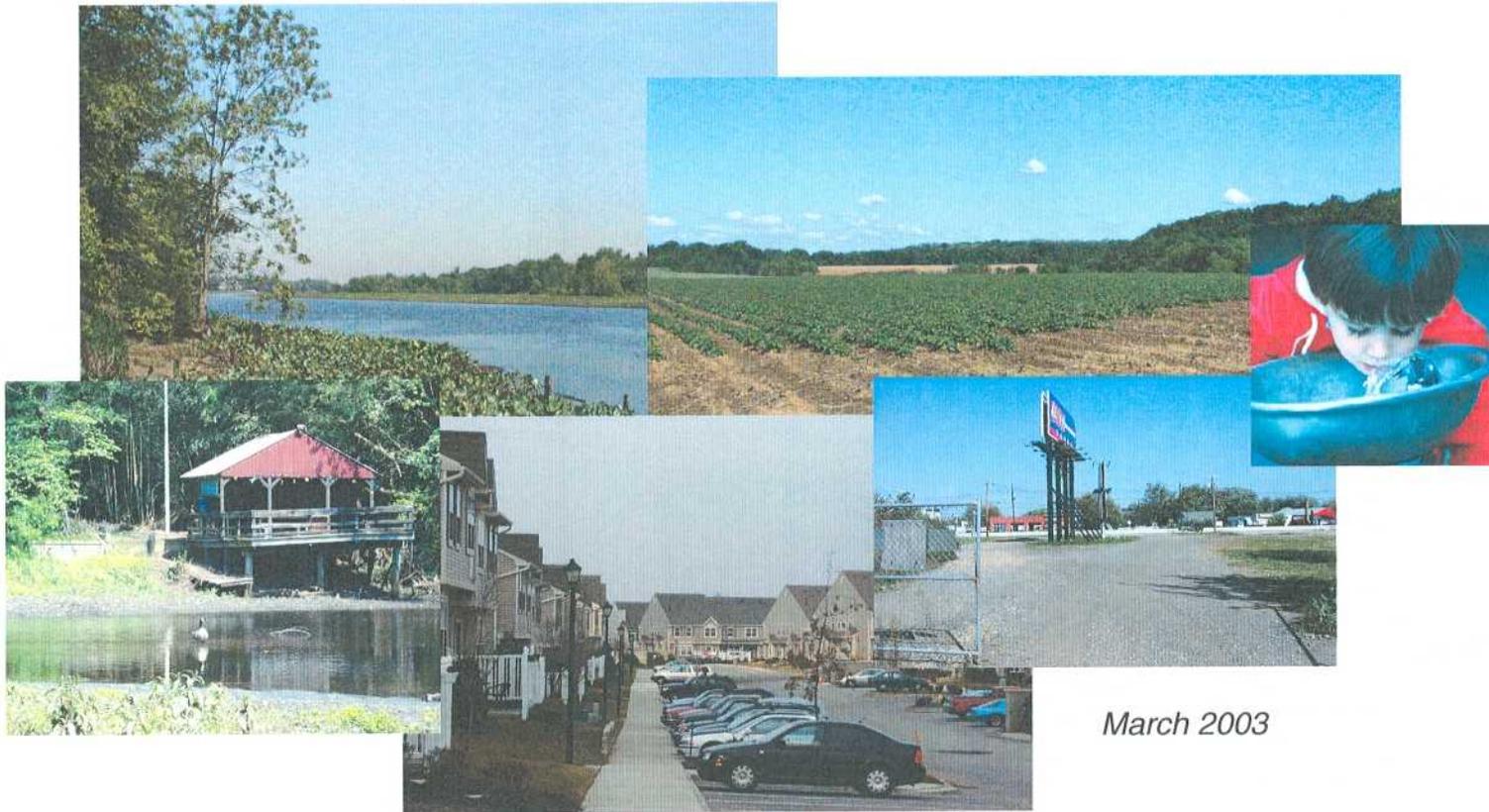


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# *Clean and Plentiful Water: A Management Plan for the Rancocas Creek Watershed*

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*March 2003*

*Rancocas Creek Watershed Management Plan prepared by:  
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## MISSION STATEMENT

*“Develop and implement a watershed management plan that protects, enhances, manages or maintains our natural resources, including water quality and quantity that is fishable, swimmable, and potable; and improve public awareness of watershed issues.”*

— adopted by the Rancocas Creek Watershed  
Public Advisory Committee, Sept. 1998

## Acknowledgements

In recognition of their participation, cooperation and support, sincere thanks are extended to the Burlington County Board of Chosen Freeholders, the Mount Holly MUA and members of the Rancocas Watershed Association, the Rancocas Conservancy, the Burlington County Soil Conservation District, Omni Environmental Corporation, Woodford Cedar Run Wildlife Refuge and the many volunteers who attended meetings and contributed to this plan, which has been reviewed and endorsed by the Watershed Management Area 19 Public Advisory Committee and the Burlington County Board of Chosen Freeholders.

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*“The creation of a thousand forests is in one acorn.” — Ralph Waldo Emerson*

## Introduction

The purpose of a watershed management plan is to outline a comprehensive strategy for identifying water quality problems in waterways in a defined area and developing and implementing a broad range of practical solutions to address those problems.

This watershed management plan covers the Rancocas Creek Watershed Management Area — Watershed Management Area 19 as designated by the New Jersey Department of Environmental Protection (DEP) — one of 20 such areas in the state. Figure 1 illustrates the extent of Watershed Management Area (WMA) 19. The entire area is 360 square miles. It spans 29 municipalities in portions of three counties.



Figure 1. The Rancocas Creek Watershed Management Area

## **A Partnership Approach**

DEP initiated watershed management planning in an effort to bring state and local resources together to facilitate compliance with the federal Clean Water Act. The primary goal is clean and plentiful water statewide that is swimmable, fishable and potable.

This watershed management plan represents the results of work carried out by the Public Advisory Committee (PAC) of the Rancocas Creek Watershed, the Burlington County Board of Chosen Freeholders, the DEP, and the many partners to the Public Advisory Committee. The PAC is a citizens' group comprised of people from diverse backgrounds: environmental groups, sewerage authorities, municipal engineers, municipal officials, farmers, concerned citizens and others. Through this diverse group, partnerships were established with the Rancocas Watershed Association, an association of wastewater utilities, and the Rancocas Conservancy, a non-profit land conservation organization. The partnership of the PAC, County, DEP, RWA, and Rancocas Conservancy provided effective guidance and the momentum for the development of this plan.

The PAC began meeting in September 1998, with coordination from the DEP Division of Watershed Management. Six subcommittees eventually formed, including the Non-Point Source Subcommittee, the Water Resources Working Group, the Technical Advisory Committee, the Land Use Subcommittee, the Public Education and Outreach Subcommittee, and the

## **What is a Watershed?**

*A watershed is all of the land that drains into a waterway and its tributaries. The Rancocas Creek watershed stretches from headwaters in Manchester Township, Ocean County, in the east, down to Berlin Township, Camden County, in the southwest and up to the Delaware River at the mouth of the Rancocas in the northwest. At the western end, the watershed is older, urban development. The mid-section is more recent suburban, primarily residential development, and the eastern third contains rural, residential and agricultural lands. The range of land uses atop wide variations in geology and soil makes water quality management challenging on this broad scale. However, this plan outlines proven strategies for achievable water resource improvements in this watershed.*

Steering Committee. The diverse character of the PAC extended to the membership of the subcommittees, assuring a balanced approach to identifying the issues, goals, and objectives.

In November 2000, DEP granted Burlington County \$550,000 over four years to administer the process and produce deliverables spelled out in the scope of work. That grant was subsequently reduced to \$350,000 over two years. The grant contract between DEP and Burlington County identified a number of deliverables, including base maps and GIS layers, education and outreach materials (press kit, display, WMA19 brochure,

a watershed education presentation, and others), vision and issues lists, an “Action Now” spreadsheet, an open space spreadsheet, selection of Total Maximum Daily Load (TMDL) reference stations, review and input on development of TMDLs, a water budget in participation with DEP, an updated water quality and biological database, and a watershed management plan.

This document represents the culmination of administrative efforts by Burlington County to assist the PAC in producing a watershed management plan. It reflects both the planning efforts and the steps already taken in a clear strategy to attain a cleaner watershed with a more abundant water supply.

### ***Plan Overview***

This plan includes specific water quality objectives of the PAC and strategies to achieve those objectives. In text and charts, it also identifies partners responsible for implementing strategies, and provides for evaluation of the effectiveness of the plan in future years to determine if additional measures are needed.

In addressing the requirements of the Clean Water Act, this plan lists specific contaminants of concern identified through DEP’s water quality monitoring and elaborates on the potential sources of contaminants, with emphasis on non-point source pollutants. The plan also discusses the development of TMDLs for those contaminants.

Appended to this management plan is a report that greatly aided the process of identifying water quality problems within the watershed and developing appropriate strategies to address them. The “Rancocas Creek Watershed Characterization and Assessment Report” includes information on geology, cultural background, hydrology and water quality data gathered from several organizations. Data sources included the Mount Holly Municipal Utilities Authority, the Burlington County Health Department, the Pinelands Commission and DEP. TRC Omni Environmental Corporation produced the report under contract to the Burlington County Board of Chosen Freeholders. This report on CD-ROM is attached to this plan as Appendix A.

### ***Summary***

The information presented in this report provides a comprehensive overview of the water quality challenges within this watershed and specific steps to improve water quality and quantity. The charts and checklists provide responsible partners with a blueprint for action, outreach and subsequent evaluation. With completion of this management plan, the process now moves from planning to implementation. Given the steps taken to date to improve and protect water quality, including model ordinances for reducing stormwater runoff, partners in this watershed can now build upon that foundation using this blueprint in a concerted effort to help assure clean and plentiful water resources for future generations.

*“One touch of nature ... makes all the world kin.” – Shakespeare*

## Challenges

Effective watershed management planning involves identification of

- the major threats to water quality and quantity,
- sources of pollutants of concern, and
- practical, corrective and preventive measures.

To identify water quality and supply problems within the watershed, this planning process progressed down dual paths. One process used DEP's 303(d) lists of impaired waterways to identify water pollutants for which Total Maximum Daily Loads (TMDLs) had to be established. The Technical Advisory Committee worked with DEP on that effort. The PAC then approved the recommended approach for setting TMDLs. The TMDL approach paper is available from DEP's Division of Watershed Management. In the second process, the PAC identified other water quality concerns.

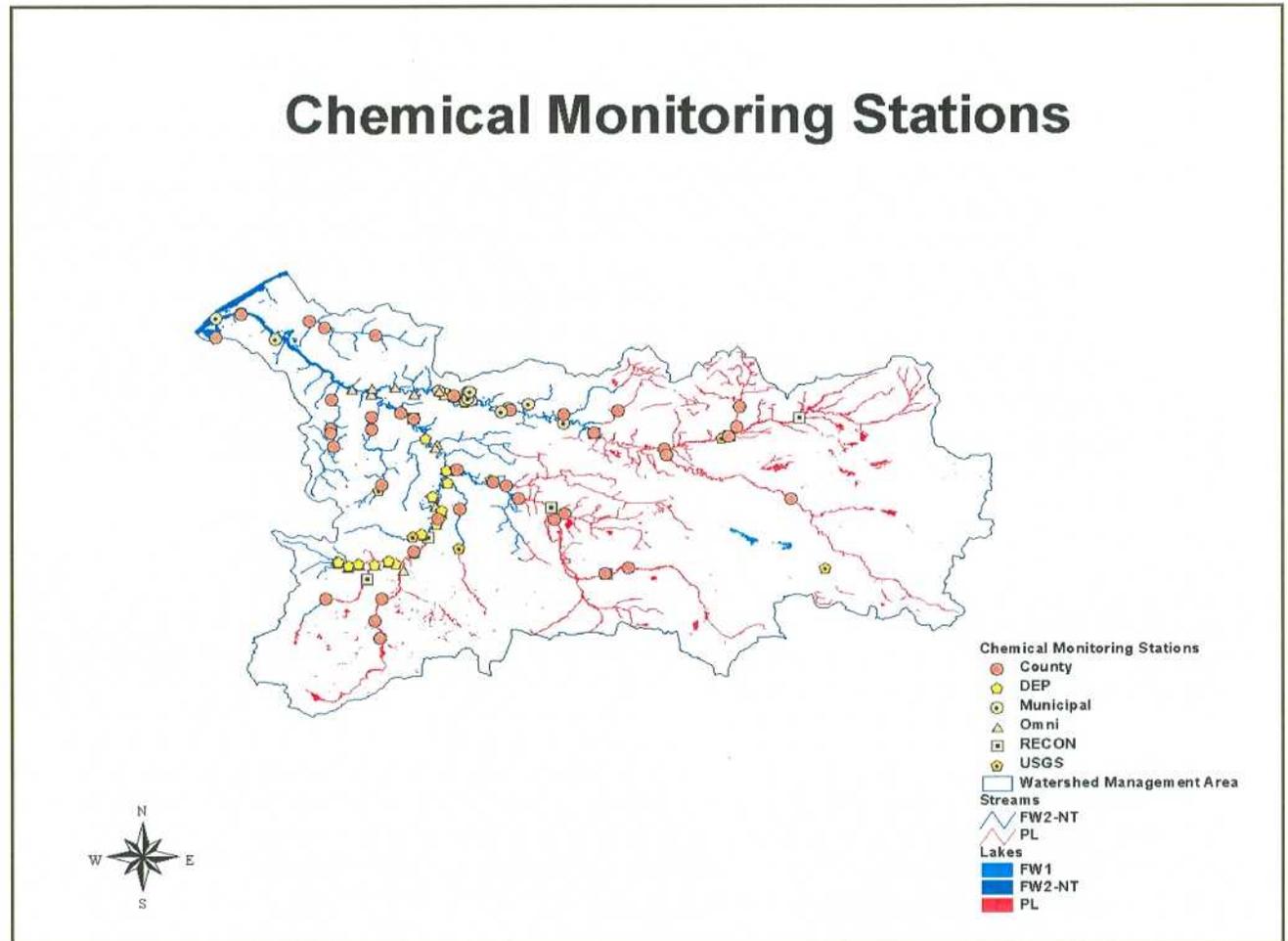


Figure 2. Sampling locations

### Contaminants of Concern

The Characterization and Assessment Report appended to this plan maps numerous locations throughout the watershed where sampling has been conducted by various agencies (See Figure 2) for dissolved oxygen, phosphorus, nitrogen, fecal coliform, total dissolved solids and pH - key indicators of the health of a waterway.

The report concludes that dissolved oxygen, total dissolved solids and nitrogen levels are generally good, and that low pH levels may in most cases be naturally occurring, given the natural acidity of the headwaters in the pinelands. However, fecal coliform, a potential health hazard, and phosphorus, which can lead to eutrophication of a waterway, are a concern.

Table 1 lists the contaminants of concern identified by DEP in its 1998 listing of impaired waters, Identification and Setting of Priorities for Section 303(d) Water Quality Limited Waters in New Jersey, NJDEP, Sept., 1998. It listed impairments based on samples collected between 1995 and 1997 through its Ambient Surface Water Monitoring Network. Not all sites were sampled for each contaminant during every sampling round.

DEP updated the listing in 2002 based on additional sampling, concerns over the quality of the data, and the assumptions used in evaluating the data. The updated listing did not remove any of these contaminants from

the list of impairments to the Rancocas Creek. However, some locations that were formerly considered impaired were removed from the list or listed as not impaired. DEP has been reviewing the methodology by which sites or contaminants were originally included on the lists. For details regarding the methodology, contact DEP's Division of Watershed Management.

As required by the Clean Water Act, DEP formulated an approach to deal with each contaminant in the non-tidal reaches of the Rancocas Creek and its tributaries - the eastern end of the watershed and much of the central region, up to Vincentown and Mt. Holly. The document, Technical Approaches to Restore Impaired Waterbodies in the Non-Tidal Rancocas Creek Watershed, NJDEP, April, 2002, recommends steps to develop TMDLs for the contaminants or to determine that no TMDL is needed. The technical approach document was reviewed and approved by the WMA19 Technical Advisory Committee (TAC). In May 2002, the entire PAC supported the recommended approach. The document is available from DEP's Division of Watershed Management.

The approach document deals only with non-tidal waters. The approach for developing TMDLs in the tidally influenced waters is being prepared by the Delaware River Basin Commission. At the time this plan went to press, the commission had not yet completed its report.

Contaminants of Concern			
Contaminant	1998 Sites	2002 303d Lists	Recommendation of Approach Paper
Metals	copper	SB051-050-01465850B	<b>N.Branch</b> @ Pemberton & Hanover Furnace Site remediation of contaminated Fort Dix location will remove cause (does not address existing levels in sediment) in North Branch
	lead	SB 051-050-01465850B	<b>S.Branch</b> @ Rt38, Hainesport; Rt70, Medford; & Vincentown. <b>N.Branch</b> @ Pemberton & Hanover Furnace Insufficient data – due to inadequate analytical detection limits
	mercury	NB 052	(fish tissue) – <b>Mirror Lake.</b> <b>N.Branch</b> @ Hanover Furnace Insufficient data – detection limit is above aquatic life standard
	zinc	? Tidal	Not Listed De-list based on existing, readily available data
Total Dissolved Solids	SB 051-050-01465850B		De-list based on readily available data and additional data
Fecal Coliform Bacteria	AN0151 NB; SB 051-050-01465850B; NB 052-040-01467000	<b>N.Branch</b> @ Pine St., Mt. Holly; & Browns Mills. <b>S.Branch</b> @ Hainesport. <b>Sharps Run</b> @ Rt.541, Medford	Evaluate source before setting TMDL on North Branch <u>only</u> between Pemberton Borough and Mount Holly Dam Additional monitoring at Sharps Run & on Little Creek @ Chairville
Total Phosphorus	SB 051-050-01465850B NB AN0151	<b>N.Branch</b> @ Iron Works Park & Pine St., Mt. Holly; & Browns Mills. <b>S.Branch</b> @ Rt38, Hainesport; & Vincentown. <b>Sharps Run</b> @ Rt541 Medford	Evaluate source – potential contribution of Navesink formation; possibly de-list due to naturally occurring condition DEP will develop site-specific nutrient criteria to address designated use impairments
pH	SB051-050-01465850B	<b>Little Creek</b> @ Chairville	No recommendation

Table 1. Contaminants of Concern. Source: NJDEP

*The place to improve the world is first in one's own heart and head and hands.” – Robert Persig*

### Sources of Contaminants

The potential sources of contaminants and factors contributing to water quality degradation as well as declines in water supply were identified during the planning process through public outreach meetings hosted by the PAC and its subcommittees. Most of these sources are recognized for their potential to contribute to water quality or quantity problems, not only in this watershed, but in watersheds statewide.

The PAC and its subcommittees explored how, and to what extent, these sources or factors might be contributing to problems in the Rancocas Watershed. None of the potential sources has been confirmed by any definitive studies. However, recommendations were developed based on strategies that have been shown to be effective in other watersheds. The potential sources and factors are listed in Figure 3 and detailed below.

#### ➤ **Point Source Discharges**

Point sources are discharges from a single source such as an outfall pipe. Known, treated sewage effluent discharges permitted under DEP's New Jersey Pollution Discharge Elimination System program have not contributed significantly to water quality degradation in this watershed, due to treatment plant upgrades, and close permit regulation and enforcement. While phosphorus levels are a concern statewide, existing data indicate phosphorus levels near permitted discharge outlets do not appear to be causing excessive

primary productivity in the form of algal blooms and thus are not rendering surface waters unsuitable for their designated uses. However, stormwater discharge outlets and other point sources are contributing to the degradation of area waterways. While singular point sources are more controllable than widespread, non-point sources, all point sources may not be known and need to be identified and regulated.

#### Sources & Factors Affecting Water Quality & Quantity

##### *Sources:*

Point Source Discharges  
Non-Point Sources  
Failing Septic Systems  
Agricultural, Residential,  
Commercial/Industrial Runoff  
Brownfields  
Managed Turf  
Wildlife

##### *Factors:*

Condition of Riparian Lands  
Water Budget  
TMDLs  
Public Education  
Implementation

**Figure 3. Contributing Sources and Factors**

#### ➤ **Non-Point Sources**

Non-point source pollution comes from widespread areas such as roadways, farms, lawns, and lands with failing septic systems and animal wastes. The non-point sources of greatest concern are enumerated below.

**1. Failing Septic Systems** – The summary of data in the Characterization and Assessment Report

(Appendix A) indicates that fecal contamination is a concern throughout the Rancocas Creek Watershed. Failing septic systems are considered at least one cause of high fecal coliform levels in the watershed. A survey conducted by RWA indicates that optical brightener, a constituent of laundry detergent, is found within the North and South Branches. The presence of optical brightener implies that either household septic effluent is leaking into the Creek from septic systems that are malfunctioning, or that effluent or graywater is being discharged into the Creek more directly. The concern of the PAC is that the high fecal coliform counts could indicate the presence of dangerous human pathogens.



**2. Agricultural Run-off** – Rainwater can carry sediment, pesticides and nutrients from farmlands to adjacent water bodies. However, studies done for this plan indicate that nutrients and pesticides are not a significant problem in this watershed, even though extensive farmland remains in this region.

A buffer gap assessment (see Appendix B) shows that over 80 percent of the riparian corridor within 150 feet of the waterways is wooded to some extent. These vegetated buffer areas effectively filter out pollutants from agricultural run-off. Localized problems may exist where farm fields abut unbuffered roads that carry farm and road run-off directly to a stream. In addition, a review of water quality data shows that nutrients are not causing a general degradation of water quality. However, a more detailed review, particularly of impoundments, may show localized need for riparian buffer restoration.

A pesticide “snapshot” survey was authorized by the Burlington County Freeholders and the PAC and was carried out by the University of Medicine and Dentistry of New Jersey. It showed extremely low concentrations of the analyzed pesticides in all sampling locations. (See Appendix C)

In short, existing water quality data, a buffer gap assessment and pesticide snapshot all indicate agricultural operations are having minimal impact on the Creek. This positive situation should be enhanced through buffer maintenance, and support of environmentally sound farming practices through offices such as the Rutgers Extension Service, the Natural Resource Conservation Service and the Soil Conservation Districts. These offices administer many programs that provide farmers with information and incentive to protect the watershed, and ensure that buffers are maintained, not removed.

**3. Residential Run-off** – Stormwater can wash fertilizers, sediment, pet wastes and other pollutants from residential lawns into local lakes and waterways. The PAC found that residential run-off contributes more to streambank instability and water quality degradation than other land uses in this watershed. In particular, residential development constructed prior to the 1980s is causing erosion problems in a number of communities, due primarily to lack of adequate stormwater controls. Examples of problems identified are listed in the “Action Now” spreadsheet. (See Appendix F)

Concern over residential run-off and homeowner use of fertilizers and pesticides is increasing as residential development increases in the central and eastern portions of the watershed. Appendix B, the pesticide report, indicates that residential lawn care contributes a variety of pesticides to surface waters. Residential run-off will contribute more contaminants over time as development spreads, unless measures are implemented to reduce stormwater impacts, and strong municipal ordinances are enacted and enforced to protect wooded buffers.

A number of groups are attempting to educate the public on integrated pest management and landscaping techniques that require less water, fewer nutrients and pesticides and less intensive care. These groups also advocate maintenance of riparian buffers. However, increased residential, commercial and industrial development along wetlands, lakes and streams

warrants stronger buffer protection methods than simply offering educational programs alone.

**4. Wildlife** – Large populations of resident (year-round) Canada geese and other waterfowl threaten water quality throughout the watershed. The nutrients from waterfowl feces contributes to eutrophication in places where streams are impounded and are not buffered, surrounded only by grasses which attract large numbers of grazing geese. Bacteria from the feces can create health hazards.

Other wildlife, such as deer, may contribute to non-point source pollution in some locations of the watershed. Just downstream from the DEP Wildlife Refuge on Ark Road in Medford Township, the Burlington County Health Department has records of high fecal bacteria counts where residential sources are not present. The lack of knowledge regarding sources of fecal contamination underscores the need for fecal source assessment throughout the watershed.

**5. Commercial and Industrial Stormwater Management** – Commercial and industrial development often generate vast areas of pavement and other impervious coverage. The loss of recharge reduces groundwater levels, stream baseflow and water quality. Commercial and industrial development must manage stormwater run-off to decrease volume and increase quality and infiltration. While there are state stormwater regulations, municipal stormwater ordinances should be enacted to require stormwater inserts to remove

floatables, oils, and other pollutants at commercial and industrial sites, as well as requiring a long-term maintenance program, insured by escrow accounts.

**6. Managed Turf** – Managed turf, including sod farms, golf courses and certain highly managed recreational fields, are potential sources of non-point source pollutants due to the intensive use of pesticides and fertilizers. (See Appendix B) These large areas of grassed fields also often require extensive watering, or they may be on soils with a high water table (within 12 inches of the surface) creating a potential threat to groundwater quality. Therefore, managed turf can impact both water quality and quantity in the watershed.



➤ **Other Factors**

**1. Condition of Riparian Lands** – As mentioned previously, riparian lands are in relatively good condition in the watershed. This has resulted in better overall water quality as compared with more developed areas of the state. The asset of vegetated

buffers should not be lost to development. While buffers in the Pinelands Protection Area have the best protection against development, municipalities in the rest of the watershed should enact or strengthen buffer protection ordinances. Model ordinances are contained in the Land Use Subcommittee report in Appendix D, and are listed in Figure 4.

**2. Public Education** – Government entities cannot eliminate non-point source pollution without the cooperation of citizens. Thus, outreach and education efforts have targeted three groups: municipalities, homeowners and school students. Municipal officials must be kept apprised of water quality and quantity issues and tools they can employ to protect their water resources. The PAC determined that fecal bacteria levels, stormwater management, and buffer protection in particular require the attention of municipal administrators, engineers, and other local officials.

The PAC, through its Public Education and Outreach Subcommittee (PEOS), recommended public education and outreach through a newsletter, presently issued quarterly, a program for educators, and a landscaping program for homeowners' associations. Watershed partners, the Rancocas Conservancy, PEOS and the Cedar Run Wildlife Refuge are seeking funding to develop the latter. The Delaware Valley Regional Planning Commission's Rancocas Greenways plan, which Burlington County helped introduce to affected municipalities, is another example of the role various entities can play in improving the watershed.

<i>Land Use Standard</i>	<i>Ordinance Source</i>
Drainage and Conservation Easement	Long Valley, NJ
Lot Suitability Definition	Mount Laurel, NJ
Historic Pesticide Use Assessment and Remediation	Medford, NJ
Riparian Buffer Conservation	Association of New Jersey Environmental Commissions
Stormwater Facilities Maintenance	Hammonton, NJ
Stream Corridor Protection	Holmdel, NJ
Stormwater Management	Chatham, NJ
Wetland Buffer Strips	Gloucester County, NJ
Stream Corridor Protection	Colts Neck, NJ
Stream Corridor Protection	Marlboro, NJ
Landscaping and Vegetation	Pinelands Comprehensive Management Plan
Groundwater Quality	Southampton Twp., NJ

Figure 4. Model Ordinance Chart

**3. Stormwater Management** – As so much non-point source pollution can be carried to waterways through stormwater run-off, federal and state water quality programs increasingly are focusing on stormwater management. Future laws and regulations will require municipalities to more carefully manage stormwater, creating a greater need for information on the various stormwater management tools.

To increase awareness of effective stormwater management initiatives, the Steering Committee recommended an annual conference and award program for municipal officials, engineers, and planners. At the conference, an award was presented to Willingboro Township and Lord, Worrell & Richter Engineers for the design and installation of an innovative retrofit to Willingboro’s stormwater management system.

**4. Water Conservation and Re-use** – The drought of recent years underscores the need for water conservation and re-use of treated effluent. In addition, much of the Rancocas watershed is in DEP-designated Critical Water Area (CWA) #2 where withdrawals from the Potomac Raritan Magothy (PRM) aquifer are limited to prevent salt water from intruding into the groundwater. Many municipalities in this watershed rely on the PRM, and the limit on new PRM withdrawals in CWA#2 heightens the need for beneficial re-use. Managed turf, for example, consumes large amounts of potable water for which treated effluent could be substituted. A concern of stakeholders is that current DEP regulations regarding effluent quality deter beneficial re-use. DEP must re-tool regulations to address the prohibitive effect its regulations have on implementation and must explore new ways to encourage re-use.

## Objectives and Strategies

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The PAC endorsed a number of objectives for this Watershed Management Plan through the course of the two-year planning process and recommended several strategic projects to achieve those goals. While many projects have already been carried out by the Board of Chosen Freeholders, additional strategies have not yet been implemented. Partners who can assist in implementation of those strategies and help achieve the goals for this watershed are identified in the next section, "Implementation." The PAC's objectives and recommended strategies are detailed below and diagrammed on the following page.

- *Water quality:* Maintain and enhance water quality so that all sections of the waterways meet surface water quality standards for fishing and swimming. Promote stormwater management practices that retain stormwater on site. Retrofit existing stormwater systems that discharge to waterways.
- *Water quantity:* Promote land uses, site design, and stormwater practices to allow stream base flows to approximate pre-development conditions. Identify methods to equitably distribute water supplies while encouraging water conservation and re-use. Develop regional distribution systems for water re-use.
- *Wildlife habitat:* Encourage a more natural wetland and wetland fringe landscape while discouraging large, concentrated populations of Canada geese.
- *Human habitat:* Develop model ordinances that encourage better site design, as described above.
- *Recreational accessibility:* Target lands for creation of an integrated public park system to provide opportunities for fishing, swimming, boating, sightseeing, hiking, biking, and picnicking.
- *Agricultural viability:* Assure that agriculture remains economically profitable and physically possible through wise and sustainable use of land area, roads, and increased water supply.
- *Partnership:* Create and sustain partnerships among concerned citizens' groups, agricultural groups, municipal, county and state officials, and all other willing and interested parties. Through educational programs and grant programs, provide the means for partners to achieve the PAC's vision for the watershed.

*"The nation that destroys its soil destroys itself." – Franklin D. Roosevelt*

The objectives and strategies of the watershed planning process are diagramed below.

Objective: Improve and maintain water quality

- Strategy: Educate local officials regarding watershed issues
- Strategy: Develop model ordinances to improve water quality and encourage their adoption
- Strategy: Encourage stormwater management retrofits
- Strategy: Conduct buffer gap assessment (completed)
- Strategy: Conduct pesticide “snapshot” survey (completed)

Objective: Maximize water supplies through better water management

- Strategy: Encourage stormwater infiltration and retrofits
- Strategy: Develop model ordinances to improve water supply and encourage water conservation

Objective: Reduce fecal coliform levels through wildlife habitat management

- Strategy: Conduct a buffer gap assessment (completed)
- Strategy: Revegetate buffers around Woolman Lake and at Iron Works Park (completed)

Objective: Reduce run-off and improve re-charge through better site design in human habitats

- Strategy: Educate municipal officials and engineers regarding water resource planning
- Strategy: Develop municipal ordinances requiring better water resource management

Objective: Secure lands to increase recreational use and public access along the Rancocas Creek

- Strategy: Promote DVRPC Rancocas Greenways project, County Parks plan and local open space planning
- Strategy: Implement Burlington County Parks and Open Space Master Plan

Objective: Assure agricultural viability

- Strategy: Educate the public regarding the County Farmland Preservation Program
- Strategy: Obtain input from agricultural operators on how to further watershed goals and agricultural viability through water and soil conservation and resource protection and management
- Strategy: Educate PAC on agricultural programs promoting environmentally sound farm management and on the water resource needs of farmers

Objective: Create and sustain partnerships through outreach and education

- Strategy: Invite individuals and municipalities affected by watershed issues to participate in PAC and subcommittee meetings
- Strategy: Help Americorps provide River Assessment Training and water quality protection awareness programs for the general public
- Strategy: Issue a quarterly newsletter for the general public
- Strategy: Develop and maintain a website promoting PAC and subcommittee meetings and related events and information
- Strategy: Provide presentations to interested organizations

*"When drinking water, think of its source." — Chinese proverb*

## Successes

During the first two years of this planning process, several of the strategies designed to achieve the PAC's objectives were initiated. These include a buffer gap assessment, public and municipal education efforts, a watershed characterization and assessment, a pesticide survey, an ordinance review and open space planning. Some of these achievements are detailed below.

## **Buffer Assessment**

The Land Use Subcommittee initiated a project to assess the integrity of the riparian buffer system in the

watershed. To assemble a Geographic Information System (GIS) layer showing where forested buffers remain or are absent in the watershed, the Heritage Conservancy was retained for preparation of an analysis using air photo interpretation and videography from a helicopter. The resulting assessment report indicates that, throughout most of the watershed, over 80 percent of the riparian corridor within 150 feet of the waterways remains wooded. Although field verification of that assessment must be completed, the initial review indicates that buffer maintenance rather than buffer restoration is the greater challenge in the Rancocas Creek Watershed Management Area. Figure 5

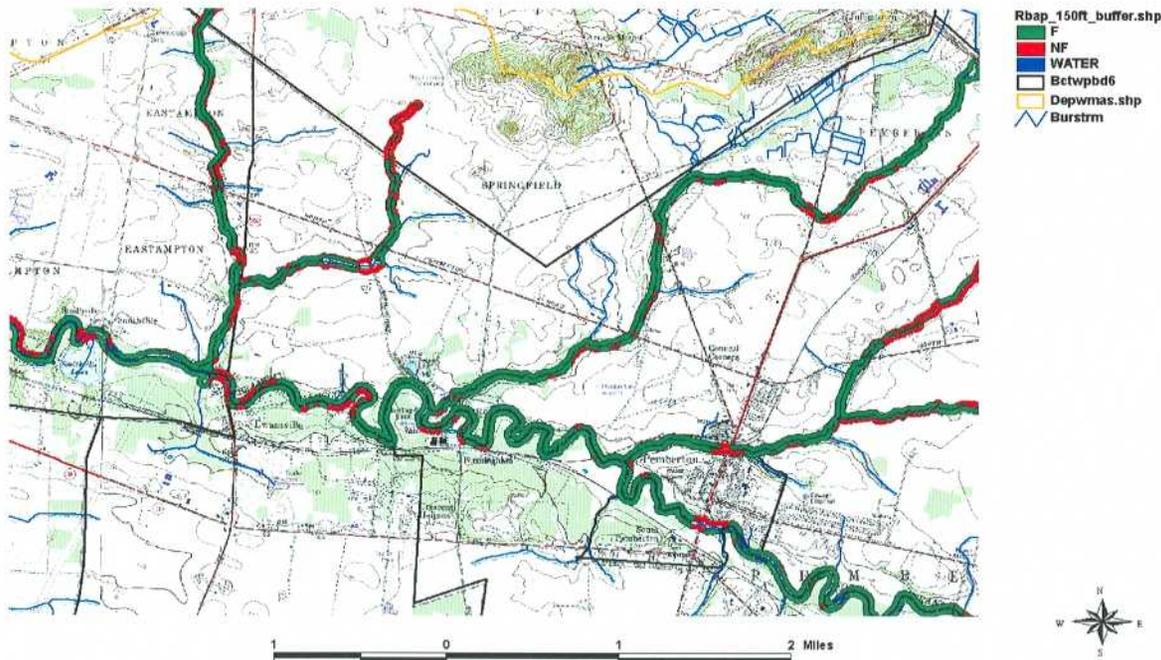


Figure 5. Sample Buffer Assessment Results

illustrates the results of the assessment for the presence of vegetated buffers within 150 feet of the stream in the North Branch between Eastampton and Pemberton townships. For additional maps and information, see Appendix C.

## **Education**

In the past two years, many public and municipal education projects were initiated, including publishing a newsletter, hosting a stormwater management conference, inviting municipal officials to attend subcommittee

meetings of particular importance to their municipality, establishing a website and preparing watershed displays with hand-outs at a number of venues. Specific steps were taken to provide information to municipal administrators, engineers, school children and the general public. Education remains an important tool in protecting water quality and quantity in this watershed.

### ***Watershed Assessment***

Completion of a watershed characterization and assessment report was a significant achievement in the planning process. With information on water quality, land use and cultural history, the report provides the baseline for review of conditions in the watershed. Included are detailed maps and data showing Pinelands areas, groundwater recharge values and buffer restoration projects, such as the one shown in the photo on this page. The report, a PowerPoint document, was prepared by Omni Environmental as consultants to the PAC and the Burlington County Freeholders. It is attached to this plan as Appendix A.

### ***Pesticide Survey***

The Non-Point Source Subcommittee recommended that the PAC commission a survey of the pesticide concentrations in the North and South Branches of the Rancocas Creek. The University of Medicine and Dentistry of New Jersey, in cooperation with the United States Geological Survey, undertook this project. Results indicate that some pesticides are present in the

Creek, but only at extremely low concentrations below applicable standards. Full details can be reviewed in the report attached as Appendix B.

### ***Model Ordinances***

An additional project in the planning process was gathering and reviewing land use ordinances that might help municipalities protect and improve water quality and quantity. The Land Use Subcommittee spearheaded the effort, gathering the ordinances (see Appendix E) which were then reviewed by recognized experts at a workshop. Municipalities are encouraged to adopt their own versions of these model ordinances to help achieve smarter growth and better water quality.



## ***Open Space***

A final project in the planning process was prioritization of land parcels which, if preserved, can help protect water quality and water supplies. The prioritization is a deliverable required by DEP. Readily available data from the New Jersey Geological Survey, DEP, DVRPC and the New Jersey Conservation Foundation were used in evaluating the environmental importance of open lands.

Criteria included aquifer recharge values, development pressure (as measured by the change in land use between 1986 and 1995), headwaters, forestation, wetlands, threatened or endangered species habitat, contiguity with existing preserved parcels and other commonly used criteria. Unfortunately, all data were not available for portions of the watershed in Ocean and Camden counties.

The ranking weighted each criterion to maximize water quality protection and groundwater recharge, as well as to target lands under the greatest development pressure. The ranking gave equal weight and top priority to aquifer recharge and development pressure. Next, lands in headwaters and in forested upland received the second greatest weight. Wetlands and threatened or endangered species habitat received the third greatest weight and contiguity with existing preserved land received a minimal weight in the ranking system.

Many individuals were involved in identifying the criteria that should be used, determining the weight of each criterion, and evaluating the data. Recommendations were gathered from the Land Use Subcommittee, the Rancocas Conservancy, the New Jersey Conservation Foundation, an Open Space Technical Focus Group and the Burlington County Open Space Coordinators.

The results of the evaluation are mapped in Figure 7. It is hoped that the mapping will assist the state, the counties and municipalities in directing open space acquisition toward lands with the greatest benefit to water resource management that are also under the highest risk of development.

### **Prioritization:**

- Supports the County and Municipal Open Space Programs
- Supports the Watershed Management Programs (fulfill contract deliverable)
- Protects environmentally important lands for water quality and quantity management
- Recognizes the impact of development pressure on acquisition priority
- Considers associated environmental benefits (wetlands, habitat, woodlands, etc.)
- Creates a baseline or reference framework for coordination among entities acquiring land in the watershed

**Figure 6. Benefits of Open Space Prioritization**

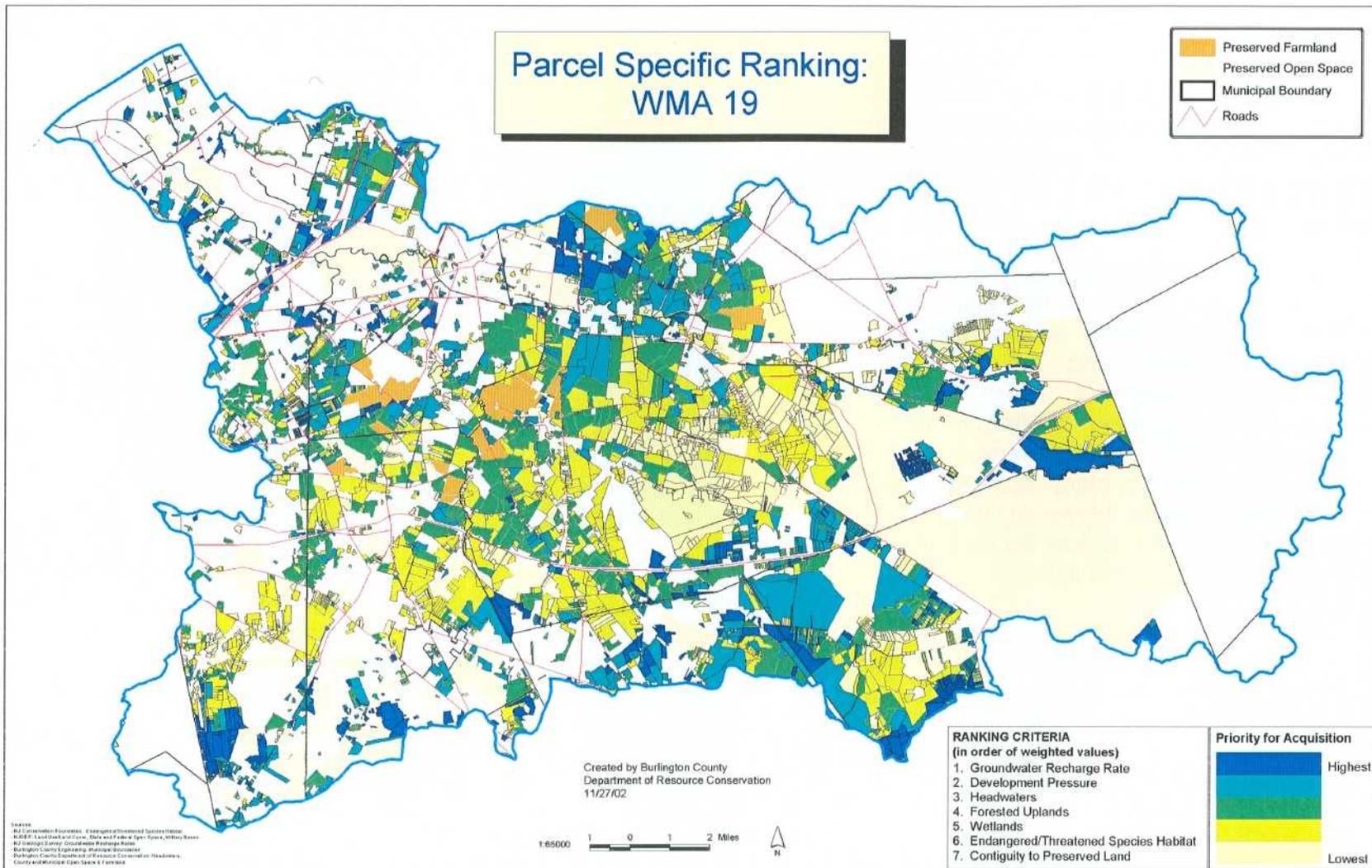


Figure 7. Open Space Acquisition Ranking

## *Implementation: Next Steps*

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This management plan is the culmination of studies and subcommittee meetings to define the mission of this planning process, and the objectives and strategies to achieve that mission. Following the planning wheel (Figure 8), it also entails two more steps: implementation and evaluation.

The strategies in the preceding section provide the basis for the implementation phase of the plan. The PAC subcommittees prepared reports on strategic efforts to meet targeted objectives, and several suggested additional strategies, most of which have been incorporated into this document. Others were omitted because they presented implementation challenges exceeding the scope of this plan, such as increasing penalties for illegal dumping. However, the reports are included in the appendix for review so they may serve as seeds for growth of future initiatives.

As noted, first steps already have been taken in educating, in evaluating sources of non-point pollutants and in sustaining partnerships. Table 2 summarizes the next steps watershed partners could take to achieve better water quality and quantity management, and to enhance wildlife habitat and recreational use.

Implementation of this plan will continue the hard work of the PAC and its many partners, and will shift the focus to the local level. Consequently, successful coordination



of the implementation strategies will require an intensive municipal outreach program. In addition, the state has recently proposed stormwater management measures – and plans to propose additional measures – that would give the County greater oversight of land use planning decisions, most notably, review and approval of municipal stormwater management plans. The County should review these proposals within the context of this watershed management plan to further promote protection of water resources.

# The Planning Wheel

Adapted from the Natural Resource Conservation Service

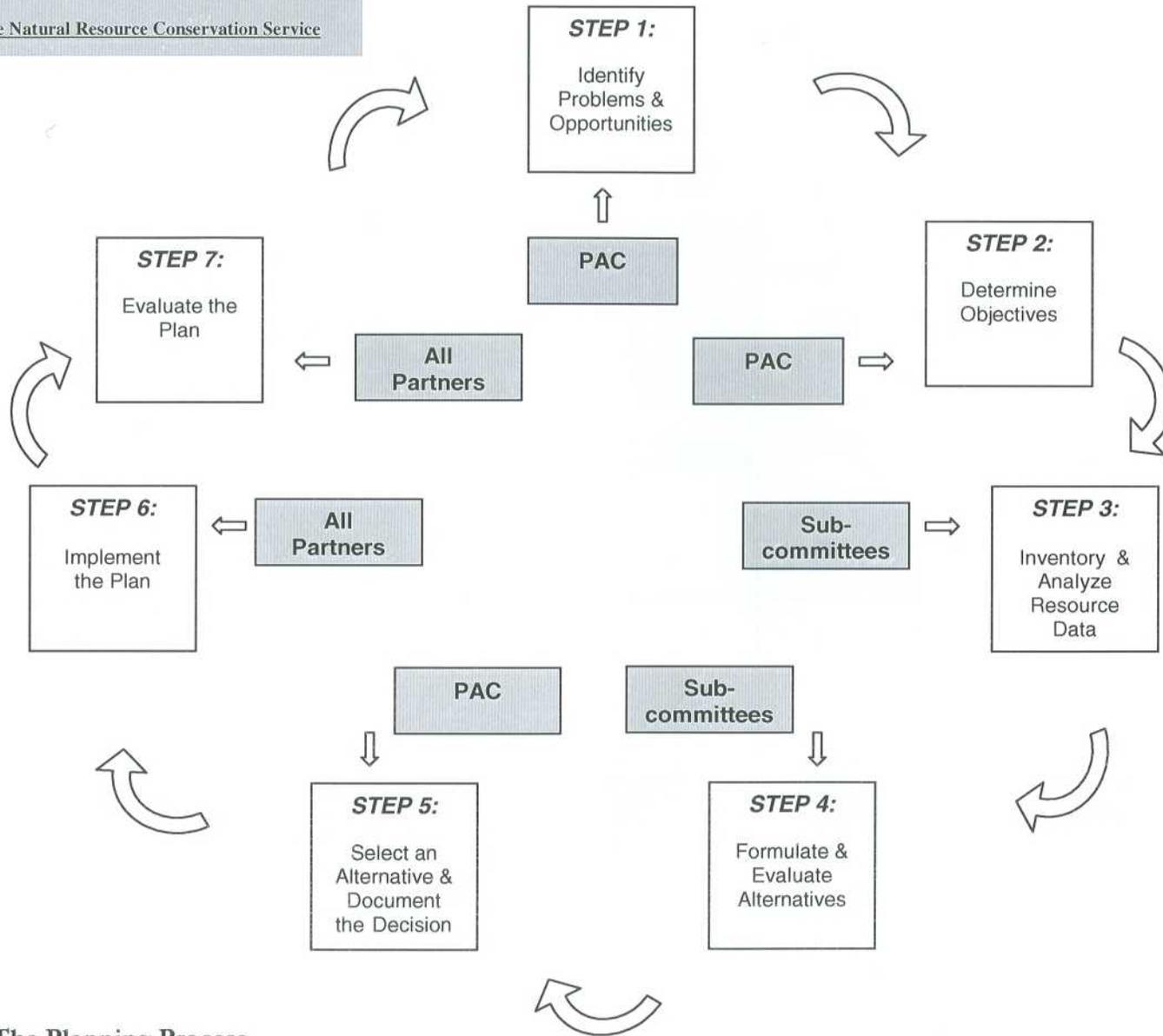


Figure 8. The Planning Process

Table 2. Future Strategies for Watershed Partners

Objective	Responsibility			
	State	County	Municipal	Other Partners
<b>Water Quality Management</b>	<p>Complete fecal coliform source assessment throughout the watershed and establish a program to buy out properties identified as contributing to problem</p> <p>Develop better evaluation criteria based on this watershed</p> <p>Extend monitoring network: more stations, more reliable methods, more pesticides included</p>	<p>Educate public and encourage buffer revegetation</p> <p>Acquisition or easement purchase of buffers and wetlands</p> <p>Develop spreadsheet of targeted restoration projects from the buffer analysis and identify three projects from the analysis for immediate implementation, in cooperation with the Restoration Subcommittee and Cedar Run Wildlife Refuge</p>	<p>Establish a comprehensive municipal management program for inspection and maintenance of on-site septic systems</p> <p>Establish "no mow" zones on publicly owned lands</p> <p>Adopt ordinances requiring pet owners to clean-up after pets</p> <p>Require water quality inserts at parking lot storm drains and maintenance bonding</p>	<p>Evaluate available data regarding total phosphorus concentration and effect on ecology of the creek (TAC)</p> <p>Identify stormwater projects requiring BMP implementation (BurCo &amp; CamCo Soil Conservation Districts)</p> <p>Assist implementation of IPM policy by municipalities, schools, public (NJEF)</p>
<b>Water Quantity Management</b>	<p>Develop a water budget</p> <p>Install more stream and rain gauges in sub-basins</p> <p>Assess and revise NJPDES regulations that may act prohibitively toward permit amendments to allow beneficial re-use of effluent</p>	<p>Develop a beneficial re-use plan</p> <p>Implement Critical Water Area #2 Allocation Bank</p>		
<b>Wildlife Habitat Management</b>			<p>Identify streambank or lake shore areas in need of buffer restoration</p>	<p>Establish vegetated buffers around lakes and ponds (homeowners)</p> <p>Enforce "no mow" zones (homeowners &amp; homeowners associations)</p>
<b>Better Site Design in Human Habitats</b>	<p>Create tax credit incentive for stormwater retrofit that achieves infiltration of the 1.25" storm</p>	<p>Help municipalities seek funding sources to implement measures to achieve infiltration of the 1.25" storm and augment County Phase II permit</p>	<p>Adopt stronger buffer protection ordinances</p> <p>Adopt ordinance for stormwater capacity transference between parcels in the same small basin</p>	<p>Provide homeowners education program (Rancocas Conservancy and Cedar Run Wildlife Refuge)</p> <p>Arrange ANJEC presentations on ordinances and septic maintenance for water quality</p>

Objective	Responsibility			
	State	County	Municipal	Other Partners
<b>Recreational Accessibility to the Creek</b>		<p>Establish a Burlington County Land Trust to coordinate future land acquisitions within the watershed among the various agencies and organizations</p> <p>Fund a staff position to monitor open space lands for compliance with conditions for access where land was acquired through County Open Space Program or through County/Municipal program</p>		Distribute Boat Launch Access Brochure (Boater Voter Coalition)
<b>Agricultural Viability</b>		<p>Continue to identify and preserve farms in the farmbelt</p> <p>Fund a staff position to monitor environmental condition of open space lands acquired through County Open Space Program or through County/Municipal program</p>		
<b>Partnership: Outreach and Education</b>	Conduct build-out analysis/GOZ	<p>Assist municipalities in adopting stronger buffer protection ordinances</p> <p>Publish and distribute bi-annual watershed newsletter</p> <p>Continue stormwater management conference and award program</p> <p>Maintain Rancocas Watershed website</p> <p>Educate the municipal representatives through GOZ</p>		Participate in three events per year to increase public awareness and membership in the watershed group (PEOS)

## Evaluation

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The stated mission of the Public Advisory Committee in developing a watershed management plan was to **“Develop and implement a watershed management plan that protects, enhances, manages or maintains our natural resources, including water quality and quantity that is fishable, swimmable, and potable; and improve public awareness of watershed issues.”** This plan recommends various strategies and implementation methods to protect, enhance, manage and maintain water quality and quantity in the Rancocas Creek Watershed. Fulfillment of this mission requires an evaluation of the effects of implementation and then revision of the implementation strategies where the plan’s objectives are not being met.

An evaluation of the effectiveness of this plan should include a review of the steps that were recommended in the management plan. The report should list the steps completed or the degree to which a strategy was implemented. A water quality assessment report should be completed that includes documentation of the sampling results, locations, methodology, and the conclusions of the assessment.



This evaluation must identify which of the implemented steps do not appear to be delivering the desired results. Finally, it should recommend alternatives. The following checklist is designed to help determine if the goals of the Watershed Management Plan are being achieved.

*“We do not inherit this land from our ancestors; we borrow it from our children.” — Haida Indian saying*

In this Watershed Management Plan, the desired four-year results are:

### Evaluation Checklist

- ❑ Identification of all stream reaches where elevated fecal coliform counts are caused by septic system failure
- ❑ In Riverside, Delanco, Edgewater Park, Beverly, Burlington City, Burlington Township, Mount Holly and Willingboro, adoption of stormwater management ordinances which require: retrofit at the time of site plan approval or subdivision approval of re-development or development changes to create infiltration of the 2-year, 24-hour storm or 1.25" storm; where that is not feasible due to physical constraints (defined in ordinance), stormwater quality devices should be installed in stormwater drains; where that is not possible because no stormwater drains exist, contribution to a stormwater management escrow account
- ❑ In 50 percent of the remaining municipalities, adoption of ordinances requiring new development to provide for either infiltration of the entire run-off from a (50-year) storm on site, or infiltration of run-off from 2-year, 24-hour storms and contribution to a stormwater management escrow account if the municipality has adopted a regional stormwater management plan. Such plan must identify the parcels to be used for regional management of run-off from the full (50-year) storm. Where regional facilities will be used, on-site infiltration of run-off from the 1.25" storm must occur.
- ❑ A watershed-wide elementary school education program that will bring children out to be educated on watershed protection at a local environmental center
- ❑ Edible fish in the Rancocas Creek
- ❑ Development of a plan to re-distribute treated effluent to targeted land uses which include agriculture, (particularly horticultural operations, nursery stock and turf farms), golf courses, and other managed turf (irrigated ballfields)

## *Glossary*

**Beneficial re-use:** “The utilization of reclaimed water rather than the use of water by means of withdrawal of ground water or consumption of potable water, in other words, source substitution.” From *Guidance Manual for Reclaimed Water for Beneficial Reuse (draft)*, NJDEP, undated.

**BOD:** Biological Oxygen Demand. The amount of oxygen (measured in mg/L) required in the oxidation of organic matter by biological action under specific standard test conditions. Widely used to measure the amount of organic pollution in wastewater and streams.

**Brownfields:** Any former or current commercial or industrial site that is currently vacant or underutilized and on which there has been, or there is suspected to have been, a discharge of contamination.” From NJDEP Site Remediation Program website, November 14, 2002.

**GIS: Geographic Information System:** a computerized mapping and data analysis tool

**GOZ: Regional Planning Partnership’s “Goal Oriented Zoning” model.** A GIS-based tool that calculates the impact of build-out on the environment, infrastructure, and public costs. The model allows the user to compare the impacts of build-out under existing zoning and alternative zoning scenarios. The model was designed to assist municipal officials in their land use decision-making process.

**Managed turf:** Typically, large areas managed for establishment and growth of grass through an intensive regime of fertilization, pesticide management and irrigation. Any grassed area that receives regular (daily, monthly, annually) applications of soil amendments such as fertilizer, lime and pesticides. These areas include, but are not limited to residential lawns, golf courses, sod farms, and recreational areas.

**NJPDES: New Jersey Pollutant Discharge Elimination System:** A state program that issues permits for the discharge of wastewater and stormwater, limiting the mass and/or concentration of pollutants that may be discharged into groundwater, streams, rivers and the ocean. The types of regulated facilities can range from very small users such as campgrounds, schools, and shopping centers to larger industrial and municipal wastewater dischargers.

**PEOS:** Public Education and Outreach Subcommittee of the WMA19 PAC

**Rancocas Greenways plan:** A plan for municipalities in the project area to acquire open parcels along the Rancocas Creek for the establishment of a greenway. A greenway preserves riparian buffers, protects water quality and provides recreational opportunities for the public. The Rancocas Greenways area extends between Rancocas State Park to the Pinelands border on the North and South branches of the Creek, and to the Barton's Run headwaters of the Southwest Branch. The planning area involves eleven municipalities. The Delaware Valley Regional Planning Commission prepared the plan.

**Riparian:** "Relating to or living or located on the bank of a natural watercourse (as a river) or sometimes of a lake or a tidewater." From *Webster's New Collegiate Dictionary*, 1975.

"Riparian lands, or tidelands, are lands now or formerly flowed by the mean high tide." From *The Environmental Manual for Municipal Officials*, ANJEC, 1992.

**River Assessment Teams (RATS):** A method of evaluating stream health, including vegetation and erosion features, that involves training public volunteers to participate on a team and submit findings to NJDEP.

**TMDL:** "A TMDL refers to the total maximum daily load of a pollutant that achieves compliance with a water quality standard." From *Assessing the TMDL Approach To Water Quality Management*, National Research Council, 2001.

"TMDLs are written plans and analyses established to ensure that the waterbody will attain and maintain water quality standards (existing uses, designated uses, numeric and narrative criteria and antidegradation requirements defined at 40 CFR 131) including consideration of reasonably foreseeable increases in pollutant loads." From *Draft Guidance for Water Quality-based Decisions: The TMDL Process (Second Edition)*, USEPA, August 1999.

**Water budget:** "An evaluation of all the sources of supply and the corresponding discharges with respect to an aquifer or a drainage basin." From *Applied Hydrogeology*, Third Edition. C.W. Fetter, 1994.

**303(d) lists:** Lists of the state's impacted waters which do not meet the state surface water quality standards. Refers to Section 303(d) of the federal Clean Water Act.

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