APRIL 2002

OLNEY AND VICINITY

ENVIRONMENTAL RESOURCES INVENTORY

MONTGOMERY COUNTY DEPARTMENT OF PARK AND PLANNING
THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

ABSTRACT

TITLE:	Environmental Resources Inventory for Olney and Vicinity - Including the Rock Creek North Branch and tributaries north of MD 28, the Hawlings River and tributaries, and Northwest Branch and tributaries north of Bonifant Road.
AUTHOR:	The Maryland-National Capital Park and Planning Commission
SUBJECT:	Background information on environmental conditions, policies and regulations affecting master planning in Olney and vicinity.
DATE:	April 2002
PLANNING AGENCY:	The Maryland-National Capital Park and Planning Commission 8787 Georgia Avenue Silver Spring, MD 20910-3760
SOURCE OF COPIES:	The Maryland-National Capital Park and Planning Commission 8787 Georgia Avenue Silver Spring, MD 20910-3760
NUMBER OF PAGES:	99
ABSTRACT:	This report contains technical and historical background information relating to existing environmental conditions and policies to support the preparation of the Olney Master Plan. The master plan should be consulted for the specific area environmental recommendations.

Environmental Resources Inventory

for Olney and Vicinity

Including the North Branch Rock Creek and tributaries north of MD 28, Hawlings River and tributaries, Northwest Branch and tributaries north of Bonifant Road, and a portion of the Patuxent River and tributaries north of Triadelphia Reservoir and south of Hipsley Mill Road.

Prepared by The Maryland-National Capital Park and Planning Commission
Montgomery County Department of Park and Planning

April 2002

THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

The Maryland-National Capital Park and Planning Commission is a bi-county agency created by the General Assembly of Maryland in 1927. The Commission's geographic authority covers most of Montgomery and Prince George's counties. The Commission's planning jurisdiction, the Maryland-Washington Regional District, comprises 908 square miles; its parks jurisdiction, the Metropolitan District, comprises 75 square miles.

The Commission has three major functions:

(1) The preparation, adoption, and, from time to time, amendment or extension of The General Plan (On Wedges and Corridors) for the Physical Development of the Maryland-Washington Regional District within Montgomery and Prince George's Counties.

(2) The acquisition, development, operation, and maintenance of a public park system.

(3) In Prince George's County only, the operation of the entire County public recreation program.

The Commission operates in each County through a Planning Board appointed by and responsible to the County government. The Planning Boards are responsible for preparation of all local master plans, recommendations on zoning amendments, administration of subdivision regulations, and general administration of parks.

The Maryland-National Capital Park and Planning Commission encourages the involvement and participation of individuals with disabilities, and its facilities are accessible. For assistance with special needs (i.e., large print materials, assistive listening devices, sign language interpretation, etc.), please contact the Community Relations Office, (301) 495-4600 or TTY (301) 495-1331.

ELECTED AND APPOINTED OFFICIALS

COUNTY COUNCIL

Steven A. Silverman, President
Derick P. Berlage, Vice President
Phil Andrews
Nancy Dacek
Howard A. Denis
Blair G. Ewing
Isiah Leggett
Marilyn Praisner
Michael L. Subin

COUNTY EXECUTIVE

Douglas M. Duncan

THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

Elizabeth M. Hewlett, Chairman
Arthur Holmes, Jr., Vice-Chairman

COMMISSIONERS

Montgomery County Planning Board

Arthur Holmes, Jr., Chairman
Wendy C. Perdue, Vice Chair
Allison Bryant
John L. Robinson
Meredith K. Wellington

Prince George's County Planning Board

Elizabeth M. Hewlett, Chairman
William M. Eley, Jr., Vice Chairman
James M. Brown
George H. Lowe, Jr.
Albert C. Scott

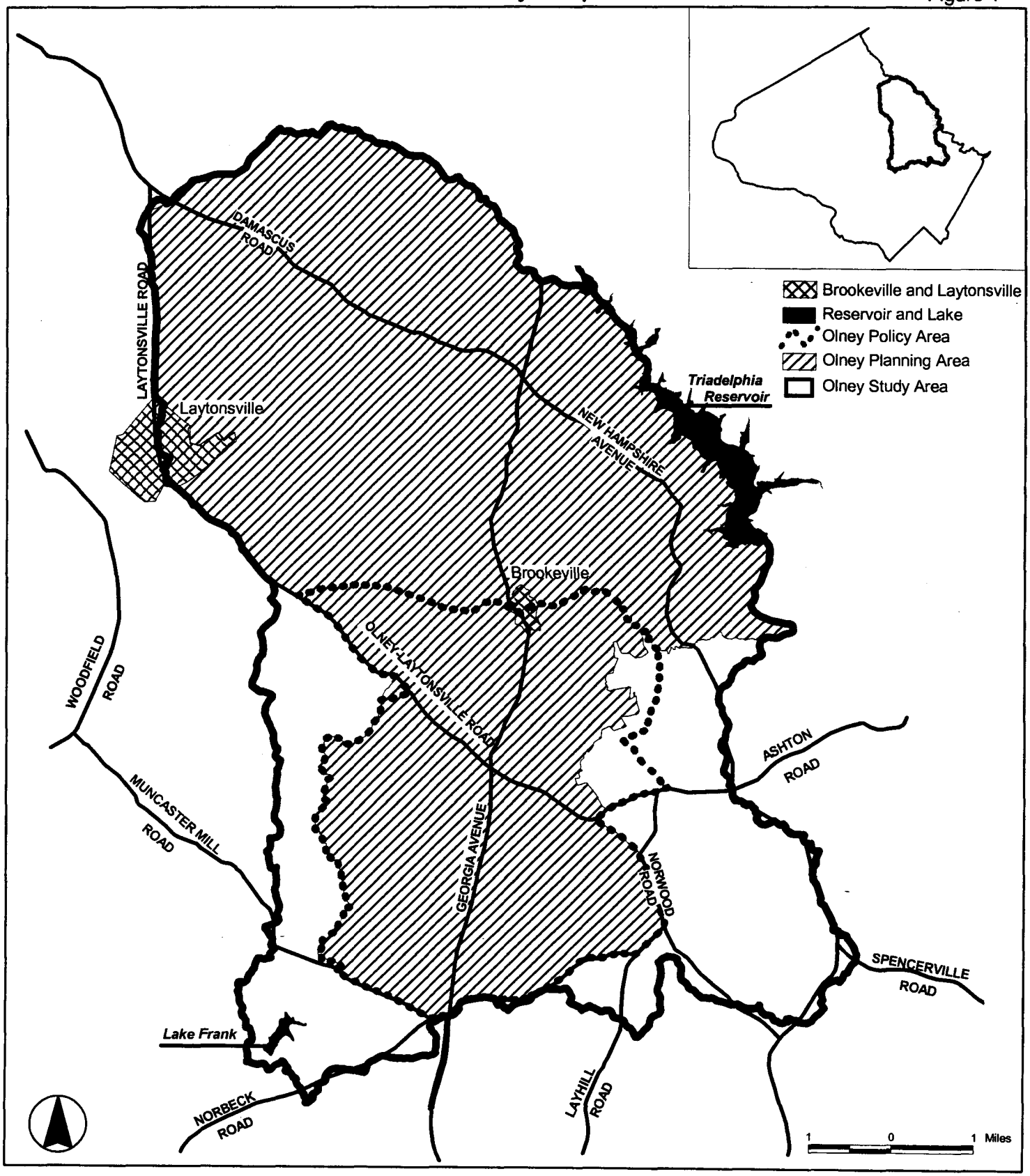
Table of Contents

List of Tables

List of Figures

Vicinity Map

Figure 1



Introduction and Executive Summary

This environmental resources report provides an inventory of environmental conditions for Olney and vicinity and the policy context that applies to environmental resource protection. The report provides background information on the environment for the master planning process. That process, which follows the publication of this report, will develop environmental protection and management goals, objectives and recommendations specific to the Olney Planning Area.

Description of the Olney Study Area

The Olney environmental study area is located in northern Montgomery County, Maryland. It is bounded approximately by the Patuxent River and Hipsley Mill Road to the north (near the intersection of Damascus Road and Laytonsville Road), Laytonsville Road and the North Branch of Rock Creek to the west, Norbeck Road to the south, and New Hampshire Avenue and the Patuxent River to the east. The study area encompasses 39,694 acres (62 square miles) which includes the entirety of the Olney Planning Area (29,772 acres) and the subwatershed area of tributary streams that are part of the planning area hydrology although they fall outside the planning area boundary (see Figures 1 and 2). The Olney Policy Area, which is the portion of the planning area with the highest development potential, encompasses approximately 11,000 acres and is also shown (see Figure 1).

This inventory uses a watershed and subwatershed approach to document the existing environmental conditions and health of the natural resources in Olney and its vicinity. The study area encompasses all or part of five watersheds: all of the Hawlings River watershed (18,069 acres) and parts of the Northwest Branch (6,502 acres), North Branch of Rock Creek (8,014 acres), Patuxent River (7,011 acres), and Great Seneca Creek (98 acres) watersheds (see Figure 2). Only a very small fraction of the Great Seneca Creek watershed lies within the study area. An assessment of the natural resources of the Seneca watershed is not included in this study.

The land uses in the study area range from medium density suburban-residential and commercial uses in the town center of Olney to low-density, rural, and agricultural uses in roughly the northern half of the study area. The town of Brookeville lies in the center of the study area. Public lands which provide protection of natural resources generally follow the various stream valleys, including the Patuxent River which forms the northeast border of Montgomery County.

Summary of Environmental Resources

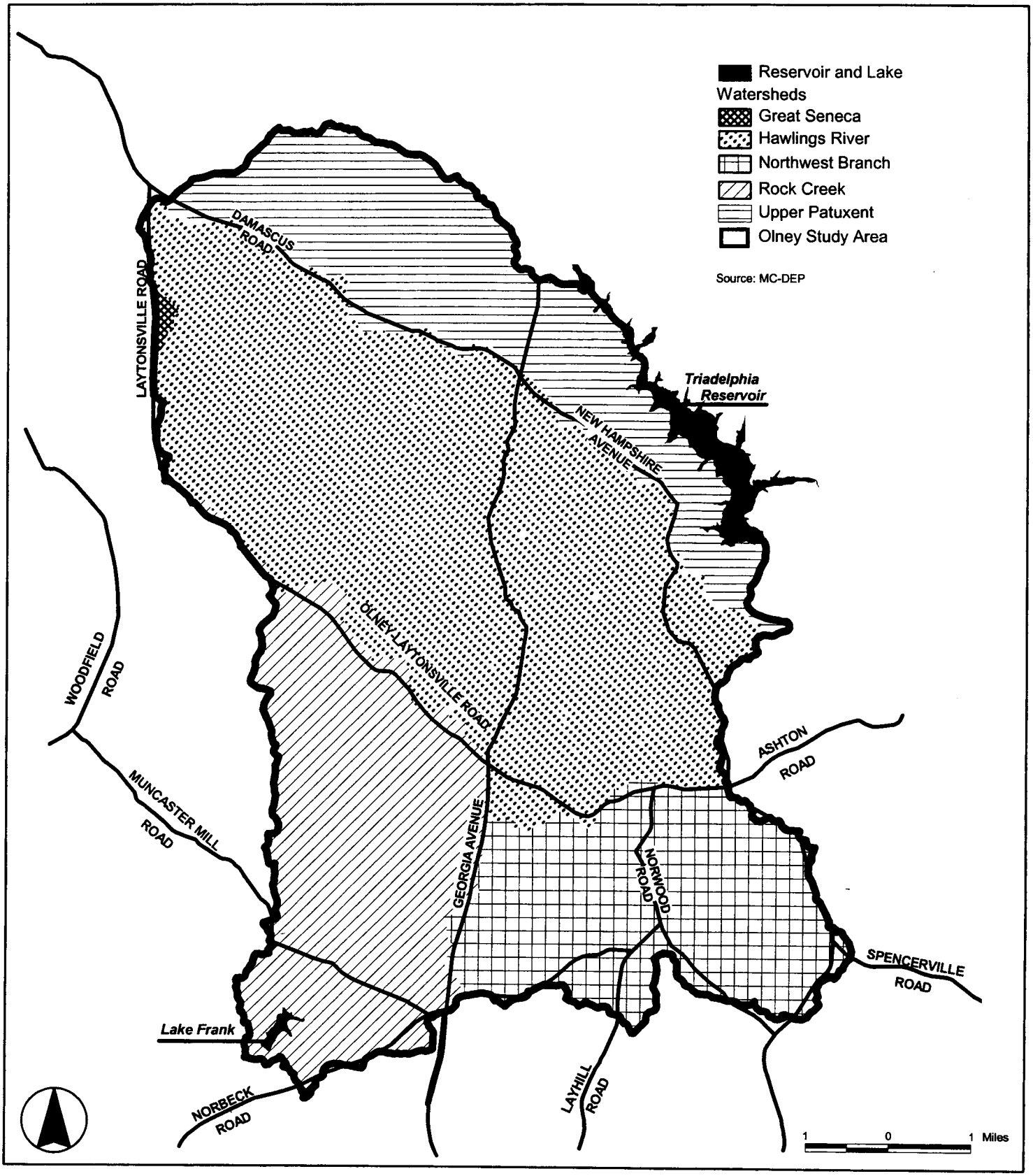
Streams in the Olney study area are currently designated by the state of Maryland as high quality cold water habitats (either Use III or Use IV[1]). Hawlings River and the portion of the Patuxent River watershed in the study area are also designated as Water Supply (P). According to the *County-wide Stream Protection Strategy* (DEP, 1998) report, subwatershed stream conditions where covered in the study area, range from excellent to poor. Subwatersheds in excellent condition exist in the relatively undeveloped, lower impervious portions of the study area. Those streams with poor conditions include Manor Run in the North Branch of Rock Creek, and upper James Creek, upper Olney Mill and upper Mt. Zion in the Hawlings River. They were mostly degraded by the effects of urbanization. The upper Mt. Zion tributary subwatershed has been affected by the Oaks Landfill.

Forests within the study area generally follow stream valleys, with significant upland habitat also occurring. Many large blocks of contiguous forest that contain both stream valley and upland areas are present. These large blocks of contiguous forest are important habitat for forest interior dwelling animal and plant species, and are relatively rare in Montgomery County due to land development and agriculture. In some

[1] State water use III designation includes waters which have the potential for, or are suitable for the growth and propagation of trout and are capable of supporting self-sustaining trout populations and their associated food organisms. State water use IV designation includes cold or warm waters which have the potential for or are capable of holding or supporting adult trout for put and take fishing; and are managed as a special fishery by periodic stocking and seasonal catching (COMAR § 26.08.01).

Watersheds

Figure 2



instances, the quality of the forest contained in these areas is exceptionally high. They contain uncommon or rare species and exceptionally large individual trees in good condition. Significant upland forest habitat occurs along North Branch, Hawlings River, the Patuxent and along the Bachelors Forest tributaries to Northwest Branch. Where development has occurred, forests in many cases have been highly fragmented.

Wetlands occur throughout the study area, generally along streams. By far, the greatest amount of wetland occurs within the Patuxent and Hawlings River portions of the study area, however, several high quality wetlands are also present within parkland along North Branch. A variety of functions are performed by these wetlands, including provision of terrestrial and aquatic wildlife habitat, amelioration of flooding, filtering of stormwater, and provision of groundwater flow to surface streams.

Agricultural land uses are concentrated in the northern half of the study area. This is due in part to the inclusion of Olney in the early Rural Density Transfer (RDT) program which has resulted in a more compact development pattern around the town center and protection of agricultural land. Approximately 8,482 acres of pasture and crop land occupy 21 percent of the study area. Approximately 12 percent of these agricultural areas are in parkland.

Lake Frank within the Rock Creek Regional Park and the Triadelphia Reservoir in the Patuxent River provide various benefits. Both provide flood mitigation and sediment removal for upstream development and agriculture which do not have stormwater management controls. They also provide recreational opportunities, and the reservoirs provide regional water supply. Increased sediment deposition in Lake Frank is gradually decreasing its functionality for recreation. Periodic dredging or the creation and maintenance of a forebay will eventually be required to retain the recreational functions of the lake. Elevated nutrient levels, depressed dissolved oxygen concentrations and sediment deposition are affecting water quality in the reservoir.

Natural resources in the study area receive varying levels of protection on public lands. These public lands cover 7,070 acres of the study area; they include M-NCPPC and state of Maryland parklands, and WSSC properties that abut and protect the Patuxent River and the Triadelphia Reservoir. Wide bands of parkland exist along the stream valleys of the North Branch of Rock Creek and the Hawlings River, and along the Patuxent River. The Reddy Branch of Hawlings and the mainstem of Northwest Branch are also protected in parkland. Protection of small headwater tributaries relies primarily on conservation areas set aside during the land development process.

Air quality in the study area is similar to that found throughout the County. Ground-level ozone is formed from a regional mixture of vehicle and industrial emissions, creating unhealthy ozone levels throughout the metropolitan area several days each summer.

Noise is generated by roadway traffic. Noise is created along main roads by high levels of traffic and distribution of roads throughout the area, especially within the policy area boundary.

Water and sewer systems serve approximately two thirds of the area south of Brookeville and very limited portions of the study area north of Brookeville. Water service is not currently planned for the northern half and significant portions of the southeastern quarter of the study area. Sewer service is available primarily to properties zoned higher density residential, commercial or industrial within the policy area boundary; it is not currently planned for the majority of the study area. Potable water is provided by WSSC from either the Patuxent water filtration plant (WFP) or the Potomac WFP. Sewer service is provided by the WSSC trunk lines along the mainstem of the North Branch of Rock Creek, and in limited areas of the Northwest Branch.

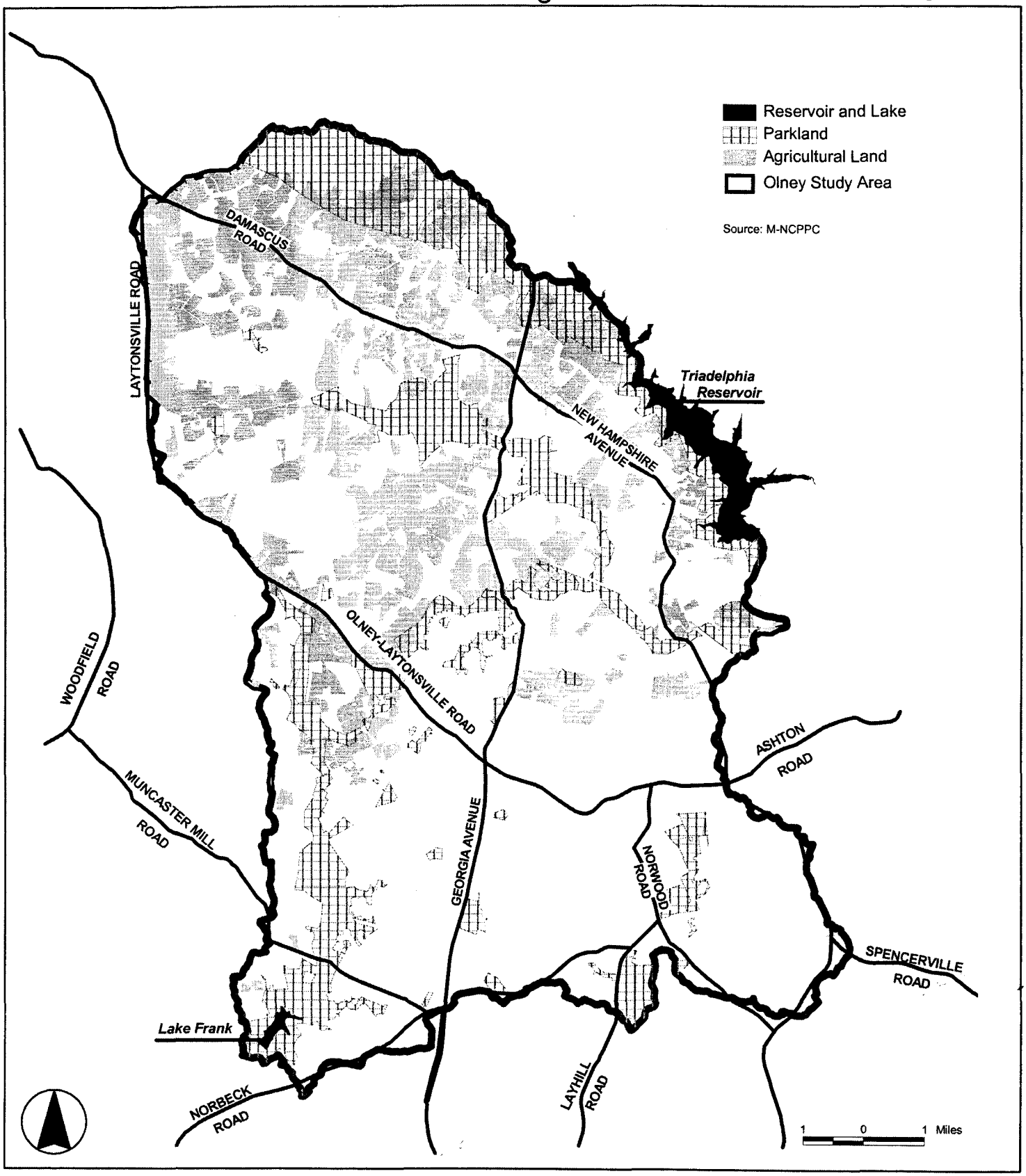
Environmental Policy Framework

Many existing environmental laws, policies, and regulations affect planning for Olney and vicinity. This policy framework is reflected in the environmental goals and objectives of the General Plan Refinement. The federal, state and local framework helps identify resources to be protected and guides local decisions regarding land use planning and zoning as it affects the natural environment.

The identification and protection of sensitive areas are required by the state of Maryland Economic Growth, Resource Protection, and Planning Act of 1992. This environmental inventory report is designed to satisfy the requirements of the Planning Act's Sensitive Areas Element for Olney and vicinity.

Parkland and Agriculture

Figure 3



Existing Environmental Conditions

The following description of the natural resources of Olney and vicinity are organized in two sections. The first part of the chapter provides an overview of the study area geology, soils, terrain, vegetation, sensitive areas and habitats of rare, threatened and endangered species, wildlife and fish, air quality, noise conditions and the availability of sewer and water service. The second part of the chapter examines the character, water quality and management of the component watersheds in the study area.

The subsection covering wetland resources of the study area provide analysis at two levels of detail. A general overview of the major wetland resources is provided for the study area. More detailed information based upon field inventory is provided for the Olney policy area. In-depth field study of wetland resources was focused on the policy area because of limited staff resources and the expectation that most land use decisions would be focused in this area.

Parkland and Agriculture

Approximately eighteen percent of the study area is within public parkland and WSSC-owned land, and 21% is in agriculture (see Table 1 and Figure 3). The agricultural land is concentrated in the northern headwaters of the North Branch of Rock Creek, and in the Hawlings and Patuxent watersheds. The lower levels of imperviousness associated with agricultural land uses contribute toward the high water quality in these areas. Parkland includes 1,023 acres, or 12 percent, of the agricultural land. Approximately 17% (5,318 acres) of the planning area and 8% (907 acres) of the policy area are in parkland. Parks contain many of the sensitive areas in the watershed. Whenever practical, this inventory distinguishes between resources in parkland and resources outside parkland.

Study Area Existing Parkland[1] and Agriculture Distribution

Table 1

Watershed	Total Acres	Acres in Parkland	% of Watershed[2] in Parkland	Acres in Agriculture	% of Watershed[2] in Agriculture
Great Seneca Creek	98	0	0	84	86
Hawlings River	18,069	1,885	10	4,869	27
Northwest Branch	6,502	566	9	15	.2
Patuxent	7,011	2,966	42	2,783	40
North Branch Rock Creek	8,014	1,653	21	731	9
TOTALS	39,694	7,070[3]	18	8,482	21

(1) GIS coverage of existing parkland, M-NCPPC 1997. For parkland ownership, see Appendix, Table A-1.
(2) Includes only the portions of the Great Seneca Creek, Northwest Branch, Patuxent, and North Branch Rock Creek watersheds which fall within the study area boundary.
(3) Includes both existing and proposed parkland based upon the most recent version of the park-acquisition map.

Geology and Soils

The Hawlings River, upper Northwest Branch, North Branch of Rock Creek, and the lower portion of the upper Patuxent River lie entirely within the Piedmont physiographic province, where bedrock is composed of metamorphic and igneous rocks of Pre-Cambrian to early Paleozoic age. The study area is predominantly underlain by schist and gneiss crystalline rocks of the Wissahickon and Sykesville formations (see Figure 4). A small portion of the southern part of the Hawlings River watershed and the western portion of the upper Northwest Branch watershed are underlain by mafic and ultramafic rock. The Hawlings River and upper Patuxent River watersheds also have minor amounts of mafic and ultramafic rock in the areas underlain by schist. A mantle of loose unconsolidated material, the regolith, generally overlies solid rock. It comprises saprolite, soils and alluvium. The saprolite is gradational material overlying bedrock. Saprolite is rocky and barely weathered just above the bedrock and clay-rich at the surface.

Soils in the study area are generally deep to very deep. The depth of soils to bedrock ranges from 0 to 75 ft., and is greater than 5 feet for more than 85 percent of the watershed area. Well-drained soils, mostly Glenelg, Wheaton and Gaila, dominate the uplands. Poorly drained hydric soils, including Baile and Hatboro, are more common in the floodplain and low-lying areas of the stream valleys.

Upland soils on ridge tops and side slopes are generally well drained and deep, with slight to moderate restrictions to development. In low lying areas, and in the proximity of streams in general, hydric and poorly drained soils present severe limitations to on-site sewage disposal. In those areas, development using individual on-site sewage disposal systems may be constrained due to slow percolation, wetness, flooding or depth to bedrock (see Figure 5). Approximately 23 percent of the study area outside the sewer service area and parkland, contains soils which present severe limitations to on-site sewage disposal.

Topography and Slopes

The terrain of the study area exhibits gentle to steep slopes (see Figure 6). The majority of the area has slopes less than 8 percent (see Table 2). Steep slopes (25 percent or greater) occur along the mainstem of the North Branch of Rock Creek, along the Patuxent River and some of its major tributaries, and along the mainstem and major tributaries of the Hawlings River. The majority of steep slopes are contained within parkland.

Study Area Slopes

Table 2

Slope	Approximate % of Total Area
Less than 8%	68
8-14%	22
15-24	7.5
25 or greater	2.5

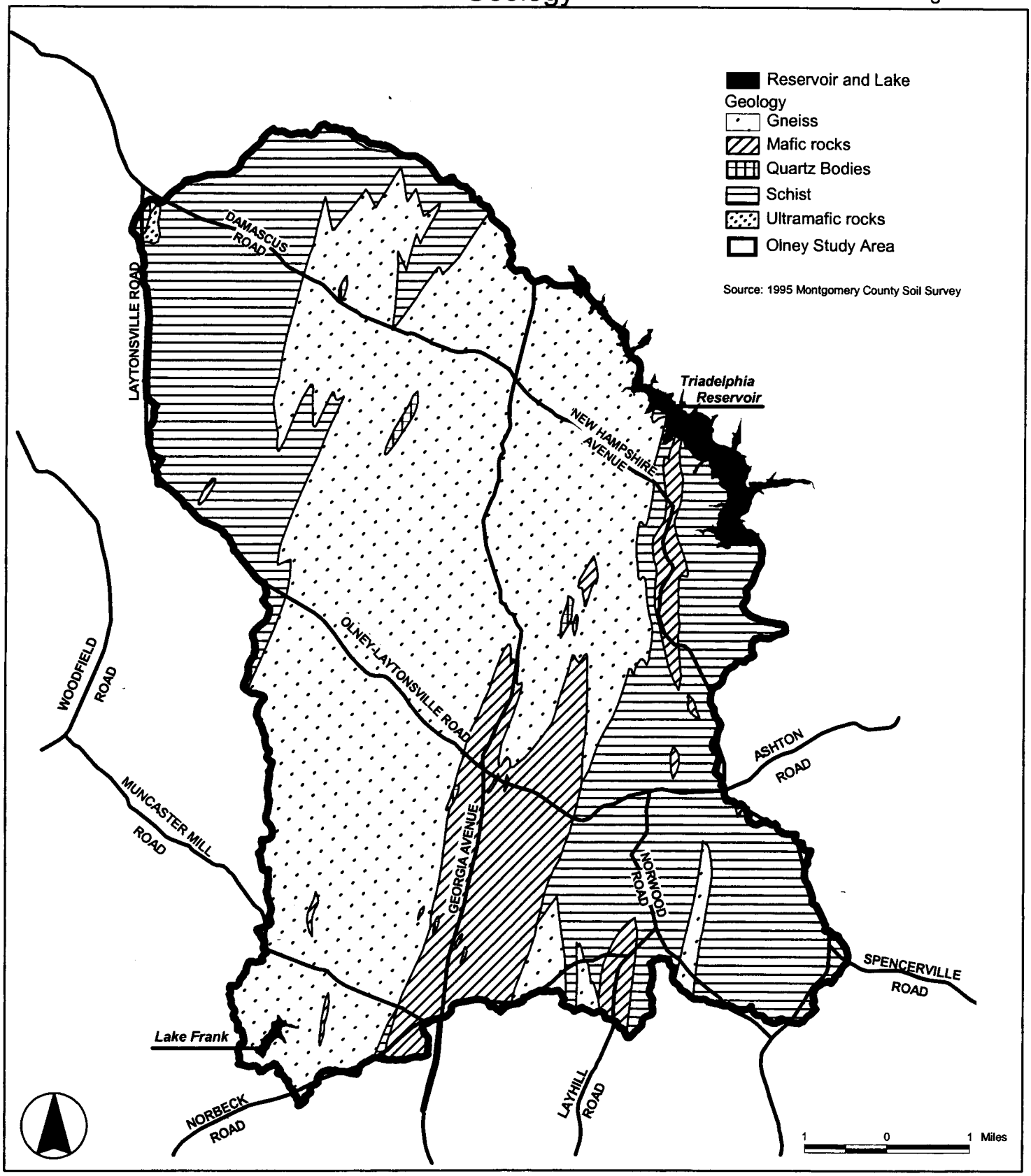
Groundwater

The Olney master plan study area lies entirely within the upland section of the Piedmont physiographic province in Montgomery County. The hydrogeologic setting of the watersheds within the study area is typical of the Maryland Piedmont – precipitation that infiltrates the ground recharges ground water, which discharges to streams. Precipitation is the primary source of aquifer recharge in Montgomery County. The average annual rainfall is about 42 inches, of which an estimated 9 to 10 inches is available as recharge. Most precipitation either runs off or is intercepted or taken up by plants and other organisms and returned to the atmosphere as evapotranspiration.

Groundwater flow systems in the Maryland Piedmont are generally unconfined and local. By unconfined we mean that the top of the aquifer is not bounded by an impermeable layer; rather, the top of the aquifer is simply the top of the zone of saturation, otherwise known as the water table. The water table surface generally reflects the overlying topography. As a result, groundwater watersheds and divides generally mimic surface watersheds and drainage divides. There is little or no groundwater flow between drainage basins in the Maryland Piedmont; therefore, processes acting within the individual basins determine water quality. This is a fundamental difference between crystalline rock aquifers of the Piedmont and the sedimentary aquifers of the Coastal Plain, where recharge water travels long distances in confined aquifers and water quality may not bear any relation to land use near the well. During dry weather stream flow is maintained predominantly by

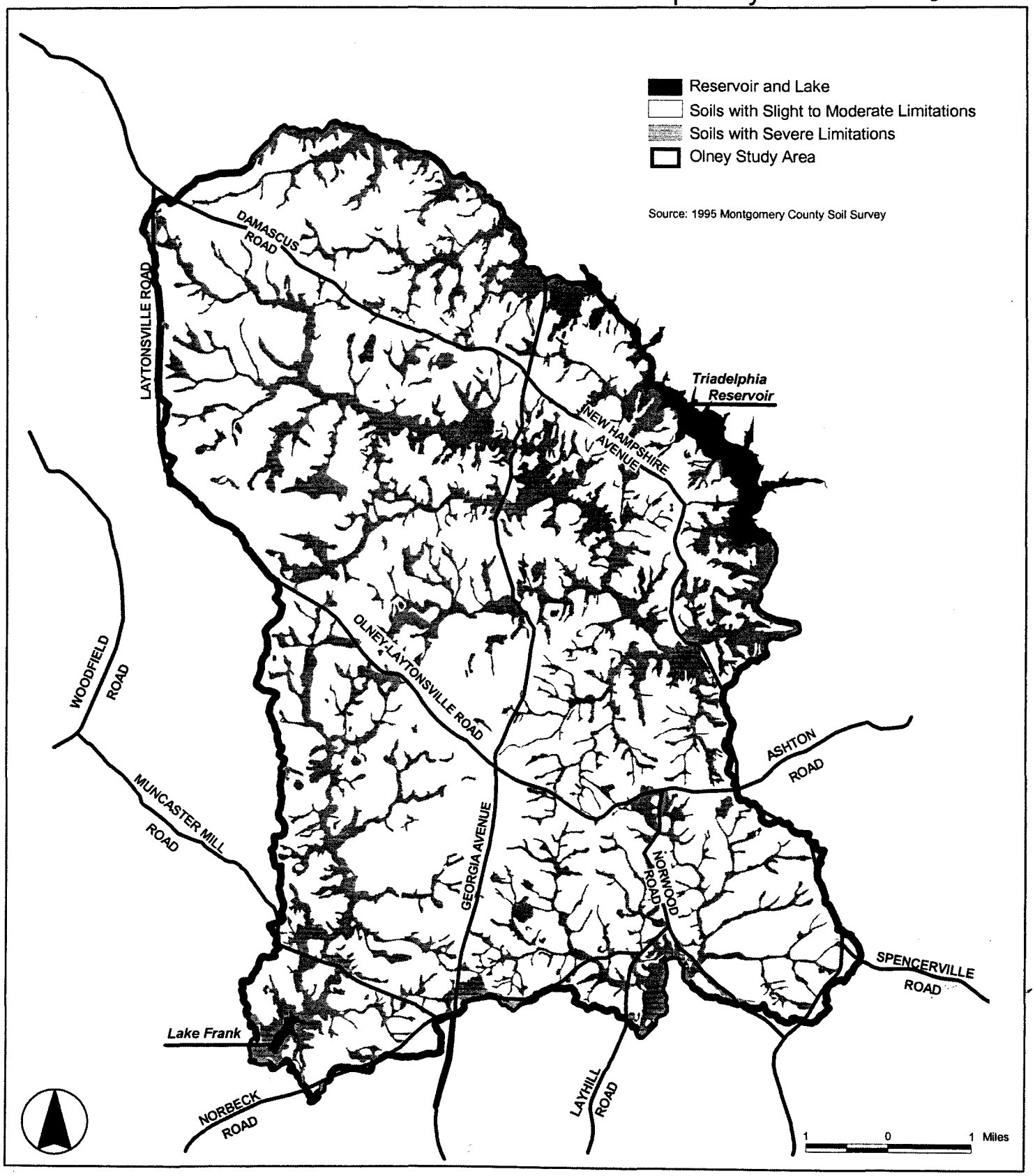
Geology

Figure 4



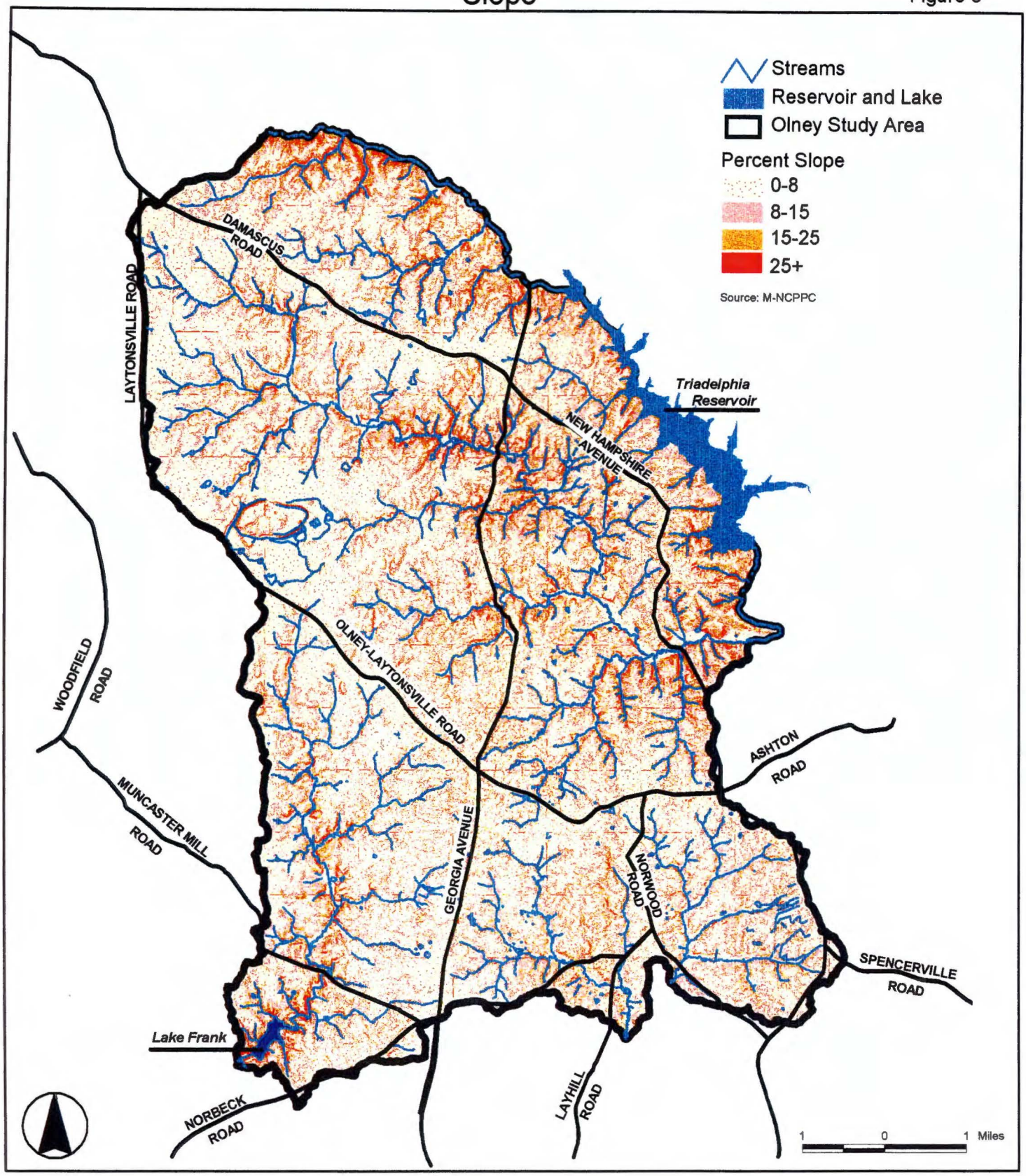
Soils with Severe Limitations to Septic Systems

Figure 5



Slope

Figure 6



groundwater discharge. As a result, under low flow conditions groundwater and surface water quality are closely linked.

In areas of Montgomery County that depend on individual well systems, protection of groundwater quality is essential. Ironically, those same areas usually depend on individual on-site sewage disposal systems (septic systems) that may contribute to groundwater pollution. Regulations are in place to require separation of wells and septic systems, and proper design to avoid contamination from failing systems. Use of such systems, however, requires large lots especially where soils have septic limitations due to shallow bedrock or wet conditions. Other sources of groundwater pollution include animal waste, excessive application of fertilizers and pesticides, improper land disposal of hazardous substances, and recharge from heavily contaminated surface sources such as stormwater management infiltration trenches.

From a water quantity standpoint, the disturbance or replacement of natural water recharge and discharge areas interferes with the hydrologic cycle of groundwater. Streams in heavily urbanized areas experience a decrease in stream base flow and lower groundwater yields. The impacts can be serious for areas that depend on public or private wells. Also, low baseflow in streams adversely impacts the natural aquatic environment.

As discussed in the previous section, the four watersheds that occur in the Olney master plan study area are all characterized by very similar geology and soils (see Figure 4). Well yields in the gneiss crystalline rock aquifer range from less than 1 gallon per minute (gpm) to 183 gpm, but yields are generally low, averaging 11 gpm in schist bedrock. The relatively low yield from wells in this aquifer has been attributed to the poorly developed network of points and fractures in the rock. Movement of groundwater is slow, with transmissivities of 2100 to 6500 gpd/ft.

Variability in well yields has been associated with area topography and geology. A greater percentage of wells in the valleys have high yields than wells located on hilltops. This is a typical occurrence in gneiss crystalline rock where valleys tend to develop along zones of structural weakness, where fracturing is greater. Also, a slightly larger percentage of wells in Montgomery County drilled in gneiss have produced high (25 gpm or greater) and intermediate (6-25 gpm) yields than wells drilled in schist or mafic rock.

In general, the crystalline rock aquifer is considered suitable for providing limited quantities of high quality water, such as for individual homes in rural areas. A trend among municipalities in the area has been to shift from initially using groundwater to using treated surface water, as population growth results in the need for larger water supplies.

General Characteristics of Vegetation and Natural Resources

Forest Resources

The forest areas of Olney and vicinity provide various environmental functions, including enhancing air quality, filtering particulates, absorbing nitrogen oxides, and reducing energy needs by reducing the need for cooling and heating. They also provide habitat for a range of plants and animals and recreation opportunities and resources for people. Along streams and waterways, forests play a vital role in maintaining water quality by filtering and reducing surface runoff, helping to alleviate flooding, and moderating stream temperature fluctuations. The quality of life in communities is also improved by forests and trees which provide recreation, aesthetics, and beautification.

A forest resources inventory was conducted in the Olney study area to aid in identifying priority forest stands and locating forest enhancement and reforestation areas in the master plan. The existing forests were analyzed to determine their distribution and amount, and to classify them by forest type. The approach and methodology used are described in the Appendix.

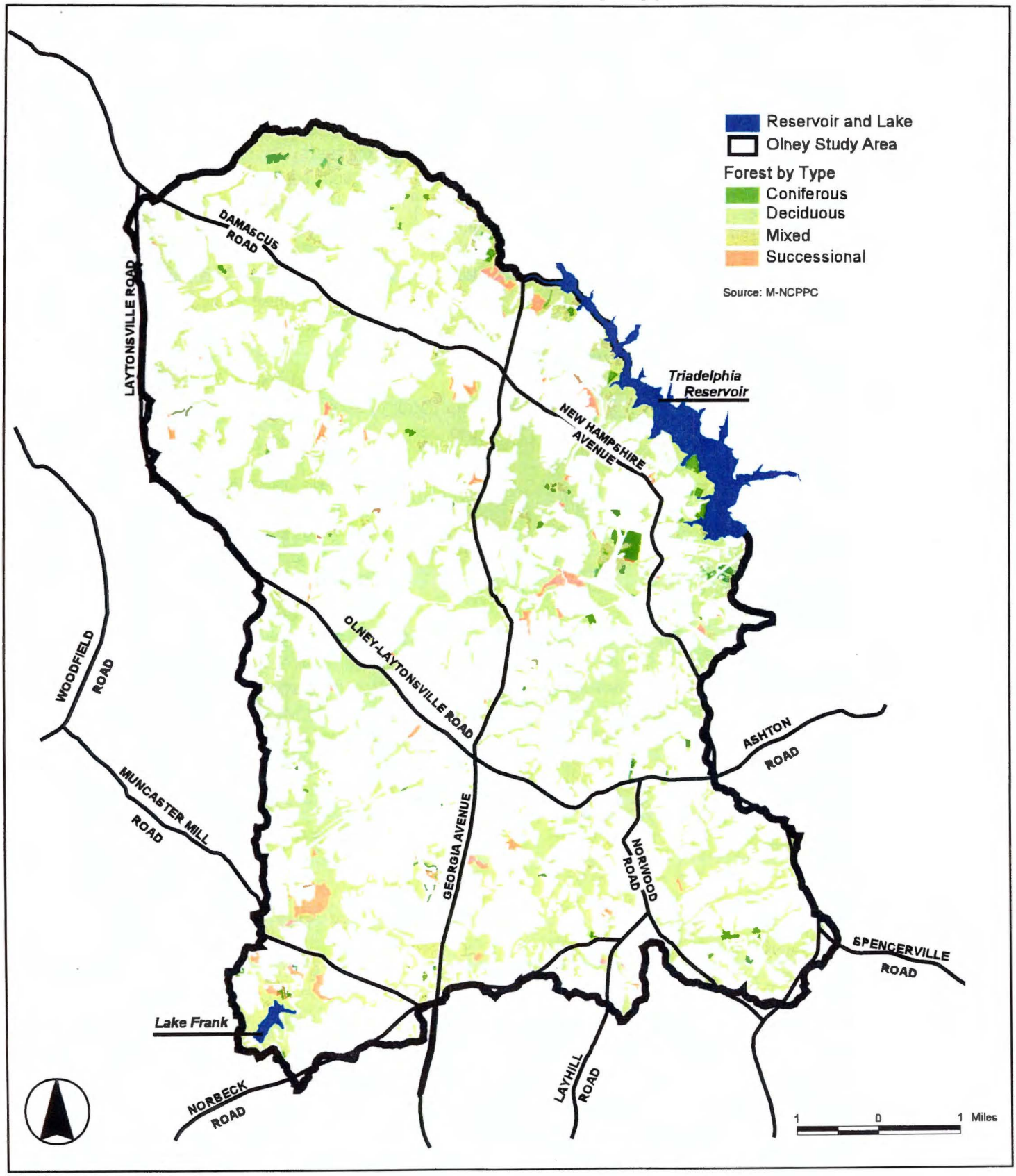
Inventory Results

The forests of the study area were categorized into deciduous, mixed deciduous/coniferous, coniferous, and successional forest types (see Figure 7). Definitions of these types are included in the Appendix.

Forest dominated by deciduous species are the predominant type within the study area. In the North Branch of Rock Creek, and some areas of the Hawlings and Patuxent, successional forest is also an important component. Mixed deciduous/coniferous forests are a relatively small component of the overall study area forest, but are more predominant in the Hawlings and

Study Area Forest by Type

Figure 7



Patuxent River areas. Coniferous forests are rare in the North Branch of Rock Creek and Northwest Branch, but large coniferous forest stands are present in the Hawlings and Patuxent River areas.

Several significant coniferous stands exist along land bordering the Triadelphia Reservoir. Table 3 provides a summary of forest types by acreage in the study area. Approximately forty percent of the forest resources of the study area are within existing parkland.

Study Area Forest by Type[1]

Table 3

Forest Type	Acreage[2]	% of Total Forest
Deciduous	11,235	90
Mixed Deciduous/ Coniferous	490	4
Coniferous	260	2
Successional	460	4
TOTAL	12,445	100

(1) The forest categories used represent generalized forest types recognized by the Maryland state forest inventory.

(2) A total of 4,391 acres (or 35 percent) of the study area forest is within parkland.

As is typical throughout the county, the deciduous forests in the study area are comprised of various forest stands which differ in age, species, and quality throughout their extent. Many of the stands contain mature woodland with specimen size trees. Non-native, invasive vegetation is a problem in many of the deciduous forests. Although the amount of invasive species varies widely within the different stands, in some cases they are a major inhibitor to overall forest development. Several instances were observed in the Northwest Branch and Hawlings River watershed areas of old fields completely covered with multiflora rose bushes that were inhibiting development of the areas as forest. In many instances, the deciduous forest stands have also been affected by excessive deer browsing and, as a result, contain little to none of the typical forest understory tree, shrub and herbaceous plants.

Dominant tree species in the deciduous forest areas vary across the topography. The more mature upland forest areas are representative of the oak/hickory forest association (Brush et al., 1980). Dominant tree species include white oak (*Quercus alba*), northern red oak (*Q. rubra*), chestnut oak (*Q. prinus*), scarlet oak (*Q. coccinea*), mockernut hickory (*Carya tomentosa*), and pignut hickory (*C. glabra*) with tulip poplar (*Liriodendron tulipifiera*) as an important secondary component. Many unusual features within deciduous forest stands were noted. They included occurrences of healthy stands of Amercian chestnut (*Castanea dentata*) containing unusually large trees; stands dominated by exceptionally large specimen trees; and stands where not only are existing trees specimen size, but also they are made up of an unusual variety of tree species for one location. This exceptional level of diversity and health make several of the existing deciduous forest stands important candidates for preservation.

Slopes and lowland areas are typically dominated by tulip poplar in association with red maple (*Acer rubrum*) and sycamore (*Platanus occidentalis*). Black cherry (*Prunus serotina*) is an important associated species along with green ash (*Fraxinus pennsylvanica*), black walnut (*Juglans nigra*), black gum (*Nyssa sylvatica*), American elm (*Ulmus americana*) and beech (*Fagus grandifolia*). In many locations, exceptionally large tulip poplars and sycamore are present within the stands.

Typical woody understory vegetation in the deciduous forests includes dogwood (*Cornus florida*), spicebush (*Lindera benzoin*), mountain laurel (*Kalmia latifolia*), ironwood (*Carpinus caroliniana*), blueberries (*Vaccinium spp.*), and viburnums (*Viburnum spp.*) with occurrences of more unusual species such as hornbeam (*Ostrya virginiana*). Alien and invasive plants include multiflora rose (*Rosa multiflora*), Japanese honeysuckle (*Lonicera japonica*), Asiatic bittersweet (*Celastrus orbiculatus*), porcelain berry (*Ampelopsis brevipedunculata*) garlic mustard (*Alliaria petiolata*), and Vietnamese stilt grass (*Microstegium vimineum*).

The mixed deciduous/coniferous forests contain many of the same species of trees as the deciduous forest in association with Virginia or scrub pine (*Pinus virginiana*), eastern hemlock (*Tsuga* Canadensis) and white pine (*Pinus strobus*). In the younger mixed forest stands eastern red cedar (*Juniperus virginiana*) replace the pines as the dominant associated coniferous tree. The coniferous forest stands include planted stands of white pine and a combination of planted and natural occurrences of eastern hemlock. The hemlocks occur primarily on the rocky, north-facing slopes within the forest along the Triadelphia Reservoir. Unlike some areas of

occurrence in the county, most of these hemlock stands appear to be healthy and in some cases the individual trees are quite large.

The successional forest areas are dominated by tulip poplar, red maple, and black cherry in association with eastern red cedar. They also contain the alien invasive species mentioned above in various quantities. Successional forest areas and old fields offer opportunities for expansion of existing forest resources in the watershed. One significant area exists north of Muncaster Mill Road in the North Branch Stream Valley Park. Another location is the area north of Lake Frank in Rock Creek Regional Park. Large areas of successional forest also exist along the Reddy Branch Stream Valley Park east of Brookeville and within public land east and west of Georgia Avenue along the Patuxent River.

Important Forest Resource Areas

In Montgomery County where urbanization and agriculture have removed much of the existing forest, conservation of all remaining forest resources is important. High quality forest stands may warrant preservation. Quality of a forest stand is a reflection of such characteristics as acreage of the stand, tree species and age, stand structure, percent of non-native or invasive vegetation within the stand, and overall health. High quality forest stands are large enough to provide a variety of habitats including forest interior. They may contain tree species which are rare or the trees may be significant because of their maturity and size. High quality stands have more diverse forest structure including varying layers of tree canopy with associated understory trees, shrubs and herbaceous plants. Forest stands which are in good health and have a small percentage of non-native or invasive vegetation are also high quality.

As a first cut to identifying high quality forest stands, significant forest areas based upon stand size and proximity to existing streams were identified (see Figure 8). Using this coverage, more detailed analysis for stand quality was carried out. Several forest areas exhibiting one or more of the characteristics of high quality forest are present in Olney and vicinity.

Within existing park and WSSC land, important forest areas include (see Figure 8):

1. The forest south of Olney-Laytonsville Road midway between its intersection with Georgia Avenue and the western study area boundary in the North Branch of Rock Creek Stream Valley Park
2. The forest within the stream valley north of Lake Frank, including the stand north of Muncaster Mill Road
3. Rachel Carson Conservation Park south of Damascus Road just west of Georgia Avenue
4. Hawlings River Stream Valley Park east of Georgia Avenue
5. Patuxent River State Park along the river on the northern boundary of the study area
6. Reddy Branch Stream Valley Park west of the town of Brookeville; and
7. Most of the forest along the Triadelphia Reservoir within WSSC property

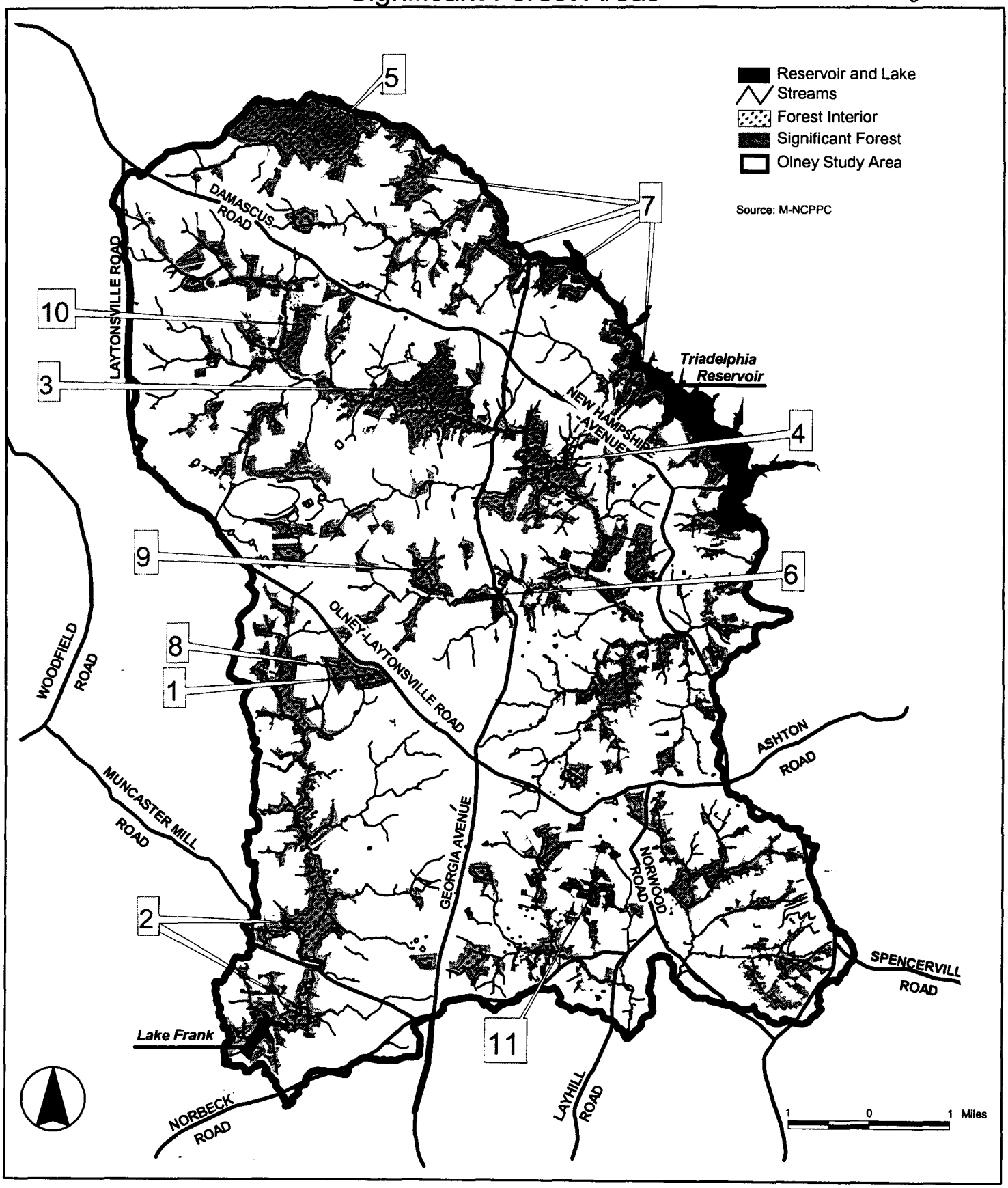
Outside parkland, important forest areas include:

8. The forest between the North Branch of Rock Creek Stream Valley Park area south of Olney-Laytonsville Road and west of the policy area boundary
9. The forest in the headwaters of Reddy Branch west of Brookeville
10. The forest north and west of Rachel Carson park in the Hawlings River area; and
11. The forest along the Bachelors Forest tributaries of Northwest Branch east of Georgia Avenue and south of Norwood Road

Table 4 summarizes the location and significance of forest within the study area.

Significant Forest Areas

Figure 8



Study Area Forest by Location and Significance

Table 4

Watershed	Watershed Area	Total Forest Area		Forest in Parkland		Significant Forest[1]				Forest Interior Habitat[2]
	Acres	Acres	% of watershed area	Acres	% of total forest acreage	Acres	% of total forest acreage	Acres in parkland	% of significant forest in parkland	Acres
North Branch of Rock Creek	8,014	2,255	28	1,210	54	1,670	74	1,109	66	455
Hawlings River	18,069	5,709	32	1,402	24	4,336	76	1,330	31	1,085
Upper Northwest Branch	6,502	1,970	30	162	8	1,517	77	89	6	198
Upper Patuxent River	7,011	2,511	36	1,616	64	2,216	88	1,540	69	675
TOTAL	39,694[3]	12,445	31	4,391	35	9,739	78	4,068	42	2,413

[1] Consists of forest areas that contain forest interior (300 feet) and riparian corridors (600 feet). For a discussion of Significant Forest Areas, see the Appendix.

[2] Included under significant forest

[3] Total includes the study area acreage within the Great Seneca Creek watershed which has no forest.

Wetlands

According to the definition listed in both federal and state wetlands statutes, a wetland is an area that is inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Wetlands have soils which are saturated or flooded for a significant portion of the growing season each year. The wet soil conditions smother the root systems of typical upland plants, making it difficult for them to grow and reproduce. In wetlands therefore, the plant community changes to one dominated by plants having physiological adaptations which enable them to grow and thrive in the wet conditions. Often, plants which have become adapted to wetland areas occur nowhere else. For this reason, wetlands harbor comparatively higher numbers of rare, threatened, and endangered species than upland habitats.

Many species of animals use wetlands for some portion of their life cycle, and some kinds of animals, such as amphibian species, are completely dependent on damp soils and standing pools of water for their survival. Other animal species, especially insects, may depend on host plants which occur only in wetlands. Because many plants and animals in wetlands are specialized to survive in saturated or flooded soil conditions, wetlands have unique biological communities which contribute significantly to the biological diversity of the county.

Wetlands frequently occur where the water table intersects low areas in the landscape. This also means that wetlands often are found in close proximity to stream systems. The location of these wetlands, coupled with some unique physical, chemical, and biological processes, allows wetlands to provide important water quality and flood control functions. The combination of water quality, flood control, and habitat functions make wetlands valuable components of the landscape. Unfortunately, many wetlands which were historically present have been lost to agriculture and development. In recognition of this, various regulations and guidelines have been passed at the federal, state, and local government levels in an effort to protect and restore wetlands.

Among the water quality goals for Montgomery County are to "protect, maintain, and restore high quality chemical, physical, and biological conditions in the waters of the state in the county; reverse the past trends of stream deterioration through improved water management practices; maintain physical, chemical, biological, and stream habitat conditions in county streams that support aquatic life along with appropriate recreational, water supply, and other water uses; (and) restore county streams, damaged by inadequate water management practices of the past, by reestablishing the flow regime, chemistry, physical conditions, and biological diversity of natural stream systems as closely as possible (Montgomery County Code, Chapter 19, Article IV)." Protection and restoration of wetlands and wetland functions is vital to the achievement of these goals.

The purpose of this wetland inventory is to broadly identify, characterize, and assess the wetland resources within the study area. The information collected in this inventory may then be used to help identify and prioritize opportunities to protect or restore wetland systems in the study area. It is anticipated that wetland protection or restoration opportunities would be factored into the land use analysis of the master planning process so that recommendations that form the master plan amendment help support County goals of protecting and improving aquatic resources, including wetlands.

The Digital Ortho Quarter Quad (DOQQ) wetland inventory prepared for the Maryland Department of Natural Resources (Md. DNR) formed the basis for the representation of wetland resources in the Olney study area. The DNR inventory represents interpretation of 1993-94 aerial photography. Staff has found the DOQQ inventory to be considerably more accurate than either the federal National Wetlands Inventory (NWI) or the maps of hydric soils in Montgomery County in depicting the likely locations of wetlands, although the DOQQ inventory does include errors of both addition and omission. In general, staff observed that the DOQQ's tended to overestimate the total area of wetlands; however, most areas depicted as wetlands contained at least pockets of wetlands embedded within floodplain plant communities. In a few cases, wetlands are more extensive than represented by the DOQQ.

Based on the DOQQ information, wetlands account for approximately 4 percent of the total acreage of the Olney study area (see Figure 9 and Table 5). According to the most widely accepted standard for wetlands classification in the United States[2] , most of the wetlands (about 49 percent) are palustrine[3] forested (PFO) wetlands. In the study area, as is typical in the county, these forested wetlands occur in low areas adjacent to streams. Palustrine emergent (PEM) wetlands, which lie near streams and are dominated by emergent vegetation, account for a little more than nine percent of the study area's wetlands. (Emergent vegetation consists of herbaceous plants which may have their root systems temporarily or permanently flooded, but which cannot survive if the entire plant is covered with water for any significant length of time.) A little less than four percent of the study area's wetlands are palustrine scrub-shrub (PSS), which consist of wetlands which occur near streams and are dominated by shrubs and small trees. Lakes and ponds account for about 27 percent and 10 percent, respectively, of wetlands in the study area. It should be noted that the lakes and ponds in this study area, as is the case in the county, are man-made. These include two large lakes: Lake Bernard Frank in Rock Creek and Lake Hallowell in the Hawlings River basin.

All the wetlands in the study area lie within a Use III or IV watershed. By definition (Code of Maryland Regulations 26.23.01.01), they are considered to be wetlands of "significant plant or wildlife value". None of the wetlands within the Olney study area are currently listed as wetlands of Special State Concern in the Code of Maryland Regulations. Wetlands may be designated wetlands of Special State Concern if they provide habitat or ecologically important buffers for state or federal rare, threatened, or endangered species, or if the wetlands contain unique or unusual natural communities.

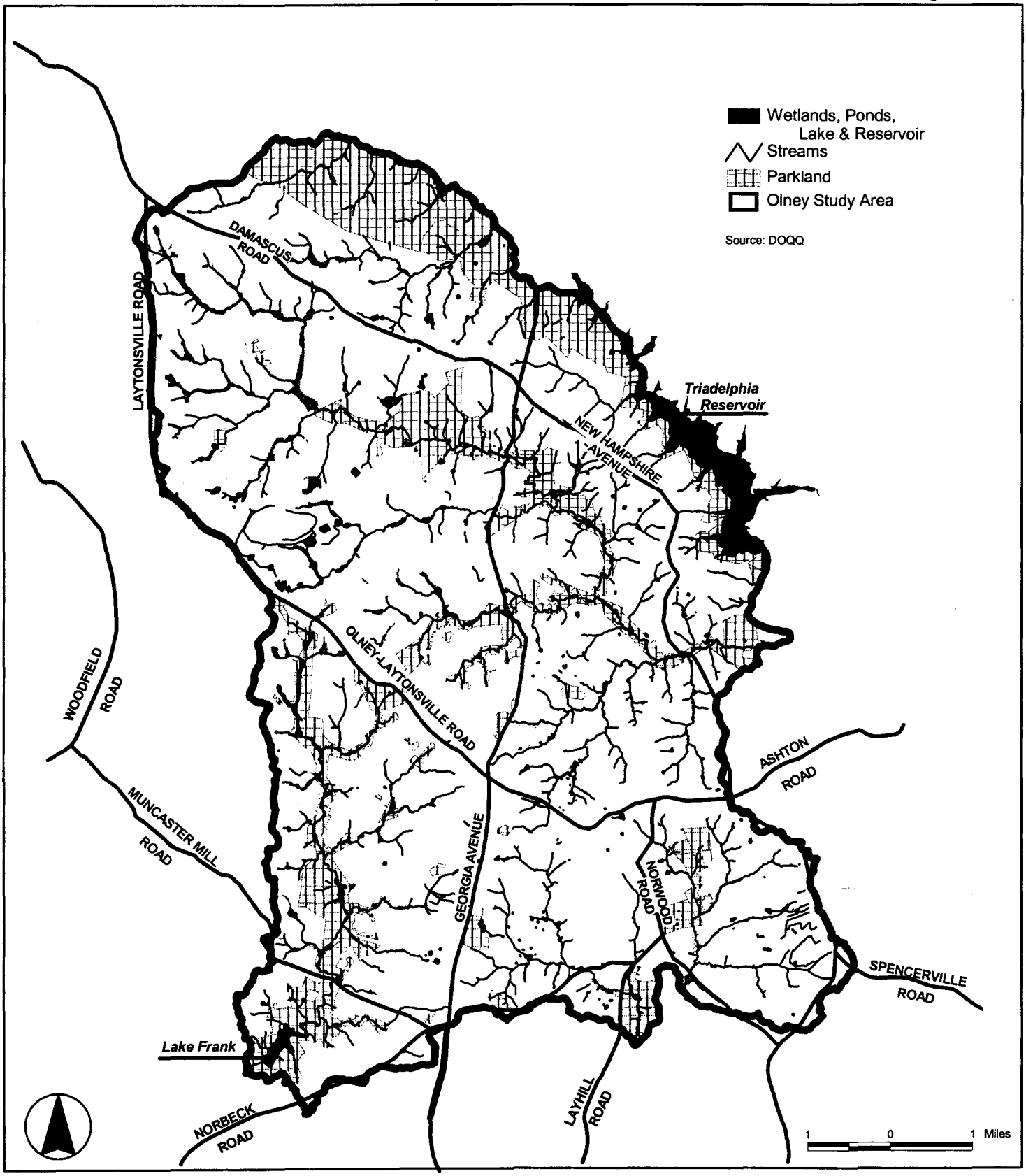
Although there currently are no wetlands of Special State Concern, there are wetland systems that are part of high-quality forest stands with richly diverse native plant communities. One such system lies within the Hawlings River watershed. Two wetland groups within the Rachel Carson Conservation Park are part of a large tract of high quality mixed deciduous forest. These wetland groups

[2] Categories are adapted from Cowardin, et. Al., 1979, "Classification of Wetlands and Deepwater Habitats of the United States", U.S. Department of the Interior, Fish and Wildlife Service.

[3] Palustrine wetlands are wetlands that are traditionally known as marsh, swamp, bog, fen, and prairie. They also include small, shallow, permanent, or intermittent water bodies called ponds. The reader should refer to Cowardin et. al. (1979) for a more complete description.

Study Area Wetlands

Figure 9



Study Area Wetlands[1] by Type

Table 5

Wetland Type[2]	Watershed (Acres)				Total (Acres)
	Northwest Branch	North Branch Rock Creek	Hawlings River	Patuxent River	
Forested (PFO)	26	221	439	75	761
Emergent (PEM)	0	23	69	30	122
Scrub Shrub (PSS)	1	3	30	25	59
Ponds (PU and PAB)	27	17	91	17	152
Farmed (Pf)	0	13	17	4	36
Lakes (L)	0	58	14	348	420
Riverine (R)	0	0	0	2	2
Total Wetlands	54	335	660	501	1,552
Total Watershed in Study Area	6,502	8,015	18,069	7,011	39,694 [4]
Percent of Watershed Covered by Wetlands [3]	<1%	4%	4%	7%	4%

(1) GIS coverage of wetlands (DOQQ), Earth Data 1998.

(2) Categories are adapted from Cowardin, et. al., 1979, Classification of Wetlands and Deepwater Habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service.

(3) Percentages rounded to the nearest 1 percent.

(4) This acreage represents the entire study area and includes that part of Great Seneca Creek (98 acres) that lies within the study area.

also support a small and widely scattered population of green dragon (Arisaema dracontium), a state watchlist[4] plant. Another high quality wetland is a large wetland in M-NCPPC parkland in the North Branch of Rock Creek. This wetland is part of a natural area identified by M-NCPPC as a biodiversity area. Such a designation recognizes the high quality, diverse, and unusual nature of the native plant and animal communities found in the designated area. This wetland is also recognized as important to the county's biological diversity by the Maryland Department of Natural Resources Heritage and Biodiversity Conservation Program.

Staff evaluated, at a preliminary level, the extent to which long-term protection has been provided to wetlands in the study area. Generally, the highest level of protection for natural resources occurs if conservation areas within public parkland are created over and around these resources. Using GIS data, staff identified wetlands that currently lie within state parkland, M-NCPPC parkland, or WSSC Triadelphia Reservoir watershed land. The results are summarized in Table 6, and Figure 9. Although this preliminary evaluation does not distinguish the different types of parkland (e.g., conservation parks, local parks, stream valley parks, etc.), the results give an indication of where wetlands are relatively well-protected from significant direct disturbance activities. It should be noted that wetlands, as well as other natural features, may be protected by other means, such as conservation easements on private land. The location and extent of such protective easements were not included in this evaluation.

[4] A watchlist plant or animal is a species that is rare to uncommon with the number of occurrences typically in the range of 21 to 100 in Maryland. According to the Maryland Natural Heritage Program of the Maryland Department of Natural Resources, a watchlist species may have fewer occurrences but with a large number of individuals in some populations, and it may be susceptible to large-scale disturbances. Watchlist species are not actively tracked by the Natural Heritage Program.

Study Area Wetlands[1] on Public Lands[2]

Table 6

Wetland Type	Acres of Wetlands In:											
	Northwest Branch			North Branch of Rock Creek			Hawlings River			Patuxent River		
	Total	In Parkland	% in Parkland	Total	In Park-land	% in Park-land	Total	In Park-land	% in Park-land	Total	In Parkland	% in Parkland
Forested (PFO)	26	13	50%	221	159	72%	439	91	21%	75	39	52%
Emergent (PEM)	0	0	—	23	11	48%	69	13	19%	30	25	83%
Scrub-Shrub (PSS)	1	<1	7%	3	0	0%	30	5	17%	25	21	84%
Ponds (PU and PAB)	27	5	19%	17	3	18%	91	4	4%	17	2	12%
Farmed (Pf)	0	0	—	13	0	0%	17	0	0%	4	0	0%
Lakes (L)	0	0	—	58	58	100%	14	0	0%	348	301	86%
Riverine (R)	0	0	—	0	0	—	0	0	—	2	2	100%
TOTAL	54	18	33%	335	231	69%	660	113	17%	501	390	78%

[1] GIS coverage of wetlands (DOQQ), Earth Data, 1998.

[2] Public lands include parkland owned by M-NCPPC and the state of Maryland, and WSSC Triadelphia Reservoir watershed property.

Assessment of Wetlands by Watershed

This inventory encompassed two levels of assessment of the wetland resources in this study area. A first-level, general assessment was conducted using mapped and previously documented information only. A more detailed assessment of wetlands, wetland types, and their functions was conducted within the Olney policy area. The detailed assessment could not be conducted within the entire study area because of constraints on time and staff. The policy area wetland types are shown in Figure 10 and detailed in Table 7. The more detailed functional assessment is presented in the Appendix.

Conclusions and observations in this section are based on both the general and more detailed assessments. It is anticipated that those parts of the Olney study area which were not part of the wetlands functional assessment will be covered under a future wetlands functional assessment inventory.

It should be noted that the comparisons of wetlands between watersheds made in this inventory apply only within the bounds of this study area. The study area cuts across three of the four watersheds that are included in this inventory (Patuxent, Northwest Branch, upper Rock Creek). Therefore, comparisons of wetlands and watersheds that are only partially located in the study area may not be valid or hold true if such wetlands are inventoried as part of a study that includes the entirety of a watershed.

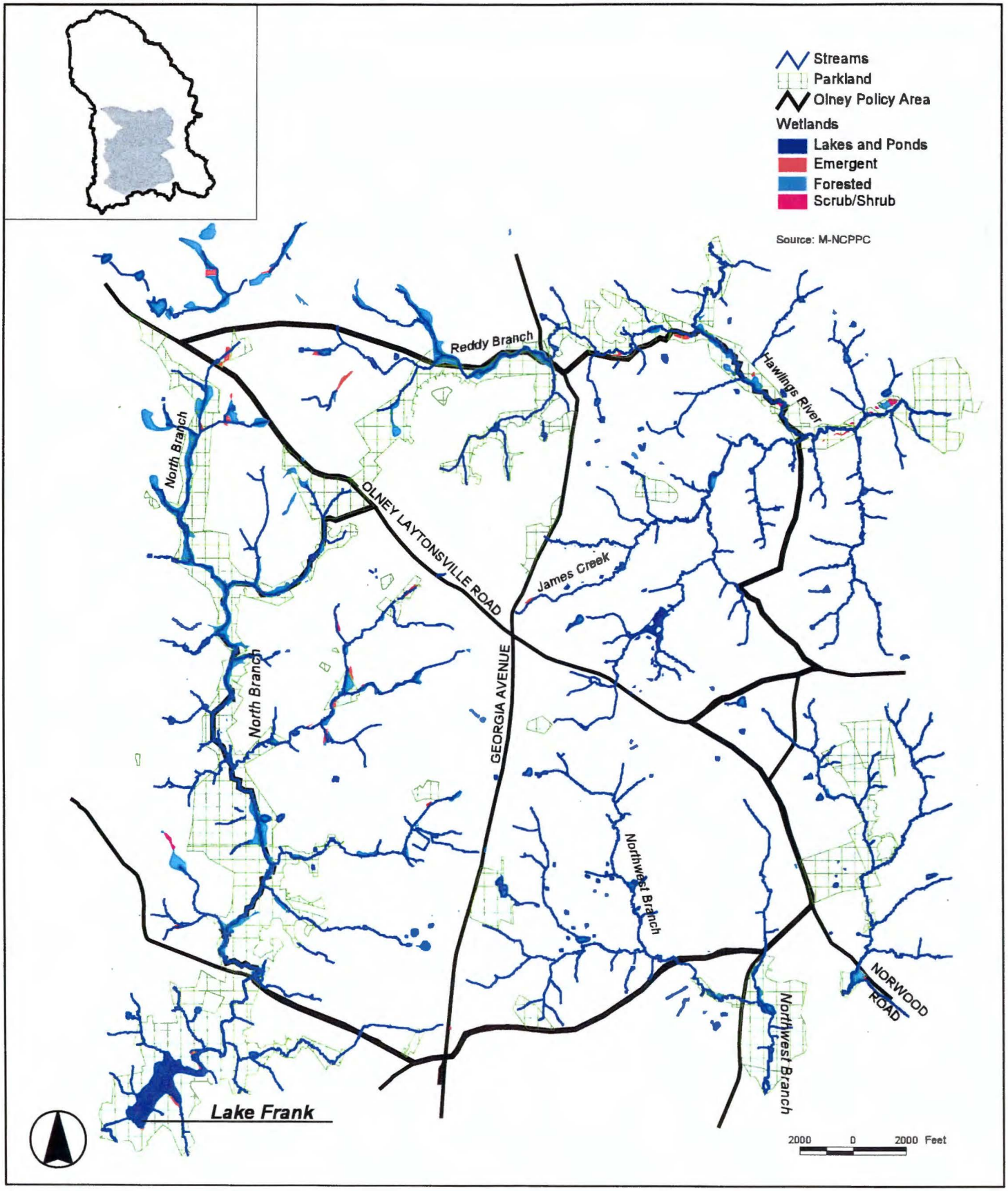
Northwest Branch

In this part of Northwest Branch, about half the wetlands are associated with man-made ponds. Only about one-third of the wetlands lie within public lands (see Figure 10).

There are relatively few wetlands (by acreage and proportion of watershed coverage) within this portion of Northwest Branch. However, some of these wetlands are part of a larger network of forested stream valley features

Policy Area Wetlands by Type

Figure 10



Policy Area Wetlands[1] by Type

Table 7

Wetland Type [2]	Watershed (Acres) Northwest Branch	North Branch Rock Creek	Hawlings River	Total (Acres)
Forested (PFO)	4	84	35	123
Emergent (PEM)	0	13	7	20
Scrub Shrub (PSS)	0	2	1	3
Ponds (PU and PAB)	10	11	14	35
Farmed (Pf)	0	0	0	0
Lakes (L)	0	0	14	14
Riverine (R)	0	0	0	0
Total Wetlands	14	110	71	195
Total Watershed in Policy Area	2,619	3,953	4,427	10,999
Percent of Watershed Covered by Wetlands [3]	1%	3%	2%	2%

(1) GIS coverage of wetlands (DOQQ), Earth Data 1998.
(2) Categories are adapted from Cowardin, et. al., 1979, Classification of Wetlands and Deepwater Habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service.
(3) Percentages rounded to the nearest 1 percent.

of floodplain, vernal pools, and springs that provide valuable habitat for wildlife, including amphibians such as frogs and salamanders.

North Branch of Rock Creek

Roughly two-thirds of the wetlands in this part of upper Rock Creek watershed are forested. Much of the wetlands (over two-thirds) are found on public lands (see Figure 10).

Wetlands in this watershed include those associated with Lake Bernard Frank in Rock Creek Park.

The North Branch and many of its tributaries harbor a rich variety of high-quality wetlands. The combination of large forested wetlands, high-quality scrub-shrub and emergent wetlands, and large vernal pool areas make the wetlands of North Branch especially valuable as habitat for aquatic, semi-aquatic, and terrestrial plants and animals, including amphibians. A large wetland (in M-NCPPC parkland) in this North Branch complex is part of a natural area identified by M-NCPPC as a biodiversity area. Such a designation recognizes the high quality, diverse, and unusual nature of the native plant and animal communities found in the designated area.

Hawlings River

By far, the greatest amount of wetlands occur within the Hawlings River portion of the study area. However, compared to the other watersheds in the study area, this watershed has the lowest proportion of its wetlands within public lands (see Figure 10).

It appears that high quality wetlands lie throughout the Hawlings River valley around Brookeville Road and north. These wetlands are associated with the mainstem, Reddy Branch, and some of the first and second order tributaries at the extreme western headwaters of the watershed. Many of these wetlands are forested and cover extensive areas. Many of these wetland lie within Rachel Carson Conservation Park and Hawlings River Stream Valley Park and are part of large forest stands. There are also large forested wetlands within private property, especially at the extreme western headwaters of the watershed which lie within private properties.

In contrast, there are groups of wetlands in this watershed which lie within one of the most highly developed portions of the study area. Such wetlands show substantial characteristics of adverse impacts due to urbanization. Generally, these wetlands are small, highly fragmented, and populated by non-native, invasive plant species.

Patuxent River

The Patuxent River watershed has the second highest amount of wetlands in the study area. It has the highest proportions of wetlands lying within protected public lands (see Figure 10).

The watershed of the Patuxent River mainstem contains some large areas of forested wetlands. Many of these wetlands are adjacent to or are near the mainstem and lie within the Patuxent River State Park or the WSSC Triadelphia watershed properties. One large forested wetland which may be of high quality lies on private property within the Haights Branch stream valley (tributary of Patuxent River) north of Damascus Road (Rte. 650), just east of Bridgeton Lane.

Habitats of Rare, Threatened, and Endangered Species and Areas Likely to Contain Unusual Biological Communities

Wetlands, large contiguous forest blocks, and certain stream valleys are probable habitats for rare, threatened, and endangered species (RT&E). Many stream valleys in Montgomery County have been protected over time by their steep topography or by excessive wetness. Where possible, they have been acquired as park land. Besides providing important habitat for plants and animals, stream valleys historically have served as important migration corridors for many species.

The probability of finding RT&E species or unusual biological communities increases in areas underlain by certain bedrock types such as ultramafic and diabase rock formations and in areas of serpentine soils. There is a very small area containing the ultramafic bedrock formation near the edge of the study area at the top of the Hawlings River watershed, but there are no serpentine soils.

Most of the known locations of rare, threatened, or endangered species of plants and animals occur in Montgomery County's park system. Surveys for RT&E species and unusual biological communities have been conducted on parkland by the Maryland Department of Natural Resources Heritage and Biodiversity Conservation Program as well as by M-NCPPC staff. As a result of these surveys, several areas within the park system have been designated as Biodiversity Areas. Biodiversity Areas included in the Olney study area are shown in Figure 11. A list of rare, threatened and endangered plants identified in these areas is shown in Table 8. The significant habitats and communities identified in the surveys of the areas included: high quality unfragmented forests; upland forest; a large seepage swamp; and a large emergent wetland in the North Branch of Rock Creek; and maturing, high quality, mixed deciduous forest; very high quality mixed deciduous forest; and high quality seeps in the Hawlings River.

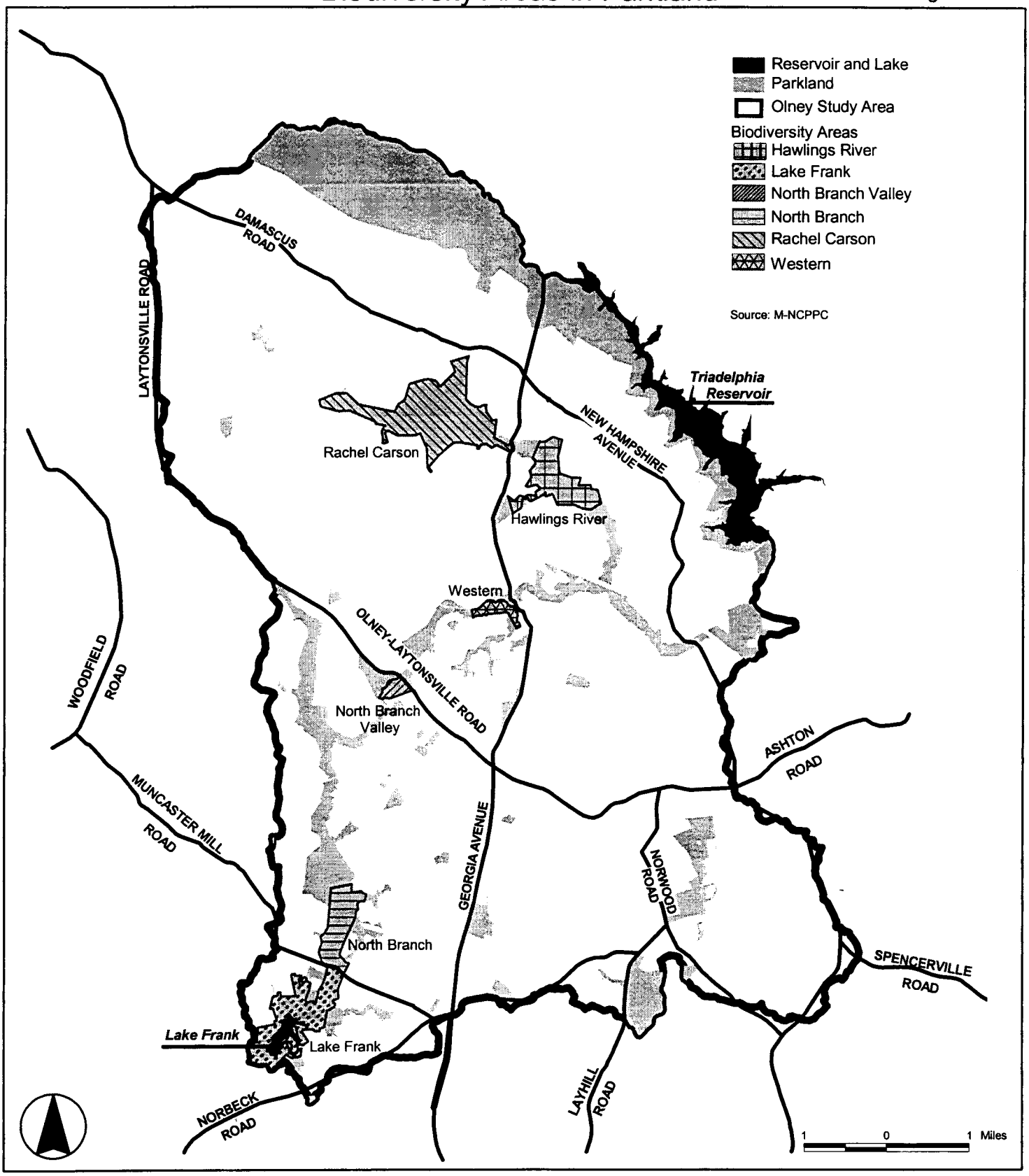
Wildlife

There have been few comprehensive wildlife inventories conducted in the study area. Only the Maryland Breeding Bird Atlas (1983-1987) covers the entire study area. Other inventories have been conducted on parkland including, breeding bird surveys in the North Branch of Rock Creek, Rachel Carson Conservation Park and Woodlawn Cultural Park. A more comprehensive wildlife inventory including birds, mammals, reptiles and amphibians was conducted as part of the development of the Rachel Carson Conservation Park Master Plan. A list of wildlife species that occur in Rachel Carson Conservation Park is included in the Appendix (see Table A-3).

A number of wildlife habitats and species occur in the study area that are noteworthy because they are declining regionally or they can have a direct or indirect impact on humans and human development issues.

Biodiversity Areas in Parkland

Figure 11



Study Area Rare, Threatened, and Endangered Plants

Table 8

Species in the Biodiversity Areas of the North Branch of Rock Creek		
Plant Species	**Common name**	**Official Status**
Aristolochia serpentaria	Virginia snakeroot	watchlist (1)
Calystegia spithamaea	low bindweed	State rare/watchlist(2)
Carex radiata	stellate sedge	endangered
Castenea pumila	chinquapin	watchlist
Castanea dentata	American chestnut	State rare/watchlist
Chamaelirium luteum	devil's bit	watchlist
Heteranthera dubia	water stargrass	infrequent in county(4)
Iris cristata	crested iris	endangered
Linderna dubia	false pimpernel	infrequent in county
Lysimachia terrestris	swamp loosestrife	infrequent in county
Melica mutica	narrow melicgrass	threatened (5)
Ostrya virginiana	hornbeam	infrequent in county
Penthorum sedoides	ditch stonecrop	infrequent in county
Potamogeton diversifolius	variable pondweed	infrequent in county
Quercus imbricaria	shingle oak	watchlist
Rotala ramosior	toothcup	watchlist
Scutellaria serrata	*showy skullcap*	*watchlist*
Senecio pauperculus	balsam ragwort	watchlist

Species in the Biodiversity Areas of the Hawlings River		
Plant Species	**Common name**	**Official Status**
Arisaema dracontium	green dragon	watchlist
Aristolochia serpentaria	Virginia snakeroot	watchlist
Castanea dentata	American chestnut	State rare/watchlist
Castanea pumila	chinquapin	watchlist
Commelina virginica	Virginia dayflower	watchlist
Elisia nyctelea	ellisia	watchlist
Geum laciniatum	rough avens	watchlist
Geum vernum	spring avens	watchlist
Quercus imbricaria	shingle oak	watchlist

(1) ***Watchlist***: Rare to uncommon with the number of occurrences typically in the range of 21 to 100 in Maryland. It may have fewer occurrences but with a large number of individuals in some populations, and it may be susceptible to large-scale disturbances. Not actively tracked by the Heritage and Biodiversity Conservation Programs. Source: *Explanation of Rank and Status Categories*. Maryland Department of Natural Resources, Heritage and Biodiversity Conservation Programs. April 19, 1996.

(2) ***State rare***: Imperiled in Maryland because of rarity (typically 6 to 20 estimated occurrences or few remaining individuals or acres in the State) or because of some factor(s) making it vulnerable to becoming extirpated. Actively tracked by the Heritage and Biodiversity Conservation Programs. Source: *Explanation of Rank and Status Categories*. Maryland Department of Natural Resources, Heritage and Biodiversity Conservation Programs. April 19, 1996.

(3) ***Endangered*** species means any species whose continued existence as a viable component of the State's flora or fauna is determined to be in jeopardy including any species determined to be an "endangered species" pursuant to the federal Endangered Species Act. Source: COMAR 08.03.08.

(4) ***Infrequent in Montgomery County***: Species singled out by M-NCPPC biologists as important to the County's biodiversity due to their scarcity in the County.

(5) ***Threatened*** species means any species of flora or fauna which appears likely, within the foreseeable future, to become endangered including any species determined to be a "threatened species" pursuant to the federal Endangered Species Act. Source: COMAR 08.03.08.

Forest Interior and Riparian Forest Habitat

Forest interior dwelling (FID) species, particularly birds, require large tracts of unfragmented woodland to supply their life requisites. Forested areas at least 100 acres in size or riparian (streamside) forests that are at least 300 feet wide provide appropriate forest interior dwelling species habitat. As forested land throughout the east and central U.S. has been fragmented by development, FID species have declined dramatically. Approximately 2,413 acres of forest interior habitat have been identified in the study area. The Maryland Breeding Bird Atlas (1983-1987) indicates that many of these areas were supporting FID species. Preservation and protection of forest interior and riparian forest habitats needs to be a high priority.

Grassland and edge habitat

Land use in parts of the study area currently support large areas of grassland (> 20 acres) and edge habitat. Pastureland, hayfields, sod farms, large estates and golf courses provide grassland habitat for several specialized species of birds that are declining regionally. Species include eastern bluebirds, eastern meadowlarks, grasshopper sparrows, kestrels (a small falcon), and other grassland or open country specialists. In addition to providing habitat, these pastoral areas add a distinctive rural character to the landscape and are often of considerable importance to local residents. Unlike forest habitats, large grasslands are often not maintained on parkland. Edges where fields meet other habitats, particularly forest, provide important habitat for other uncommon species including Baltimore orioles, red-tailed and red-shouldered hawks. Second growth areas consisting of shrubs and small trees often occur along edges and provide habitat for shrub specialists. This habitat too is becoming uncommon in the study area.

Wildlife Species that Impact Humans

White-tailed deer, beaver, and Canada geese have expanded their range and population dramatically within the study area over the past decade. These three species have the potential to have direct or indirect impacts to humans and human development issues.

Increased white-tailed deer populations have resulted in increased deer impacts including: deer-auto collisions, and damage to farm crops, home landscapes and natural vegetation. The county developed and began implementing a comprehensive deer management program in 1995 that includes data collection, public education, and implementation of management options including population management. Given the juxtaposition of parkland, farmland, housing communities and large estates, deer populations in the area will most likely continue to increase for some time. Property development and particularly road construction proposed for the area must take deer populations into consideration when planning new construction or upgrading existing infrastructure. This is especially important where roads cross undeveloped stream valleys or parks.

Beaver are now present in virtually all stream valleys in the study area. Beaver activities include the cutting of trees and the damming and flooding of small streams both of which can impact human development. No studies of beaver populations or habitat usage have been undertaken in the study area but casual observations and the monitoring of citizen complaints indicate that sites are often colonized for a short period of time, usually several months to a year before they are abandoned. Most impacts to private property are limited to properties built close to or within floodplains or adjacent to storm water management ponds. Efforts are underway to develop a management plan similar to the county's deer plan that will focus on education and the use of various management options to address impacts on a site-by-site basis. Current environmental guidelines should minimize problems with private landowners. Roads, sewer lines, and trails that are constructed within floodplains should be designed with the consideration that flooding from beaver will periodically impact them.

Large numbers of Canada geese have taken up residence in the county over the past decade. These resident flocks do not migrate but spend the entire year in the area. Geese are attracted to areas of open grass with ponds or lakes. Golf courses, parks and large estates can attract large numbers resulting in problems with interference in activities including golf, picnicking, swimming etc., and feces buildup on lawn areas and in ponds.

Fish

Numerous fish surveys have been conducted in the watersheds within the Olney study area since the beginning of this century. Montgomery County Department of Environmental Protection (DEP) assesses streams on a 5-year rotating basis and inventory fish, amphibian, and benthic macroinvertebrate species. A list of the fish species found in the upper Rock Creek, Northwest Branch, Hawlings River, and Upper Patuxent River watersheds, as reported in the *Countywide Stream Protection Strategy* (DEP, 1998) is presented in the Appendix (see Table A-2).

Although the North Branch of Rock Creek upstream of Muncaster Mill Road is designated Use III (Natural Trout Waters), trout are unlikely to be found in this stream. In the early 1990's brown trout were stocked in the North Branch immediately upstream of Muncaster Mill Road. These trout persisted for a few years, but showed no evidence of spawning. Low flows during dry years make this stream marginally suitable for trout at best, despite generally good water quality. Fish surveys in the summer of 2000 found 14 species of fish, including rosyside dace (*Clinostomus funduloides*) and Potomac sculpin (*Cottus giardi*) that are characteristic of high quality cool-water systems. Lake Frank, located just upstream of the confluence of the North Branch with the mainstem of Rock Creek, is managed by the Maryland Department of Natural Resources (DNR) as a recreational fishery, and has been stocked with largemouth bass (*Micropterus salmoides*), tiger muskies (*Esox lucius x masquinongy*), channel catfish (*Ictalurus punctatus*), and several species of panfish.

Northwest Branch is designated Use IV (Recreational Trout Waters), and is stocked by DNR every spring. The portion of Northwest Branch in the study area is well upstream of the stocking points, but trout could be expected to move into the study area on rare occasions. The study area includes the highest quality tributaries of Northwest Branch, where the fish community contains such relatively pollution-intolerant species as rosyside dace, northern hogsucker (*Hypentelium nigricans*), and fantail darter (*Etheostoma flabellare*).

The Hawlings River is designated Use IV, but is not regularly stocked with trout. Although some portions of the watershed have poor water quality, much of the watershed is in good condition, with a fish community that includes rosyside dace, northern hogsucker, shield darter (*Percina peltata*), and greenside darter (*Etheostoma blennoides*).

The portion of the Patuxent River in the study area includes the Triadelphia Reservoir and part of the Use III section of the river upstream of MD 97. Triadelphia Reservoir is owned and managed by the Washington Suburban Sanitary Commission, has been stocked with a variety of game fish, including walleye (*Stizostedion vitreum*), striped bass (*Morone saxatilis*), largemouth bass, smallmouth bass (*Micropterus dolomieu*), tiger muskie, and northern pike (*Esox lucius*). The Use III portion of the river is stocked by DNR with brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*); there is also a spawning population of brown trout upstream of the study area. Water quality is generally good to excellent in the upper Patuxent River, and the fish community includes rosyside dace, northern hogsuckers, and shield darters.

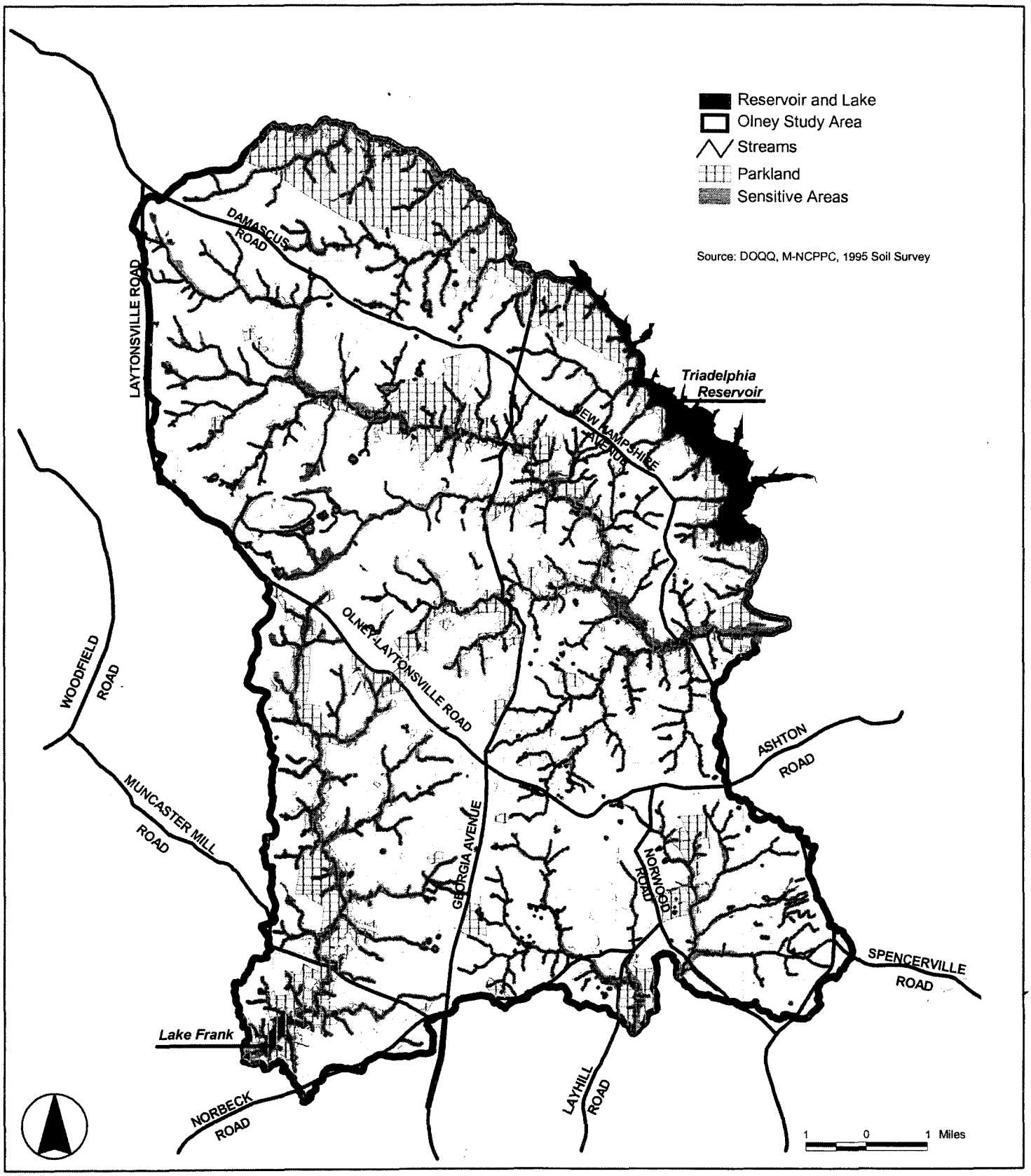
Sensitive Areas

Sensitive areas are defined by the 1992 State Planning Act as streams and their buffers; the 100-year floodplain; steep slopes; and habitats of rare, threatened, and endangered species. For the purposes of this report, wetlands and wetland buffers are also considered sensitive areas and are included in the relevant maps and tables. Habitats of rare, threatened and endangered species are not mapped as part of sensitive areas because they are not comprehensively documented.

Sensitive areas are distributed across the watersheds of the Olney study area, and are generally contained within the stream valleys (see Figure 12). Sensitive areas cover roughly 8,850 acres extending over approximately 22 percent of the study area (see Table 9). Within the watersheds of the study area, sensitive area extends over approximately 21 percent of the North Branch of Rock Creek watershed area, 18 percent of the Northwest Branch watershed area, 22 percent of the Hawlings River watershed area, and 28 percent of the upper Patuxent watershed area. About 34 percent of all sensitive areas in the study area are contained within parkland. The majority of sensitive areas outside parkland consist of headwater stream buffers.

Sensitive Areas

Figure 12



Chapter 2 provides a detailed definition of sensitive areas and associated policies under Sensitive Area Protection and Biodiversity. The Appendix provides a description of the components that make up the sensitive area coverage.

Study Area Sensitive Area[1] by Watershed

Table 9

Watershed	Sensitive Area		
	Acres	Acres	% of Watershed
North Branch of Rock Creek	8,014	1,683	21
Hawlings River	18,069	3,998	22
Patuxent River	7,011	1,983	28
Northwest Branch	6,502	1,180	18

(1) Geographic sum (overlay) of the following sensitive areas: wetlands and wetland buffers, floodplain, minimum buffers of streams identified in the M-NCPPC, GIS planimetric data, steep slopes and highly erodible soils. Stream buffers, wetlands, floodplain, stream buffer, and steep/erodible soils, overlap significantly (e.g., wetlands may be partially within floodplain areas). See the Appendix for a more detailed definition of sensitive areas.

The 100-year Floodplain

The 100-year floodplain is defined as the land area adjacent to the streams and lakes that is susceptible to inundation by the 100-year flood as a result of heavy rainfall and runoff from upland areas. The 100-year floodplain is a component of the Sensitive Areas element required by the 1992 State Planning Act. The 100-year floodplain boundary is usually defined through engineering studies, field observations, soils surveys, and historical data.

Protection of the floodplain from development presents several advantages. The floodplain helps guard against injury and destruction of property by moderating and storing floodwaters. The floodplain also helps protect water quality and natural habitats by reducing erosion and sedimentation, and by providing a natural corridor for wildlife.

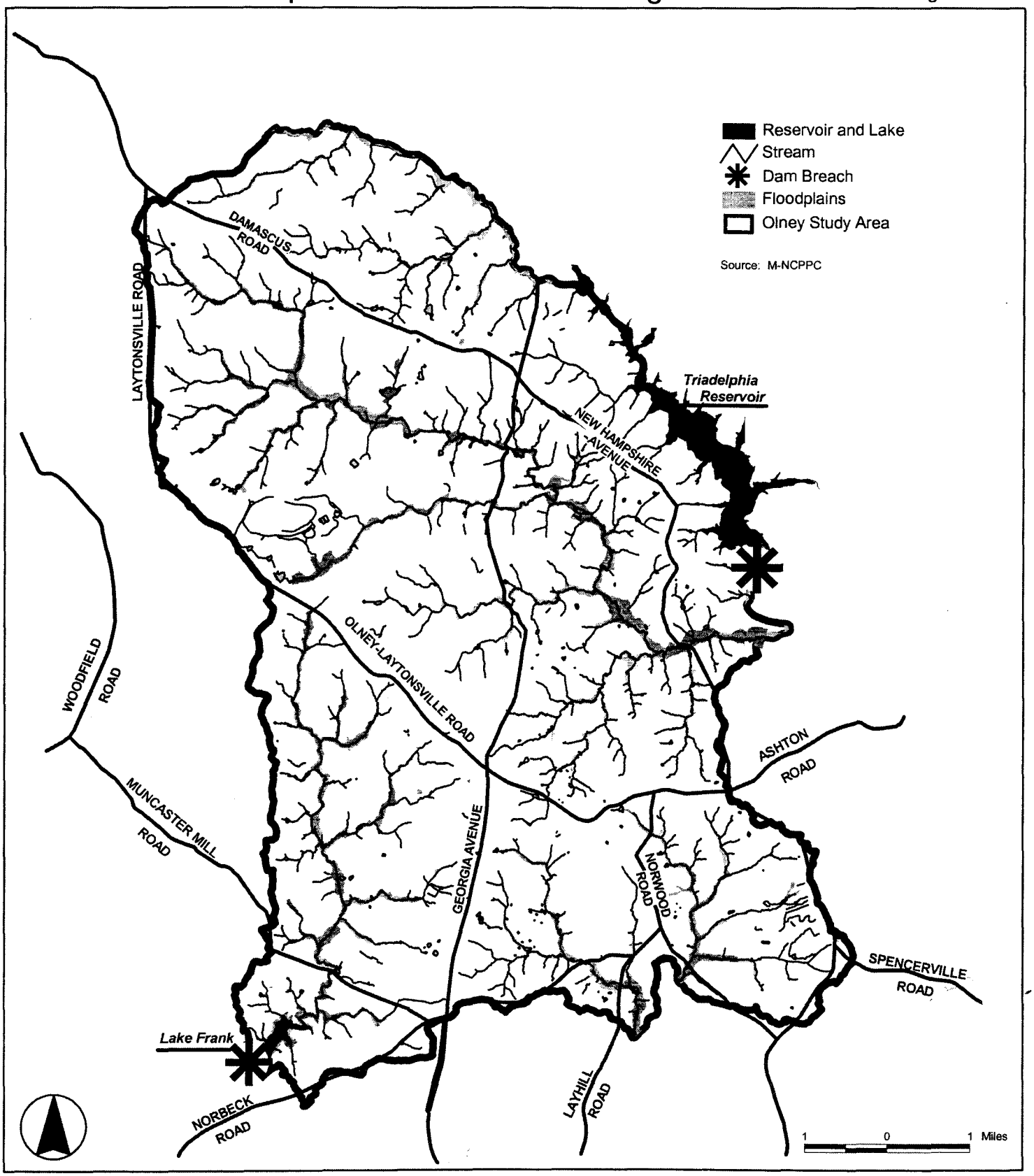
Much of the floodplain information available for the North Branch Rock Creek, Northwest Branch, and Hawlings River consists of the M-NCPPC ultimate land use 100-year floodplain maps. These maps were developed in the late 1970s, taking into account projected development densities based on zoning plans in effect at that time. While they may not satisfy current regulatory requirements, they remain the best available reference for planning purposes.

The floodplain maps are based on a detailed hydrologic study of larger tributaries. The 1995 revised Soil Survey in Montgomery County provides less detailed information on areas that are generally associated with floodplain. The survey provides supplemental floodplain information for areas not covered by the M-NCPPC detailed studies. Figure 13 depicts the floodplain mapping for the study area. The 100-year floodplain areas are contained mostly within parkland. The known or estimated 100-year floodplain outside parkland consists of areas associated with smaller headwater tributaries.

The Rock Creek Stormwater and Water Quality Management Study report (CH2Mhill, 1977) and the Anacostia Watershed Technical Study (CH2Mhill, 1982) included the only comprehensive floodplain analyses of Rock Creek and the Northwest Branch. They identified several roadway stream crossings in both watersheds that

Floodplain and Dam Breach Danger Reach Area

Figure 13



were subject to frequent flooding. Since the time of these studies, structural improvements at the identified crossings have been completed, which has substantially reduced flooding frequency and problems.

The Patuxent Watershed Management Study (Greenhorne & O'Mara, 1990) included the only comprehensive floodplain analysis of the Hawlings River. It identified all the road crossings (a total of 30) in the Hawlings watershed as being flooded by the 100-year storm. The model predicted a depth of flooding on many of these roads of greater than 2 feet, which creates a hazard to vehicles and makes roads unsafe during the peak of the storm. The model also predicted that most of these roads are also flooded by the 10-year event, with some by the 2-year storm as well. The stream crossings in the Hawlings watershed are older bridges and culverts, which were not designed to pass the larger storm events. Since the time of the study, the county has made structural improvements to some of these bridges and culverts that have substantially reduced flooding frequency.

No county sponsored floodplain study has been conducted for the mainstem Patuxent River watershed. As a result, the floodplain information available on the upper Patuxent River consists of Federal Emergency Management Agency (FEMA) floodplain insurance maps. The FEMA maps for this watershed show that the 100-year floodplain is predominantly confined to the floodplain of the mainstem of the Patuxent, and does not extend significantly up the tributaries. Most of the area within the 100-year floodplain is forested, with minor areas in agriculture.

The Montgomery County Department of Public Works and Transportation (DPWT) maintains a list of roadway locations in Montgomery County that experience frequent flooding. According to the DPWT list, several locations within the study area flood too frequently and should be improved. These include:

- Emory Lane near Pinetree Lane in the North Branch of Rock Creek watershed
- Brighton Dam Road, Goldmine Road, Brookville Road, and Zion Road bridges in the Hawlings River watershed
- The stream crossing on Elton Farm Road across Haight's Branch in the Patuxent River watershed

Air Quality

The entire Washington metropolitan region, which includes all Montgomery County exceeds the federal air quality standard for only one air pollutant, ground level ozone. Exposure to excessive ground-level ozone can pose health risks to vulnerable populations including children, the elderly, and people with respiratory ailments.

Ground-level ozone is an invisible gas formed when two pollutants -- volatile organic compounds (VOCs) and nitrogen oxides (NOx) -- react in sunlight. The primary sources of these pollutants are emissions from utilities and other industrial sources, automobiles, trucks, buses, lawnmowers, boats, and small businesses that use solvents and cleaning solutions. Other sources of these pollutants include household products such as non-latex paints, household cleaners, and insecticides.

On a typical summer day, over one third the pollutants that cause ground-level ozone in the Washington region come from sources outside the region. Some sources migrate from other states, hundreds of miles away. Likewise, sources in the Washington area emit pollutants that travel many miles and eventually affect ozone concentrations in other regions and states. From 1986 to 1995, the Washington metropolitan region exceeded the federal one-hour ozone standard, on average, twelve days a year. Since 1996, the Region exceeded the federal one-hour ozone standard, on average, six days a year. Today, the region faces the challenge of meeting stricter federal health standards for ground-level ozone. In 1997, the United States Environmental Protection Agency changed the averaging time from one-hour to eight-hours and reduced the standard downward to reflect the best current knowledge of the effects of ozone on human health.

Local carbon monoxide violations noted in the 1980 air quality plan have been virtually eliminated due to cleaner burning fuels.

Noise

Excessive noise is an environmental health problem, which can interfere with sleep, disrupt speech, cause psychological stress and degrade the quality of life for an impacted community. The degree of annoyance and impact varies among individuals and by the type of noise.

Mobile sources of nuisance noise in the Olney planning area include traffic-generated noise along major roadways. General motor vehicle traffic volume is the most prevalent noise source due to the distribution of roads throughout the Olney planning area.

Noise is expressed in decibels (dB), a standard for units of sound, with "A" weighting (dBA) to account for the sensitivity of the human ear. Noise generated over a 24-hour period is measured as Ldn. Ldn is an average sound pressure level reflecting the variations in noise over time, including "dn", a weighting, or penalty, for nighttime noise. The Federal Highway Administration estimates background noise in typical urban neighborhoods to be approximately 55 Ldn. Humans experience increased levels of interference with sleep, speech and communication at a level greater than 55 Ldn.

The Noise Guidelines (M-NCPPC, June 1983) set attainable goals for all areas of the county. For the Olney planning area, an attainable goal of 55 to 60dBA Ldn has been selected given its low-density residential and rural character. This goal sets a maximum noise level for new residential development and noise-sensitive land uses, measured over a 24-hour period at the building line.

Noise contours of existing conditions for all major roads have been computer-generated using an approved Federal Highway Administration model (see Figure 14). The noise model does have limitations, as it does not account for the influence of existing noise barriers and natural land features, which act as noise barriers. The noise contours do not provide the level of accuracy needed to determine site-specific noise impacts.

A noise contour map can be used to identify where existing houses and other noise sensitive uses are currently impacted by excessive noise. The contours also identify vacant or redevelopable properties that may be affected should they develop or redevelop in the future. The master plan should use this information to:

- identify noise compatible land uses (industrial/commercial) in areas impacted by excessive noise;
- recommend site design criteria to minimize noise impacts; and
- recommend noise compatible uses for existing structures in noise affected areas.

Solid Waste/Landfills

The Olney planning area has no fully operating landfills within its boundaries. The Oaks landfill, which is located near the intersection of MD 108 and Fieldcrest Road, was closed in October 1997 but still accepts solids collected from the pumping of stormwater management facilities. No other county solid waste facilities are planned in the upper Olney planning area.

Post-closure maintenance and monitoring of the Oaks landfill is required under state and federal regulations for a minimum of 30 years. Responsibilities include leachate and gas management, routine groundwater and gas monitoring wells, maintenance of stormwater management and erosion control systems, and grounds maintenance. These activities do not preclude public use for certain portions of the site. M-NCPPC, the community and the county celebrated the opening of the 1.25 mile Blue Mash Nature Trail in the buffer area of the site in June 2001.

Water Supply and Sewerage Systems

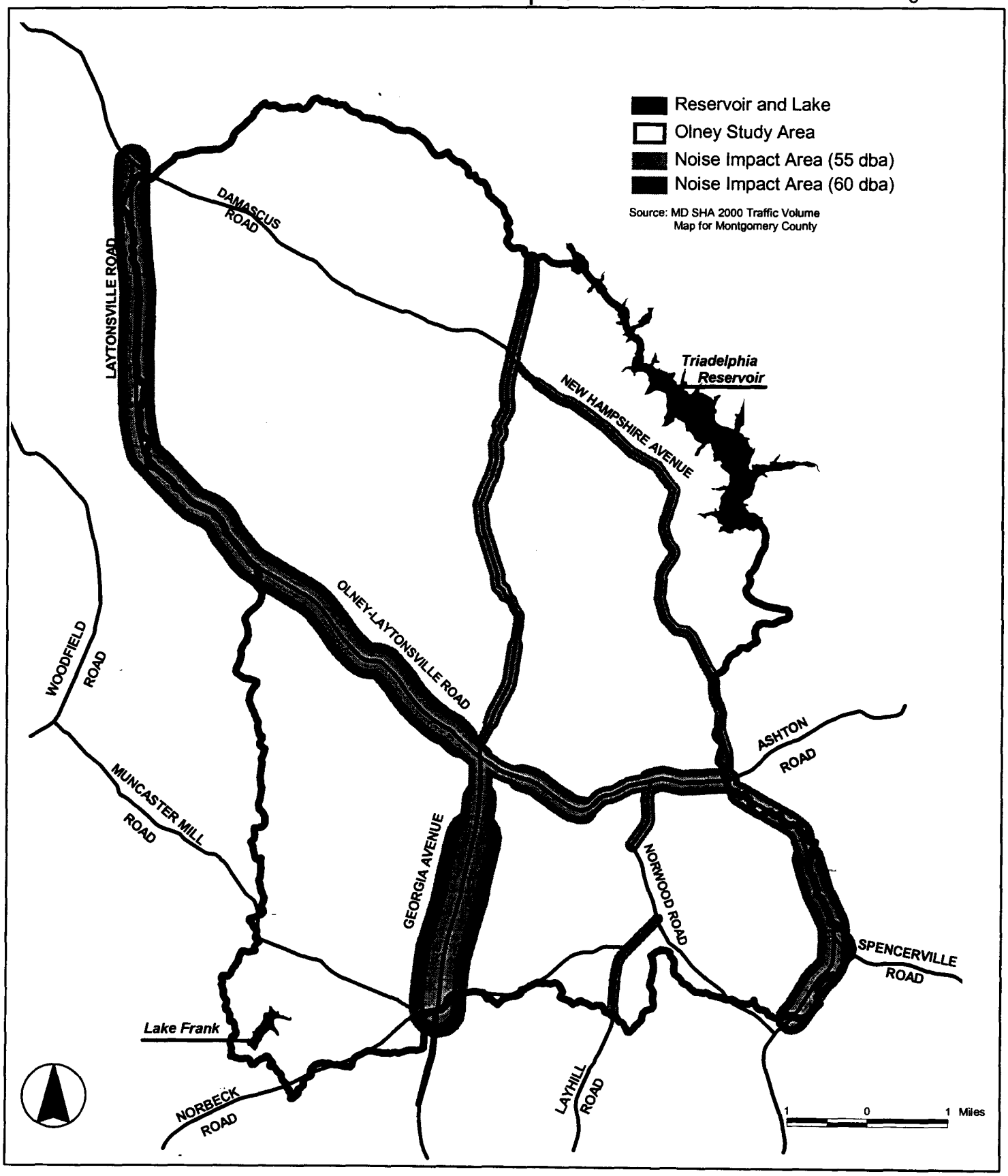
The community public water and sewer systems in the Olney Master Plan Area are operated and maintained by WSSC. The community service mains and other facilities were incrementally extended into this master plan area to serve the growth areas identified in the master plan under the policies of the *Water and Sewer Plan*. *Water and Sewer Plan* policies generally provide for community service to property zoned for one-half acre lots or more dense development, and for clustered lots in the one and two units per acre zones. The *Water and Sewer Plan* also allows for the provision of community water service only to areas zoned for one- to two-acre lots, and to clustered lots with a one unit per five-acre density. Although the 1980 master plan predates this *Water and Sewer Plan* water service policy, the County Council has acknowledged its appropriate application in this master plan area.

Service Areas

The current water and sewer envelopes are shown in Figures 15 and 16. In Olney, community water and sewer are generally available to areas zoned for high and

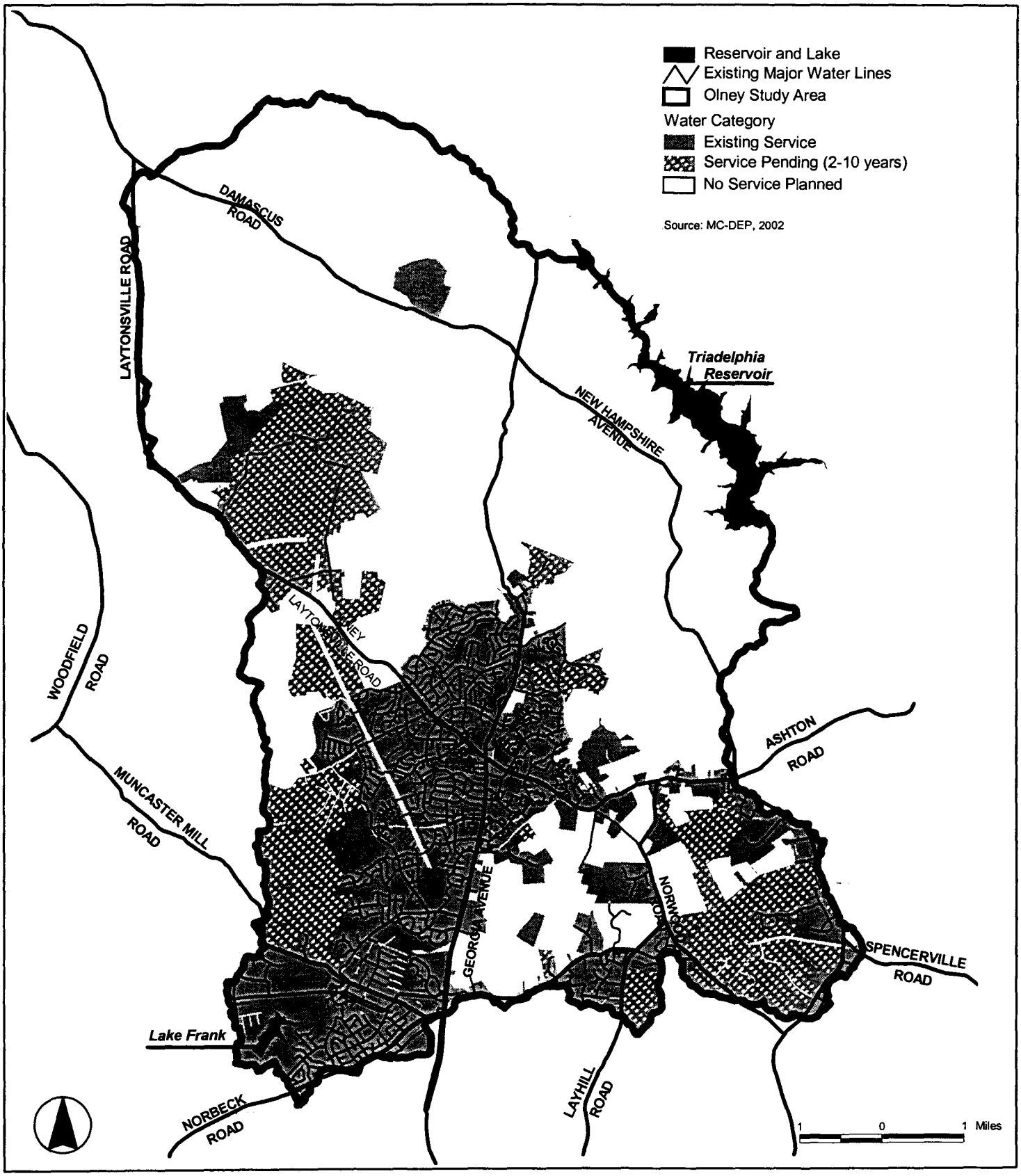
Traffic Noise Impact Areas

Figure 14



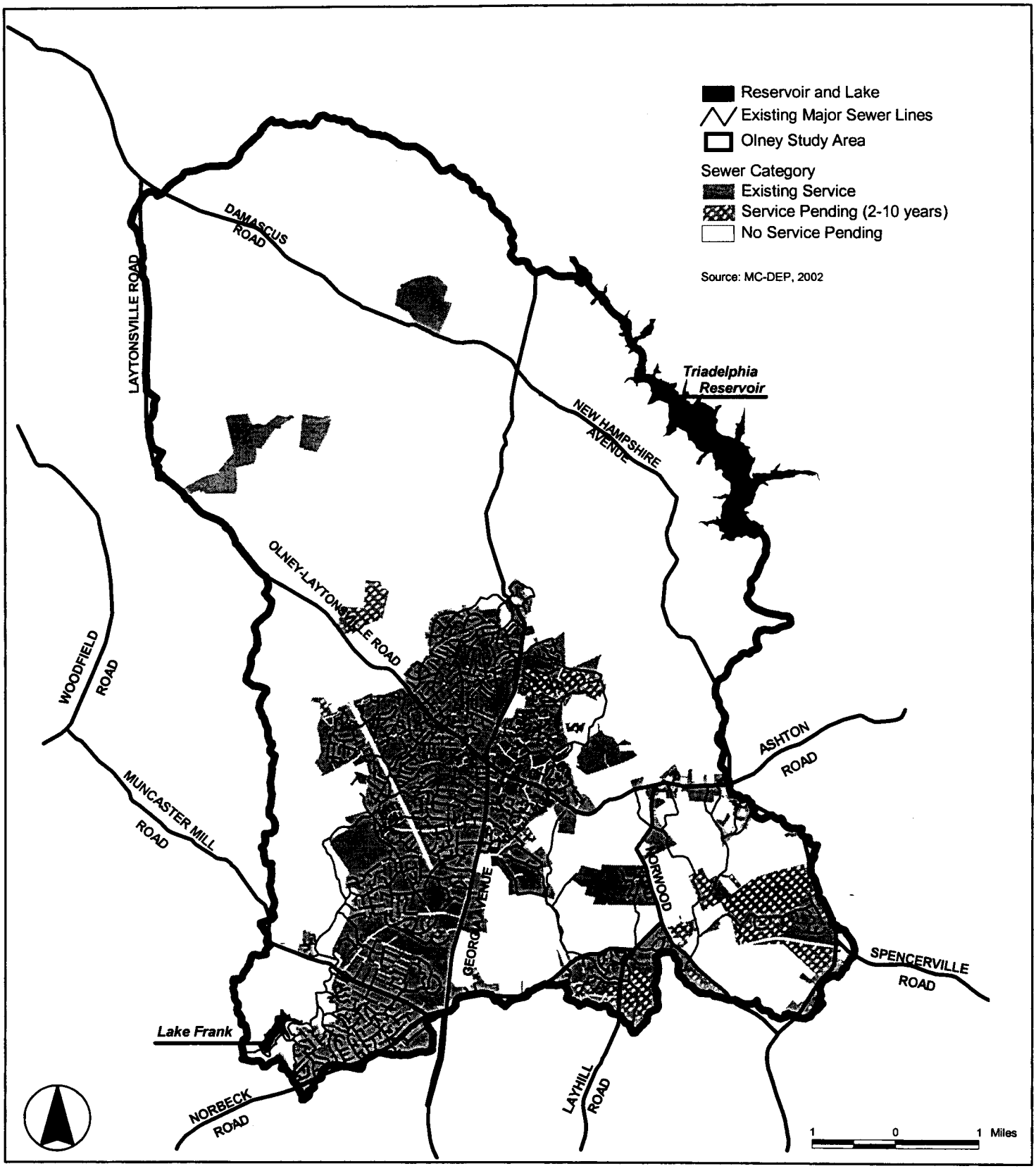
Water Service Areas

Figure 15



Sewer Service Areas

Figure 16



moderate density development, and to the commercial town center. Areas north of the Olney Policy area towards the Patuxent River (within Patuxent River drainage) are generally outside of planned expansion area for the water and sewer envelope. An exception to this general trend is in the vicinity of the county's Oaks Sanitary Landfill near Mount Zion. Under an agreement between the County and the local community, WSSC extended public water service to properties surrounding the landfill. The County has also approved and is planning for the provision of community water service to most of the Town of Laytonsville, which is located adjacent to the master plan area.

The 1980 master plan recommended an exception to the general *Water and Sewer Plan* policies with regard to the area referred to as Southeast Olney, an area east and south of Georgia Avenue, Old Baltimore Road, and Olney–Sandy Spring Road. There the master plan advocated providing community water and sewer service to those properties rezoned from one unit per two acres (RE-2) to Rural Cluster (RC) as part of the Olney sectional zoning map amendment, and which would use the RC zone cluster development option. In the mid-1990s, the County Council approved the use of a new, floating five-acre cluster zone, Low-Density Rural Cluster (LDRC), to accomplish a similar goal using local zoning map amendments. Only a few of these projects have been approved to date.

Properties located outside the existing/planned community water and sewer service envelopes are served by private, on-site wells and septic systems. MCDPS regulates and permits these on-site systems.

Water Service

For areas receiving community water service, WSSC provides water primarily from the Potomac Water Treatment Plant, supplemented by water from the Patuxent Water Treatment Plant near Laurel. The Patuxent River and the Triadelphia Reservoir form the northeastern boundary of the master plan area. The reservoir is one of two along the river supplying the Patuxent Water Treatment Plant. A number of water storage facilities and pumping stations are located in the planning area to transmit water. WSSC has identified the need for additional water storage capacity in the Olney area. The agency has planned for a new ground-level storage tank, scheduled for completion in FY 2006, to meet that need. WSSC expects to locate the new tank, with a capacity of up 4.3 million gallons, on WSSC-owned property at Norbeck.

Sewer Service

An important policy related to water quality is the provision of community sewer service. Providing community sewer service to relieve failed septic systems minimizes groundwater contamination. However, the provision of community sewer service can damage the environment by impairing water resources and facilitating development to the maximum zoned density, leading to increased imperviousness. Extensions along stream valleys can also create habitat disturbance, forest fragmentation, corridor creation for invasive exotic plant species entry- threatening native species survival, and general disruption to the natural hydrologic systems. Once sewer lines are in-place, their structural integrity may deteriorate over time, resulting in sewerage leaks and further ecosystem disturbance. This is particularly troublesome where eroding or shifting stream channels expose sewer mains and manholes, leaving them more susceptible to damage.

Unlike the water system, which operates under pressure, the vast majority of sewers in the planning area rely on gravity to transmit sewage flows, thus they are located in the stream valleys and other low areas. Rock Creek and the North Branch and Northwest Branch all have large trunk lines that convey flows from the planning area south to the District of Columbia's Blue Plains Sewage Treatment Plant. The District of Columbia has operated the wastewater treatment facilities at Blue Plains since 1938. The Olney Planning Area (PA23) falls within the Blue Plains Sewerage Service Area.

The Rock Creek trunk sewers serve the entire Rock Creek Basin, the most intensely developed basin in Montgomery County. The limited wastewater transmission capacity in the Rock Creek trunk sewers at the point where they enter the District of Columbia has been a major constraint in meeting the wastewater conveyance needs on the Rock Creek Basin since the early 1980s. The peak flow from Montgomery County through the Rock Creek Basin to the Blue Plains WWTP is limited to 56.6 mgd by the 1985 IMA.

An agreement between the District and the WSSC limits the amount of sewage that can be conveyed through the Rock Creek sewer main within the District of Columbia. Flow meters located at the point where the Rock Creek sewer enters the District, indicate that the WSSC has reached the limits outlined in the inter-municipal agreement. The WSSC is currently studying alternatives that will allow it to expand within peak flow capacity limitations in the Rock Creek sewerage system, as established by an agreement with the District of Columbia. The WSSC has also identified segments of the North Branch trunk sewer that will reach capacity in the next 20 years. Under current forecasts, portions of the sewer upstream of the confluence with the Rock Creek trunk sewer and downstream of Muncaster Mill Road may need relief in the 10 to 20 year time frame. While the anticipated relief measures for these constraints may not directly affect the Olney and Vicinity Planning Area, growth within the Rock Creek sewerage basin in the master plan area will affect these capacity limitations in the future.

Not all the areas approved or planned for community sewer service have access to gravity sewerage systems; these areas are served by wastewater pumping stations and force mains. The Reddy Branch and James Creek stations pump sewage flows from within the Hawlings River watershed into the North Branch of Rock Creek and Northwest Branch sewerage systems, respectively. The North Branch station pumps sewage flows from the TDR-receiving area north of Bowie Mill Road into a trunk main further downstream in the subwatershed. This pump-around avoided the need for trunk sewer construction through a portion of the North Branch Stream Valley Park. There are no community sewerage systems existing or planned for the Upper Patuxent River watershed.

Tributary Watersheds of Olney and Vicinity

The major streams of the Olney study area include the North Branch of Rock Creek and its tributaries, the headwater tributaries of Northwest Branch, Hawlings River and its tributaries, and a portion of the Patuxent River and its tributaries[5]. The watershed character and stream water quality of each of these streams is discussed in this section. Watershed management strategies for each stream is also covered.

The discussion of stream water quality covers both historical data and current conditions. The historical data is presented largely from Montgomery County Department of Environmental Protection (MCDEP) stream water quality monitoring at numerous stations throughout the county conducted during the 1970's. This monitoring included several stations within the study area. Parameters analyzed included DO, pH, temperature, BOD, nitrite-nitrate nitrogen, total phosphorus, mean turbidity, and fecal coliform. Monitoring results have been published each year presenting annual parameter averages for each station.

Current conditions of each watershed are summarized from both county and state sources. Current conditions of the natural stream waters in the study area are summarized in the *County-wide Stream Protection Strategy* (CSPS) document (MCDEP, 1998). The CSPS is based on a biological monitoring program (1994-1996 data) that assesses all county streams according to the same methodology. The CSPS ranks biological stream conditions as excellent, good, fair, or poor. The results of the CSPS monitoring have been presented in this inventory with update added when more recent information was available. More detailed presentation of these results may also be found in separate MCDEP assessments that have been done for the watersheds in the study area. These assessments also include monitoring data for DO, pH, air and water temperature, TDS, and conductivity.

The Maryland Department of Natural Resources (DNR), through the Maryland Biological Stream Survey (MBSS) program, conducts biological sampling of streams throughout Maryland. The MBSS program uses a score ranking scale of good, fair, poor, or very poor.

Maryland's water quality standards are described in Maryland regulations. (COMAR § 26.08.01 General, which contains definition of terms, and COMAR § 26.08.02- Water Quality, which describes the uses, criteria and policies). Under section 303(d) of the federal Clean Water Act, the state of Maryland is required to prepare a list of all water bodies in which applicable water quality standards are not being met through the use of required controls, as set forth in the Code of Federal Regulations, 40 C.F.R. 130.7(b)(1)(i, iii). Also, under section 305(b) of the Clean Water Act the state is required to prepare a water quality report that includes an inventory of Maryland's waters and an update on the progress made toward meeting the goals of the federal Clean Water Act. The Maryland 305(b) report identifies water pollution problems and sources, describes water quality control programs, and highlights special state concerns. The 303(d) list and 305(b) report are updated and submitted to the US Environmental Protection Agency (EPA) every two years.

Watershed management strategies are also summarized from both county and state sources. Based on the assessments and projections of potential development (with existing zoning), the CSPS assigns a management category for each subwatershed in the study area, and identifies a set of management tools to address the stream conditions and anticipated levels of development. The management categories and tools provide a basis for prioritizing resources to address stream quality problems using a focused, watershed approach. The Appendix in this report contains a detailed

[5] The Northwest Branch is a major tributary of the Anacostia River system. Its watershed covers 53.2 square miles (34,048 acres), of which 19,603 acres lie in Montgomery County. Rock Creek drains 77.4 square miles (49,536 acres), flowing into the Potomac River; about 60.6 square miles (38784 acres) of its watershed lies within Montgomery County. Great Seneca Creek also flows into the Potomac River; its watershed lies entirely within the county and covers 75 square miles (47,791 acres). The Patuxent River, the largest river entirely contained within the state of Maryland, drains 910 square miles (582,000 acres) of land, of which 60.2 square miles (38,550 acres) lie in Montgomery County. Of the 60.2 square miles of the Patuxent River watershed in the county, 28.2 square miles (18,069 acres) make up the watershed of the Hawlings River, a major tributary of the Patuxent River.

description of the management categories from the CSPS.

The Maryland Clean Water Action Plan identifies several watersheds in Montgomery County that need restoration and deserve priority consideration. The Maryland Unified Watershed Assessment (UWA) under the 1998 Clean Water Action Plan (see Chapter 2 of this report) categorizes watersheds based upon consideration of components of the watershed related to aquatic systems including; biological, physical, and chemical characteristics, and related landscape factors. Category 1 watersheds are those found to not meet clean water and other natural resource goals, and to be in need of restoration.

Watersheds may also be designated as watershed restoration priorities under the Maryland Clean Water Action Plan. The schedule of restoration and protection actions must be coordinated with the state's schedule to determine Total Maximum Daily Loads (TMDLs) for pollutants from watersheds.

North Branch of Rock Creek

Watershed Character

The North Branch of Rock Creek watershed consists of roughly half of the upper Rock Creek basin, and about one quarter of the entire Rock Creek drainage area in Montgomery County. It includes approximately 48 miles of streams that drain 12.5 square miles (8,014 acres) of land upstream of Norbeck Road/MD 28 east of Georgia Avenue and south of Route 108 in central Montgomery County. Most of the stream is designated as Use III, with a relatively small portion south of Muncaster Mill Road designated as Use IV.

The North Branch of Rock Creek originates in Mount Zion Park, between Olney and Laytonsville. From there it flows south to its confluence with the mainstem Rock Creek north of Norbeck Road, which continues south before ultimately discharging in the Potomac River. Floodplain areas are largely undeveloped parklands. Wetlands are often present within the floodplain and may extend beyond floodplain boundaries.

The upper reaches of the North Branch are the most rural of the streams in the watershed. The rolling landscape is dominated by farm fields and forested areas punctuated by large-lot development. Imperviousness in this portion of the watershed ranges from 4 to 6 percent (MCDEP, 1998, see Figure 17).

Between Bowie Mill Road and Muncaster Mill Road, low to medium density residential development predominates, with some areas of large-lot development. The stream valley, thus far, is in succession from farm fields to young forests. The imperviousness of the basins which drain directly to the mainstem range from 3 to 7 percent, but the larger tributaries to this segment of the drainage basin have considerably higher percentages of imperviousness. Cherrywood Manor and Williamsburg Run drain subwatershed areas with imperviousness ranging between 14 and 19 percent (MCDEP, 1998).

The stream reaches between Muncaster Mill Road and Norbeck Road/MD 28, accommodate the confluence of another large tributary, Manor Run. This region of the watershed contains Lake Frank. Downstream of the lake, North Branch joins the mainstem that flows south to Norbeck Road thereby entering the lower Rock Creek watershed. The land surrounding the lake and the North Branch is mostly undeveloped parkland with low imperviousness (MCDEP, 1998).

Stream Water Quality

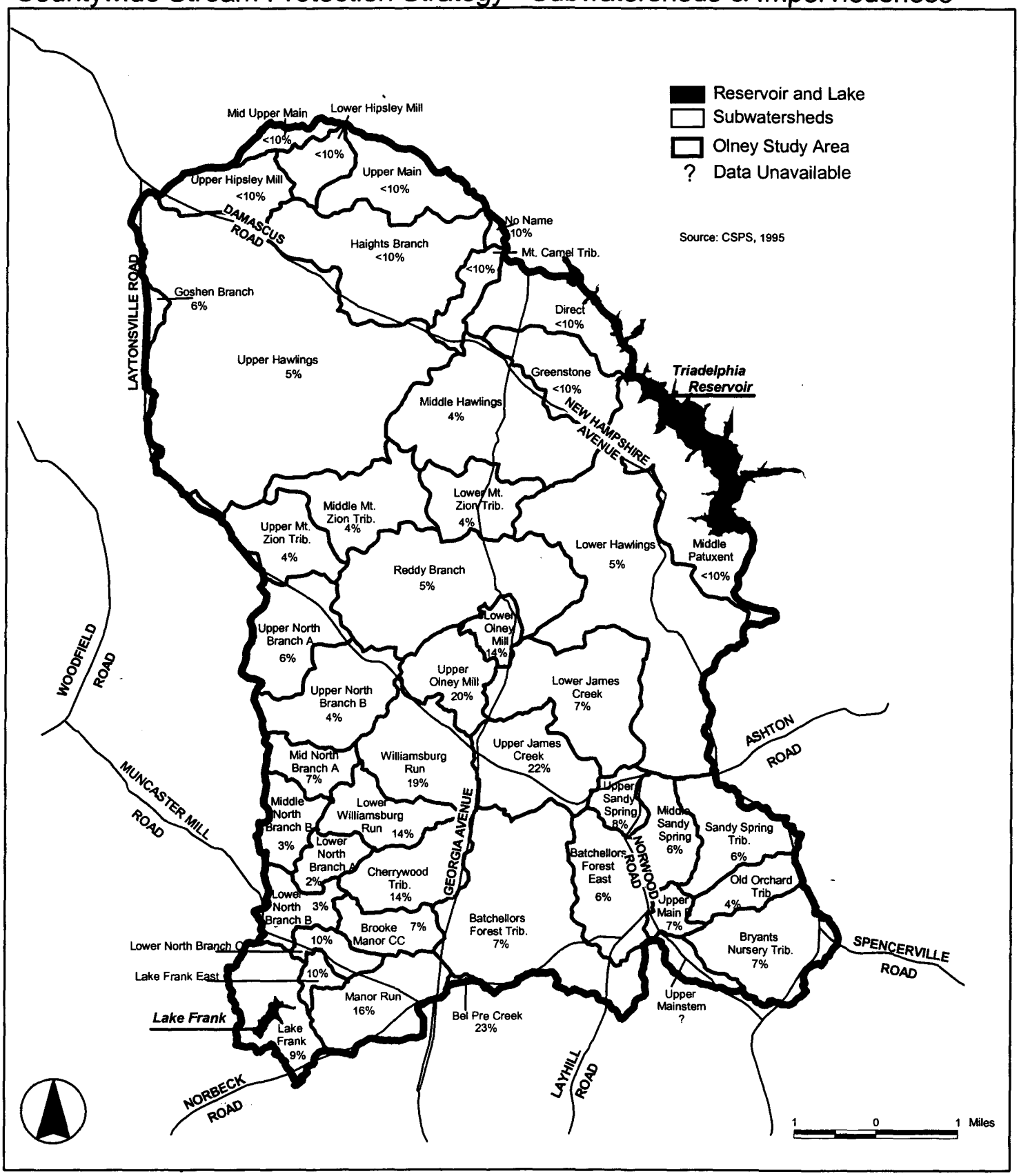
Historical Data

In 1962, a work plan for the upper Rock Creek (Montgomery County, 1962) addressed generalized water quality issues as they pertained to increased erosion and sediment damage. This work plan led to the construction of two sediment and flood control lakes: Lake Needwood on the mainstem Rock Creek, and Lake Bernard Frank on the North Branch.

In 1977, a water quality management study (CH2MHill, 1977) presented an overview of water quality conditions in the upper Rock Creek subwatershed. The North Branch Rock Creek was characterized as "Medium" to "Low" problem severity (CH2M Hill, 1977). The following three water quality criteria failed occasionally (<25 percent of the time): turbidity, fecal coliform, and temperature.

Figure 17

Countywide Stream Protection Strategy - Subwatersheds & Imperviousness



The Montgomery County DEP stream monitoring conducted in the 1970's in the study area included two stations on the North Branch of Rock Creek. Water quality was generally found to be in the permissible category. In 1981, DEP determined that water quality in the North Branch had improved from permissible to good. Water quality improvements were attributed to decreases in turbidity, BOD (biochemical oxygen demand), and fecal coliform levels (MCDEP, 1981).

Between 1991 and 1993, the Maryland Department of the Environment's bioassessment of upper Rock Creek indicated an apparent water quality impact. Unimpaired habitat conditions were observed, but the biological community was moderately or severely impaired. Increased levels of nutrient and sediment flow into Lake Frank had caused eutrophic water conditions. The water quality problems in the lakes were a result of urban land use patterns and developing areas (MDE 1994, p. 211).

In 1996, a Rapid Stream Assessment Technique (RSAT) survey rated the stream condition of the North Branch and individual tributaries (Galli, 1996). Most mainstem reaches were rated good for overall stream condition (see Figure 18) and excellent for biological indicators. This was interpreted as evidence of slight levels of degradation. The major tributaries were also mostly in the good and excellent range for overall rating and biological indicators respectively. However, two of the tributaries, Williamsburg Run and Manor Run received an overall rating of fair, indicating moderate degradation. These subwatersheds are among the most heavily developed in the North Branch watershed. Measurements of physical and chemical parameters were generally consistent with the state of Maryland stream water Use III and Use IV designations.

Current Conditions

Countywide Stream Protection Strategy

According to the CSPS, the stream condition in the North Branch of Rock Creek watershed ranges from excellent to poor (see Figure 19). Brown trout still survive in some portions of Rock Creek, but almost certainly not in the North Branch. Most of the mainstem subwatersheds exhibit good or excellent biological conditions, with Williamsburg Run, Brooke Manor Country Club tributary and one mainstem subwatershed showing fair conditions. Poor stream biological conditions were reported in Manor Run where higher density developments were built with little or no stormwater management controls.

Maryland Biological Stream Survey

Two sites were sampled in the North Branch of Rock Creek in 1997. The benthic scores for that year reflect fair conditions, and the fish scores indicate good conditions. The physical habitat index for both sites was in the fair range.

Maryland 303 (d) List and 305 (b) Report

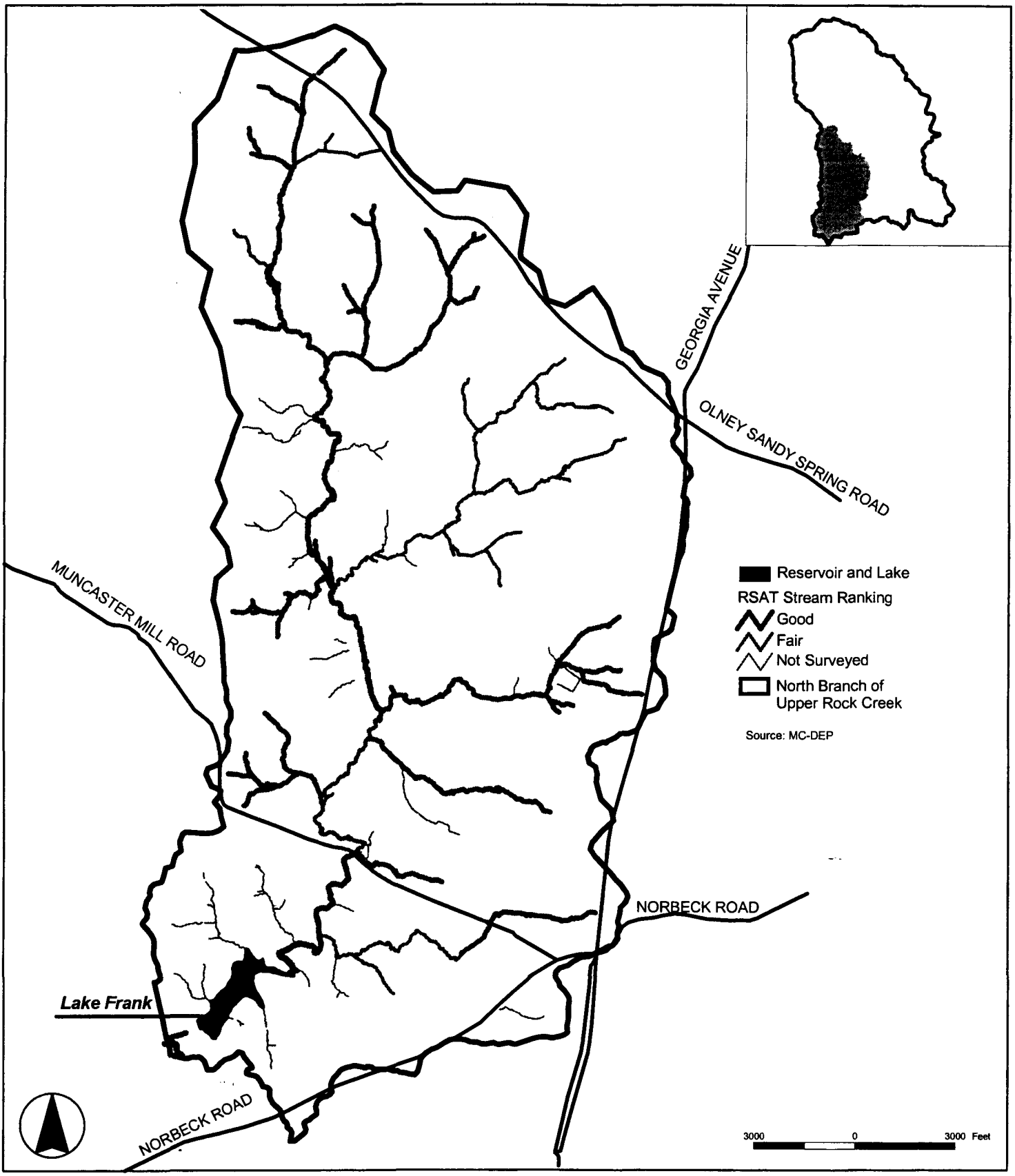
Rock Creek is identified in the 1996 DNR 303(d) list as not meeting applicable water quality standards through the use of required controls. Identified sources of pollution are nutrients and suspended sediments originating from non-point and natural sources. Nutrient impairment of Rock Creek in the 303(d) list is based on the inclusion of Rock Creek in the Chesapeake Tributary Strategies and does not necessarily indicate a localized nutrient impairment. A 1998 update to the 303(d) list added Lake Bernard Frank to the list of water bodies impaired by nutrient pollution from non-point sources.

The 1996 DNR 305(b) report indicates that water quality in the Rock Creek watershed varies from good in the headwaters (upper Rock Creek) to fair in the lower portion (lower Rock Creek). High bacteria, nutrient (phosphorus) and suspended sediment levels are due to agricultural runoff in the upper areas, and to suburban development and urban runoff. Some unimpaired habitat conditions were observed, but the biological communities were moderately to severely impaired. Lake Frank is classified as eutrophic due to nutrients and sediments from upstream areas (DNR 1996).

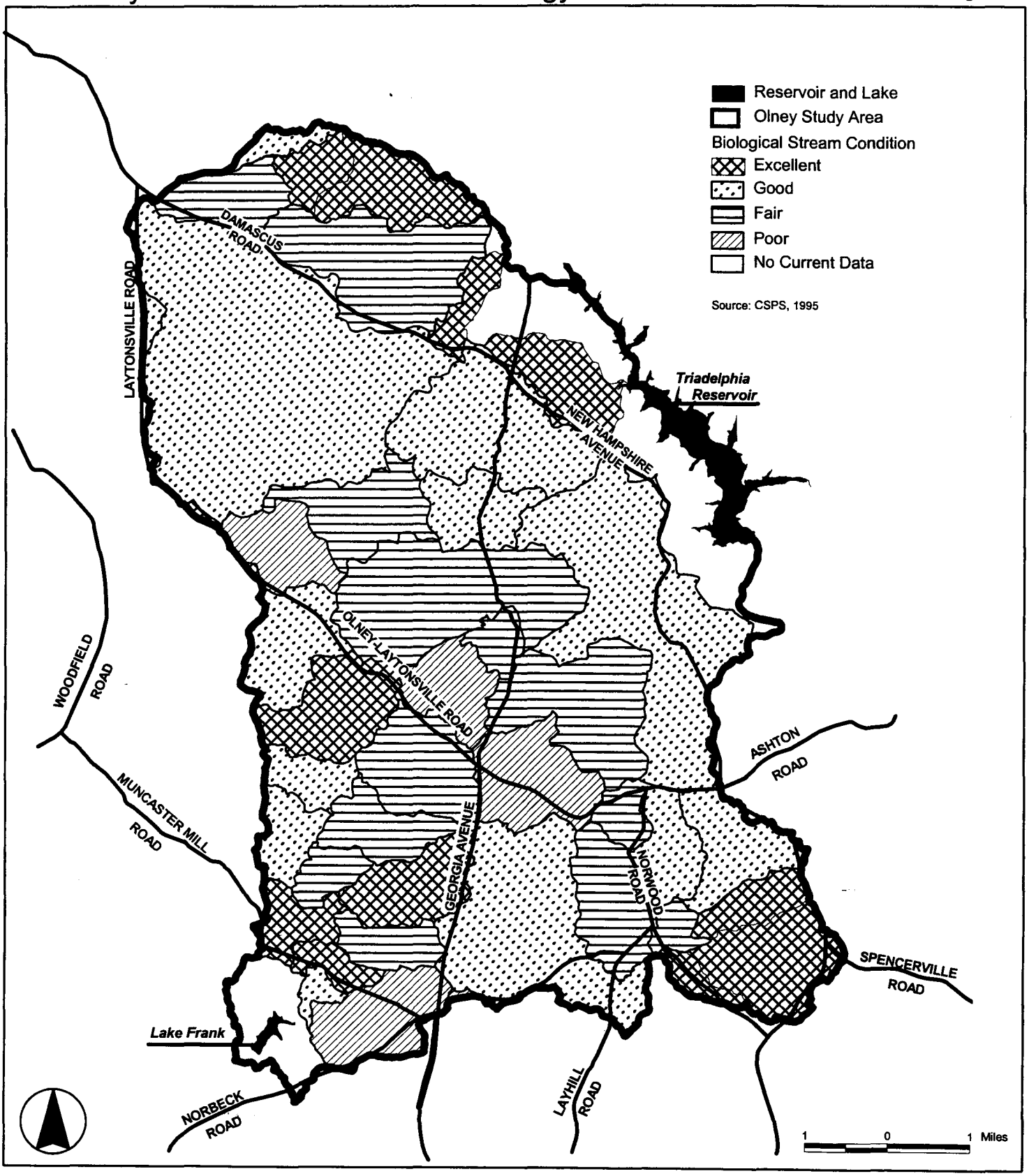
The 1998 DNR 305(b) report indicated that water quality criteria were not recently exceeded, and that no use impairments were noted at the state's water quality monitoring stations in the Potomac-Washington Metropolitan Area Sub-basin that includes the Rock Creek watershed. This finding is based on data from seven ambient water quality monitoring stations in the Washington Metropolitan Area, including a single station on Rock Creek near East-West Highway. The report also indicates that Lake Frank is listed as partially supporting aquatic life. The lake experiences seasonally low oxygen levels in the deeper portions as a result of accelerated

Upper Rock Creek - North Branch Rapid Stream Assessment

Figure 18



Countywide Stream Protection Strategy - Subwatershed Condition Figure 19



eutrophication due to nutrients from unspecified non-point source runoff (DNR, 1998).

Originally built to control flooding and trap eroded sediments from upstream, Lake Frank has become important as a recreational facility and wildlife habitat. In order to preserve these uses, a watershed management plan would be desirable to help reduce and mitigate the impacts of excessive sedimentation and nutrient enrichment.

Watershed Management

Maryland Clean Water Action Plan

The entire Rock Creek watershed is in Category 1 of the Maryland Unified Watershed Assessment (UWA). Rock Creek is also designated a priority watershed being most in need of restoration. In addition, Rock Creek is listed as a Category 3 (Preservation) watershed having at least some stream in pristine or high quality conditions. Thus, the watershed shows signs of stress and degradation but still contains pristine or sensitive habitat resources.

Countywide Stream Protection Strategy

The CSPS divides the North Branch of Rock Creek watershed into 13 subwatersheds. Except for Lower North Branch B, all subwatersheds are designated as either restoration or protection areas. Restoration areas consist primarily of densely developed areas, while protection areas are mostly rural or low density (see Figure 20). The CSPS also identifies six priority subwatersheds, representing about one half the entire North Branch of Rock Creek watershed area. They include four special level Watershed Protection Areas in the north central portion of the watershed. The special level designation reflects the need to protect sensitive resources in headwater areas where projected increases in imperviousness are high.

Rock Creek Watershed Restoration Action Plan

MCDEP has recently completed a major component of the Rock Creek restoration action plan with publication of their Rock Creek Watershed Feasibility Study (DEP, 2001) covering the entire Rock Creek basin within Montgomery County. The study identified, prioritized, and designed stormwater management and stream restoration projects. The life expectancy of Lakes Needwood and Frank were also evaluated in terms of maintaining water quality and quantity benefits for Rock Creek.

Twenty proposed priority sites were evaluated with respect to their locations in the twenty priority subwatersheds and within the entire Rock Creek watershed. Of these, ten top priority sites were selected for preliminary concept design. Two sites in the North Branch watershed, one in Williamsburg Run and the other in the Cherrywood Tributary, are among the top twenty projects. One of these, the Olney Oaks project in Williamsburg Run, was ranked among the top priority sites. A section of the lower North Branch, in the Lower North Branch B and C subwatersheds was identified as a proposed stream restoration project. See Figure 21 for location of the priority retrofit and stream restoration projects.

Based on sediment volume and yield values, Lake Frank was estimated to have a life expectancy from about 105 to 245 years from present. In addition, Lake Frank was found to have a high sediment trapping efficiency, with significant sediment reduction value for the waters downstream of the lake. Although the location of the lake outlet structure will ensure good flood control benefits even if the lake becomes filled with sediment, the recreational benefits would, of course, be lost. Eventually, dredging or the creation and maintenance of a forebay will be required to retain the recreational function of the lake (MCDEP, 2001).

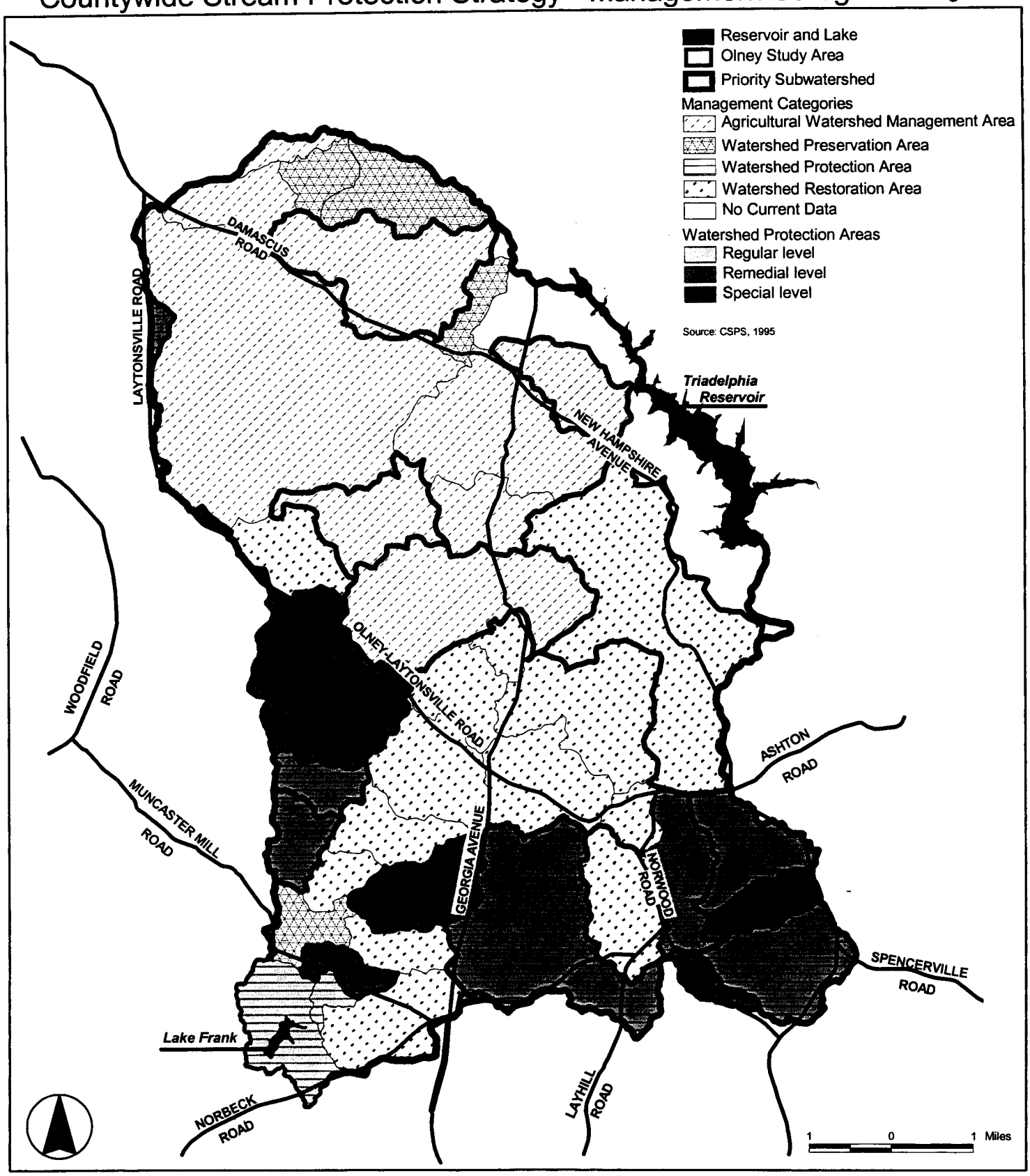
Northwest Branch

Watershed Character

The Northwest Branch, a Use IV stream located in the eastern part of the county, is the largest of the county's four contributing watersheds to the Anacostia River. Land uses differ greatly from the headwaters downstream to where the Northwest Branch flows into Prince George's County. Different development patterns have shaped the watershed, affecting the stream system to different degrees. Tributaries in the upper part of the watershed, particularly the headwaters, support the few remaining streams with excellent and good conditions in the Northwest Branch watershed (MCDEP, 1998)

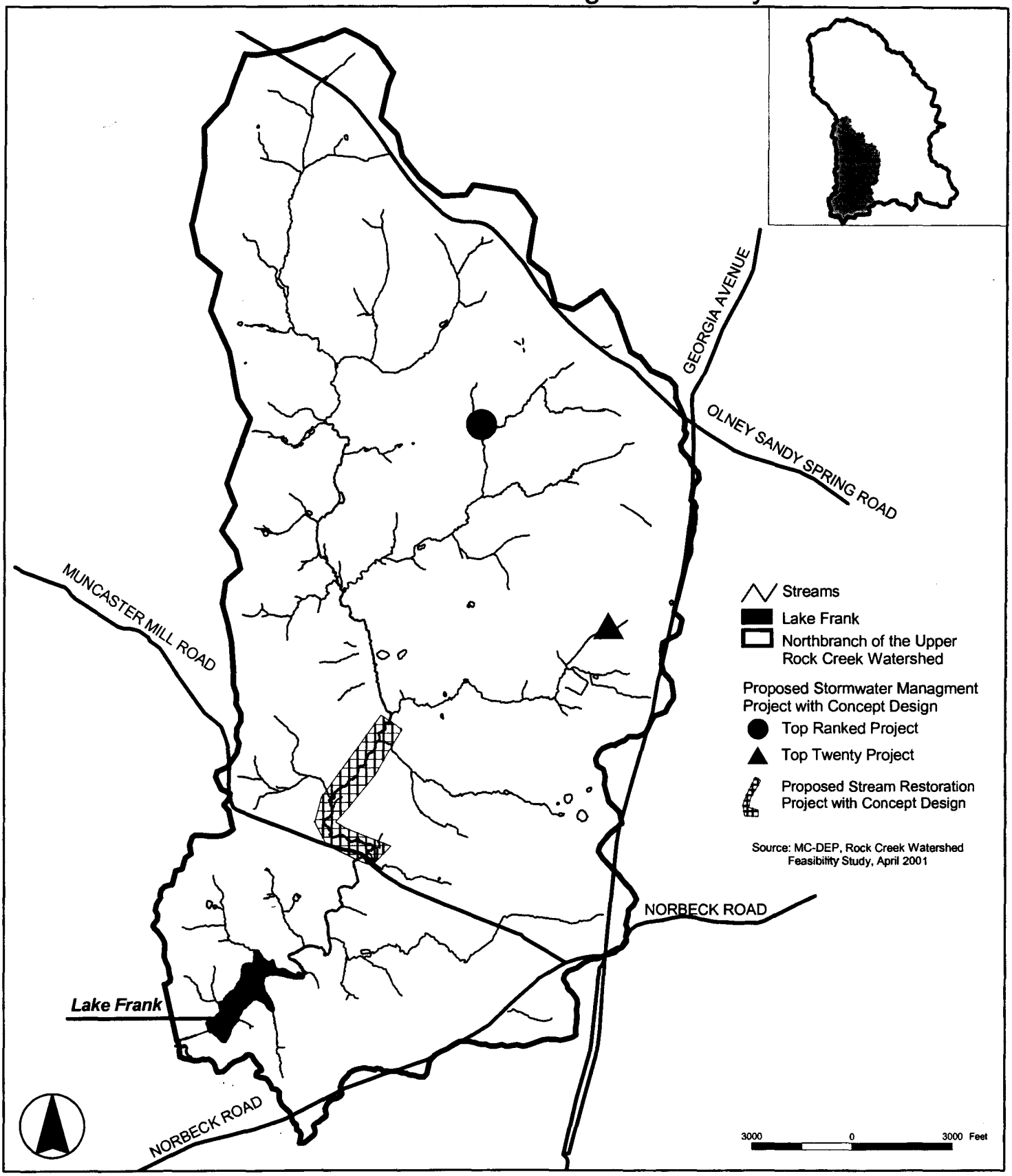
The Olney master plan area encompasses only the

Countywide Stream Protection Strategy - Management Categories Figure 20



Upper Rock Creek - North Branch Priority Stream Restoration and Stormwater Managment Facility Retrofits

Figure 21



uppermost reaches of the Northwest Branch watershed, mostly those north of Layhill Road and Norwood Road. Consequently, only the headwater subwatersheds are covered in this inventory (see Figure 2). This area includes approximately 40 miles of stream that drain 10.1 square miles (6,502 acres) of land.

Land use in these subwatersheds is dominated by low-density uses including forest, pasture, and open space. Nevertheless, some areas such as Bryant's Nursery tributary have seen an increase in residential development. Imperviousness levels are fairly low, especially compared with the rest of the watershed, and in 1997 ranged from 4 percent to 8 percent (Figure 17).

In the upper reaches, then, the landscape is in a transition from formerly widespread agricultural land uses to a more suburban landscape. The streams in this area are also in a transition, from carrying sediment loads and nutrients associated with past farming activities, to a watershed condition that includes less widespread land disturbance, but higher imperviousness. As this area develops and the imperviousness increases, today's environmental standards will provide forested buffers, floodplain and wetland protection, and management of stormwater runoff. However, even with application of modern stormwater controls, some changes in watershed hydrology are inevitable (MCDEP, 1998).

Stream Water Quality

Historical Data

MCDEP's monitoring from the early 1970's to 1981 included two stations in upper Northwest Branch. During the period of record, upper Northwest Branch received a rating of permissible water quality.

The Anacostia Technical Watershed Study, prepared in 1982 by CH2Mhill, summarized water quality conditions in the Northwest Branch watershed, and used the MCDEP water quality data to calibrate the Hydrologic Simulation Program Fortran (HSPF) water quality model. The data as of 1981 indicate that water quality criteria for temperature and dissolved oxygen were seldom or never exceeded, a typical occurrence in well shaded streams with adequate aeration. Limited data on turbidity indicated that elevated turbidity values occasionally occurred in Northwest Branch, usually associated with high flows. The data also indicate that pH was not a serious problem throughout the Northwest Branch watershed. However, a large majority of fecal coliform measurements made in the Northwest Branch including the headwaters exceeded the state standard. Possible sources of bacteria include leaking or overflowing sewers or urban stormwater runoff. In the upper, less developed areas of the watershed, runoff from pastures may also be a significant source of coliform loadings.

Current Conditions

Countywide Stream Protection Strategy

Nine subwatersheds in the Northwest Branch fall within the study area for the Olney Master Plan. According to the CSPS, the stream conditions in these Northwest Branch headwater subwatersheds range from fair to excellent (see Figure 19). Bryants Nursery tributary, Old Orchard tributary, and Upper Mainstem reflect excellent biological conditions. Batchellors Forest tributary, Middle Sandy Spring, and Sandy Spring tributary are in good condition. Three subwatersheds including Upper Sandy Spring, Batchellors Forest East, and upper Mainstem B show fair stream conditions. Most of the upper reaches are in good or excellent condition reflecting more forest area, open space, and the lower imperviousness percentages associated with a relatively low level of development compared with the rest of the watershed.

Maryland Biological Stream Survey

DNR reported 1997 MBSS biological and habitat data for 2 stations in the upper Northwest Branch – one in Batchelor's Forest East and one just downstream of the Upper Mainstem subwatershed. The data for these stations indicate fair conditions based on benthic, fish, and habitat scores, except for the site near the Upper Mainstem subwatershed that showed good conditions based on fish data.

Maryland 303(d) List and 305(b) Report

The Anacostia River (of which Northwest Branch is a part) is one of a number of low priority streams identified in the 1996 DNR 303(d) List. Identified pollutants are nutrients and suspended sediments originating from non-point and natural sources. Watersheds are assigned to low priority status when the state believes the impairments may be corrected through the implementation of the high priority Tributary Strategies or

through other routine regulatory and voluntary programs currently underway. Low priority also reflects the fact that the information supporting the listing may not be reliable and that the impairment may be very localized within the segment.

The 1998 DNR 305(b) report indicated that water quality criteria were not recently exceeded, and that no use impairments were noted at the state's water quality monitoring stations in the Potomac-Washington Metropolitan Area Sub-basin that includes the Northwest Branch watershed. This finding was based on data from seven ambient water quality monitoring stations including a single station on the mainstem Anacostia River at Bladensburg far downstream of the study area. However, the 1996 305(b) report noted elevated bacteria levels at this station. These elevated levels are due to urban and upstream agricultural runoff.

Watershed Management

Maryland Clean Water Action Plan

The Anacostia River watershed is in Category 1 of the Maryland Unified Watershed Assessment (UWA) under the 1998 Clean Water Action Plan, being found not to meet clean water and other natural resource goals, and being in need of restoration. The Anacostia River is also designated a priority watershed most in need of restoration. In addition, the Anacostia River is listed as a Category 3 (Preservation) watershed considered to have at least some stream in pristine or high quality condition. Thus, the watershed shows signs of stress and degradation in some sections, but still contain pristine or sensitive habitat resources.

Countywide Stream Protection Strategy

Of the nine Northwest Branch CSPS subwatersheds that are part of the study area for this inventory, six, including Batchellors Forest Tributary, Middle Sandy Spring, Sandy Spring Tributary, Old Orchard Tributary, Upper Mainstem, and Bryants Nursery Tributary are identified as Watershed Protection Areas. The three remaining watersheds: Batchellors Forest East, Upper Sandy Spring, and Upper Main B are designated as Watershed Restoration Areas (see Figure 20). Restoration areas consist primarily of densely developed areas, while protection areas are mostly rural or low density. In addition, with the exception of Batchellors Forest East, Upper Sandy Spring, and Upper Main B, the CSPS identifies all the study area subwatersheds as being priority subwatersheds. The priority level designation reflects the need to protect sensitive resources, especially in headwater areas.

Hawlings River

Watershed Character

The Hawlings River, a Use IV stream located in the northeastern part of the county, originates near Etchison, just below the intersection of Routes 108 and 650. It includes approximately 129 miles of streams that drain 28.1 square miles (18,069 acres) of land upstream of its confluence with the Patuxent River, between the Triadelphia and Rocky Gorge (T.Howard Duckett) reservoirs. As a major tributary to the Patuxent, the Hawlings plays an important role in the overall efforts to reduce nutrient and sediment loadings to this river, and in particular, to the Rocky Gorge reservoir, a public drinking water supply downstream (MCDEP, 1998).

Much of the Hawlings River watershed, particularly above the Reddy Branch tributary, is agricultural land, parkland, and newer large lot residential areas. Subwatershed imperviousness ranges from 4 to 7 percent, averaging about 5 percent (see Figure 17). A relatively small portion of the watershed, about 10%, in the Olney Mill and Upper James Creek subwatersheds has a primarily residential land use, with mostly medium sized lots. Imperviousness in these subwatersheds ranges from 14 to 22 percent, with an average of about 20 percent (MCDEP, 1998).

The Hawlings River passes through three distinct land uses. The upper watershed above Sundown Road is in rolling agricultural lands east of Laytonsville. This headwater area has many small tributaries that flow to create the Hawlings River mainstem. The middle section passes though a narrow, rocky valley area where the velocity of the stream increases. Within Rachel Carson Conservation Park, there is some of the best stream habitat in the watershed. Below Georgia Avenue, the stream passes through a sandy loam floodplain. The change to sandy soils and the addition of uncontrolled storm flows from the Olney Mill tributary has resulted in severe bank erosion and scour pools. The tributaries

flowing into the Hawlings from the southwest, including James Creek and the Olney Mill tributary in Reddy Branch, contain much higher densities than in the rest of the watershed as a result of development in and around Olney. The resulting higher impervious conditions and regional in-stream stormwater ponds such as the Christie Property facility in James Creek have contributed to the degradation of stream conditions in certain areas. In general, regional in-stream ponds control runoff from large areas, through one large facility rather than many on-site structures. Streams above these types of facilities are often exposed to uncontrolled high runoff velocities from contributing areas with high imperviousness (MCDEP, 1998).

Stream Water Quality

Historical Data

MCDEP stream water quality monitoring conducted in the 1970's included seven stations in the Hawlings River watershed. Throughout the period of record, water quality in the Hawlings watershed was good for most years, with some years showing slightly lower, but permissible water quality. In recent years MCDEP has been conducting water quality monitoring of two small first order tributaries to the Reddy Branch subwatershed, near the inactive Oaks Landfill where some stream impairment has been detected.

As part of its reservoir monitoring program, the Washington Suburban Sanitary Commission (WSSC) has at various times conducted stream water quality monitoring of the Hawlings River watershed. Approximately twenty-five parameters have been analyzed, including nutrients and metals. From 1973 to 1979 the station was located at Haviland Mill Road near the confluence with the Patuxent River. Since 1998, the monitoring station has been near Sandy Spring at New Hampshire Avenue and the Hawlings River.

In 1990, a watershed management study conducted by Greenhorne & O'Mara (G&O, 1990) presented an overview of water quality conditions in the Hawlings River watershed. As part of this study, water quality data for the Hawlings River at New Hampshire Avenue was collected for an eighteen-month period from April 1986 to October 1987. Based on this data and a review of existing data, water quality in the Hawlings River was found to be typical for a watershed with mainly agricultural uses. Phosphorus, nitrogen, and suspended solids were measured in relatively high concentrations, particularly during storm events. HSPF models for the Hawlings River and the reservoirs were calibrated and run. The model was used to predict major sources of sediment, total phosphorus, and total nitrogen within the Hawlings River watershed. Two priority areas near the headwaters were identified based on pollutant contribution on a unit area basis. The model was also used to predict DO concentrations. Over 9 years of simulation, DO concentrations were found to be generally good, remaining well above the state standard for a Use IV-P stream. This study also identified stream reaches with medium to high erosion potential. Most of these are located on the Mt. Zion, Reddy Branch, Olney Mill, and James Creek tributaries. The Hawlings River mainstem stream reaches between Sundown Road and Mt. Zion Road, and downstream of Reddy Branch to the Patuxent River were also identified as having medium to high erosion potential.

Current Conditions

Water Quality Monitoring

WSSC completed its third year of water quality monitoring at the station on the mainstem near Sandy Spring. A final report will be available in Spring 2002. A preliminary evaluation of the data shows that phosphorus is carried into the stream system primarily during storm events. By contrast, most of the nitrogen appears to be associated with groundwater flow (Patuxent Reservoir Watershed Annual Report, 2001).

Countywide Stream Protection Strategy

According to the CSPS, the stream condition in the Hawlings River ranges from good to poor (see Figure 19). Stream conditions were evaluated for 11 subwatersheds. Throughout the watershed, a cool-water fish community may be found. Overall, the Hawlings River, particularly the mainstem, continues to maintain good resource conditions. Subwatersheds with lower impervious values or primarily in agricultural land use, including upper, middle and lower Hawlings, and lower Mt. Zion tributary, had a good stream condition rating. Below Georgia Avenue, however, stream habitat conditions degrade with large areas of bank erosion, scour pools, and sediment deposition. The upper Olney Mill and upper James Creek

subwatersheds are predominantly urbanized and reflect poor stream conditions. The upper Mt Zion tributary drains an area containing the closed Oaks Landfill, and also reflects poor stream conditions. The subwatersheds that are immediately downstream of those in poor condition, namely middle Mt. Zion tributary, Reddy Branch, lower Olney Mill, and lower James Creek are in fair condition before transitioning to the good conditions along the Hawlings River mainstem.

Maryland Biological Stream Survey

Four sites were sampled in the Hawlings River watershed in 1997. Both the benthic and the fish scores for that year reflect fair to good conditions. The physical habitat index for three of the sites was in the good range, with one site in poor condition.

Maryland 303(d) List and 305(b) Report

The 303(d) lists for 1996 and 1998 do not list the Hawlings River. The 1996 305(b) Report listed the Hawlings River as having unimpaired habitat and an unimpacted benthic community. The 1998 Report provided no further information on the Hawlings River. The 2000 Report, in reference to the Rocky Gorge Reservoir drainage (which includes the Hawlings River) states that there are no long-term state monitoring sites in this segment. Data from biological sampling sites in three Rocky Gorge drainage subwatersheds were analyzed using draft biological protocols. No impairments to the aquatic community were observed.

Watershed Management

Patuxent Primary Management Area (PMA)

The Patuxent Primary Management Area (PMA) in Montgomery County is a water quality protection and restoration area, providing a stream buffer and transition zone, where land use activities are managed to protect and enhance water quality in the Patuxent River and its tributaries. The PMA is composed of strips of land that run along the entire length of all streams within the watershed. In the study area approximately 25,000 acres of land within the Hawlings River and Patuxent River watersheds fall within the PMA (see Figure 22). The recommended land uses and related activities within the PMA are managed through a series of specially designed programs directed to promote water quality and improve overall stream condition by reducing nonpoint source pollution, providing Best Management Practices (BMPs), preserving agricultural land, and protecting and re-establishing forest cover. The ultimate goal for the PMA is to maintain low-density, low intensity land uses in the stream valleys of the Patuxent River and its tributaries, and to actively establish a minimum 50-foot forested buffer immediately adjacent to all streams.

Maryland Clean Water Action Plan

The Maryland Clean Water Action Plan identifies the Rocky Gorge Dam watershed, which includes the Hawlings River (see Figure 23), as needing restoration and deserving priority consideration. The watershed is in Category 1 (Restoration Watersheds) of the Maryland Unified Watershed Assessment (UWA) being found not to meet clean water and other natural resource goals, and being in need of restoration. The Rocky Gorge Dam watershed is also designated a priority watershed most in need of restoration. In addition, the watershed is listed as a Selected Category 3 (Preservation) watershed that has at least some stream in pristine or high quality condition. Thus, the watershed shows signs of stress and degradation but still contains pristine or sensitive habitat resources.

Countywide Stream Protection Strategy

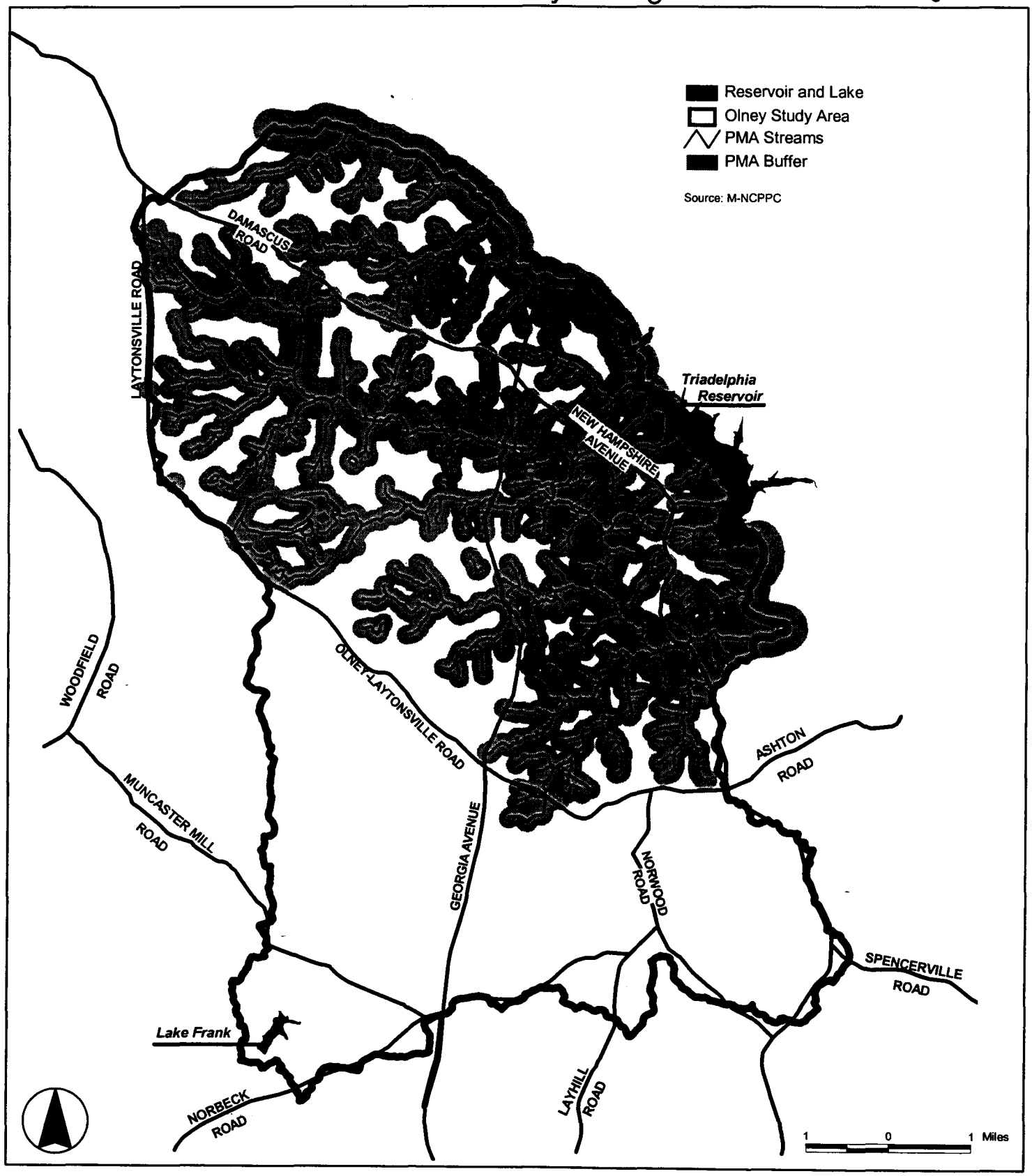
The CSPS divides the Hawlings River watershed into 11 subwatersheds. The subwatersheds in the upper portion of the Hawlings River, with the exception of upper Mt. Zion Tributary are designated as Agricultural Watershed Management Areas. Upper Mt. Zion Tributary and the lower portion of the watershed are designated as Watershed Restoration Areas. Restoration areas consist primarily of densely developed areas, while protection areas are mostly rural or low density (see Figure 20).

Hawlings River Watershed Restoration Study

Montgomery County's Department of Environmental Protection (MCDEP) is currently conducting a watershed feasibility study to identify, prioritize, and design stormwater management and stream restoration projects comprehensively throughout the watershed, in support of the county's watershed restoration program. During the year 2000, MCDEP awarded the Task Order for the Hawlings River Watershed Restoration Study. The purpose of the study is to identify and rank projects that

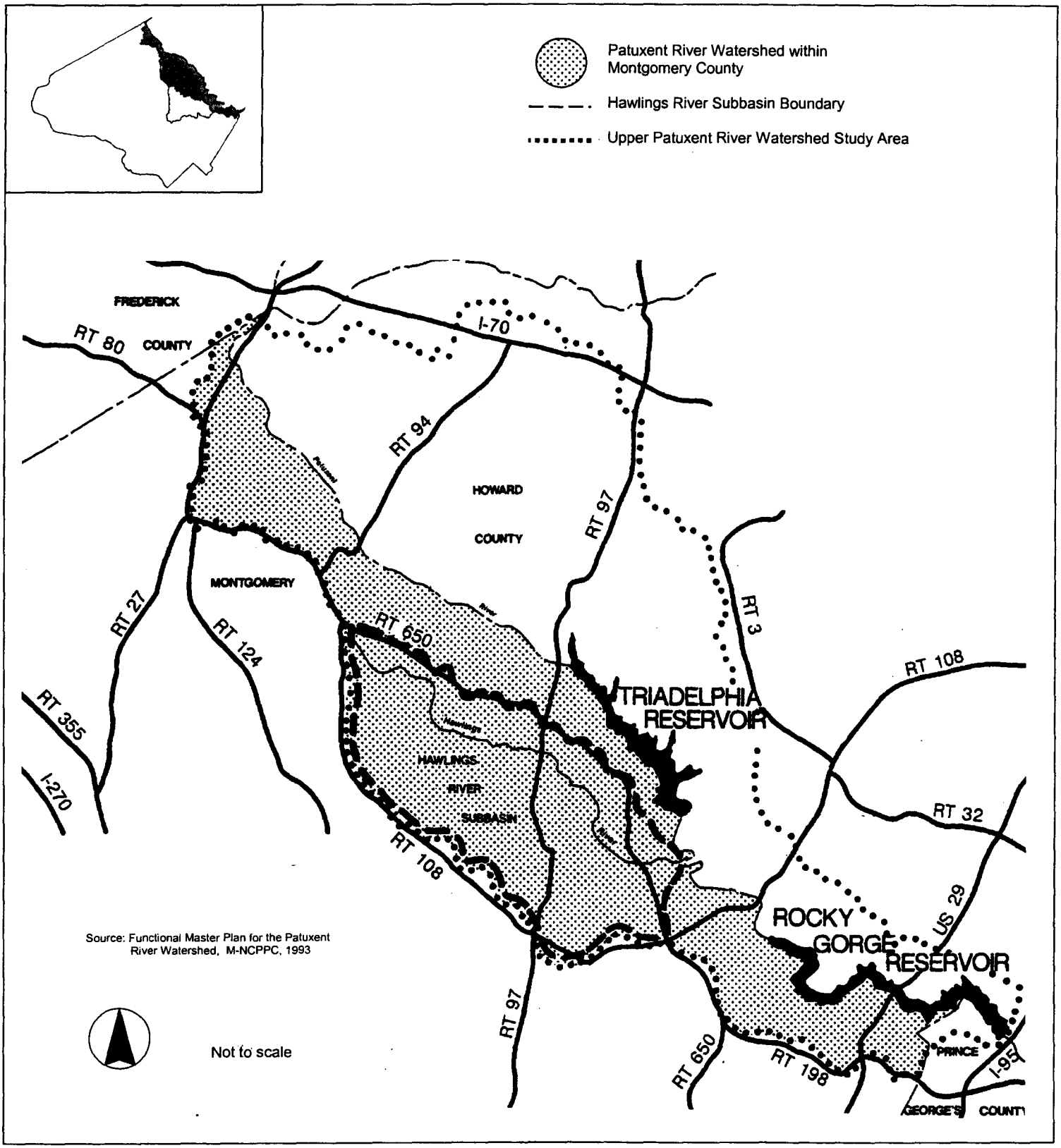
Patuxent River Primary Management Area

Figure 22



Location of Rocky Gorge and Triadelphia Reservoirs Watersheds

Figure 23



will enhance and protect aquatic and riparian habitat in the Hawlings River watershed and reduce sediment and associated nutrient loadings to the Rocky Gorge Reservoir. The Task Order elements included: an inventory and summary of data and major results from previous studies and available maps; hydrology modeling to evaluate pre- and post-development storm flows; an inventory of opportunities for stream restoration, habitat enhancement, and stormwater retrofits; design concept sketches and costs for potential projects; and estimates of stream habitat and water quality benefits associated with implementing these projects.

The study continues on target for completion in early 2002. Bank pin and crest gauge monitoring to evaluate stream channel configuration changes associated with high flows have been completed at eight stations for six storm events. Fourteen miles of priority stream reaches, from approximately 100 miles total in the watershed, have been walked and field assessments for stream restoration and enhancement projects completed. See Figure 24 for preliminary mapping showing locations of streambank erosion problems and inadequate stream buffers. Consultants are developing concept sketches for 12 stream restoration projects in the stream reaches and concept designs for 5 potential stormwater retrofits in the watershed. Next steps are to set priorities for these projects and to estimate benefits from their implementation. Implementation will proceed as grant funding becomes available over the next several years.

Upper Patuxent River

Watershed Character

The Patuxent River originates in the northeast corner of Montgomery County at the Montgomery County-Frederick County border (see Figure 23). Downstream of its source, the upper Patuxent River forms the boundary between Montgomery County and Howard County. It includes approximately 108 miles of stream that drain 11 square miles (7,011 acres) of land upstream of the Triadelphia reservoir. The upper Patuxent is designated by the state as a Use III stream. The Olney Master Plan study area covers approximately the lower two thirds of this drainage area, from the confluence of Scott's Branch to the Triadelphia Reservoir, a major component of our drinking water system. The watershed on both sides of the river includes large forested areas, particularly along the mainstem of the Patuxent River, along with agricultural cropland, pasture, and large-lot rural residential development. Forest and agricultural land predominate in this watershed, with imperviousness in all subwatersheds below 10 percent (see Figure 17).

A naturally reproducing brown trout population occurs in the stream above Annapolis Rock Road (Route 94). To protect this resource, the upper Patuxent above Georgia Avenue (Route 97) has been designated a special trout management area (catch and release stream) by the Maryland Department of Natural Resources. The brown trout population is part of a generally high quality cold water fish community found throughout this watershed. Extensive forested areas in the Patuxent River State Park surround the upper Patuxent for much of its length. Areas of the state park are or will soon be designated as Maryland Wildlands. The mature floodplain and upland forests support a rich wildlife community with some of the best forest interior breeding bird habitat remaining in the county. The streams in the Patuxent watershed are among the best remaining in the county and many serve as reference streams for the county's stream monitoring program (MCDEP, 1998).

There has been some concern about accelerated rates of sedimentation, elevated nutrient levels, and depressed dissolved oxygen concentrations being observed at Triadelphia Reservoir, and further downstream at the Rocky Gorge Reservoir. These two reservoirs have a total capacity of over 11 billion gallons of drinking water for suburban Montgomery County and Prince George's County, and to limited extent, Howard County (MCDEP, 1998).

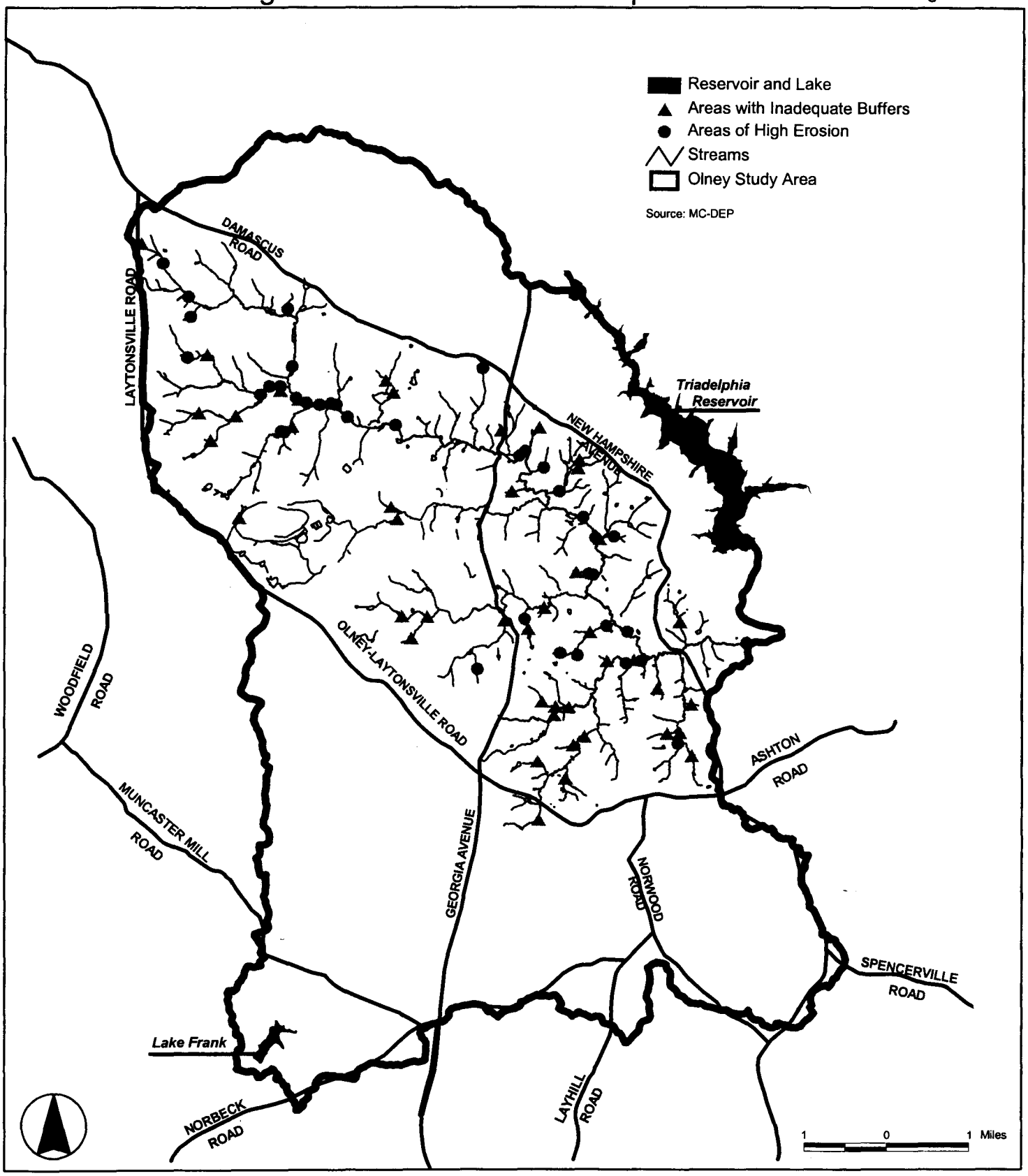
Stream Water Quality

Historical Data

The MCDEP stream water quality monitoring conducted during the 1970's included two stations along the mainstem of the Patuxent River above the Triadelphia Reservoir, and one station below the reservoir, just downstream of the Hawlings River confluence. Throughout the period of record, water quality in the

Hawlings River Erosion and Inadequate Buffer Areas

Figure 24



Patuxent River was good for most years and slightly lower, but permissible for the others.

From 1969 to the present, WSSC, in conjunction with various other agencies including USGS and MDNR, has conducted long-term sampling in the mainstem approximately 0.8 miles upstream of the Triadelphia Reservoir, at the Route 97 bridge. Sampled parameters include pH, DO, turbidity, sediment, COD, BOD, and nutrients. Data from this station indicate generally good water quality over the years. However, elevated nutrients and sediment levels reflect non-point source input from agricultural runoff.

In 1990, a watershed management study conducted by Greenhorne & O'Mara (G&O, 1990) presented an overview of water quality conditions in the Patuxent River watershed in Montgomery County. As part of this study, water quality data from the Patuxent River downstream of the Triadelphia Reservoir was collected over an eighteen-month period from April 1986 to October 1987. Sampled parameters included nutrients, TSS, and BOD. The data from this station indicate good water quality. The high trap efficiency of the Triadelphia Reservoir, particularly for small storm events, most likely explains the good quality of released water.

Triadelphia Reservoir

The Triadelphia Reservoir is an 800-acre water supply/storage reservoir on the upper Patuxent River. The reservoir is owned by WSSC and water is released from Triadelphia to meet demands on the Rocky Gorge Reservoir, located downstream on the Patuxent River. Using a trophic classification scheme and data from samples collected as part of the statewide lake assessment program in 1991, Triadelphia reservoir was classified as a mesotrophic lake, meaning it has a moderate amount of dissolved nutrients. Over the years, the reservoir has experienced water quality problems due to sediment and nutrient enrichment from agricultural runoff and increased urban development in the watershed.

WSSC received a grant from the Maryland Department of the Environment (MDE) to develop a reservoir eutrophication model that will be used in support of the State's Source Water Assessment Program. WSSC contracted with Tetra Tech, Inc. to develop the model. The contract includes a trend analysis of the reservoir water quality data that WSSC has been collecting over the past 10 years. Resource Management Concepts (RMC), Inc., will perform this work as well as compare how the Patuxent reservoirs' water quality trends compare with that of the nearby Baltimore reservoirs. Sedimentation survey results from prior years will also be evaluated and compared for both WSSC and Baltimore reservoirs.

Current Conditions

Countywide Stream Protection Strategy

According to the CSPS, the stream condition in the portion of the upper Patuxent within the study area ranges from fair to excellent (see Figure 19). Stream conditions were evaluated for 8 subwatersheds in the lower portion of the upper Patuxent. Data for two additional subwatersheds adjacent to the Triadelphia Reservoir were not available. The lower portion of the upper Patuxent supports a generally high-quality cold water fish community, although sculpin, which are usually found in these communities are absent. Although adequate habitat and water quality exist in the upper Patuxent to support sculpin, their absence is probably due to the isolation of the stream from the rest of the watershed caused by the presence of the Triadelphia reservoir. The mainstem upstream from Route 94 supports a naturally reproducing trout population. A very short segment of the mainstem at the furthest upstream portion of the study area (from Route 94 to Scott's Branch) falls within the lowermost part of this natural trout stream section. Overall, the lower upper Patuxent continues to maintain good to excellent stream resource conditions, with most of the subwatersheds exhibiting an excellent resource condition. Most of the excellent subwatersheds are within the Patuxent River State Park and are heavily forested. Mid upper Mainstem B has a mixed agricultural and forest cover and is in good condition. Upper Hipsley Mill and Haight's Branch have much less forest cover, poor bank stability with high levels of sediment deposition, and are in fair condition (MCDEP, 1998).

2001 Patuxent Reservoirs Technical Advisory Committee Annual Report

The 2001 Patuxent Reservoirs Technical Advisory Committee Annual Report contains a compilation of data collection and analysis conducted by the advisory committee agencies for the Patuxent Reservoirs

watershed. During 2000, MCDEP monitored 14 stations along the mainstem and its tributaries. The benthic macroinvertebrate community, fish community, and habitat was monitored and assessed. Stream channel configuration, water temperature, dissolved oxygen, pH, and conductivity were also monitored at each station. Water temperature, dissolved oxygen, and pH almost all fell within the State's acceptable water quality ranges. Rapid habitat assessment results all scored in the good to excellent range.

Four stations within second order reaches were identified as needing further examination. The main limiting factor at those stations appeared to be reduced stream flow related to small contributing drainage areas. Even though there was apparently a lack of enough seasonal flow to sustain a healthy diverse fish population at all sites, the benthic macroinvertebrates scored excellent or good.

Continuous temperature monitoring at five stations during the summer months showed that all sites exceeded the state established criterion (20°C) to protect trout at various times, but never remained over the criterion for any length of time. These temperature spikes may be due to sites being downstream of open agricultural areas or below roads.

Seven stations showed moderately to severely entrenched streams, with steep high banks. Even though the biological community is not currently showing severe effects from adverse temperature or stream channel impairments, the continuation of these impacts may eventually harm the benthic macroinvertebrate and fish communities.

Maryland Biological Stream Survey

A number of sites were sampled along the upper Patuxent mainstem in 1997. The benthic score, fish score, and physical habitat index for that year reflect predominantly good conditions, with some of each type of score falling in the fair range.

Maryland 303(d) List and 305(b) Report

The 1996 303(d) report listed the entire Patuxent River for nutrients. The 1998 303(d) report listed the upper Patuxent River draining to the Triadelphia Reservoir for nutrients and sediment. The 1996 305(b) report indicated that water quality in this segment is generally good. However, it notes that some high nitrate, total nitrogen, and elevated phosphorus, bacteria and temperature levels were observed at a monitoring station above the Triadelphia Reservoir in the study area. These higher levels were presumably due to agricultural runoff. Bioassessment of three sites in the upper Patuxent showed unimpaired habitat and unimpacted or moderately impacted biological communities, suggesting some water quality impact. The 2000 305(b) report indicated that data from the sampling stations upstream of the reservoir do not show any water quality impairment. However, based on biological sampling data, the state's Biological Criteria Advisory Committee identifies these watershed segments as potentially impaired.

The 1996 305(b) report stated that the Triadelphia Reservoir experienced water quality problems due to moderate nutrient enrichment from agricultural runoff and increasing urban development in the watershed. The 1998 and 2000 305(b) reports list the reservoir as only partially supporting aquatic life uses as a result of low oxygen levels in the deeper portion of the lake. These hypoxic conditions are the result of natural stratification, which restricts circulation of oxygen to deeper portions of the lake, worsened by eutrophication from non-point source runoff.

Triadelphia Reservoir Monitoring

WSSC staff has completed its tenth year of reservoir monitoring that includes a suite of chemical and physical parameters. Water quality is monitored at three locations within the reservoir. This information will be used in the development of the reservoir eutrophication model (Patuxent Reservoir Watershed Annual Report, 2001).

In the past year, bottom samples were collected to perform a sediment flux study. Evaluating the contribution of nutrients released from the reservoir sediment along with the nutrients flowing into the reservoir from tributaries provides insights into nutrient management techniques that may be most suitable for the reservoir and the streams in the watershed. Preliminary results show that the bottom sediments are indeed contributing to the nutrients seen in the reservoir water column (Patuxent Reservoir Watershed Annual Report, 2001).

Watershed Management

Patuxent Primary Management Area

The Patuxent Primary Management Area (PMA) and its implications for land use decisions have been discussed earlier in this report in the watershed management section for Hawlings River. The upper Patuxent watershed in the study area also falls within the PMA (see Figure 22). These areas should also be maintained in low-density, low intensity land uses with establishment of a minimum 50-foot forested buffer immediately adjacent to all streams.

Countywide Stream Protection Strategy

The CSPS divides the lower part of the upper Patuxent River watershed into 10 subwatersheds. The mid upper Main B, upper Hipsley Mill, Haight's Branch, and Greenstone Tributary are designated as Agricultural Watershed Management Areas. The remaining watersheds are designated as Watershed Preservation Areas (see Figure 20).

Regulatory and Policy Framework for Environmental Planning in Olney and Vicinity

Master planning attempts to balance appropriate land uses and zoning densities with environmental protection goals adopted by federal, state and local government. Environmental assessments are conducted during the master planning process to assure that land use and density decisions are made with knowledge of sensitive environmental resources and potential impacts. While many environmental regulations and guidelines are applied at the time of subdivision or site plan, the master plan recommends appropriate zoning and development to allow the development process to proceed more smoothly. The process avoids conflicts between the natural environment and development where possible, or addresses potential impacts when other goals are judged more important.

The information in this chapter summarizes the environmental framework established by federal, state and local laws, regulations and policy by subject area (see Table 10 for a chronology of environmental policy and regulation). This framework is reflected in the 1993 General Plan Refinement for Montgomery County in the chapter on Environment. (Figure 25 shows the legislative guidance organized according to the General Plan Refinement goals.) The information on existing environmental conditions in Chapter 1 and in the data and mapping conducted as part of the environmental study supports the master plan by providing the baseline information as it relates to the legislation and policies affecting the watersheds in Olney and vicinity.

Stream Water Quality Management

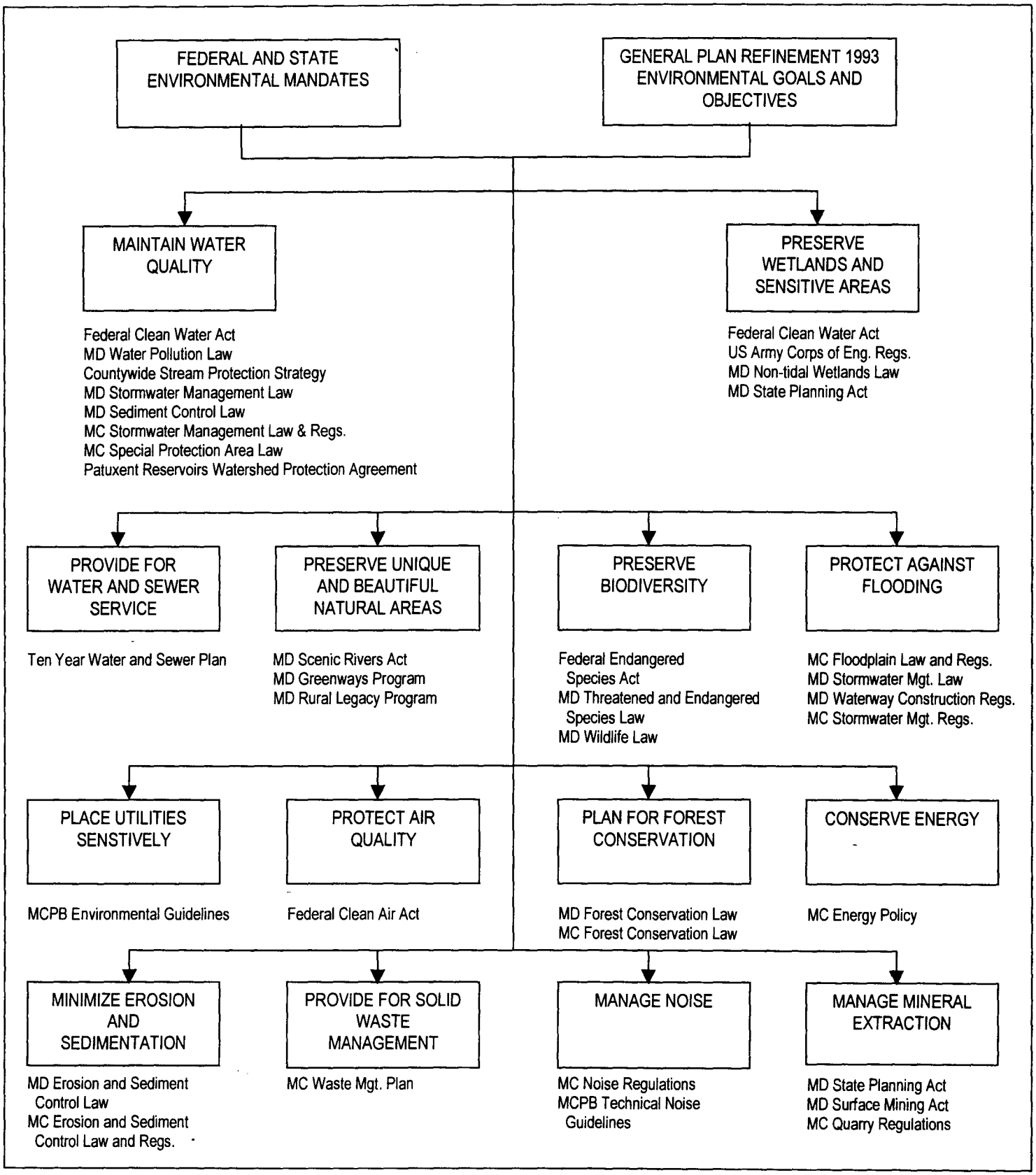
The need for protecting water resources is reflected in federal, state, and local laws as well as in regulations and guidelines. The county's numerous small streams and creeks flow into the main water supply resources (i.e., Potomac and Patuxent Rivers) and the Chesapeake Bay. The state of Maryland and Montgomery County are national leaders in developing sound watershed management plans and policies.

The condition of water resources, including streams and wetlands, has been of primary environmental concern for the state of Maryland for at least the past twenty years (see Table 10). The quality of the Chesapeake Bay and its many tributaries have dramatically benefited from environmental programs that reduce both point and some non-point sources of pollution. Improvement in sewage plant discharges, removal of obstacles to fish passage, construction of stormwater management and stream enhancement projects have all contributed to improving water quality. At the same time, continuing increases in human population and development still create stresses on aquatic systems despite benefits that have been attained through the various water quality protection programs. Efforts in Montgomery County are coordinated with federal, state and regional programs to reduce the impact of new development and repair the impact of existing land uses and past development activity.

Tributary Strategies

The Chesapeake Bay Agreement of 1983 is a commitment by the states of Maryland, Virginia, and Pennsylvania, and the District of Columbia, and the Environmental Protection Agency to restore and protect the Chesapeake Bay. In 1987 the same parties agreed to a 40 percent reduction of phosphorus and nitrogen loadings to the Bay. In 1992 the Bay partners agreed to develop "tributary strategies"- watershed based plans to reduce nitrogen and phosphorous entering the Bay. Maryland's tributary strategies are an addition to the historic Chesapeake Bay Agreement, to address the problems of excess nutrients and their impacts on the living resources.

Environmental Policy Sources To Guide Master Planning Figure 25



Chronology of Environmental Policy and Regulatory Actions

Table 10

Chronology of Environmental Policy and Regulatory Actions

- 1948 - The *Federal Water Pollution Control Act* regulates dumping and disposal into navigable waters.
- 1965 - The *Water Quality Act* created ambient water quality standards for interstate waters.
- 1970 - The *Maryland Sediment Control Act* requires sediment control at construction sites and has been used to require stormwater management.
- 1972 - The *Federal Clean Water Act* with amendments in 1977 and 1981, provides guidelines for preservation of fishable and swimmable waters of the U.S.
- 1973 - The *Maryland Environmental Policy Act* declares that State policy give the highest public priority to the protection, preservation, and enhancement of the State's diverse environment.
- 1983 - The *Chesapeake Bay Agreement* is a commitment by the states of Pennsylvania, Maryland, and Virginia, the District of Columbia, and the Environmental Protection Agency to restore and protect the Bay through correcting existing pollution problems and avoiding new ones.
- 1983 – Section 208 of the State Water Quality management Plan by the State, in compliance with that section of the federal Clean Water Act.
- 1983 – Montgomery County issues stormwater management regulations for water quality and quantity control.
- 1983 – Montgomery County Planning Board approves stream buffer guidelines (updated in 1993) to protect stream valleys from physical development using environmental buffers and conservation easements.
- 1987 – The *Chesapeake Bay Agreement of 1987* established a goal of reducing by 40 percent the nutrient input to the Chesapeake Bay.
- 1989 – The *Maryland Non-Tidal Wetlands Act* regulates land-disturbing activities in wetlands outside the tidal waters of the Chesapeake Bay.
- 1992 - The *State Planning Act*, in which one of the seven visions given, states that stewardship of the Chesapeake Bay is to be considered a universal ethic. The planning act also requires implementation of the sensitive areas element, including 100-year floodplains, streams and their buffers, habitats of threatened and endangered species, and steep slopes.
- 1992 – *The Chesapeake Bay Agreement* requires a 40 percent reduction from the 1985 level in controllable nutrient loads of nitrogen and phosphorous to the Bay by the year 2000. The State initiates the tributary strategies program to customize nutrient reduction plans for different subwatersheds. Montgomery County has two tributary plans (Middle Potomac and Patuxent) that will focus on a combination of urban and agricultural non-point source best management practices (BMPs) to reduce pollution from runoff.
- 1992 – *County Forest Conservation Law* (revised in 2001) provides for tree preservation and planting in new developments; forest is protected with conservation easements.
- 1993 – *General Plan Refinement* contains fourteen environmental goals; three are protection and improvement of water quality; conservation of County waterways, wetlands, and sensitive parts of stream valleys; and comprehensive stormwater management to minimize sedimentation.
- 1994 – *Special Protection Area (SPA) law* requires certain developments to prepare a water quality plan and monitor the site before and after development to determine if the objectives of the water quality plan are met.
- 1995 – Montgomery County enacts regulations for special protection areas to implement the SPA law, including performance standards that are intended to maintain baseflow, wetland and aquatic habitat functions, and groundwater recharge.

Chronology of Environmental Policy and Regulatory Actions (Continued)

- 1996 - *Patuxent Reservoirs Watershed Protection Agreement* signed by Howard, Montgomery, and Prince George's Counties, the Howard and Montgomery Soil Conservation Districts, the Maryland-National Capital Park and Planning Commission, and the Washington Suburban Sanitary Commission for interagency cooperation to protect the aquatic, terrestrial, and groundwater resources of the Patuxent River, the reservoirs, and the tributary streams.
- 1997 – Planning Board *Environmental Guidelines* revised to include a chapter on special protection areas.
- 1998 – *Countywide Stream Protection Strategy* assesses water quality conditions Countywide on a consistent biological basis, develops management categories, and prepares a list of priority watersheds that will be periodically updated.
- 1998 – *Middle Potomac Tributary Strategies Annual Report* defines an intergovernmental approach to improving conditions in the Maryland portion of the middle Potomac watershed (includes parts of Montgomery, Prince George's and Frederick Counties). This report is updated annually.
- 2000 – *Legacy Open Space Functional Master Plan* designates certain county sites for protection through acquisition or easement as part of a public/private effort to protect significant open spaces in Montgomery County.
- 2000 – *Chesapeake 2000 Agreement* reconfirms the nutrient reduction goals of the 1992 agreement and establishes goal to protect and restore living resource habitats, protect and restore water quality, manage the impacts of development and promote public awareness.
- 2000 – *Montgomery County Forest Preservation Strategy Report* prepared by a task force appointed by the County Executive outlines a strategy to increase the quantity of forest canopy, improve the quality of forest and trees, and protect and restore forest ecosystems throughout the county.
- 2001 – *Montgomery County Groundwater Protection Strategy Report* prepared by the Groundwater Protection Strategy Work Group outlines a strategy to protect public health and the integrity of groundwater and of surface watersheds.

The tributaries covered in this inventory are located in both the middle Potomac (North Branch of Rock Creek and Northwest Branch) and Patuxent (Hawlings River and upper Patuxent River) basins. The Middle Potomac Tributary Strategy Team and the Patuxent River Commission include representatives of state and local agencies, the farming community, business, environmental organizations, federal facilities and citizens. The teams bring together citizens and local governments on a watershed basis, and provide a forum for regional cooperation and communication.

The Middle Potomac team has established urban watershed, agricultural, and wastewater/point source workgroups to address the following matters relative to nutrient reduction:

- Nutrient trading
- Maryland's Smart Growth initiative
- Maryland's Clean Water Action Plan
- Total Maximum Daily Loads (TMDLs)
- Local watershed management
- Pasture/manure management
- Riparian forest buffer programs
- Education and outreach programs
- Septic systems
- Stormwater management design and BMPs
- The Chesapeake Bay watershed model

The Middle Potomac Tributary Strategy Team's recent accomplishments have been mostly in the areas of public education, outreach programs, informational and practical workshops, and demonstration projects. No recommendations specific to the Rock Creek or Northwest Branch watersheds have been made.

The Patuxent River Commission created by state legislation in 1980 serves as the Patuxent Tributary team. During 1998, the Patuxent River Commission selected the Patuxent Reservoirs subwatershed to focus environmental outreach and stewardship awareness activities. These included a Reservoirs Watershed Awareness Day in 1999 and six other outreach activities from 1999-2001 to increase awareness about pollutant

sources to the reservoirs and tributary streams and ways that individual residents and resource users can decrease water quality impacts. The Commission continues to be active in Reservoir watershed activities, including riparian tree plantings, participating in Reservoir Earth Month activities, and coordination with the Colonial Pipeline Company. The Commission addresses a variety of policy issues that affect the entire watershed such as:

- Smart Growth
- The Clean Water Action Plan
- Storm Water Management
- TMDL's
- Agricultural Management
- Pipeline safety
- Patuxent Policy Plan Implementation
- Rural Legacy
- Public outreach and education

The Patuxent Reservoirs Watershed Protection Group (PRWPG) is an interagency group comprised of representatives from Howard, Montgomery, and Prince George's Counties, the Washington Suburban Sanitary Commission, the Howard and Montgomery Soil Conservation Districts, and the Maryland-National Capital Park and Planning Commission. The PRWPG Agreement signed in 1996 committed the signatories to cooperate to protect the biological, physical, and chemical integrity of the aquatic and terrestrial watershed resources. The Comprehensive Management Planning Study for the Patuxent Reservoir Watershed (TetraTech, 1997) identified six priority resources for protection including, reservoirs, terrestrial habitat, stream system quality, aquatic biota, rural character and landscape, and public awareness and stewardship. The year 2002 work program includes continuation of reservoir and tributary water quality monitoring, stream corridor assessments, identification of sediment hot spots, enhancement of a GIS based watershed modeling tool, and development of a reservoir modeling tool. The Maryland Department of the Environment (MDE), the state agency responsible for the implementation of the Safe Drinking Water Act, has awarded of the Sanitary Commission a grant for the establishment of a Reservoir Eutrophication model. The WSSC contracted with a consulting firm for the development of such a model. MDE intends to use the results of the reservoir model as part of its source water assessment program (SWAP). The results may be used in the establishment of TMDL's as well.

The Planning Commission has recognized the importance of water supply protection and has targeted areas in the Patuxent River watershed for additional protection under the Legacy Open Space Functional Master Plan.

Total Maximum Daily Loads (TMDLs)

The Total Maximum Daily Load (TMDL) approach to water quality management is mandated in the federal Clean Water Act. The TMDL approach establishes a maximum limit for a pollutant or other quantifiable parameters that cause water quality impairment in a specific subwatershed. The state of Maryland is in the process of developing a TMDL program. In the Chesapeake Bay, the purpose and process of the established tributary strategies for nutrient reduction in the Potomac and Patuxent rivers work in tandem with the regulatory TMDL approach. Consequently, the Chesapeake Bay tributary strategies will provide guidance in the establishment of TMDLs in Maryland.

Under Section 303(d) of the Clean Water Act, each state is required to develop lists of impaired waters. These are waters that do not meet water quality standards, even though the minimum level of pollution control technology has been installed at the pollution point source. The 303(d) list published by the Maryland Department of the Environment has classified Rock Creek, Lake Needwood, and Lake Bernard Frank as impacted waters with nutrients as the suspected source of pollution. The list assigns low priority for the development of TMDL's for these waters. In 1998, the state identified the Rocky Gorge Reservoir as impaired by nutrients and the Triadelphia Reservoir as impaired waters by both nutrients and sedimentation. These two water bodies were assigned a medium priority level for TMDL development for these two pollutants.

Although no loading limits have been set for the Olney watersheds, Maryland Department of the Environment plans to require TMDLs for nutrients and suspended sediments in the Bay-wide TMDL. The master planning process will consider the state's initial findings

when they are available. Current MDE plans include establishing TMDL's for phosphorous for Lake Frank by the end of 2002. Prior to the establishment of the TMDLs, the state intends to supplement existing water quality data.

Clean Water Action Plan

The 1998 federal Clean Water Action Plan (CWAP) is a program designed to use, coordinate and supplement existing federal, state and local pollution control programs to help address nonpoint source pollution of surface and ground waters due to storm runoff from farms, lawns, streets, parking lots, and industrial facilities and from air deposition and polluted ground waters.

The CWAP proposes a new collaborative effort by state, federal, and local governments, the private sector and the public to restore those watersheds not meeting clean water and other natural resource goals and to sustain healthy conditions in watersheds that currently meet these goals. The CWAP addresses all aspects of watershed condition: water quality, including public health issues; aquatic living resources; physical habitat and the landscape. The Montgomery County CSPS data has been incorporated into the CWAP. The Department of Natural Resources (DNR) administers the CWAP program within Maryland and has incorporated the results from the Montgomery County CSPS in ranking watersheds for restoration.

The key steps in this national effort are:

Unified Watershed Assessment--The Unified Watershed Assessment (UWA) uses the best available information to assess the condition of the state's watersheds, identify watersheds in need of restoration, identify watersheds that need preventive action to sustain water quality and aquatic resources, and identify pristine or sensitive watersheds that need extra protection. Based on condition, watersheds are classified into the following categories:

Category 1: Watersheds not meeting clean water and other natural resource goals and needing restoration

Category 2 Watersheds currently meeting goals that need preventive actions to sustain water quality and aquatic resources

Category 3 Pristine or sensitive watersheds that need an extra level of protection

Category 4 Insufficient data

Watershed Restoration Priorities—Based on the UWA, the state establishes watershed restoration priorities. This involves selecting those watersheds not meeting clean water and other natural resource goals that are most in need of restoration actions during the next two years.

Watershed Restoration Action Strategies —will identify the most important causes of water pollution and resource degradation, detail the actions needed to address these problems, and set milestones by which to measure progress. Funds available to federal agencies through the federal FY 1999 Clean Water and Watershed Restoration Budget Initiative will be used to help the states implement these strategies.

Consistent with the Clean Water Action Plan, the state of Maryland has issued the Final 1998 Report on Unified Watershed Assessment, Watershed Prioritization and Plans for Restoration Action Strategies report on December 31, 1998 (State of Maryland, 1998). The report addresses the three key steps above. It provides a Unified Watershed Assessment, sets Watershed Restoration Priorities, and describes the process under development to identify and implement Watershed Restoration Action Strategies. Findings relevant to the Olney study area watersheds are presented in Chapter 1 of this report.

Watershed Protection and Restoration

Montgomery County has aggressively pursued efforts to protect streams, rivers, wetlands and other directly related sensitive features. Montgomery County Code subsection 19-61 provides for the protection of a geographic area where existing water resources or other environmental features directly related to those water resources are of high quality and are unusually sensitive and where special measures (over and above standard environmental laws, regulations and guidelines) must be applied to land development and certain land uses in order to protect the high quality conditions of these natural features. These areas, known as special protection areas (SPAs), are designated through area master plans, watershed plans, the Comprehensive Water Supply and

Sewerage System Plan, or by resolution of the County Council. The County Executive and the Planning Board have implemented Executive regulations and Environmental Guidelines, respectively, to implement the special protection area law. As of the date of this report, no areas within the Olney study area have been designated special protection areas.

Development projects on property in special protection areas undergo additional water quality review as part of the development process. A water quality plan is prepared to determine how specific water quality protection goals can be met through stormwater management and protection of environmental buffers around streams and wetlands. Water quality is monitored before and after the development to assess the extent to which the goals are met.

The *Countywide Stream Protection Strategy* (CSPS) was developed by the Montgomery County Department of Environmental Protection and M-NCPPC to provide an overall assessment of county stream conditions. The CSPS ranks countywide stream conditions (excellent, good, fair, and poor) based on biological and habitat assessments. Prior to 1980, stream quality was analyzed based solely on chemical and physical parameters. Until the CSPS effort was undertaken, biological data on county streams was limited.

The CSPS assigns a management category that recognizes the sensitivity of the stream condition and the projected imperviousness levels, and determines the potential for maintaining that level. The CSPS identifies broad management goals for the preservation, protection, and restoration of streams, along with management tools that can be applied to effectively meet those goals. The CSPS helps agencies identify, target, and budget specific watershed-based resource protection initiatives, and serves as a useful technical tool. The CSPS also identifies priority subwatersheds where instability in the stream condition indicates that action is needed to address immediate problems.

The CSPS is a dynamic effort by the county to provide updated water quality information, management information and priorities. The document is planned to be updated once every five years, incorporating new data on stream conditions.

This report includes CSPS information available at the time of publication on stream conditions, management categories, and priorities. For the most current information, check the CSPS latest update.

Watershed Restoration Action Plans

The Montgomery County Department of Environmental Protection (MCDEP) is developing watershed restoration action plans for Rock Creek and Hawlings River. The Rock Creek effort began in the mid-1990s in order to meet NPDES Stormwater Permit requirements. The Hawlings River Study was initiated as part of the county's commitment to the interjurisdictional efforts to protect the Patuxent Reservoirs and their watershed. The plans also address Montgomery County's goal to improve water quality, in-stream habitat conditions, and fish passage by protecting against further degradation contributed by uncontrolled stormwater flows.

The process for developing the plans involves assessment of existing stream conditions followed by a feasibility study to provide analysis of potential stormwater retrofit project sites and preliminary design of sites to address severe erosion and stream degradation problems. The feasibility study for Rock Creek has been completed and the study for Hawlings River is ongoing. The results to date for both studies are discussed in the Watershed Management section for each watershed in Chapter 1 of this report.

Patuxent Primary Management Area (PMA)

The purpose of the Patuxent watershed PMA is to identify and manage land from which nonpoint source pollution is most likely to be transported to the river, to the two water supply reservoirs, and ultimately to the Chesapeake Bay. It identifies a stream buffer and a transition area to reduce the potential for impacts to the streams and reservoirs.

Montgomery County's PMA for the Patuxent is consistent with the state's Patuxent River Policy Plan. The transition area is established as ¼ mile (1320 feet) for the Patuxent mainstem and 1/8 mile (660 feet) for all tributaries. In addition, Montgomery County also

recommends a ¼ mile transition area for the mainstem of the Hawlings River.

A property will be subject to PMA requirements only when it is submitted to M-NCPPC for subdivision and/or site plan review. Land that remains in agricultural use, as part of a plan for subdivision, will be subject to the recommended PMA stream buffer and transition area requirements. The PMA guidelines are otherwise voluntarily implemented and strongly encouraged on remaining parcels throughout the watershed.

Stormwater Management

The county Department of Permitting Services administers the county's stormwater management regulations, as well as the sediment and erosion control regulations, to protect stream quality and downstream areas from the impacts of land development. New developments are required to submit plans complying with these regulations during the development review (subdivision) process.

The state of Maryland has recently adopted new stormwater management regulations requiring changes to Montgomery County regulations. These changes are anticipated in 2002 and will result in greater requirements for low density development and retention of flows from more frequent, smaller storms.

Floodplain Management

Floodplain management includes a full range of tools, programs, and policies. County agencies have been working together to deal with some of the major problems associated with changes in watershed hydrology and stream impacts as a result of urbanization. To address severe flooding problems, the M-NCPPC in concert with the county Department of Permitting Services (DPS) restrict development and construction activity in the 100-year floodplain throughout the county. New development within the 100-year floodplain is prohibited. A 25-foot building restriction line setback from the 100-year floodplain is required for new structures. New roadway stream crossings that encroach on the 100-year floodplain are subject to strict design requirements. Additionally, the M-NCPPC has a nationally recognized stream valley park system that provides flood and stream quality protection and recreational use. Increased water flows and velocities during heavy storm events result from continued development in the watersheds. These increases are at least partially controlled through the county's stormwater management law and regulations.

Since the early 1990s, the County's Department of Permitting Services was designated lead agency for administering the county floodplain regulations and coordinating the National Flood Insurance Program (see Table 11). DPS is the county agency designated to receive and act on proposals for encroachments on the 100-year floodplain. DPS requires site specific floodplain studies, where necessary, to determine the flood impact of a particular development and to establish floodplain boundaries where no data exists. DPS also updates and maintains regulatory floodplain data for Montgomery County.

The M-NCPPC and the Washington Suburban Sanitary Commission are the custodians of large multi-purpose dams in Montgomery County. The county's Department of Public Works and Transportation (DPWT) is responsible for managing state and county roads and responding to flooding issues at road crossings.

On-site sewerage systems are prohibited in the 100-year floodplain by county and state regulations administered by DPS.

Solid Waste

Maryland state law authorizes the County Council to regulate and control management of solid waste under sections 9-501 through 9-521 of the Environmental Article of the Annotated Code of Maryland. The Maryland Department of the Environment requires each county, town and municipal corporation to develop a comprehensive plan to address solid waste needs for a ten year period and that it be reviewed at least every three years. The Montgomery County Comprehensive Solid Waste Plan sets forth the policies, goals and plans for the comprehensive management of solid waste generated by the county's residential, industrial, commercial, institutional and agricultural uses. The Plan is prepared by the Solid Waste Division of the Department of Public Works and Transportation. All amendments and revisions

Floodplain and Stormwater Management Responsibilities

Table 11

RESPONSIBILITY	AGENCY
Evaluation of impact of land use changes as part of master plan effort	M-NCPPC
Delineation of floodplain	DPS, M-NCPPC
Park development planning, stream valley acquisition (including floodplain)	M-NCPPC
Protection of floodplain in proposed subdivision site plans, zoning map amendments, urban redevelopment	M-NCPPC, DPS, DPWT
Maintenance of large multi-purpose dams	M-NCPPC, WSSC
Maintenance of small stormwater management structures	M-NCPPC, DEP, HOA
Review of encroachment applications and detailed floodplain analyses and floodplain regulations	DPS
Flood insurance program	FEMA, MDE, DPS
Health Regulations	DPS, MDE
Review of sediment control and stormwater management plans	DPS
Overall program for approval, operation, and maintenance of stormwater management facilities. (Treatment and control of stormwater runoff from developed areas into stream valleys, including floodplain.)	DPS, DEP

M-NCPPC - Maryland-National Capital Park and Planning Commission

DEP - Department of Environmental Protection

DPS - Department of Permitting Services

DPWT - Department of Public Works & Transportation

WSSC - Washington Suburban Sanitary Commission

MDE - Maryland Department of the Environment

FEMA - Federal Emergency Management Agency

HOA - Homeowners Association

to the Plan must be adopted by the Montgomery County Council and reviewed by the Maryland Department of the Environment. The County Executive implements the Comprehensive Solid Waste Plan. The current plan, adopted in 1998, describes the framework on which the county's current and future solid waste programs are built through the year 2007.

The Plan sets forth a hierarchy of waste management principles including: waste reduction, recycling/reuse, co-generation and waste disposal. The county has imposed an objective of no growth in its waste stream and is pursuing pilot programs to determine ways to reduce solid waste generation. The county has an aggressive waste recycling plan that is striving to reach a mandated recycling goals of 45 percent of its municipal

waste stream by the end of year 2002, and 50% by the end of 2004. The County's Resource Recovery Facility located in Dickerson, generates electricity by burning waste that cannot be recycled. The most favorable residue option involves landfilling of ash and non-combustibles at a location out of state.

State Smart Growth Initiatives

The Maryland Economic Development, Resource Protection, and Planning Act of 1992 ("Planning Act of 1992") requires comprehensive plans prepared by local governments to include the following seven "visions" designed to encourage economic growth, limit sprawl development, and protect natural resources:

1. Development is concentrated in suitable areas.
2. Sensitive areas are protected.
3. In rural areas, growth is directed to existing population centers and resource areas are protected.
4. Stewardship of the Chesapeake Bay and the land is a universal ethic.
5. Conservation of resources, including a reduction in resource consumption, is practiced.
6. To assure the achievement of 1 through 5 above, economic growth is encouraged and regulatory mechanisms are streamlined.
7. Funding mechanisms are addressed to achieve these visions.

In Montgomery County, the General Plan Refinement (1993) has been accepted by the state as meeting this requirement.

To strengthen and detail these policies to support development targeted to areas of the state with existing infrastructure, the Maryland legislature enacted a series of laws to encourage smart growth and neighborhood conservation. This legislative package includes incentives for workers to relocate near their places of work, a job creation tax credit for small businesses in smart growth areas, incentives to clean up and redevelop contaminated brownfield sites, and funding for acquisition of land to protect the state's rural legacy. More recently, the state provided funding through the "Greenprint" program to protect the green infrastructure through acquisition of new parkland.

The most important new policy established under the smart growth umbrella is the requirement that state money for infrastructure be directed to existing towns and cities and other designated smart growth areas. The state is attempting to reverse the subsidy of sprawl by targeting highway, water, sewer, and other building and infrastructure funds to existing developed areas that already have or may have the transportation, housing, and infrastructure capacity to support increased use. This program does not limit where counties can allow development, but it does prevent the use of state dollars to support development outside Smart Growth areas.

Within Montgomery County, all areas within the Capital Beltway (I-495) are designated as Smart Growth priority funding areas. In 1998, the county designated additional priority funding areas that meet state requirements for sewer service, planned density, and access to existing infrastructure. Parts of the Olney study area are included in these Smart Growth areas (see Figure 26). The master planning process will be coordinated with Smart Growth initiatives to ensure that land use and zoning are compatible with state policies.

Sensitive Areas Protection and Biodiversity

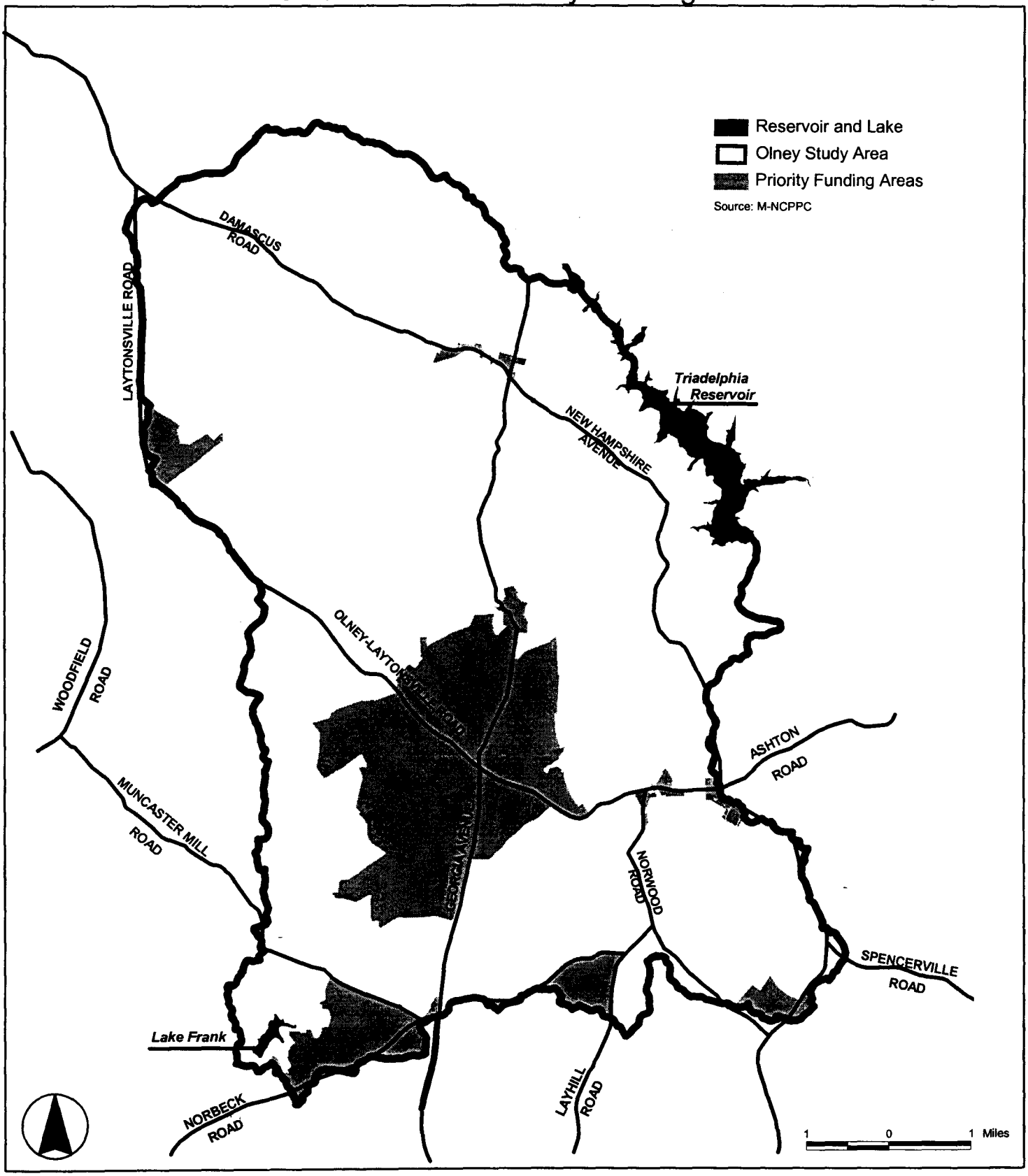
The Planning Act of 1992 establishes criteria that must be included in local government comprehensive plans such as Montgomery County's General Plan. Among the criteria to be incorporated are the seven visions for the state and the preparation of a "sensitive areas" element.

Implementation of the sensitive areas element is intended to protect streams and their buffers, 100-year floodplains, steep slopes, and the habitats of threatened or endangered species, as well as any particular resource the locality deems appropriate.

Of the environmental goals, objectives, and strategies developed for the General Plan in response to the seven visions, objectives 2, 4, and 6 particularly relate to the protection of environmentally sensitive areas:

Smart Growth - Priority Funding Areas

Figure 26



Objective 2: Preserve natural areas and features that are ecologically unusual, environmentally sensitive, or possess outstanding natural beauty

Objective 4: Conserve County waterways, wetlands, and sensitive parts of stream valleys to minimize flooding, pollution, sedimentation, and damage to the ecology and to preserve natural beauty and open space.

Objective 6: Preserve and enhance a diversity of plant and animal species in self-sustaining concentrations.

Local area master plans such as the Upper Rock Creek and Olney master plans "are adopted as amendments to the General Plan" and "are expected to conform to the General Plan" (General Plan Refinement, Goals and Objectives for Montgomery County, 1993). To reflect the priorities established in the planning act and the General Plan, master plans consider the presence and amount of sensitive areas in their land use proposals. One approach to protecting sensitive areas is direct acquisition and conservation as parkland.

Another approach to managing sensitive areas is to incorporate their protection within proposed development plans for residential, commercial, and industrial development. During the development review process the *Environmental Guidelines* for development are applied to each development proposal. These guidelines recommend specific protection measures for sensitive areas such as establishing undisturbed stream buffers, protecting wetlands and establishing wetland buffers, maintaining areas of steep slopes and highly erodible soils, conserving trees within development sites and implementing county stormwater management and sediment/erosion control standards.

In addition to protection provided by the guidelines, federal and state statutes regulate wetlands in Montgomery County. Federal regulation of wetlands was established through section 404 of the Clean Water Act and subsequent court cases defining wetlands as "waters of the U.S." In Maryland, federal and state environmental agencies share responsibility for issuing or denying permits to dredge, fill or otherwise disturb wetlands. The proposed disturbance also must meet the more stringent requirements of the Maryland Non-tidal Wetlands Act. This act established a minimum 25-foot buffer between the edge of the area disturbed by construction and the wetland boundary. The Maryland Department of the Environment also administers state wetlands and water quality certification permits.

Federal and state environmental agencies also assist Montgomery County with wetland functional assessment studies, review of environmental and land use information contained within master plans, and regulatory review of proposed development. A Wetland Functional Assessment Study was recently completed by M-NCPPC in cooperation with the state government to prepare a field-based assessment of the upper Rock Creek wetlands and wetlands in selected parts of the Olney Study Area. These studies evaluate wetlands for five functions: groundwater discharge, flood attenuation, sediment/nutrient retention, aquatic habitat, and wildlife habitat.

State and federal law also require preservation of habitats of endangered species. For several years the M-NCPPC has contracted with the Maryland Department of Natural Resources, Wildlife and Heritage Division, to conduct surveys for rare, threatened, and endangered species and high-quality native habitats on selected parklands in Montgomery County. The result of these surveys has been the identification of several sites that contain rare, threatened, or endangered species. Surveys by M-NCPPC have identified additional areas containing rare, threatened or endangered species on park property.

Determinations regarding which species are rare, threatened, or endangered may be made either by the U.S. Fish and Wildlife Service (federal RTE species) or the Maryland Department of Natural Resources Heritage and Biodiversity Conservation Program (state RTE species). The state list includes "watchlist" species which, although not officially listed as endangered or threatened, have been identified as species in need of conservation due to declining or restricted populations.

Concern over the decline and disappearance of rare, threatened, and endangered species of plants and animals is part of a broader concern for the preservation of biological diversity. Biological diversity encompasses the variety of living species, variations within species, and the variable composition of biological communities. Biological diversity can be examined at different levels of

organization, including genetic, species, ecosystem, and landscape scales (Scott et al., 1993).

Good biological diversity contributes to ecosystem stability, provides the genetic raw material to adapt to changing environmental conditions, preserves natural resources for potentially valuable future uses, and enhances the quality of life for many county residents. In addition, planning for the preservation of biological diversity now may help preclude the need to undertake expensive and controversial endangered species restoration plans in the future.

In recent years, preservation of biological diversity has become a goal of government and conservation organizations. Approaches to preservation of biodiversity include the identification and acquisition of unique or representative natural communities by public agencies or private foundations; identification and protection of unique or representative natural communities on existing public lands, and land use planning which recognizes the value of biological diversity.

Legacy Open Space

The Legacy Open Space Functional Master Plan has identified target land resources needed to protect water supply, rural open space, greenway corridors and historic resources in Olney. Funding is allocated through the Capital Improvement Program over time to acquire land or easements to protect important resources. The water supply, rural open space and greenway corridor categories indicate large target areas where additional resource protection is possible.

Within Olney, the Planning Board can use reservation as a tool to protect greenway connections. This means that approval for development proposed in these corridors can be delayed for up to three years to allow time for the county to find funds to purchase these properties. Water supply, rural open space and historic resources must be prioritized based on importance and threat of development and easements purchased from willing sellers as funds allow.

The Olney master plan will help to further examine these resources and set priorities in the target areas within Olney.

Forest Conservation

Forest conservation helps retain the natural beauty of the community and protects dependent ecosystems. Trees cleanse the air and water runoff and provide shade to ameliorate summer temperatures and provide cover and food for a variety of wildlife. Since 1992, Montgomery County has been requiring forest conservation as part of applications for land disturbance and development. The county forest conservation law is required by and modeled after the Maryland Forest Conservation Act of 1991. Forest conservation recognizes the benefits of forest and trees in our increasingly urbanized environment and requires preservation and reforestation as part of the development process.

A general framework for the planting of street trees, establishment of new forests, and protection of existing forests during the area master planning process comes from the General Plan Refinement Goals and Objectives, approved and adopted in 1993. Specifically, Strategy F under Objective 4 is to "plant and retain trees and other vegetation near streams" and Strategy E under Objective 6 is to "minimize forest fragmentation to protect habitat continuity." Objective 8, which is to "increase and conserve the County's forests and trees," applies to forest and tree conservation. Strategies under Objective 8 are:

- Identify and designate forest preservation and tree planting areas.
- Ensure forest land conservation, tree planting, and related maintenance in all new development.
- Provide for increased tree cover and maintenance in urban and suburban areas and along transportation rights-of-way.
- Encourage private and public landowners to protect existing trees and to plant additional environmentally appropriate and native trees on their properties.

Preservation of urban forest and trees often is intended to meet the needs of people as much as the environment. Frequently woods in developed areas are isolated, invaded by exotic vegetation, and in poor health. Some individual trees are worthy of preservation, but they can be difficult to save given site and layout constraints in new development or redevelopment. The forest conservation law encourages retention of existing trees

wherever possible, as well as appropriate maintenance to keep them viable. Street trees, which enhance neighborhoods, provide habitat for common species and buffer road noise, are an important part of the urban landscape.

Forest Protection Strategy

In October of 2000, a task force appointed by the Montgomery County Executive produced a forest preservation strategy. The strategy included recommendations for increasing the quantity of forest canopy, improving the quality of forests and trees, and protecting and restoring forest ecosystems throughout the county. The recommendations were broken down for riparian forest, upland forest, urban street trees, forests on private land, and forests on public land. Among the action items included in the final report were:

Riparian Forests

- Reforest a total of 300 acres and protect 1000 acres per year of riparian forest throughout the county for the next five years.
- Identify and inventory all riparian areas that can be preserved or reforested.

Upland Forests

- Identify and prioritize upland forests throughout the county for preservation.
- Increase economic incentive programs for upland forest preservation on private land.
- Protect 500 acres of upland forests per year for the next five years.

Urban Street Trees

- Develop a long-term street tree planting and maintenance strategy.

Forests on Private Land

- Amend the existing Forest Conservation Law so that there is no net loss of forest cover in the county from new development.
- Establish minimum canopy cover standards for development projects.

Forests on Public Land

- Establish public agency guidelines to restore forest and tree canopy to available open space on public lands.
- Encourage interior forest restoration and preservation by creating "exclusion or limited use" areas.
- Increase funding for public initiatives, such as Legacy Open Space, to purchase and protect high priority forested lands.

Wetland Laws and Regulations

Federal

The primary goal of current wetland regulations and policies is to achieve "no net loss of wetland acreage and function, and [to] strive for a net resource gain". Regulatory programs flow from Section 404 of the federal Clean Water Act of 1972. The federal legislation authorizes the U.S. Army Corps of Engineers to issue permits for the discharge of dredged or fill materials into waters of the United States, including wetlands.

State and Regional

The state of Maryland modeled its Nontidal Wetlands Protection Act (COMAR Title 26, Subtitle 23) after the federal legislation. Differences include state provisions for regulation of activities which alter wetland hydrology or vegetation and activities which impact the 100-year floodplain, 25-foot wetlands buffer, and 100-foot expanded buffer.

Much of the impetus for protection of wetlands in Maryland comes from regional efforts to protect and restore the Chesapeake Bay, especially including the 1987 Chesapeake Bay Agreement and subsequent directives from the Chesapeake Bay Executive Council(CBEC). In 1997 the CBEC issued directive 97-2, which established regional wetland protection and restoration goals. Maryland's Governor has committed the state to seek voluntary restoration of 60,000 acres of wetlands in excess of regulatory requirements as part of the regional wetland restoration effort.

Local

Based on Article 28 of the Annotated Code of Maryland, and with guidance provided by the Maryland Economic Growth, Resource Protection, and Planning Act of 1992 (requiring a sensitive areas element in each local jurisdiction's general plan), Montgomery County has prepared a General Plan for the Development of Montgomery County, Maryland. Included in the Environmental section of the General Plan is the following policy guidance:

General Plan Objective 4

"Conserve County waterways, wetlands, and sensitive parts of stream valleys to minimize flooding, pollution, sedimentation, and damage to the ecology and to preserve natural beauty and open space."

Strategies (related to wetlands protection):

- Identify and protect wetlands and other sensitive parts of watersheds.
- Maintain the natural character of drainage areas in the immediate vicinity of streams, rivers, and lakes.
- Minimize impacts from construction and operation of public and private facilities located in stream valleys, buffers, and floodplains; first priority should be given to preserving natural areas (avoidance), second priority to mitigation, and third priority to replacement with functional equivalents.
- Develop programs to rehabilitate damaged streams and then to maintain them.
- Mandate "no net loss" of wetlands.

This objective and these strategies are to be considered during master planning and implemented through application of the M-NCPPC's Environmental Guidelines during the development review process.

The Draft Montgomery County Strategic Plan for Water Quality Protection, Volume I (Goals, Objectives, and Implementation Tasks) states that the M-NCPPC, in cooperation with MCDEP, "will work to improve the existing State inventory of wetlands in Montgomery County. The M-NCPPC, in cooperation with DNR will develop functional assessment studies for wetlands in various planning areas and watersheds as resources permit. The M-NCPPC has integrated wetland protection provisions into its work program for master plan preparation, regulatory review, and environmental studies. This information will be included in the environmental analysis of new development projects."

One objective of the draft Montgomery County Strategic Plan for Water Quality Protection is "To protect and enhance existing wetlands, restore degraded wetlands, and mitigate unavoidable wetlands losses through successful mitigation projects." The implementation task associated with this objective states "The County will work closely with the State permit agencies and developers to facilitate local protection, management and restoration of wetlands resources. This will include a cooperative approach to identify and protect the county's wetlands through master planning efforts, permitting and subdivision review, and through the development of special area management plans. Advance planning for wetland protection can help regulatory agencies and developers by identifying priority wetlands for protection and avoidance, discussing opportunities for acceptable mitigation and restoration when necessary, and minimizing costs of extended development reviews or requirements for site redesign. The M-NCPPC will update and amend the Environmental Guidelines ... to include a provision for expanded buffers around wetlands in SPAs (Special Protection Areas)."

The master planning process takes into account the available information about wetlands and other natural resources and features of a planning area and determines the most appropriate protection areas, land uses and densities that balances the goals and objectives of communities with the protection of wetland and other natural resources.

At a site-specific level, a proposal for development is reviewed in terms of environmental impact and protection before being approved by the Montgomery County Planning Board. This includes review for protection of and minimizing impacts on wetlands on a site proposed for development. The Planning Board's *Environmental Guidelines* define undisturbed natural buffers from wetlands and other natural features. The guidelines document is applied to a development proposal and is used, in conjunction with master plan recommendations and applicable federal, state, and county laws and

regulations, as a basis to determine if the development proposal adequately protects natural features, including wetlands, on the development site. If wetland impacts are necessary and unavoidable, the environmental guidelines provide the Planning Board with a framework to determine if such impacts are minimized.

Air Quality Policies and Regulations

Air quality improvement is a regional effort. The Metropolitan Washington Air Quality Committee is responsible for approval of the air pollution control measures to be implemented by the region and for preparing the region's air quality plans.

Although there are various forms of air pollution, the major health concern in this region is ozone. Ozone is formed in the lower atmosphere when nitrogen oxides (NOx) and volatile organic compounds (VOC) react in the presence of sunlight and heat. Factors affecting ozone formation include pollutant concentrations in the air, wind velocity, temperature, and sunlight. Ozone typically forms on hot, sunny, windless days. Adverse impacts of ozone include vegetation damage and health effects such as coughing and chest pains, irritation of the eyes and throat, breathing difficulties, and greater susceptibility to infection.

Control measures target two sources of NOx and VOC: mobile and stationary sources. Mobile sources are generally internal combustion engines in on-road vehicles. Stationary sources cover a wide range of structures such as smoke stacks and gaseous industrial exhaust. Other contributors are lawn and garden equipment, varnishes and solvents.

In 1997, the Environmental Protection Agency strengthened ozone and particulate matter standards in light of new scientific evidence that federal standards was insufficient to protect public health. As a result, the one-hour ozone standard was replaced with a stricter eight-hour standard, and the particulate matter standards were also revised.

The new standards pose additional challenges for reducing air pollution. To help meet those challenges, the federal government has taken several important actions:

First, it is requiring twenty-two states in the eastern third of the United States to substantially cut their emissions of NOx in order to reduce the amount of pollutants that drift from state to state. Each state can decide how emissions will be reduced, but most are expected to focus on utilities and big industrial plants that generate electricity by burning coal.

Second, it has established a National Low-Emission Vehicle Program to further reduce the amount of pollutants emitted from the ever-increasing number of cars. Motor vehicle manufacturers have voluntarily agreed to build vehicles with more stringent tailpipe emission standards, and each state will have the opportunity to adopt the new standards and implement the program.

Third, it is setting new emission reduction standards for diesel trucks, buses, and off-road heavy equipment. The new standards will significantly reduce emissions of NOx and particulate matter from these sources.

The Washington region has made considerable progress in reducing the emissions of VOCs and NOx through previous actions of federal, state and local governments. The biggest impacts are due to the high-tech motor vehicle inspection and maintenance programs, vapor recovery nozzles at service stations, reformulated gasoline, reformulated surface coatings, and new federal emission standards for both small and large engines.

In addition to such actions, the Washington region's air quality plans set an upper limit on the overall tons of pollutants that motor vehicles can emit in the region. The region's Transportation Improvement Program and Constrained Long-Range Plan must conform to this limit.

Because ground-level ozone is currently the only major air pollution problem in the Washington region, and because the source of the problem is area-wide in scope, the most cost-effective approach is to continue with the multi-state strategy.

It is, nevertheless, important for Montgomery County to do its part in supplementing that strategy by focusing on local initiatives that can reduce vehicle emissions. Such initiatives could include:

- converting government vehicles from gasoline or diesel to compressed natural gas or hydrogen.
- establishing "Commuter Express Stores" at major employment centers to provide personalized

assistance to commuters who are interested in using carpools, vanpools and public transit.

- strengthening the "Fare-Share" program that provides employees transit fare discounts if their employers offer a matching discount.
- continuing the "Code Red/Ride Free" program for Ride-On buses during air pollution alerts.
- expanding public awareness activities associated with the "ENDZONE Partners" program during air pollution alerts. This program informs the general public about what they can do to reduce polluting activities during air pollution alerts.

To achieve air quality attainment goals, development needs to be concentrated in areas served by public infrastructure and transit as stated in the General Plan. Other policies include promotion of live near work programs, telecommuting, transit trip mitigation measures, cluster and mixed-use development, bicycle paths and lanes, park-and-ride lots, and carpool lanes.

The main approach used in master planning is to reinforce and implement the General Plan by emphasizing access to transit, bikeways, and sidewalks.

Noise Regulation

In Montgomery County, local government agencies have the authority to control the effects of two generalized sources of noise: stationary sources which affect nearby properties; and mobile (i.e., transportation-related) sources emanating from public linear rights-of-way. The Montgomery County Noise Ordinance regulates stationary noise sources from private property such as heating and air conditioning units, construction activity, and neighborhood noise disturbances. The Montgomery County Department of Environmental Protection, Office of Environmental Policy and Compliance administers the Noise Ordinance. The Noise Ordinance sets maximum permissible decibel limits based on land use and time of day. Violations of this ordinance are punishable by law.

Since 1983, the M-NCPPC (Montgomery County Park and Planning Department) *Staff Guidelines For The Consideration Of Transportation Noise Impacts In Land Use Planning And Development* have been used to develop staff recommendations to the Planning Board on reducing mobile source impacts on sensitive receptors. This document was developed to assure consistency in master plan and regulatory review recommendations on noise compatibility, and to promote greater understanding of noise compatible site design. Unlike the regulations in the County Noise Ordinance, the staff noise guidelines are intended to be considered proactively as an integral part of the land use planning and regulatory review process, and are tailored to be consistent yet flexible to allow a balanced achievement of all significant land use and site design objectives.

The staff noise guidelines include reasonable noise level goals for the entire county, ranging from a maximum acceptable noise ceiling of 65 dBA, to a goal of 55 dBA to protect the rural environment in estate and agricultural areas. Along freeways and within the urban core [principally high density areas within and just outside the Capital Beltway (I-495)], a noise guideline of 65 dBA was determined to be achievable and appropriate given the high ambient noise levels, and traffic volumes. In the suburban "ring" around the urban core, a 60 dBA level was determined to be an achievable goal given lower ambient levels and greater opportunity for cost-effective noise mitigation. In the rural areas of the county where development densities and ambient noise levels are much lower, the 55 dBA level guideline is applied.

To achieve these goals, the guidelines identify several measures to reduce traffic noise problems for affected properties, which include:

- Noise compatible land use (typically done at master plan or rezoning)
- Noise compatible site design, distancing sensitive uses/receptors from the source
- Blocking the path from source to receiver
- Acoustical treatment of buildings

These measures are typically applied at one of two opportunities. The first is the master plan process. The master plan identifies where noise impacts may occur and examines potential options for noise compatible land uses, or alternatively, suggests zoning categories that allow sensitive land uses (residential) to be clustered, set back or otherwise buffered from high noise levels. The second opportunity is during the regulatory review

process when noise mitigation techniques can be applied to individual properties.

Water Supply and Sewerage

The Montgomery County *Comprehensive Water Supply and Sewerage Systems Plan* governs the provision of water and sewer service throughout the county. The goal of the plan is to insure adequate, cost-effective, and environmentally sound water supply and wastewater treatment for existing and planned residential, business, and institutional development throughout the county. The plan directs the systematically extension of community water and sewerage systems in concert with other public facilities along the corridors as defined in the General Plan, to accommodate growth only in areas indicated by adopted master or sector plans. In addition, the *Water and Sewerage Systems Plan* considers other adopted or proposed policies of various agencies affecting land use, including guidelines for the administration of the Adequate Public Facilities Ordinance.

For all properties in the county, the plan designates one of six water and/or sewer staging categories that are primarily based on master plan development staging strategies and/or capital program infrastructure staging. The authority to adopt and amend the Water and Sewerage Systems Plan resides with the County Council. The County Executive administers the plan through MCDEP in cooperation with MCDPS, M-NCPPC and WSSC. WSSC provides community water and sewer service at the direction of the County's *Water and Sewer Plan* and in accord with that agency's own regulations and guidelines.

Where community water and sewer service is not provided, water supply and wastewater disposal is accomplished by private, on-site systems: usually wells and septic systems. The Department of Permitting Services administers the regulation and permitting of these systems through the County's *On-Site Systems Regulations*.

Groundwater

Montgomery County Department of Environmental Protection has recently initiated a countywide groundwater protection strategy to guide public and private sectors in watershed planning. The desire is for a comprehensive groundwater protection strategy (GWPS) that will complement the existing Countywide Stream Protection Strategy (CSPS), and thus will serve to complete protection of the hydrologic cycle. DEP has divided the GWPS development into three phases. Phase I consists of collecting, computerizing, and mapping existing county groundwater data including well locations, groundwater elevations, identification of uses, location and identification of aquifers, and existing groundwater quality data. Phase II will cover strategy development including legislative models, public input, determining and defining measurements, and integration within the existing environmental protection regulatory framework. Phase III will encompass plan implementation including drafting regulations, enforcement, and public outreach and education.

In anticipation of the completion of Phase I, and to help lay a foundation for Phase II, a Groundwater Protection Strategy Workgroup, comprised of various government and private members was formed by DEP. The workgroup first met in April 2001, and undertook a 6-month project to produce a groundwater protection strategy report that outlines major issues and specific program recommendations. This report is intended to help establish a strategy for Montgomery County that will protect public health and ground and surface watershed integrity from the impacts of groundwater contamination.

The final report of the Workgroup was published in November 2001. The report set forth recommendations including the establishment of a ground water monitoring program to establish baseline ground water conditions in the county. Establishment of baseline ground water conditions will aid in identifying and prioritizing critical recharge areas. Other recommendations focused on measures for providing public outreach and education, and the need for guidelines and regulations for protecting critical recharge areas (MCDEP, 2001).

References

Booth, Derek B. and Lorin E. Reinelt. "Consequences of Urbanization on Aquatic Systems-Measured Effects, Degradation Thresholds, and Corrective Strategies". In: Proceedings Watershed '93, A National Conference on Watershed Management, pp. 545-550. March 21 -24, 1993. Alexandria, Virginia.

Brush, G. S., C. Lenk, and J. Smith. 1980. The Natural Forests of Maryland: An Explanation of the Vegetation Map of Maryland. Ecological Monographs 50(1), 1980. pp. 77-92.

CH2MHill. 1977. Rock Creek Stormwater & Water Quality Management Study. Prepared for Montgomery County Planning Board. 1977.

CH2Mhill. 1982. Anacostia Technical Watershed Study. Prepared for the Montgomery County Planning Board. May, 1982.

Dietemann, A.J. 1975. A provisional inventory of the fishes of Rock Creek, Little Falls Branch, Cabin John Creek, and Rock Run, Montgomery County, Maryland. Maryland-National Capital Park and Planning Commission. pp. 1-40.

Fugro East. 1995. A Method for the Assessment of Wetland Function. Prepared for the Maryland Department of the Environment. 1995.

Galli, J., and K. Corish.1996. Rapid Stream Assessment Technique (RSAT) Survey of Rock Creek Watershed, Montgomery County, Maryland. Final Report. Prepared for Montgomery County Department of Environmental Protection, Division of Water Resources Management. August, 1996.

Greeley and Hansen. 1993. Strategic Sewerage Study - Executive Summary. Prepared for the Washington Suburban Sanitary Commission. March 1993.

Greenhorne & O'Mara. 1990. Patuxent Watershed Management Study – Technical Report. Prepared for the Maryland-National Capital Park and Planning Commission. February, 1990.

James, R.W., R.H. Simmons, and B.F. Strain. 1993. Water Resources Data, Maryland and Delaware, Water Year 1993. Volume 1. Surface Water Data. U.S. Geological Survey Water-Data Report MD-DE-93-1.

Maryland-National Capital Park and Planning Commission. 1998. Draft Rock Creek Regional Park Master / Management Plan. MNCPPC Department of Park and Planning. August 1998 Draft.

_____ 1997. Environmental Guidelines - Guidelines for Environmental Management of Development in Montgomery County. The Maryland-National Capital Park and Planning Commission. Silver Spring, Maryland. February 1997.

_____ 1988. Water Resources Map of Montgomery County, Maryland. The Maryland-National Capital Park and Planning Commission. Silver Spring, Maryland. September 1988.

_____ 1988. Minor Amendment to the Upper Rock Creek Master Plan. Maryland-National Capital Park and Planning Commission. Silver Spring, Maryland May, 1988.

_____ 1985. A Comprehensive Amendment to the Upper Rock Creek Master Plan, Technical Appendix. Maryland-National Capital Park and Planning Commission. Silver Spring, Maryland. July, 1985. p. 3.

_____ 1983. Staff Guidelines For The Consideration Of Transportation Noise Impacts In Land Use Planning And Development. June, 1983.

_____ 1980. Approved and Adopted Functional Master Plan For Conservation and Management in the Rock Creek Basin, Montgomery County, Maryland. Maryland-National Capital Park and Planning Commission. Silver Spring, Maryland. August, 1980.

_____ 1968. Adopted Master Plan for the Rock Creek Planning Area. Maryland-National Park and Planning Commission. October, 1968.

Maryland Department of Natural Resources. 1990. Maryland Non-tidal Wetlands Act. MDNR, Annapolis, Maryland.

_____ 1998. Maryland Section 305(b) Water Quality Report, MDNR Resource Assessment Service, Annapolis, Maryland. December 1998.

_____ 1996. Maryland Water Quality Inventory, 1993-1995. MDNR Resource Assessment Service, Annapolis, Maryland. December 1996.

Maryland Geological Survey. 2000. The Influence of Ground Water on Nitrate Loads of Streams in the Upper Rock Creek Basin, Montgomery County, Maryland. Open File Report 2000-02-13.

Montgomery County. 1962. Work Plan for the Upper Rock Creek Watershed. Prepared by Montgomery County, Montgomery County Soil Conservation District, Maryland-National Capital Park and Planning Commission. August 1962.

_____. 1981. Water Quality of Streams in Montgomery County, MD, Montgomery County Department of Environmental Protection. December, 1981.

_____. 1997. Upper Rock Creek Watershed Study, Montgomery County Department of Environmental Protection, Watershed Management Division. March 17, 1997.

_____. 1998. Montgomery County's County-wide Stream Protection Strategy, February, 1998. Prepared by Montgomery County Department of Environmental Protection in cooperation with the Maryland-National Capital Park & Planning Commission.

_____. 2000. Montgomery County's Forest Preservation Strategy, October, 2000. A task force report requested by the County Executive.

_____. 2001. Groundwater Protection Strategy. Report of the Groundwater Protection Strategy Work Group requested by the Director of the Montgomery County Department of Environmental Protection. November, 2001.

_____. 2001. Rock Creek Watershed Feasibility Study. Prepared for the Montgomery County Department of Environmental Protection. April, 2001.

Norden, A.W., D.C. Forester, and G.H. Fenwick, eds. 1984. Threatened and Endangered Plants and Animals of Maryland. Maryland Department of Natural Resources, Annapolis.

Patuxent Reservoir Watershed Annual Report. 2001. Report on progress made by the Patuxent Reservoirs Technical Advisory Committee (TAC).

Plafkin, James L., Michael Barbour, Kimberly Porter, Sharon Gross, Robert Hughes. Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish. EPA Publication EPA/440/4-89/001. U.S. Environmental Protection Agency. May 1989.

Ragan, R.M. and A.J. Dietemann. 1976. Characterization of urban runoff in the Maryland suburbs of Washington, D.C. University of Maryland, Water Resources Research Institute, Technical Report No. 38. pp. 82-85, 121-125.

Schueler, Thomas, editor. "The Importance of Imperviousness". In: Watershed Protection Techniques, Volume 1, No. 3, pp. 100-111. Fall 1994.

Scott, M. S. , F. Davis, B. Csuti, R. Noss, B. Butterfield, C. Groves, H. Anderson, S. Caicco, F. Derchia, T. Edwards, Jr., J. Ulliman, and R. G. Wright. 1993. Gap Analysis: A Geographic Approach to Protection of Biological Diversity. Wildlife Monographs No. 123, January 1993. 41 pp.

USDA. 1995. Soil Survey of Montgomery County, Maryland. United States Department of Agriculture. Natural Resources Conservation Service, in Cooperation with Maryland Agricultural Experiment Station and Montgomery Soil Conservation District.

Van Ness, K, K. Brown, M. Haddaway, D. Marshall, D. Jordahl. 1997. Montgomery County Water Quality Monitoring Program, Stream Monitoring Protocols. Montgomery County, Department of Environmental Protection.

Washington Suburban Sanitary Commission, 1996. Montgomery County Future Sewer Capacity Constraints Report. WSSC, 1996.

Appendix

Existing Parkland Ownership

Study Area Existing Parkland Ownership[1]

Table A-1

Owner	Acres	% of Parkland	% of Study Area
M-NCPPC	3,951	56	10
State of Maryland	2,063	29	5
WSSC	1,055	15	3
Municipalities	18	<1	<1
Total	7,087	100	18

(1) GIS coverage of existing parkland, M-NCPPC 1997.
(2) Total parks in planning area is 5,318 acres.

Environmentally Sensitive Areas

The sensitive areas mapped for purposes of this report were prepared with some limitations on both the information available and the level of effort associated with preparing the computer Geographic Information System (GIS) coverages. The sensitive areas mapped in Figure 12 and reported in Table 9 consist of a combination of several types of areas, many of which overlap. Sensitive areas are defined by the State Planning Act of 1992, which includes areas considered sensitive by the local government. For purposes of this report, wetlands and wetland buffers are added to the list defined by the legislation of 100-year floodplains, streams and their buffers, steep slopes, and habitats of rare, threatened, or endangered species. Since a comprehensive understanding of the locations of habitats of rare, threatened or endangered species is not mapped, this information was not included in the tables or maps.

The range of acreage and percentages used for stream buffers represent the highs and lows for buffer width applied consistently along the entire stream length. Slopes were not used directly to determine the buffer width as they would be when looking at individual sites. Steep slope acreages and percentages are based on a computerized analysis of the topography to determine areas with slopes greater than 25 percent. The wetlands coverage consists of information from the 1997 DNR wetlands identification project. The 100-year floodplain was mapped using two sources of information: 1) The M-NCPPC 1"=200' ultimate land use floodplain maps of major tributaries, and 2) the 1995 Soil Survey of Montgomery County which contains information on floodplain soils. The M-NCPPC floodplain maps cover the mainstem and major tributaries and lakes in the upper Rock Creek, Northwest Branch, Hawulings and Patuxent watersheds. They provide the best level of detail, and they were designed to account for full buildout based on 1977 zoning of the watershed. The soils maps are less accurate than the M-NCPPC floodplain maps, but they provide floodplain information on smaller tributary streams not covered by the M-NCPPC maps.

All these coverages were combined to obtain a single map of sensitive areas that incorporates stream buffers, steep slopes, the floodplain, wetlands, and wetland buffers as established in the *Environmental Guidelines*. The sensitive area coverage is approximate and only to be used for master planning purposes. Site specific planning and detailed design require more refined mapping and field investigation.

County-wide Stream Protection Strategy

Data Collection

The CSPS incorporates stream water quality data collected by state and county agencies, as well as volunteers from the Audubon Naturalist Society, and representatives of the development community.

Management Categories

The CSPS developed five categories that were based first on the existing stream quality and

imperviousness combined with predominant land use. The special protection area and regular protection area were included as management approaches (along with a remedial protection approach) under a more general watershed protection category. Two management categories were added to deal with the special conditions in agricultural and urban areas. The categories in the CSPS include:

Watershed Preservation Areas

- Stream condition is EXCELLENT.
- Projected land use is not expected to put significant stress on resource and projected imperviousness is generally less than 10 percent of the subwatershed area.
- Areas are generally protected by very low density zoning or parkland.

Watershed Protection Areas

- Stream condition is EXCELLENT or GOOD
- Existing and/or planned land use results in development patterns with imperviousness above 10 percent and protection of the resources from development impacts is necessary.
- Different management levels are applied based on the level and type of protection deemed necessary to protect the resource:

Special level: Due to the sensitivity of the resource and the magnitude of change between existing and planned development, some level of enhanced watershed management is necessary beyond typical environmental guidelines and sediment control and stormwater permitting requirements.

Regular level: Standard existing protection measures are expected to adequately protect the resource from existing and/or projected land use. Development activity is not expected to significantly increase impervious area over what already exists and accompanying development review requirements and stormwater controls would provide adequate mitigation.

Remedial level: Stream condition is good or excellent but problems are observed, usually in the habitat condition, that are attributable to previous land use impacts. Habitat conditions may be on the verge of, or in the process of deteriorating, but stream biological integrity has not yet deteriorated to fair or poor conditions requiring more comprehensive restoration efforts. The remedial level may be used in conjunction with a special level of protection, where existing habitat problems exist and projected land uses are expected to increase imperviousness significantly. In these areas it is particularly important to address existing channel instability so that stream reaches will be able to withstand small incremental impacts associated with change in land use. The remedial level under Watershed Protection Areas differs from Watershed Restoration areas by being applied as limited spot improvements to areas with good or excellent stream condition. Watershed Restoration areas have fair or poor stream condition and require more comprehensive restoration efforts.

Watershed Restoration Areas

- Stream condition FAIR or POOR.
- Contributing drainage generally has less than 55 percent ultimate impervious area.
- Significant areas of natural stream channel still exist.
- Most land abutting the stream is in conservation easements or public ownership.

Urban Watershed Management Areas

- Designation based on recognition that certain existing and planned land uses have a detrimental and unavoidable effect on subwatershed hydrology, stream habitat, water quality, and aquatic life that limits the potential for restoration.
- Stream condition is POOR.
- Land use generally consists of intense development (e.g. Central Business Districts, major commercial areas).
- Contributing drainage generally has 55 percent or greater ultimate impervious area and system presently does not support viable biological community.

- Significant portion of the drainage area is piped or channelized and habitat restoration is generally infeasible.

Agricultural Watershed Management Areas

- Stream condition is GOOD, FAIR, or POOR.
- Agriculture is the predominant land use.
- Some level of impairment is reflected in the monitoring data, as indicated by a resource condition of good, fair, or poor. (Excellent agricultural subwatersheds would fall into the Watershed Preservation Area management category).
- The Montgomery Soil Conservation District would be the lead agency for developing management approaches and tools for Agricultural Watershed Management Areas.

Existing Subwatershed Imperviousness

Existing imperviousness (see Figure 17) was obtained from the County-wide Stream Protection Strategy. The CSPS used the information from the County's geographic information system (GIS).

The GIS information represents conditions in the period 1993-1994 (different parts of the study area were photographed at different times). Land use conditions reflected by the planimetric data were assumed to closely represent present existing conditions. That is, available planimetric data were used to characterize existing conditions with respect to land uses and land cover.

GIS was used to measure all paved surfaces and building rooftops that are shown in the planimetric layers for each subwatershed. These layers include all features that are considered to be impervious surfaces except for sidewalks and driveways for single-family detached houses. (See below for the estimated impervious surface area attributable to sidewalks and residential driveways.)

In order to calculate the area of driveways not already accounted for, the building, road/street, and parking layers were evaluated and an approximate count obtained of the number of buildings (primarily residential single-family detached in subdivisions; rear yard structures assumed to be sheds and the like were not counted) for which a driveway existed but did not appear in the planimetric layer. This number was then multiplied by the average area for a driveway in each subwatershed, which was obtained from the required front-yard setback for the predominant residential zones within the watershed multiplied by an assumed width of 15 feet.

Sidewalks are a feature in the GIS data that are shown as lines and not as polygons. The area of sidewalks was determined by multiplying the length (taken from the planimetric layer) by an assumed width of 4 feet. In addition to the GIS layers for paved features (buildings, driveways, roads, streets and parking, cultural, and sidewalks) the impervious contribution of nonpaved land cover was calculated, based on the assumption that these surfaces also contribute to surface water runoff for some precipitation events. Remaining nonpaved land was categorized as either forested or nonforest-nonpaved. Nonforest-nonpaved land includes lawn, pasture, and crop fields and is referred to as meadow. Forest cover is assigned an imperviousness factor of one percent; nonforest green cover is assigned a factor of three percent. A one percent imperviousness factor for forest cover has been used in other studies that focus on land use imperviousness (Northern Virginia Planning District Commission, 1980; Galli, 1983; CH2M Hill, 1982). For nonforested green cover, a wider range of imperviousness factors have been used (i.e., 0 to 7 percent). The CSPS uses three percent imperviousness factor for nonforested green cover because it is roughly the middle of the range of values that have been used in other studies and it reflects the greater benefits of forest cover compared to meadow or grass cover on streams.

Fish Species of the Olney Watersheds

The County-wide Stream Protection Strategy (MCDEP, 1997) lists fish collected in each watershed in Montgomery County that were identified during the monitoring program (see Table A-2). While this information is based on a limited number of samples, it indicates the diversity of species for each watershed. The information will be updated through the CSPS as additional data is collected. Consult the most current copy of the CSPS for updated information.

Fish Species of the Olney Study Area

Table A-2.

Species Name	North Branch of Rock Creek	Hawlings River	Northwest Branch	Patuxent River
American eel			X	
Blacknose dace	X	X	X	X
Bluegill	X	X	X	X
Bluntnose minnow	X	X	X	
Brown bullhead	X		X	X
Brown trout			X	
Central stoneroller		X	X	X
Common shiner	X	X	X	X
Creek chub	X	X	X	X
Cutlips minnow	X	X	X	X
Fallfish	X	X	X	X
Fantail darter			X	
Golden shiner	X		X	
Green sunfish	X	X	X	X
Greenside darter		X		
Largemouth bass	X	X	X	X
Longnose dace	X		X	X
Margined madtom	X	X	X	X
Mottled sculpin	X	X		
Northern hogsucker	X	X	X	X
Potomac sculpin	X			
Pumpkinseed sunfish	X	X	X	X
Rainbow trout (stocked)				X
Redbreast sunfish	X	X	X	X
River chub				X
Rosyside dace	X	X	X	X
Satinfin shiner	X		X	
Shield darter		X		X
Shorthead redhorse		X		
Silverjaw minnow	X			
Smallmouth bass				X
Spotfin shiner	X		X	X
Spottail shiner	X			X
Swallowtail shiner	X	X		
Tessellated darter	X	X	X	X
White sucker	X	X	X	X
Yellow bullhead	X			
Yellow perch		X		

Source: CSPS. February 1998.

PARK WILDLIFE INVENTORY - RACHEL CARSON CONSERVATION PARK

Table A-3

	Common Name	Scientific Name		Common Name	Scientific Name
Butterflies	Eastern Tiger Swallowtail	*Papilio glaucus*	**Reptiles**	painted turtle	*Chrysemys picta*
	Spicebush Swallowtail	*Papilio Troilus*		eastern box turtle	*Terrapene carolina*
	Cabbage White	*Pieris rapae*		northern water snake	*Nerodia sipedon*
	Clouded Sulphur	*Colias philodice*		eastern garter snake	*Thamnophis sirtalis*
	Eastern Tailed Blue	*Everes comyntas*			
	Great Spangled Fritillary	*Speyeria cybele*			
	Pearl Cresent	*Phyciodes tharos*			
	Mourning Cloak	*Nymphalis antiopa*			
	Silver-spotted Skipper	*Epargyreus clarus*			
Amphibians	spotted salamander	*Ambystoma maculatum*	**Mammals**	opossum	*Didelphis virginianus*
	northern dusky salamander	*Desmognathus fuscus*		short-tailed shrew	*Blarina brevicauda*
	red-backed salamander	*Plethodon cinereus*		star-nosed mole	*Condylura cristata*
	American toad	*Bufo americanus*		eastern cottontail	*Sylvilagus floridanus*
	spring peeper	*Pseudacris crucifer*		eastern chipmunk	*Tamias striatus*
	gray tree frog	*Hyla versicolor*		groundhog	*Marmota monax*
	bullfrog	*Rana catesbeiana*		gray squirrel	*Sciurus caroinensis*
	green frog	*Rana clamitans*		southern flying squirrel	*Glaucomys volans*
	pickerel frog	*Rana palustris*		beaver	*Castor Canadensis*
	wood frog	*Rana sylvatica*		white-footed mouse	*Peromyscus leucopus*
				meadow vole	*Microtus pensylvanicus*
				muskrat	*Ondatra zibethicus*
				meadow jumping mouse	*Zapus hudsonius*
				red fox	*Vulpes vulpes*
				gray fox	*Urocyon cinereoagenteus*
				raccoon	*Procyon lotor*
				mink	*Mustela vison*
				river otter	*Lutra canadensis*
				white-tailed deer	*Odocoileus virginianus*

	Common Name	Scientific Name		Common Name	Scientific Name
Birds (*=breeding; **=breeding forest interior spp)	pied-billed grebe	*Podilymbus podiceps*	**Birds** (*=breeding; **=breeding forest interior spp)	European starling*	*Sturnus vulgaris*
	hooded merganser	*Lophodytes cucullatus*		Brown-headed cowbird	*Molothrus ater*
	mallard*	*Anas platyrhynchos*		red-winged blackbird*	*Agelaius phoeniceus*
	American black duck	*Anas rubripes*		Baltimore oriole*	*Icterus galbula*
	wood duck*	*Aix sponsa*		common grackle*	*Quiscalus quiscula*
	ring-necked duck	*Aythya collaris*		house finch*	*Carpodacus mexicanus*
	common goldeneye	*Bucephala clangula*		American goldfinch*	*Carduelis tristis*
	ruddy duck	*Oxyura jamaicensis*		grasshopper sparrow*	*Ammodramus savannarum*
	Canada goose*	*Branta candensis*		white-crowned sparrow	*Zonotrichia leucophrys*
	great blue heron	*Ardea herodias*		white-throated sparrow	*Zonotrichia albicollis*
	green heron*	*Butorides virescens*		chipping sparrow*	*Spizella passerina*
	American woodcock	*Scolopax minor*		field sparrow*	*Spizella pusilla*
	wild turkey	*Meleagris gallopavo*		dark-eyed junco	*Junco hyemalis*
	rock dove*	*Columba liva*		song sparrow*	*Melospiza melodia*
	mourning dove*	*Zenaida macroura*		swamp sparrow	*Melospiza Georgiana*
	turkey vulture	*Cathartes aura*		eastern towhee*	*Pipilo erythrophthalmus*
	black vulture*	*Coragyps atratus*		northern cardinal*	*Cardinalis cardinalis*
	red-tailed hawk*	*Buteo jamaicensis*		indigo bunting*	*Passerina cyanea*
	red-shouldered hawk**	*Buteo lineatus*		scarlet tanager**	*Piranga olivacea*
	American kestrel*	*Falco sparverius*		tree swallow*	*Tachycineta bicolor*
	barred owl**	*Strix varia*		cedar waxwing*	*Bombycilla cedrorum*
	eastern screech-owl*	*Otus asio*		red-eyed vireo**	*Vireo olivaceus*
	great horned owl*	*Bubo virginianus*		yellow-throated vireo**	*Vireo flavifrons*
	yellow-billed cuckoo*	*Coccyzus americanus*		blue-headed vireo	*Vireo solitarius*
	belted kingfisher*	*Ceryle alcyon*		white-eyed vireo*	*Vireo griseus*
	hairy woodpecker**	*Picoides villosus*		worm-eating warbler**	*Helmitheros vermivorus*
	downy woodpecker*	*Picoides pubescens*		northern parula*	*Parula Americana*
	yellow-bellied sapsucker	*Sphyrapicus varius*		yellow warbler*	*Dendroica petechia*
	pileated woodpecker**	*Dryocopus pileatus*		black-throated blue warbler	*Dendroica caerulescens*
	red-bellied woodpecker*	*Melanerpes carolinus*		yellow-rumped warbler	*Dendroica coronata*
	northern flicker*	*Colaptes auratus*		palm warbler	*Dendroica palmarum*
	chimney swift	*Chaetura pelagica*		prairie warbler*	*Dendroica discolor*
	ruby-throated hummingbird*	*Archilochus colubris*		ovenbird**	*Seiurus aurocapillus*
	great crested flycatcher*	*Myiarchus crinitus*		Louisiana waterthrush**	*Seiurus motacilla*
	eastern phoebe*	*Sayornis phoebe*		Kentucky warbler**	*Oporornis formosus*
	eastern wood-pewee*	*Contopus virens*		common yellowthroat*	*Geothlypis trichas*
	Acadian flycatcher**	*Empidonax virescens*		yellow-breasted chat*	*Icteria virens*
	willow flycatcher*	*Empidonax traillii*		house sparrow*	*Passer domesticus*
	blue jay*	*Cyanocitta cristata*		northern mockingbird*	*Mimus polyglottos*
	American crow*	*Corvus brachyrhynchos*		gray catbird*	*Dumetella carolinensis*
	fish crow*	*Corvus ossifragus*		brown thrasher*	*Toxostoma rufum*

	Common Name	Scientific Name		Common Name	Scientific Name
Birds (*=breeding; **=breeding forest interior spp)	Carolina wren*	*Thryothorus ludovicianus*	**Birds** (*=breeding; **=breeding forest interior spp)	golden-crowned kinglet	*Regulus satrapa*
	house wren*	*Troglodytes aedon*		ruby-crowned kinglet	*Regulus calendula*
	winter wren	*Troglodytes troglodytes*		blue-gray gnatcatcher*	*Polioptela caerulea*
	brown creeper	*Certhia americana*		wood thrush**	*Catharus mustelinus*
	white-breasted nuthatch*	*Sitta carolinensis*		veery*	*Catharus fuscescens*
	tufted titmouse*	*Baeolophus bicolor*		American robin*	*Turdus migratorius*
	Carolina chickadee*	*Poecile carolinensis*		eastern bluebird*	*Sialia sialis*

Source: *Rachel Carson Conservation Park Master Plan*, MNCPPC, June 2000.

Forest Inventory

Criteria for Classification

The forest types that were classified were deciduous forest, coniferous forest, mixed deciduous/coniferous forest, and successional forest. In addition, old field or pre-successional areas were identified.

Staff used the following criteria for development of the thematic layer:

- The minimum forest stand mapping unit will be 10,000 square feet, excluding obvious hedgerows, tree cover (aerial extent of canopy of individual trees and tree stands less than 10,000 square feet in size, including neighborhood tree stands) which do not constitute real forest resources.
- The boundaries between forest and non-forest areas should be accurate to within 50 feet at a scale of 1"=200'.
- The boundaries between different forest stands should be accurate to within 100 feet at a scale of 1"=200'.
- The forest resource layer should be 90% accurate, based upon a minimum of 20 ground truth areas. Ground truth areas will not be smaller than 2 acres. Ground truthing of classifications will occur at least 100 feet into the polygon. The 20 ground truth sites will consist of 4 samples within each of the 5 classification categories.
- Polygons shall be classified into five categories: deciduous forest, coniferous forest, mixed deciduous-coniferous forest, successional forest, and old fields.
- Deciduous forest areas will have a closed canopy and contain no more than 40 percent coniferous trees.
- Coniferous forest areas will have a closed canopy and contain 60 percent or more coniferous trees.
- Mixed forest areas will have a closed canopy and contain from 40-60 percent coniferous trees.
- Successional forest areas will be areas with a minimum of 100 trees per acre with at least 50 percent of those trees having a diameter at breast height (DBH) of 2 inches or greater, but lacking a closed canopy. Areas of mixed old field and successional forest are included in the successional forest category.
- Old field areas will be areas which are succeeding toward forest but which do not meet the definition of forest listed above in the successional category definition.

Methodology

Existing forest resource boundaries were determined using 1998 panchromatic digital orthophotos from M-NCPPC GIS coverage, and field verification. The photos

were overlaid with the tree line layer of the M-NCPPC planimetrics and printed at 1"=200' scale. Forest boundaries were drawn on the prints based upon staff interpretation of these photos with cross checking of color infrared photos. Field surveys were conducted and the data collected was combined with data contained in Natural Resources Inventory/Forest Stand Delineation (NRI/FSD) reports for a limited number of tracts within the analysis area. This was then used to provide information for the supervised classification of forest types. Forest boundaries were corrected to 2001 conditions using the clearing limits reflected on approved Forest Conservation Plans (FCP) for the area. Finally, additional field checking was conducted to verify the condition of questionable areas.

The forest boundaries were then digitized from the 1"=200' photos to produce a GIS forest resources thematic layer. The digitizing was conducted by Towson State University and checked for accuracy by M-NCPPC staff.

Determination of Significant Forest Blocks

Identification of significant forest blocks in Olney and vicinity is based on criteria established by the Chesapeake Bay Critical Area Commission (1986). These criteria were developed in response to concerns about the declining populations of many native breeding birds which are associated with large, relatively undisturbed blocks of mature forest. The Chesapeake Bay Critical Area Commission's report suggests that upland forest blocks of 100 acres or more and riparian (streamside) forests which are 300 feet wide or wider may serve as habitat for forest interior dwelling birds. The report goes on to note that these criteria should serve as a general guideline; forest interior birds may be found in some smaller forest areas.

Based on these recommendations, staff measured forest blocks and riparian corridors on the GIS forest layer created for the Environmental Inventory. Upland blocks in excess of 100 acres and riparian corridors 300 feet wide or more were delineated and identified as "significant forest blocks." These areas have the greatest potential to provide habitat for forest interior bird species.

Confirmation that these areas are serving as forest interior areas for birds can only be accomplished by conducting breeding bird surveys. The Chesapeake Bay Critical Area Commission suggests that breeding bird surveys, which identify at least four forest interior bird species or at least one sensitive species as "probable" or "confirmed" breeders in a given forest area, should confirm that area as a forest interior (see Table A-4). Breeding status is determined according to the criteria set forth by the Maryland Ornithological Society.

Wetlands

Functional Assessment of Wetlands in the Olney Policy Area

A more detailed functional assessment was conducted for wetlands found in the Olney policy area. Data used in this functional assessment included existing mapped and documented information (including DOQQ information) and field information collected by staff. Field information was collected for wetlands in those portions of Northwest Branch and Hawlings River within the policy area in 2000–2001. Staff collected field information on wetlands in the upper Rock Creek watershed in 1998–1999 as part of a separate functional assessment (see "Environmental Resources Inventory for the Upper Rock Creek Watershed", January 2000).

The M-NCPPC wetland functional assessment protocol is a tool to measure how well a group of wetlands performs six major functions that are attributed to natural, healthy wetlands in this geographic region: attenuation of flood flows, reductions in sediment and nutrient loads, groundwater discharge, provision of aquatic habitat, provision of terrestrial habitat, and provision of habitat for rare, threatened or endangered plants or animals. Please note that the protocol is designed to provide only estimates of the ability of a wetland group to perform the six wetland functions relative to other wetland groups within the limits of the study. The protocol is not intended to measure how well a wetland group performs a specific function in absolute terms.

The M-NCPPC wetland functional assessment protocol does not evaluate individual wetlands. Rather, the assessment is intended to be a planning level methodology to determine how well various "collections" of wetlands, considered as integral features of stream

Forest Interior Dwelling Bird Species

Table A-4.

Common Name	Scientific Name
Flycatcher, Acadian	*Empidonax virescens*
*Hawk, red-shouldered	*Buteo lineatus*
Ovenbird	*Seiurus aurocapillus*
*Owl, barred	*Strix varia*
Parula, northern	*Parula Americana*
*Redstart, American	*Setophaga ruticilla*
Tanager, scarlet	*Piranga olivacea*
Vireo, red-eyed	*Vireo olivacea*
Vireo, yellow-throated	*Vireo flavifrons*
Warbler, black-and-white	*Mniotilta varia*
*Warbler, hooded	*Wilsonia citrina*
*Warbler, Kentucky	*Oporornis formosus*
Warbler, prothonotary	*Prothonotaria citrea*
*Warbler, Swainson's	*Limnothlypis swainsonii*
*Warbler, worm-eating	*Helmitheros vermivorus*
*Waterthrush, Louisiana	*Seiurus motacilla*
Whip-poor-will	*Caprimulgus vociferous*
Woodpecker, hairy	*Picoides villosus*
Woodpecker, pileated	*Dryocopus pileatus*

* Denotes species especially sensitive to disturbance.

Sources: Chesapeake Bay Critical Area Commission (1986). A Guide to the Conservation of Forest Interior Dwelling Birds in the Critical Area. Guidance Paper No. 1; 15pp. Maryland Ornithological Society. 1982.

Maryland and D.C. Breeding Bird Atlas Project Handbook, 1983-1987. Supplement to Maryland Birdlife, Vol. 38, 1982; 20pp.

systems, fit into the functioning of the specific stream systems within the limits of the study and to provide measures of the relative contributions of these wetland groups to the health of the study area's aquatic and terrestrial environments.

The M-NCPPC protocol was developed by Environmental Planning staff, with input from the Maryland Department of the Environment (MDE), Nontidal Wetlands and Waterways Division. It is a hybrid of the Wetland Evaluation Technique (WET), MDE protocol, and an office-based protocol developed by Biohabitats, Inc. for M-NCPPC as part of the Eastern Montgomery County Wetlands Study. The M-NCPPC wetland functional assessment protocol has been applied in the M-NCPPC environmental inventories conducted for the Potomac Subregion and the Upper Rock Creek watershed.

For this assessment, the wetland resources of the Olney policy area were combined into Wetland Assessment Groups (WAGs). WAGs are groups of wetlands which lie near each other within a subwatershed. Divisions between WAGs occur where the character of the watershed changes, such as places where stream order changes significantly, or at physical separations such as major road crossings. The WAG groupings were determined by staff. Figure 28 shows approximate locations of the WAGs within the Olney policy area.

Field data collected by staff on these WAGs in 2000–2001 were combined with mapped information and data from Montgomery County's Geographic Information System (GIS) database to produce estimates of the six wetland functions for each WAG.

For each of the six wetland functions, there are a set of possible features or characteristics that a wetland may possess. The presence or absence of features or characteristics are determined through GIS or field-collected data. A score is assigned to each feature or characteristic. A wetland characteristic that indicates a healthy, well-functioning, natural, undisturbed wetland is assigned a high score. A characteristic that indicates degraded conditions and/or poor functions is assigned a low score.

For a WAG, the scores for the wetland characteristics under a particular wetland function are averaged. This average (mean) becomes the score for that wetland function. The scores for the six wetland functions are added, with the scores for wildlife habitat and aquatic habitat functions each multiplied by a factor of two. This weighted sum becomes the functional assessment score for the WAG.

The wildlife habitat and aquatic habitat functions are weighted to give them more importance in determining relative rankings of wetlands. This is because these two functions are the most difficult functions to recreate if a wetland is adversely affected and degraded.

Results of the functional assessment are summarized in Tables A-5, A-6, A-7 and Figure 27. The tables do not show the wetland function of habitat for rare, threatened, and endangered species because there is no documentation or field data to date that indicates the presence of such species in the wetlands within the Olney policy area.

A WAG with a high functional assessment score indicates that the majority of the wetlands in the group have characteristics or features showing they perform most of the six wetland functions relatively well. Generally, a WAG with a high score is of higher quality, provides significant benefits to the stream system and as plant and wildlife habitat, and has been less affected by adverse impacts, compared to a WAG with a low score. For comparison purposes, the highest possible functional assessment score is 23.7 and the lowest possible score is 3.2.

Table A-8 ranks the WAGs according to their weighted composite functional assessment score within the Olney policy area (i.e., regardless of watershed). WAGs are categorized as having high, medium, or low overall functional value based on a qualitative evaluation of the distribution of assessment scores. It should be noted that this ranking is not an absolute ranking. It is intended to show how each WAG compares to other WAGs within the limits of the study only.

Policy Area Wetland Functional Value[1] -- Northwest Branch

Table A-5

Wetland Assessment Group (WAG)	Wetland Function					Weighted Composite[2]
	Groundwater Discharge	Floodflow Attenuation	Nutrient Removal/Sediment Retention	Aquatic Habitat	Wildlife Habitat	
BF-2	3.00	2.63	3.10	1.92	1.80	16.16
BF-1	2.33	2.75	3.20	1.75	1.60	14.98
BF-East	2.33	2.75	3.00	1.42	1.10	13.12

(1) Based on field survey and analysis by M-NCPPC staff in 2000-2001.

(2) The weighted composite score is the sum of the scores for groundwater discharge, floodflow attenuation, and nutrient removal/sediment retention, plus double the scores for aquatic habitat and wildlife habitat. See explanation of weighting in the text.

Policy Area Wetland Functional Value[1] -- North Branch of Rock Creek

Table A-6

Wetland Assessment Group (WAG)	Wetland Function						Results from URC Study	
	Groundwater Discharge	Floodflow Attenuation	Nutrient Removal/ Sediment Retention	Aquatic Habitat	Wildlife Habitat	Weighted Composite[2]	URC Rank[3]	Priority Wetland
NB-2	3.67	1.75	2.80	3.17	2.42	19.38	2	Yes
NB-1	3.33	1.75	2.40	2.33	2.25	17.65	4	Yes
NB-5	3.33	2.13	2.70	2.33	2.25	17.33	5	Yes
WB-1	3.00	2.00	2.80	2.00	1.67	16.13	11	No
NB-4	3.00	1.75	2.40	2.25	1.92	15.48	12	No
NB-3	3.00	1.88	2.40	2.17	1.75	15.11	13	No
WB-2	2.67	2.00	2.40	1.92	1.67	14.23	15	No
CMT-1	2.67	1.75	2.60	1.83	1.17	13.02	16	No
NB-6	1.33	1.75	2.60	1.67	1.33	12.68	18	No
BMT-1	2.33	1.88	2.50	1.75	1.17	12.54	19	No

(1) Based on field survey and analysis by M-NCPPC staff in 2000-2001.

(2) The weighted composite score is the sum of the scores for groundwater discharge, floodflow attenuation, and nutrient removal/sediment retention, plus double the scores for aquatic habitat and wildlife habitat. See explanation of weighting in the text.

(3) Total of 21 WAGs were assessed in the Upper Rock Creek inventory.

Policy Area Wetland Functional Value[1] -- Hawlings River

Table A-7.

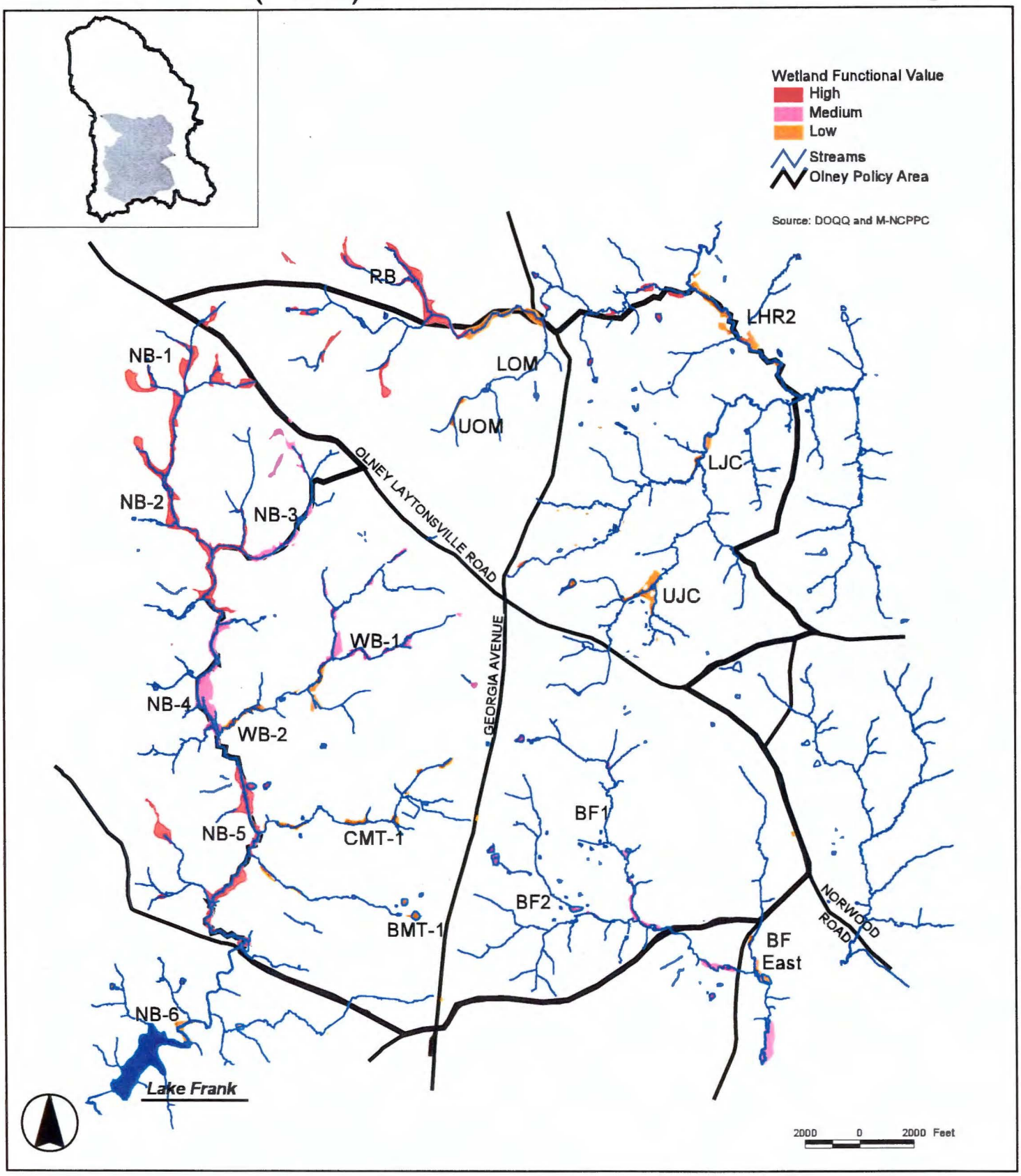
Wetland Assessment Group (WAG)	Wetland Function					Weighted Composite[2]
	Groundwater Discharge	Floodflow Attenuation	Nutrient Removal/Sediment Retention	Aquatic Habitat	Wildlife Habitat	
RB (located partly in planning area)	3.67	2.63	3.20	2.50	2.60	19.69
LJC	2.00	2.63	3.00	1.50	1.70	14.03
LOM	1.33	2.50	2.40	1.33	1.60	12.10
UOM	2.33	1.25	2.80	1.33	1.00	11.05
UJC	2.17	1.25	2.60	1.42	1.00	10.85
LHR2 (located partly in planning area)	2.50	2.50	2.40	1.67	1.50	13.74

(1) Based on field survey and analysis by M-NCPPC staff in 2000-2001.

(2) The weighted composite score is the sum of the scores for groundwater discharge, floodflow attenuation, and nutrient removal/sediment retention, plus double the scores for aquatic habitat and wildlife habitat. See explanation of weighting in the text

Policy Area Wetland Assessment Groups (WAGs) and Overall Functional Value

Figure 27



Policy Area Wetland Assessment Group (WAGs) Rankings

Table A-8

Watershed	Wetland Assessment Group	Weighted Composite Functional Assessment Score	Relative Overall Functional Value within the Policy Area
Hawlings River	RB	19.69	High Overall Functional Value
Upper Rock Creek	NB-2	19.38	
Upper Rock Creek	NB-1	17.65	
Upper Rock Creek	NB-5	17.33	
Northwest Branch	BF-2 (1)	16.16	Medium Overall Functional Value
Upper Rock Creek	WB-1	16.13	
Upper Rock Creek	NB-4	15.48	
Upper Rock Creek	NB-3	15.11	
Northwest Branch	BF-1 (1)	14.98	
Upper Rock Creek	WB-2	14.23	Low Overall Functional Value
Hawlings River	LJC	14.03	
Hawlings River	LHR-2	13.74	
Northwest Branch	BF-East	13.12	
Upper Rock Creek	CMT	13.02	
Upper Rock Creek	NB-6	12.68	
Upper Rock Creek	BMT-1	12.54	
Hawlings River	LOM	12.10	
Hawlings River	UOM	11.05	
Hawlings River	UJC	10.85	

(1) This WAG has been noted to contain a collection of vernal pools and other wetlands that provide habitat for amphibians. Therefore, a subset of this WAG has a higher functional value than the WAG's overall functional value.

From this wetland assessment, some general observations may be made

1. Northwest Branch
   a. Each of the three WAGs have some degree of past disturbance (e.g., sewer line construction). Undesirable alien, invasive plant species occur in portions of these WAGs.
   b. Compared to WAGs in the other two watersheds in the planning area, wetlands in this part of Northwest Branch cover a very small proportion of the watershed.
   c. Two (BF-1 and BF-2) of the three WAGs have overall medium functional values. But each of these WAGs contain a collection of wetlands, including vernal pools, which provide valuable habitat for amphibians. The importance of these subsets of the two WAGs are not reflected in the WAGs' overall functional value scores.
2. Rock Creek WAGs
   a. The North Branch of Rock Creek and many of its tributaries harbor a rich variety of high-quality wetlands. The combination of large forested wetlands, high-quality scrub-shrub and emergent wetlands, and large vernal pool areas make the wetlands of the North Branch especially valuable for the provision of habitat for aquatic, semi-aquatic, and terrestrial life forms. Recent concern within the scientific community about the global decline of amphibian populations increases the value of good amphibian breeding habitats such as these.

b. The wetland assessment groups associated with the mainstem of North Branch north of Muncaster Mill Road are of particularly high quality. They rank among the highest in overall wetland functions not only within the Rock Creek WAGs of the Olney planning area, but in the entire upper Rock Creek watershed that was evaluated as part of the Upper Rock Creek Environmental Inventory. A large wetland (in M-NCPPC parkland) in this North Branch complex is part of a natural area identified by M-NCPPC as a biodiversity area. Such a designation recognizes the high quality, diverse, and unusual nature of the native plant and animal communities found in the designated area. This wetland is also recognized as important to the county's biological diversity by the Maryland Department of Natural Resources Heritage and Biodiversity Conservation Program.

3. Hawlings River WAGs

a. Some of the WAGs in the Hawlings River portion of the planning area (UOM, LOM, UJC, and parts of LJC) are located in one of the most highly developed portions of the Olney environmental study area. Wetlands in these highly developed areas show significant impacts of urbanization. These wetlands are generally small and highly fragmented, with substantial degradation caused by hydrology changes and by alien plant invasions which are displacing native species. This means two things about the wetlands: On the one hand, the wetlands in highly developed areas are less valuable than they would be in a less disturbed condition, because their functional capacities have been diminished. On the other hand, while these wetlands have been made less functional, they are more valuable due to their scarcity. These are the only places remaining in the developed areas that can serve as habitat for plants and animals which are wetland-dependent. Their ability to serve in helping to filter stormwater runoff makes them more valuable for maintaining the water quality of aquatic systems in urbanized areas.

b. The Reddy Branch WAG (RB) includes a relatively large group of high quality wetlands which supports a variety of plant communities and wildlife habitats. Most of the wetlands lie within parkland, but there is a large forested wetland and wetlands associated with ponds that lie on private property. The land cover is predominantly in field, crops, and forest.

Description of Individual Wetland Assessment Groups (WAGs) in the Olney Policy Area

NORTHWEST BRANCH

WAGs in Batchellors Forest tributary. Batchellors Forest tributary is one of the major tributaries of Northwest Branch.

BF – 1: One of the headwater streams of Batchellors Forest tributary located east of Georgia Avenue and east of Norbrook Road.

Medium functional value. However, a collection of vernal pools and other wetlands within this WAG have a higher functional value than the overall WAG value because they provide important wildlife habitat.

Site 1 of the WAG is associated with the stream east of Covered Wagon Way. It is a palustrine forested and emergent wetland, with much of the emergent wetland occupying an area cleared for utility line installations. Some of the adjacent property is cleared for farming. In the forested portion, the canopy is dominated by tulip poplars and red maples, with white oaks and American beech in the nearby uplands. Several productive vernal pools occur along the sewer line corridor. Breeding populations of spring peepers and wood frogs were observed using these vernal pools in early March. The dominant vegetation in the emergent wetland area is Vietnamese stiltgrass (*Microstegium vimineum*), which is an invasive non-native grass. Soil samples taken from

this wetland yield a Munsell hue, value, and chroma of 10 Y/R 4/2 with oxidized rhizospheres[6] . The water table is within 10 inches of the soil surface.

Site 3 includes wetlands in and to the east of Trotters Glen Golf Course. Some of the wetlands (PUB) are golf course ponds. Site 2 lies within the BF-2 WAG. The remaining wetlands generally occur as pockets within the wooded floodplain of the stream valley. Wetland pockets include forested wetlands under the tree canopy and shrub wetlands along the edge of the sewer line clearing. Dominant trees include tulip poplars and red maples, with skunk cabbage dominant in the herb layer. Pools of standing water occur in some places. In other areas, bore holes fill with water at a depth of 14 inches. Soil value, hue and chroma were measured as 2.5Y 7/0.

Pools of water occur throughout Site 4, located along the stream just downstream of Batchellors Forest Rd. Soil value, hue, and chroma are 10Y/R 3/1. Standing dead trees (snags) testify to the fact that this emergent wetland was once a wooded site. Unfortunately, the dominant vegetation is the invasive, non-native Vietnamese stiltgrass.

BF – 2: Headwater streams of Batchellors Forest tributary to the east of Georgia Avenue and south of BF-1.

Medium functional value. However, a collection of wetlands within this WAG have a higher functional value than the overall WAG value because they provide important wildlife habitat. This WAG includes man-made ponds, such as those on the Trotter's Glen Golf Course, as well as wetlands within wooded stream valleys. Wetlands within the wooded stream valleys are generally located south of Batchellors Forest Road. They are characterized by large standing pools of water under a mature forest canopy. Trees within and immediately adjacent to the wetland are predominantly red maples. Skunk cabbage (*Symplocarpus foetidus*) is the dominant herbaceous vegetation.

Montgomery County Department of Environmental Protection (DEP) has observed the following species in this WAG: spring peeper, wood frog, spotted salamander, American toad, Fowlers toad, pickerel frog, grey treefrog. DEP has also observed two-lined salamander, northern red salamander, and dusky salamander in adjoining streams. (e-mail comments from DEP dated 1/14/02)

Site 2 includes standing pools of water adjacent to the stream. Vegetation includes skunk cabbage and red maples (*Acer rubrum*).

BF-East: Wetlands in this WAG tend to be clustered just east of Layhill Road and south of Route 28.

Low functional value. These are primarily small palustrine forested wetlands dominated by red maples, with spicebush (*Lindera benzoin*) in evidence in the shrub layer. Invasions of non-native plants, including multiflora rose (*Rosa multiflora*), gill-over-the-ground (*Glechoma hederacea*), and Japanese honeysuckle (*Lonicera japonica*) have degraded the native plant community, especially in the northern portion of the wetland. The Batchellors Forest East tributary runs through open fields north of Route 28. No significant wetlands were detected along this portion of the stream.

[6] Soils found in wetlands exhibit distinguishing features and characteristics that indicate wet conditions. Such features may be characterized through a combination of colors and patterns of colors, textures, and odors of the various components of the soils. Colors and patterns of colors from a soil sample are typically compared to standardized soil color charts known as Munsell soil color charts. These standardized colors are identified by three components: hue, value, and chroma. The hue is related to one of the main spectral colors (red, yellow, green, glue, or purple, or various combinations of these colors). The value measures the degree of lightness (with a range from absolute black to absolute white). The chroma indicates the color strength or purity. In a notation of color for a soil sample, the last number represents the chroma. Generally, chromas of 2 or less are considered low chromas and are often considered to show hydric soils. Low chroma colors include black, various shades of gray, and the darker shades of brown and red.

The presence of spots or blotches of colors (known as mottles) in a soil sample may aid in determining if a soil is subject to prolonged wet conditions. Brightly colored (brown or yellow) mottles in a soil sample that is predominantly gray generally indicates that the soil has some degree of water saturation during the growing season. Another indication of water saturation in soils is a soil sample that is predominantly gray with the presence of brightly colored plant root channels, known as oxidized rhizospheres.

HAWLINGS RIVER

WAGs in James Creek

LJC – 1:

Low functional value. This site contains a floodplain forest dominated by green ash (*Fraxinus pennsylvanica*). Spicebush predominates in the shrub layer. There is also a heavy infestation of multiflora rose. The herbaceous layer consists primarily of grasses and gill-over the ground. There is evidence of stream overwash (well-defined channels). The stream itself is somewhat incised, and the streambanks are noticeably eroded.

Site 2 is an emergent floodplain wetland dominated by grasses and rushes. Goldenrods and horse nettle also are present. Boxelder (*Acer negundo*) trees border the wetland. There are areas of standing water, and the soil is saturated to within 10 inches of the soil surface. This wetland has been disturbed by mowing, sewer line construction and a horse trail. There are also tractor tire ruts and extensive beaver activity. Much of this portion of the watershed has been developed relatively recently, with fairly high development densities.

A strip of palustrine, emergent wetlands (PEM1A) not recorded on the wetlands inventory occurs along the northwestern side of the stream between site 1 and site 2.

UJC: The Upper James Creek wetland assessment group contains Lake Hallowell, Brooke Grove Farm and the Brooke Grove Foundation.

Low functional value. Much of the wetland acreage in this WAG is actually the area of Lake Hallowell. Wetlands identified in the western portion of the WAG are seriously degraded by changes in hydrology, non-native plant invasions, and runoff from high density development and commercial areas. The predominant vegetation here is multiflora rose.

WAGs in Olney Mill Tributiaries

UOM – 1: This group of wetlands occur along a portion of a tributary of Reddy Branch between Rte. 108 and that part of Olney Mill Rd. near Gold Mine Road.

Low functional value. The Upper Olney Mill tributary contains the created wetlands of the Patuxent Demonstration Project. Shingle oaks (*Quercus imbricaria*) occur along the south shore of the middle pond. No significant wetlands were found below the Patuxent Demonstration Project in the Upper Olney Mill tributary.

LOM: The Lower Olney Mill tributary wetlands mostly occur along a portion of a tributary of Reddy Branch between Olney Mill Rd. (near Gold Mine Rd.) and Georgia Avenue.

Low functional value. The forested wetland is dominated by red maples over a spicebush shrub layer. Scattered skunk cabbage occurs on the forest floor.

WAG in Reddy Branch

RB: The wetlands in this group are associated with the tributary streams and mainstem Reddy Branch near Brookeville Road. Brighton Dam Road marks the downstream boundary of this WAG.

High functional value. High relative scores in all categories of wetland functions. The WAG has varied and diverse vegetation communities and wildlife habitat. Most of the wetlands lie within parkland. But there is a large forest wetland and wetlands associated with ponds that lie on private property.

Site 1 is a large PEM wetland adjacent to Oakley Cabin. Dominant vegetation includes soft rush (*Juncus effusus*), skunk cabbage, sedges (*Carex species*), Vietnamese stiltgrass, and Asiatic tearthumb (*Polygonum perfoliatum*). The last two named are non-native, invasive species. Some scattered black willows (*Salix nigra*) also occur in the wetland. This area previously was flooded by a beaver pond.

Site 2 is a palustrine forested wetland containing vernal pools. The vernal pools serve as a breeding habitat for wood frogs and spring peepers, based on observed vocalizations and the presence of egg masses. The vernal pools also were being used by wood ducks. These pools occur downslope from an old mill race. Soil value, hue and chroma were measured as 10Y/R 4/1 with distinct red-orange mottles. Dominant vegetation includes red maples in the tree layer, with spicebush in the shrub layer and skunk cabbage in the herb layer. Wild grape (*Vitis species*) also grows here. A couple of specimens of shingle oak grow near the vernal pools. Vietnamese stiltgrass and Asiatic tearthumb have spread prolifically

along the sewer line. There are active beaver dams in the stream, and considerable evidence of recent beaver activity in the wetland forest.

Site 3 is a large emergent wetland dominated by skunk cabbage, soft rush, and the non-native invasives Vietnamese stiltgrass and Asiatic tearthumb. Red maples and American sycamores (*Platanus occidentalis*) occur around the perimeter. There are large areas of standing water and vernal pools containing wood frog eggs. American toad vocalizations also were heard in this wetland. A pair of red-shouldered hawks appear to be nesting in one of the wetland's snags. This area appears to have once been inundated under a beaver pond.

Site 4 appears to be largely a floodplain forest community. The vegetation features red maples over spicebush, with some scattered skunk cabbage in the herbaceous layer.

Site 5 is a large emergent/forested wetland dominated by soft rush and grasses. This is an obvious groundwater discharge zone, with flowing springs discharging water overland and from the streambanks into Reddy Branch. The forested portion of the wetland is unusual, featuring large populations of several leguminous species, including honey locust (*Gleditsia triacanthos*), black locust (*Robinia pseudoacacia*), and Kentucky coffeetree (*Gymnocladus dioicus*). There are also heavy infestations of multiflora rose. Wildlife using this wetland include wood ducks and beavers. A red-tailed hawk was observed overhead.

Site 6 is a palustrine scrub-shrub/forested wetland with large areas of standing water near Brighton Dam Road. The scrub-shrub areas are dominated by soft rush and buttonbush, with heavy infestations of multiflora rose, Vietnamese stiltgrass, Japanese honeysuckle, and Asiatic bittersweet (*Celastrus orbiculatus*). Forested areas have a good canopy of tulip poplars (*Liriodendrum tulipfera*); the quality of the understory has been diminished by invasions of non-native plants such as Gill-over-the-ground, Asiatic tearthumb, Vietnamese stiltgrass, and Japanese barberry (*Berberis thunbergii*). Munsell soil value, hue and chroma were measured as 10 Y/R 4/2 with heavy mottling. American toads (animals and egg masses) were observed in some of the pools.

Site 7 is an emergent wetland featuring soft rush, wild mint (*Metha arvensis*), and black willow (*Salix nigra*). Soil value, hue and chroma were measured as 10 Y/R 4/2 with mottling. There is some disturbance due to grazing and mowing of this wet meadow.

Site 8 is a small red maple/skunk cabbage swamp under a floodplain forest canopy. The Munsell soil value, hue and chroma measured 10Y/R 3/2 with mottling.

WAG in Lower Hawlings River

LHR-2: This group of wetlands is associated with the portion of Hawlings River and its tributaries (excluding Reddy Branch) between Brighton Dam Rd. at Shipe Rd. and Gold Mine Rd. at Chandlee Mill Rd.

Low functional value. Field evaluation was conducted along the mainstem of Hawlings River. Generally, the wetlands are found as pockets within the floodplain forest. There are gaps in the forest due to past human disturbance. Red maple, sycamore, and pin oak (*Quercus palustris*) are some of the more common trees in this WAG. Invasive plants, such as multiflora rose, Japanese honeysuckle, and Asiatic tearthumb are also fairly common in the stream valley. The PEPCO substation lies within this drainage basin, and the associated transmission lines traverse across some of the small tributaries and wetlands.

UPPER ROCK CREEK

WAGs in North Branch

NB - 1: Headwaters of North Branch mainstem from the intersection of Brookeville Road w/ Zion Road south to beginning of third-order stream section east of Artesian Drive.

High functional value. Priority wetland, as defined in the Upper Rock Creek inventory. Not far from Muncaster Road is an area of seeps with a red maple and pin oak dominated canopy. Proceeding east, the wetland becomes larger with vernal pools and seeps and eventually forms a small channel, with water plantain growing in the stream channel. Downstream the stream channel becomes rocky and the forest is more mature. There are a few large seeps along the stream and scattered vernal pools. At the end of this WAG the forest area narrows and a large wet meadow exists, with 2 to 3 feet of mucky, saturated soils and false nettle (*Boehmeria*

cylindrica), sedges, rushes, arrow-leaved and halberd-leaved tearthumb (*Polygonum sagittatum* and *P. arifolium*, respectively), agrimony (*Agrimonia species*) and deer tongue (*Panicum species*). Near the stream channel is black willow, alder (*Alnus species*), and swamp rose (*Rosa palustris*). Flow from the stream appears to spread out through the wet meadow and maintain a seasonally/permanently saturated condition.

Along the eastern fork of the North Branch, west of Rt. 108 is an emergent wetland bisected by a small stream. Plants surveyed included rushes, sedges, peppermint (*Mentha piperita*), swamp milkweed (*Asclepias incarnata*), umbrella sedge (*Cyperus species*) and softstem bulrush (*Scirpus validus*).

Farther west the wetland narrows and then widens again into a large emergent/scrub-shrub wetland with steeplebush (*Spirea tomentosa*), fern species, rushes, arrowhead (*Sagittaria latifolia*), swamp rose, skunk cabbage, jewelweed (*Impatiens capensis*), and arrowood (*Viburnum dentatum*). There is standing water in several areas. Adjacent to the meadow/scrub-shrub swamp is a forested wetland dominated by red maple, skunk cabbage and Vietnamese stiltgrass. The forested wetland is drained by a first order stream which originates in a farm pond. The channel of this stream is degraded and there is almost no herbaceous cover in this area because of heavy use by cattle.

At the edge of the forested wetland there is a power line which crosses perpendicular to the mainstem. The area opens up to a meadow and cornfield. There is a narrow tree line along the stream dominated by pin oak, willow and red maple. A wet meadow extends on both sides of the stream with rushes and sedges. This area is contiguous with the wet meadow near the confluence with the mainstem of the North Branch.

The surrounding land use in this section of NB-1 is agricultural with corn fields, cow pasture and meadow. There is no evidence of flooding in this part of the wetland group.

Along the middle tributary of the North Branch mainstem from Mt. Zion Park to the powerline: the headwater channel originates just to the south of the eastern end of the park road (just before the eastern pad of parking spaces). In the electric transmission line right-of-way adjacent to parkland is a wet meadow with some shrubs. Plant species present included umbrella sedge (*Cyperus strigosus*), wool grass (*Scirpus cyperinus*), seedbox (*Ludwigia alternifolia*), blue vervain (*Verbena hastata*), smooth arrowwood, ironweed (*Vernonia noveboracensis*), jewelweed, softstem bulrush, sensitive fern (*Onoclea sensibilis*), and rose species. A portion of this WAG occurs within the boundaries of an area recognized as important to the county's biological diversity by the Maryland Department of Natural Resources, Heritage and Biodiversity Conservation Program.

Portions of this WAG are on Montgomery County park property; large portions, however, are on private property.

NB - 2: North Branch mainstem from beginning of third-order stream section east of Artesian Drive south to Bowie Mill Road.

High functional value. Priority Wetland, as defined in the Upper Rock Creek inventory. Downstream from Rio Vista Drive are forested wetland areas with braided stream channels and abandoned oxbows located parallel to the mainstem. Standing water exists in some areas. In other areas, springs form small first order streams which flow into the mainstem. Vegetation includes arrowwood , northern red oak (*Quercus rubra*), black gum (*Nyssa sylvatica*), spicebush and red maple. The herbaceous layer includes skunk cabbage, wild yam (*Dioscorea villosa*), club mosses (*Lycopodium species*) and fern species.

North of Bowie Mill Road a perched water table feeds a forested wetland with several first-order streams flowing into the mainstem. Standing water occurs in several areas. Vegetation includes skunk cabbage, halberd-leaved tearthumb, willow, sycamore, and red maple. Further upstream on the east side of the mainstem is a forested wetland with skunk cabbage occupying the herb layer. On the west side of the stream at the toe of the hill slope is another forested wetland with saturated soils and an herb layer dominated by skunk cabbage. Proceeding north along the right side of the channel are scattered areas of bare soil where standing water has been present. At the confluence with the tributary to the east, the stream channel has several large meanders. At this point is a very large skunk cabbage dominated wetland with several inches of standing water in places.

This WAG is designated a Priority Wetland based on its high functional assessment score.

Most of this WAG is on Montgomery County park property, with the exception of wetlands along the upper Granby Woods tributary.

NB - 3: North Branch mainstem from MD 108 west of Luray Court, southwest to confluence with North Branch mainstem.

Medium functional value. Upstream from Wickham Road across the power line right-of-way is a scrub-shrub/emergent wetland on both sides of stream. Much of this area is in pasture or meadow - the site was formerly a horse farm. About 1000 feet upstream the area transitions to a forested wetland with a predominance of red maples. Farther upstream are several wet meadows with springs draining into the creek on both sides. Species include smartweed (*Polygonum species*), arrow-leaved tearthumb, sedges, small-headed beak-rush (*Rhynchospora capitellata*), fox sedge (*Carex vulpinoidea*), and ferns. Small intermittent streams flow out of wet meadows on the northern side, near a graded area.

The upper part of this WAG is forested with fairly continuous wetlands on both sides. Red maple dominates with some tulip poplar in drier spots. There are several inches of standing water with Vietnamese stiltgrass, jewelweed, sedges and rushes, New York fern (*Thelypteris noveboracensis*), and swamp rose. Seeps are scattered throughout.

Headwaters of this tributary to the North Branch originate from two depressional areas with springs and seeps. The flow from these two areas eventually forms a small channel.

Downstream (west) of Wickham Road, along a small tributary to the North Branch of Rock Creek, an area several hundred feet wide of forest and meadow has been preserved next to the stream and adjacent wetlands. Except for the first hundred feet, most of the area on the north side of this tributary is forested wetland, dominated by large areas of skunk cabbage, red maple, white oak (*Quercus alba*), and ironwood (*Carpinus caroliniana*). Springs and seeps occur throughout the central part of this WAG. There is standing water of several inches in some areas. Some areas are saturated, while some just have bare soil or water stained leaves. Width of wetlands range from 25 to150 feet from the edge of the stream.

There are similar wetlands on the south side of the stream, but smaller and not continuous. Rushes and saturated soils were observed in a sewer right-of-way in this area.

Most of this WAG is on Montgomery County park property.

NB - 4: North Branch mainstem from Bowie Mill Road south to confluence w/ Williamsburg Run.

Medium functional value. This wetland assessment group comprises two major wetland areas. An extensive palustrine emergent wetland occupies the stream valley west of Ridge Drive. Dominant vegetation includes skunk cabbage, soft rush, and various species of grasses. Unfortunately, the quality of the plant community here appears to be threatened by the proliferation of non-native, invasive plant species, including Vietnamese stiltgrass and Asiatic tearthumb. The hydrology which created and maintains the wetland appears to result from the existence of beaver dams on the stream's mainstem. This wetland contains numerous snags and appears to provide good habitat for bird and amphibian species. At the downstream end of this wetland, watercress (*Nasturtium officinale*) grows in the stream channel, indicating good water quality.

The second wetland area in this wetland assessment group is a large palustrine forested wetland which extends from just north of Kirk Drive north to Bowie Mill Road. The canopy layer is dominated by red maple, pin oak, green ash, and tulip poplar with ironwood in the understory and a herb layer dominated by skunk cabbage. The forested wetlands are fed by numerous seeps and springs, and many excellent vernal pools are found here. The calling of frogs is testimony to the productivity of these vernal pools.

NB-4 is fragmented by sewer lines and by two utility pipeline rights-of-way. The wetlands largely occur within the confines of North Branch Stream Valley Park.

NB - 5: North Branch mainstem south of the confluence with Williamsburg Run south to Muncaster Mill Road.

High functional value. Priority Wetland, as defined in the Upper Rock Creek inventory. The wetlands within this wetland assessment group are many, varied, and complex. In the northern portion of the WAG, adjacent to Norbeck Country Club, the wetlands are primarily palustrine forested, with red maple, green ash, boxelder, pin oak, and sycamore abundant in the canopy. Ironwood and spicebush are significant components of the shrub layer, and skunk cabbage dominates the herb layer. Various species of sedges, rushes and cattails (*Typha species*) appear where openings occur in the canopy.

Large, productive vernal pools occur in the floodplain, especially west of Cherry Valley Drive. Some of these vernal pools may occupy a portion of the millrace and earthworks associated with the former Owens Mill.

West of Minuteman Terrace and adjacent to the North Branch mainstem is an emergent wetland which has been singled out by botanists from the M-NCPPC, the U.S. Army Corps of Engineers, and knowledgeable local citizens for its high quality and unusual flora. Among the plant species present include skunk cabbage, sensitive fern, marsh fern (*Thelypteris thelypteroides*), tussock sedge (*Carex stricta*), arrow-leaved tearthumb, and spatterdock (*Nuphar luteum*). Tree species in and adjacent to the wetland include red maple, shingle oak, and chinquapin (*Castanea pumila*). Areas of standing water supports populations of spotted turtles and marbled salamanders. Many box turtles live in and around the wetland as well.

South of the emergent wetland are pockets of forested wetlands. Canopy-level trees include green ash, sycamore and red maple trees, with spicebush in the shrub layer and skunk cabbage occasionally abundant.

A red maple swamp occurs north of Ellenwood Court. This wetland is characterized by a canopy of red maples over skunk cabbage.

A succeeding scrub-shrub/emergent wetland occurs in the headwaters of a tributary to North Branch just northwest of the Muncaster Mill View subdivision. Open areas contain sedges, rushes, cattails, sensitive ferns, and jewelweed, with black willows, sycamores, red maples and silver maples (*Acer saccharinum*) beginning to establish an early-successional tree canopy in some places. A portion of the wetland appears to be an old farm pond and still contains a small area of open water. The area below the pond has more of a wet meadow character.

Wetland Assessment Group NB-5 is fragmented by a sewer line corridor and in the northeast by the golf course at the Norbeck Country Club. Portions of the golf course are built on Montgomery County Park property. One tee area is built on the western side of the stream.

This WAG occurs within the boundaries of an area recognized as important to the county's biological diversity by the Maryland Department of Natural Resources, Heritage and Biodiversity Conservation Program.

The majority of this WAG occurs on Montgomery County park property; notable exceptions are the wetlands along the western tributary north of the Muncaster Mill View subdivision.

NB - 6: North Branch mainstem from Muncaster Mill Road south to Lake Frank.

Low functional value. A succeeding emergent wetland occurs in the backwater area where the North Branch mainstem enters Lake Frank. This wetland contains black willow trees over an herb layer of rushes, sedges, grasses, and sensitive ferns. The wetland occurs within the boundaries of Rock Creek Regional Park.

WAGs in Williamsburg Run

WB - 1: Headwaters of Williamsburg Run south of Bowie Mill Road, south of MD 108, and west of Georgia Avenue southwest to stream confluence in Cashell Local Park.

Medium functional value. This Wetland Assessment Group consists of several separate wetland areas which lie along the mainstem and tributary streams which form the western portion of the Williamsburg Run stream system. Most of the wetlands are forested, with pin oak, red maple, green ash, and boxelder in the canopy layer and skunk cabbage dominating the herb layer. The wetlands generally occur as pockets of wetland within a floodplain matrix. Non-native invasive plant species are a problem for plant biodiversity, with garlic mustard (Alliaria petiolata), multiflora rose , Japanese honeysuckle, and Asiatic tearthumb especially prevalent.

A number of shingle oaks occur in the wetland south of Bowie Mill Road and north of Darnell Drive adjacent to the power line. Shingle oak is a Maryland watchlist species, meaning it is of concern due to restricted or declining populations according to the Maryland Department of Natural Resources, Heritage and Biodiversity Program.

One particularly interesting wetland complex occurs along the power line corridor south of Morningwood Drive. A scrub-shrub wetland exists in the power line corridor, with alders and arrowwood growing over various sedges, rushes, jewelweed, and goldenrods (*Solidago*). West of the power line is a young forested wetland dominated by red maple in the canopy with skunk cabbage growing underneath. An emergent wetland occurs in the northwest corner of the intersection of the power line corridor with a gas line corridor, with dead pin oaks and live black willows growing amid a large area of sedges, grasses, and rushes, with considerable amounts of standing water. Adjacent to the southeast of the two utility corridors is a mature wooded wetland featuring pin oaks, red maples, sycamores and tulip poplars growing above spicebush, arrowwood, skunk cabbage and jewelweed. (Note: Since this survey was made, PEPCO has cut down all the vegetation in their power line right-of-way, effectively eliminating the scrub-shrub wetland. Some wetland herbs remain, but, due to the drought of 1999, recovery has been slow.)

WB-1 is fragmented by road crossings, subdivisions, and gas, power, and sewer line corridors.

A portion of the wetlands south of Morningwood Drive and east of Cashell Road occur within the boundaries of Cashell Local Park.

WB - 2: Stream confluence in Cashell Local Park west to mainstem of North Branch.

Low functional value. WB-2 consists of a forested wetland dominated by tulip poplar, red maple and green ash in the canopy layer and ironwood in the understory, with skunk cabbage predominating in the herb layer. A small population of false hellebore (*Veratrum viride*) occurs with the skunk cabbage. The wetland contains vernal pools on the western end and a network of seeps, pools and channels on the east end. It is fragmented by a gas pipeline, and largely occurs within the confines of North Branch Stream Valley Park.

WAG in Cherrywood Manor Tributary

CMT - 1: All of the Cherrywood Manor tributary from just west of Georgia Avenue west to confluence with North Branch mainstem.

Low functional value. This WAG contains a forested wetland with skunk cabbage, sedges, ironwood and tulip poplar. On the north side of the stream is a skunk cabbage seep set back from the stream about 40 feet. This wetland is several hundred feet long and runs parallel to the stream channel. Further downstream is another forested wetland ranging in width from 40 to100 feet and adjacent to the stream channel. It features skunk cabbage as the dominant herbaceous plant.

Wetlands along the lower reach of the Cherrywood Manor Tributary are on Montgomery County park property.

WAG in Brooke Manor Tributary

BMT - 1: This WAG includes all the Brooke Manor tributary from just west of Georgia Avenue west to the confluence with North Branch mainstem.

Low functional value. Downstream from the Emory Road stream crossing are large forested wetlands with braided channels and springs along the south side of the stream. These wetlands are dominated by skunk cabbage. Most of this area is set back from the stream by 25 to 50 feet. Vegetation includes slippery elm (*Ulmus rubra*), catalpa (*Catalpa species*), red maple, ironwood, tulip poplar, southern red oak (*Quercus falcata*), and spicebush.

Further downstream on the south side is a large, wide red maple swamp with an open emergent area in the center. Vegetation includes grasses, jewelweed, halberd-leaved tearthumb, northern arrowwood, and fern species. The area is saturated, with some standing water. It is set back from the stream channel by 50 to 75 feet.

On north side of stream are forested wetlands dominated by skunk cabbage. Other vegetation includes false hellebore, fern species and agrimony. Wetlands begin at the edge of the stream channel and extend back 100 to 150 feet. These areas are not continuous; upland areas occur throughout the north side of this wetland assessment group. Sycamore, hackberry (*Celtis*

occidentalis) and stinging nettles (*Urtica dioica*) appear downstream.

Portions of this WAG are on Montgomery County park property.

ACKNOWLEDGMENTS

Montgomery County Department of Park and Planning

Charles R. Loehr, *Director*
Jeffrey L. Zyontz, *Chief, County-wide Planning Division*

Environmental Planning/Park Planning and Resource Analysis/Natural Resources

Jorge A. Valladares, P.E., *Chief, Environmental Planning*
Nazir Baig, P.E., *Supervisor, Environmental Planning*
Mary Dolan, *Supervisor, Environmental Planning*
John E. Hench, Ph.D., *Supervisor, Park Planning and Resource Analysis*
Kenneth Ernst, *Chief, Natural Resources Division*

Project Staff

Cathy Conlon, *Environmental Planning, Project Manager*
Candy Bunnag, *Environmental Planning*
Seekey Cacciatore, *Environmental Planning*
David W. Seydel, *Environmental Planning*

Contributing Staff

Carole Bergmann, *Natural Resources Division*
Marion Clark, *Environmental Planning*
Robert Gibbs, *Natural Resources Division*
Mark Pfefferle, *Environmental Planning*
Dominic Quattrocchi, *Environmental Planning*
Douglas C. Redmond, *Park Planning and Resource Analysis*
Mark Symborski, *Environmental Planning*

Technical Staff

Charles A. Coleman, *Reproduction, Management Services*
Sam Dixon, *Design, Management Services*
Sheila Sampson, *Desktop Publishing, Environmental Planning*
John Schlee, *Research and Technology Center*
Walter Robinson, *Research and Technology Center*

Special thanks to all the staff from Park and Planning, Montgomery County Department of Environmental Protection, Maryland Department of the Environment, and the Washington Suburban Sanitary Commission who contributed to this report.

OLNEY AND VICINITY

ENVIRONMENTAL RESOURCES INVENTORY

www. mc-mncppc.org

MONTGOMERY COUNTY DEPARTMENT OF PARK AND PLANNING
THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION