percent in the Lower Raritan and 28 percent in the Millstone. While most riparian losses were initially to agriculture, most recent losses are to development. The heaviest losses are in the urban areas, but the Neshanic River watershed (with some of the worst water quality in the Basin) shows significant losses (over 40 percent), mostly to agriculture.
- **Biological Impairment of Streams** – NJDEP assesses streams for ecological health every five years, and some watershed associations have more frequent biological monitoring. The Raritan Project reports use both data sets. Based on NJDEP's basin-wide work, the number of severely and moderately impaired streams increased from 1993 to 1998, though some streams improved.
- **Loss of Ground Water Recharge** – The Raritan Project used a NJ Geological Survey model to assess ground water recharge rates in 1986 and 1995. The assessment results were startling – one of the biggest surprises in the project. Two subwatersheds showed estimated losses of over 20 percent in just 10 years, and many others showed losses between 15 and 20 percent. These losses can have a major impact on stream flows and aquifer stability. New NJDEP regulations promise to significantly reduce impacts from new development practices, but not restore existing losses. The Raritan Project used another NJ Geological Survey model to estimate the number of septic systems that could be supported in each subwatershed, based on a nitrate target level of 5.5 milligrams per liter. Using this target, **no Basin subwatershed can support septic systems at average densities higher than 1.6 acres per septic system**. A lower nitrate target – as advocated by many who wish to preserve better ground water quality – would increase those average lot sizes proportionally.
- **Water Supply Limitations** – The NJ Water Supply Authority has a safe yield of 225 million gallons per day using surface water supplies. Ground water supplies are spread out, hard to measure and extremely variable from area to area. Perhaps 85 to 135 million gallons per day are available. Population density increases in rural and suburban areas are a water supply concern, as these areas are usually dependant on ground water. Providing public supplies to rural areas is extremely expensive and substituting surface water for ground water in public supply areas may create conflicting demands for a limited resource.
- **Stormwater Impacts** – Most of the urban land that we will have in 2010 already exists. Some historic urban areas have essentially no stormwater controls – the priority then was getting water into the streams as fast as possible. Since the 1970's stormwater controls have gradually improved to control stormwater quality and discharge rates from new development sites. However, retrofit of older systems rarely occurs and even well-built systems are typically not maintained properly. Finally, we rarely manage stormwater on a watershed basis. Unfortunately, uncoordinated site-specific controls don't provide sufficient environmental protection in most cases. One of the major impacts of urbanization on streams is disrupted stream hydrology.

## Attachment B – Implementation Strategies

A set of Goals, Objectives and Strategies Tables list the implementation strategies necessary to achieve the priority objectives in each Watershed Management Area and basin-wide. It is critical to note that the Raritan Plan is not a regulatory document – every strategy requires voluntary actions at some level before it is implemented.

### Basin Transformational Strategies

Some strategies were identified that would involve major changes in how Basin water resources are perceived, protected and managed. These strategies are termed “transformational” because of their enormous potential, if implemented. The transformational strategies are:

**RB-S1** – Focus land preservation on high priority lands to protect lands that are critical to the quality and quantity of Basin ground and surface water resources

**RB-S2** – All municipalities adopt land use provisions in their master plans and ordinances requiring that developments preserve critical areas for water resource protection.

**RB-S3** – Develop an integrated water budget system (ground and surface water, graded from subwatershed to regional aquifers) that accurately defines available supplies for human and ecological uses and identifies stressed areas based on current and future needs. Allocate water yields within sustainable levels as determined by water budgets for each geographic unit.

**RB-S4** – Finance and construct a new Raritan Basin surface water supply facility in conformance with the NJ Statewide Water Supply Plan to meet projected reasonable and necessary demands in surface water supplies.

**RB-S5** – Create a policy and planning “toolbox” for municipalities and developers that can be used to control development impacts, including environmentally sensitive zoning and site design techniques such as low impact development and smart growth methods. Provide training for municipalities (e.g., municipal and consultant planners and engineers and land use boards) and developers (e.g., engineers, planners, architects and landscape architects) and provide technical and planning assistance to municipalities in using the toolbox.

**RB-S6** – Develop local institutional capacity to ensure implementation and proper operation, maintenance, upgrades and replacement of stormwater management systems for the purposes of flow control and pollutant loading controls, in a manner that assists with implementation of municipal stormwater NJPDES permits to be required by NJDEP and is consistent with a comprehensive, regional stormwater management program.

**RB-S7** – Develop and implement watershed-based stormwater management plans for all watersheds with major existing or anticipated development, to ensure no degradation of stream ecosystems or increase in flooding and mitigate existing impacts.

**RB-S8** – Implement a ground water recharge restoration pilot project in each physiographic province in subwatersheds that have lost significant recharge due to past land use changes.

### Flooding

**NSSM-S1A1:** Implement a federal level flood damage reduction study to:

- Investigate the potential for minimizing flood damages by changing current land uses in flood prone areas.
- Investigate more stringent peak site outflow requirements to reduce flooding in existing flood prone areas.
- Investigate the potential for minimizing flood damages by changing land use management practices in upland areas that are contributing to flooding problems.

- Investigate the potential for minimizing flood damages through the use of structural and nonstructural measures in flood prone areas.
- Reproduce pre-development hydraulic conditions.

**MSW-S1B1:** Conduct watershed based analyses for flood reduction projects.

**NSSM-S1B7:** Develop & implement watershed-based stormwater management plans for all watersheds with major existing or proposed development areas with evidence of localized flood damages.

**LRSW-S4A2.** Provide assistance to municipalities and counties to develop and implement local and regional stormwater management plans that incorporate the following:

- Reduce the volume of stormwater generated.
- Protect ground water recharge.
- Remove pollutants from stormwater runoff prior to release to protect water quality.
- Reduce flood runoff rates for areas contributing to frequently floodprone areas.
- Requirements that all permanent stormwater facilities be regularly inspected and maintained according to appropriate guidance to ensure performance and maximum efficiency
- Protect floodplains to reduce flooding.

**LRSW-S3B1.** Establish voluntary and regulatory measures that will minimize future flood damages. Require state, county and municipal regulation of stormwater from new development and redevelopment to accomplish the following:

- Reduce stormwater runoff rates for areas contributing to frequently floodprone areas.
- Protect floodplains and restrict land uses in floodplains and floodways to prevent future flood damages

**MSW-S1A2:** Create a public process to solicit opinions on acceptable levels of flood damage reductions and acceptable flood damage reduction solutions. Determine public demands and government requirements for flood damage reductions.

#### Riparian Areas and Surface Waters

**NSLU-S1B4:** Promote the preservation of open space by promoting the use of the Raritan Basin water resources protection open space criteria by land preservation entities and municipalities.

**MOR-S1B4:** Work with SBMWA to get all 26 municipalities to incorporate water resources open space planning and riparian area protection into their master plan.

**MOR-S2A1:** Get all open space and land trust organizations in the Millstone WMA to use the water resources protection open space criteria or the like to achieve and coordinate with their broader organizational purposes.

**NSLU-S1D4:** Encourage the implementation of municipal ordinances (e.g., tree protection, stream corridor) that require reforestation of publicly owned lands and personal property along water resources of the WMA.

**NSHW-S1C1:** Provide specific guidance to encourage municipalities to implement headwaters protection and enforcement.

**NSHW-S2B1 and LRWR-S1C1:** Establish and carry out a coordinated, watershed based, governmental and private sector effort to plan and implement restoration activities that will improve the function and quality of headwater streams.

**MOR-S3B1:** Create an “Adopt-a-Stream” program of stream bank restoration and reforestation opportunities for businesses, schools, and environmental groups.

## Stormwater and Nonpoint Source Management

**NSSM-S2B2:** Require project designs that minimize impervious surface and retain native vegetation for landscaping. Designs should utilize the pervious landscape to naturally filter and infiltrate runoff before it leaves the development site where possible.

**NSSM-S3A1:** Create financial or other incentives for incorporating BMPs, reducing NPS loads, etc. beyond current standards in development and redevelopment projects.

**NSSM-S3A2:** Adopt requirements for new development to protect water quality. Project designs shall:

- duplicate existing flow regime and volume conditions as closely as possible in a manner that protects water resources,
- utilize the pervious landscape to naturally filter and infiltrate runoff before it leaves the development site where possible.
- require utilization of nonstructural techniques, including pollution prevention and source reduction, to minimize the type of treatment stormwater needs.

**LRSW-S1B2.** Improve the effectiveness of new stormwater management systems to protect and restore watershed health through restored baseflows and controlled storm flows. Require regulation of stormwater from new development and redevelopment to accomplish the following:

- Achieve post-development hydrologic conditions that result in no additional alteration to the physical characteristics and functions of the receiving water bodies
- Maintain ground water recharge at specified levels on a municipal or county basis
- Achieve no net increase in stormwater volume
- Minimize the extent to which systems short circuit the beneficial effects of riparian areas for flow control
- Achieve no net detrimental change in post development ground water infiltration rate and volume from pre-development conditions
- Protect and utilize natural drainage features
- Require additional performance criteria to critical or sensitive areas
- Require alteration of project designs, where necessary so that the specified criteria are met

**LRLU-S3A4.** Adopt site plan provisions mandating minimum disturbance of lands that have attributes likely to exacerbate NPS loadings if developed, such as highly erodible soils, steep slopes, acid producing soils.

**MSW-S2A1:** Determine the cause of scour, erosion and sedimentation in degraded stream channels and identify and design projects to remedy.

**LRSW-S1A2.** Improve the effectiveness of existing stormwater management systems to protect and restore watershed health through restored base flows and controlled storm flows. Establish methods, priorities and projects for retrofit of existing systems to accomplish the following:

- Reduce stormwater runoff rates
- Reduce stormwater runoff volume
- Increase groundwater infiltration
- Increase groundwater recharge

**MNP-S1B6:** Implement a campaign to reduce excess lawn fertilizer use, including a phosphorus fertilizer ordinance

**MNP-S1E2:** Implementation of agricultural nutrient management plans and integrated crop management

**MNP-S1A4:** Implement pilot watershed measures, under US Fish and Wildlife Eastern US Migratory Bird Control Program, to reduce resident and non-resident geese waste impact on water quality

**NSSM-S2B4 and LRSW-S4B1:** Create local funding capacity (e.g., stormwater utility, municipal or county department, or private utility), to ensure adequate, ongoing funding for stormwater management activities and to provide funding to contribute to regional stormwater management projects.

#### Water Quality

**LRWQ-S1A1.** Develop and implement an initiative for each subwatershed to maintain water quality from 2004 forward in water bodies that meet water quality standards.

**LRWQ-S1A3.** Develop and implement an initiative to temporarily improve point source discharge quality for specific parameters of concern during extreme low flows where such actions are determined to be significantly beneficial to the water body.

**LRWQ-S1C1.** Develop and implement an initiative to improve point source and nonpoint source discharges to treat key pollutants that lack criteria but raise substantive health issues.

**LRWQ-S1D3.** Develop and implement a citizen water quality monitoring network in each subwatershed to allow for reassessment every four years, at a minimum.

**LRLU-S4A3.** Develop and implement zoning provisions and ordinances and resolutions regulating the siting, design, density and maintenance of septic systems in order to maintain no additional net negative impact to water resources. These provisions shall include, but not be limited to:

- - location of individual septic systems away from surface waters.
- - density of individual septic systems.
- - location of individual septic systems away from highly sensitive ground water recharge areas such as geologic faults, excessively drained soils, wellhead protection areas.

#### Water Supply

**MWS-S1A1:** Develop an integrated water budget system (ground and surface water, from subwatershed and local aquifer to Raritan River Basin and major aquifer) by 2005 that includes updated definition (including modifications based on provisions to reduce the need for drought declarations through a more conservative estimate of safe and dependable yields) and estimates of safe and dependable yields (both from within the target area and available through inter-watershed transfers), current water uses and water allocations, adopted through either Statewide Water Supply Plan (advisory document) or Water Quality Management Plans (regulatory).

**MWS-S1A2:** Determine reasonable potential water supply needs of future land uses, availability relative to the water budgets, and equitable allocation relative to category of water user, using water supplies of quality and dependability that correspond to the legitimate needs of the user (i.e., highest quality and dependability for sensitive ecosystems and potable water supply), and adopt through either Statewide Water Supply Plan (advisory document) or Water Quality Management Plans (regulatory).

**MWS-S1A3:** Develop and implement actions to bring into balance water use demands in specific subwatersheds, watersheds, local aquifers and regional aquifers where the water budget indicates that internal demands exceed available safe and dependable supplies (both from within the target area and available through inter-watershed transfers).

**LRLU-S4B1.** Implement and enforce water supply capacity limits for suppliers based on the water budgets developed for the WMA so that entities within the WMA will not be permitted to exceed their water supply capacity limits.

**MWS-S1C1:** Implement ground water restoration pilot project in at least one subwatershed in the Coastal Plain and the Piedmont that has experienced significant loss of estimated ground water recharge, to determine the most appropriate methods and most significant limitations to recharge restoration

**MWS-S1D2:** Develop and implement site- and watershed-specific beneficial reuse and creative, alternative or non-traditional supply projects to maximize the benefits of used water, within the sustainable capacity identified in the water budget.

**MWS-S1D5:** Implement an incentive-based program to retrofit existing buildings and landscapes to reduce water use and to provide for rapid and targeted drought conservation.

**LRLU-S2A3.** Develop and implement programs to reduce peak daily and average annual per capita water withdrawals through water conservation and re-use.

#### Education and Outreach

**RBEO-S1A5** – Improve education of students (and through them, their parents) about water and Raritan Basin issues through increased training of teachers using existing programs (e.g., Project WET, NJ Audubon Society's WATERS curriculum, teacher training programs offered by watershed associations) and additional programs as the need is identified.

**RBEO-S1B2** - Improve education of residents and homeowners (especially those within or near riparian areas and significant ground water recharge areas) through replication and expansion of the Stony Brook-Millstone Watershed Association's River Friendly Resident program or other similar programs. Encourage residents and homeowners to take personal actions beneficial to the watershed