Existing Environmental Conditions

The following description of the natural resources provides an overview of the upper Rock Creek watershed geology, soils, terrain, vegetation and sensitive areas, habitats of rare, threatened and endangered species, water quality, air quality, noise conditions and the availability of sewer and water service.

Public parks occupy nearly one fourth of the upper Rock Creek watershed area (see Table 1). Parks contain the majority of sensitive areas in the watershed. Whenever practical, this inventory distinguishes between resources in parkland and resources outside parkland.

Existing Parkland Distribution[1] in the Upper Rock Creek Watershed **Table 1**

	Acres	% of Watershed
Existing Parkland	4,320	23
Non-Parkland	14,540	77
Total	18,860	100

(1) GIS coverage of existing parkland, M-NCPPC 1997. For parkland ownership, see Appendix, Table A-1.

Geology and Soils

Upper Rock Creek lies entirely within the Piedmont physiographic province where bedrock is composed of metamorphic and igneous rocks of Pre-Cambrian to early Paleozoic age. The watershed is underlain by schist and gneiss crystalline rocks of the Wissahickon and Sykesville formations (see Figure 3). A mantle of loose unconsolidated material, the regolith, generally overlies solid rock. It comprises saprolite, soils and alluvium. The saprolite, a clay rich material weathered from schist and gneiss, still retains some characteristics of rock.

Soils in the upper Rock Creek watershed are generally deep to very deep. The depth of soils to bedrock 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 ridgetops and side slopes are generally well drained and deep, with slight to moderate restrictions to development. A visible exception depicted in Figure 4 is the relatively undeveloped land of the Pope Farm Branch watershed near MD 124 and Muncaster Mill Road. In that general area, it appears that shallow bedrock may limit the potential for development with on-site sewage disposal systems.

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 rock (see Figure 4).

Topography and Slopes

The terrain of the upper Rock Creek watershed exhibits gentle to steep slopes. Vertical elevations within the watershed range from approximately 265 feet above mean sea level near MD 28 to a high of 615 feet above mean sea level in the headwaters near the Town of Laytonsville (see Figure 5).

Slopes in the Upper Rock Creek Watershed Table 2

Slope	Approximate % of Total Area
less than 8 %	73
8 - 14 %	18
15 - 24 %	6
25 % or greater	3

The majority of the watershed has flat to moderate slopes of less than 15 percent (see Table 2). Steep slopes (25 percent or greater) in the upper Rock Creek watershed occur primarily in the stream valleys of the mainstem and North Branch, around the lake shores, and along both sides of major tributaries including the lower portions of Mill Creek, Crabbs Branch, and Southlawn Branch. The majority of steep slopes are contained within parkland.

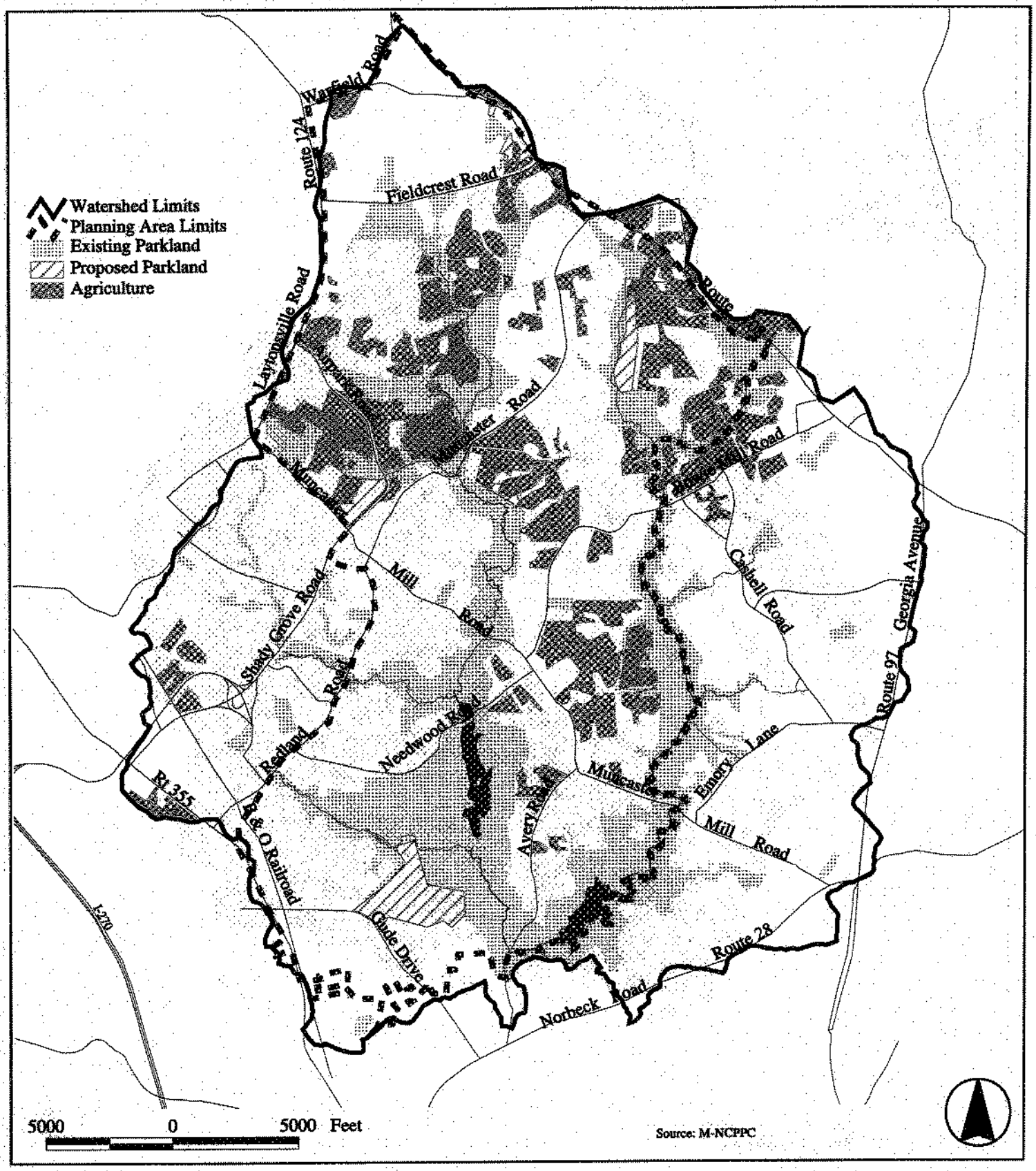
General Characteristics of Vegetation and Sensitive Areas

Existing Forest Resources

Maintaining and providing forest in increasingly urbanizing landscapes is a vital part of protecting natural resources and instilling community character. Forests enhance air quality by reducing atmospheric carbon dioxide

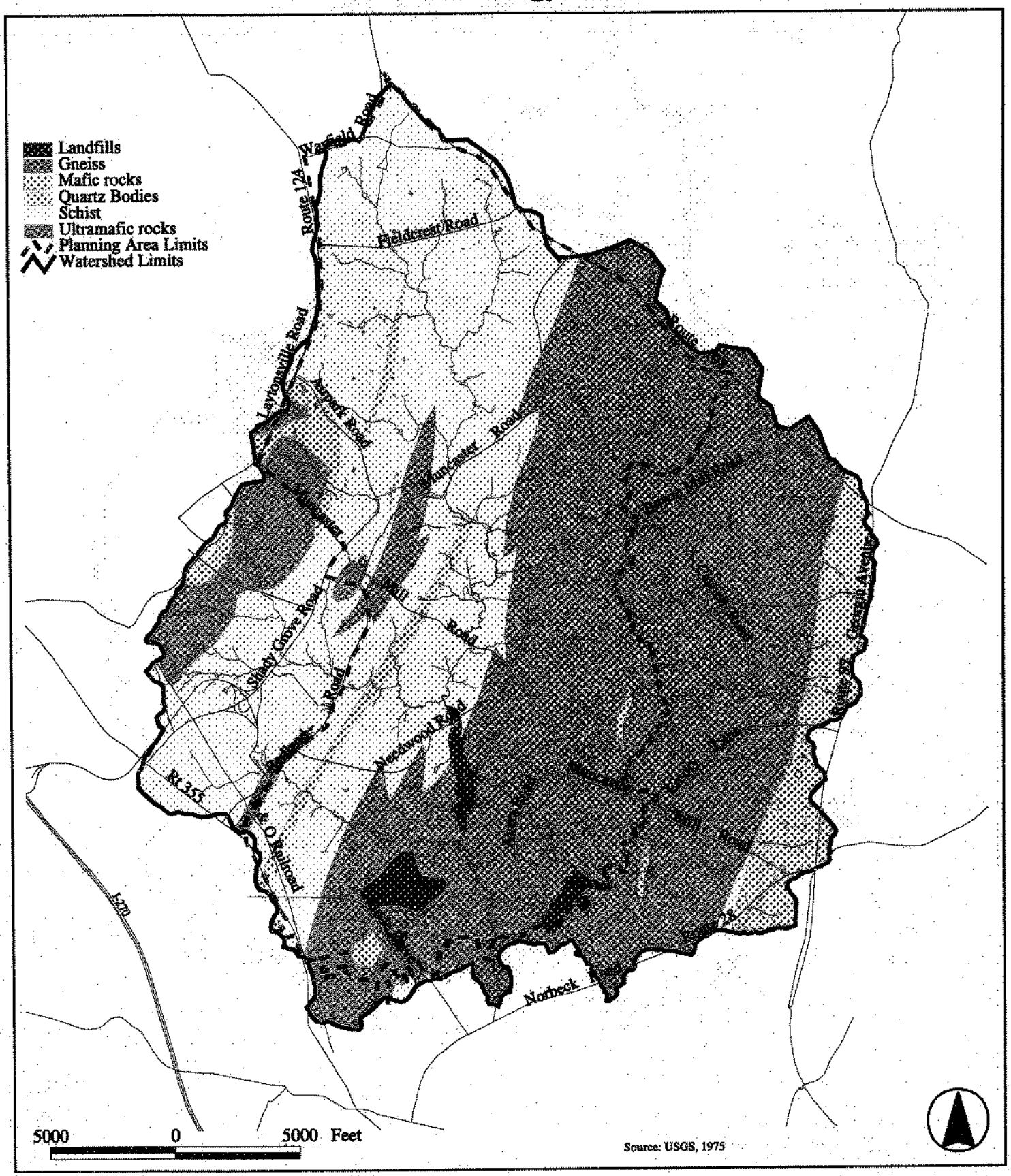
Parkland and Agriculture

Figure 2



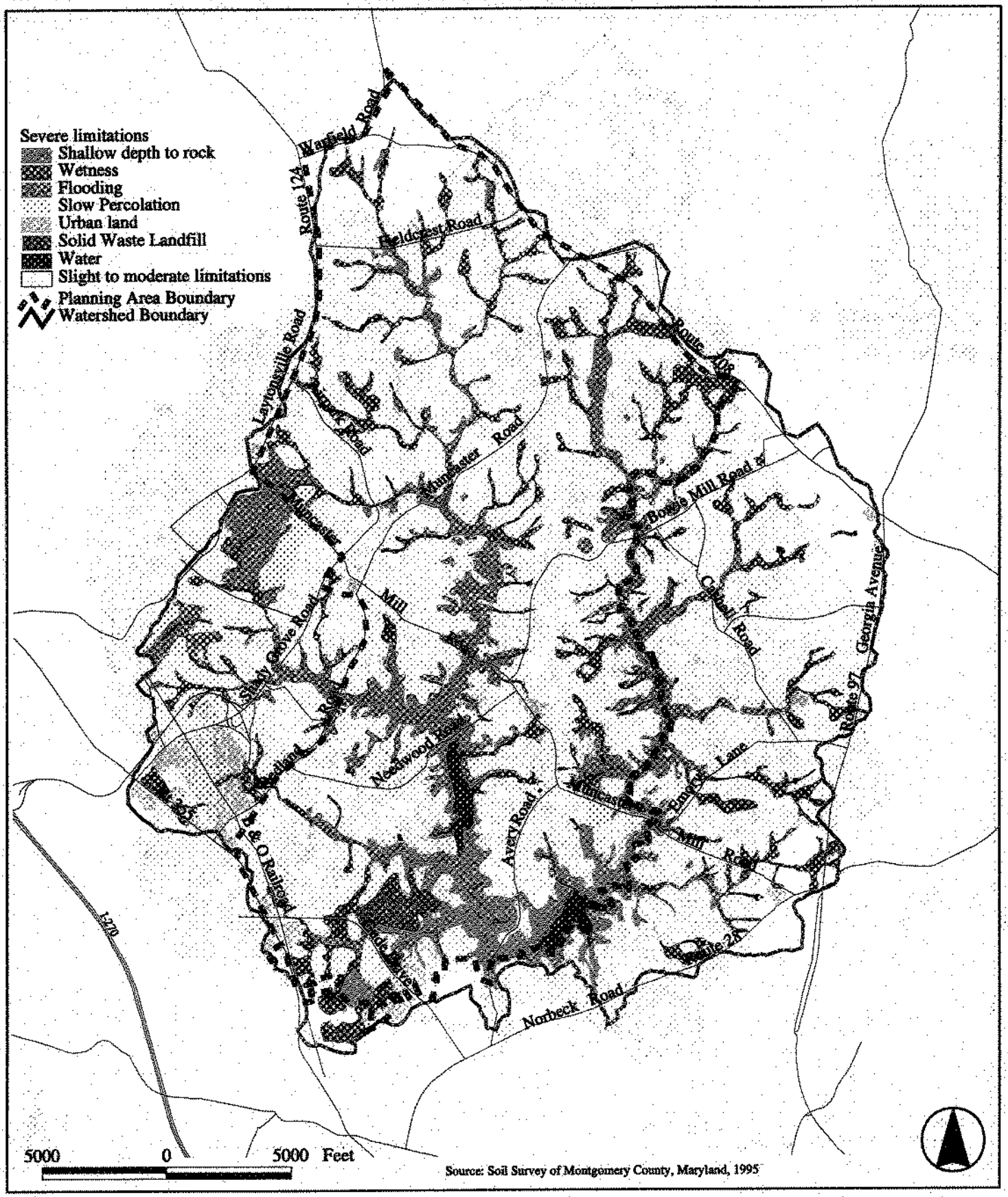
Geology

Figure 3



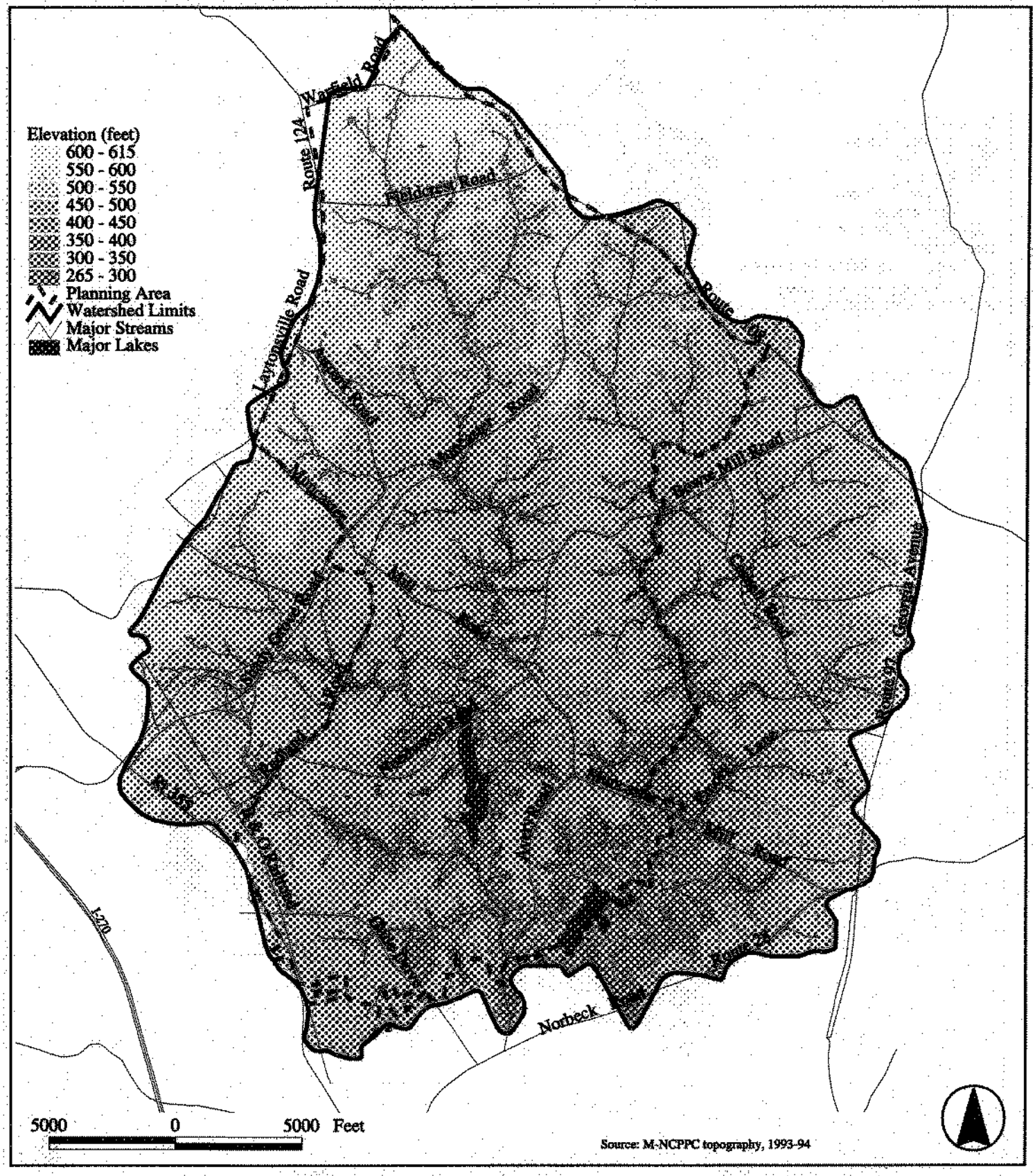
Soils With Severe Limitations to Septic Systems

Figure 4



Watershed Topography

Figure 5



through photosynthesis, filtering particulates, and absorbing nitrogen oxides. They 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 improved by forests and trees which provide recreation, aesthetics, and beautification. They also moderate climate, reducing energy needs by reducing the need for cooling and heating.

In the last half century, a significant amount of forested land in the County has been lost as a result of construction activities associated with increased urban development. Unlike clearing for agriculture or timber harvest, once land is developed, the regeneration potential of forests is lost. In response to this loss, State and County legislation was enacted to encourage forest conservation. As development pressure is exerted on the remaining forests within the County, measures must be taken to protect and restore these remnants by ensuring that existing forests are incorporated into the development design, and that new forests are planted in place of those which must be removed.

A forest resources inventory was conducted in the upper Rock Creek watershed to aid in identifying priority forest areas 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 different forest types. The approach and methodology utilized are described in the Appendix.

Inventory Results

The existing forest resources of the area were categorized into deciduous, mixed deciduous/coniferous, coniferous, and successional forests (see Figure 6). Definitions of the forest types are included in the Appendix. Forests dominated by deciduous species are clearly the predominant type within the watershed and successional forests are also important. Mixed deciduous/coniferous and pure coniferous stands are rare.

The deciduous forest areas are comprised of various forest stands which often differ significantly in age, species, and quality throughout their extent. Most forest resources are within existing parkland. The various stands are probably a reflection of the differing management of properties that existed prior to the land being acquired or dedicated. Within the deciduous forest mosaic, the stands consist of mature woodland with trees up to specimen size and well developed subcanopy layers, moderately aged woodland with marginal subcanopy development, and young woodland with closed canopy but very little subcanopy development. A significant number of the different stands contain non-native, invasive vegetation. Although the amount of the invasive species varies widely within the different stands, in some cases they are a major inhibitor to overall forest development.

Dominant tree species in the deciduous forest areas vary across the topography. Slopes and the more mature upland forest areas are typically oak/hickory and 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*), pignut hickory (*C. glabra*), and tulip poplar (*Liriodendron tulipifiera*). The lowland areas are typically dominated by tulip poplar in association with red maple (*Acer rubrum*) and sycamore (*Platanus occidentalis*). The less mature stands contain tulip poplar, red maple and to some extent black cherry (*Prunus serotina*). Other canopy tree species which are often present in the deciduous forests include green ash (*Fraxinus pennsylvanica*), black walnut (*Juglans nigra*), black gum (*Nyssa sylvatica)*, American elm (*Ulmus americana*) and beech (*Fagus grandifolia*).

Typical woody understory vegetation in the deciduous forests includes dogwood (*Cornus florida*), holly (*Ilex opaca, verticillata),* ironwood (*Carpinus caroliniana*), serviceberry (*Amelanchier canadensis*), mountain laurel (*Kalmia latifolia*), blueberries (*Vaccinium spp.*), spicebush (*Lindera benzoin*), and viburnums (*Viburnum spp.*). Alien and invasive plants include multiflora rose (*Rosa multiflora*), Japanese honeysuckle (*Lonicera japonica*), Asiatic bittersweet (*Celastrus orbiculatus*), garlic mustard (*Alliaria petiolata*), and Vietnamese stilt grass (*Microstegium vimineum*).

The mixed deciduous/coniferous forests share many of the same species of trees as the deciduous forest in association with Virginia or scrub pine (*Pinus virginiana*), white pine (*Pinus strobus*), and eastern red cedar (*Juniperus virginiana*). Nearly all the coniferous forests are planted stands of white pine which at one time served as screens or hedgerows. The successional forest areas are often dominated by eastern red cedar, black cherry, red maple, and sassafras (*Sassafras albidum*) with associated box elder (*Acer negundo*), black locust (*Robinia pseudoacacia*) and many of the alien invasive species mentioned above.

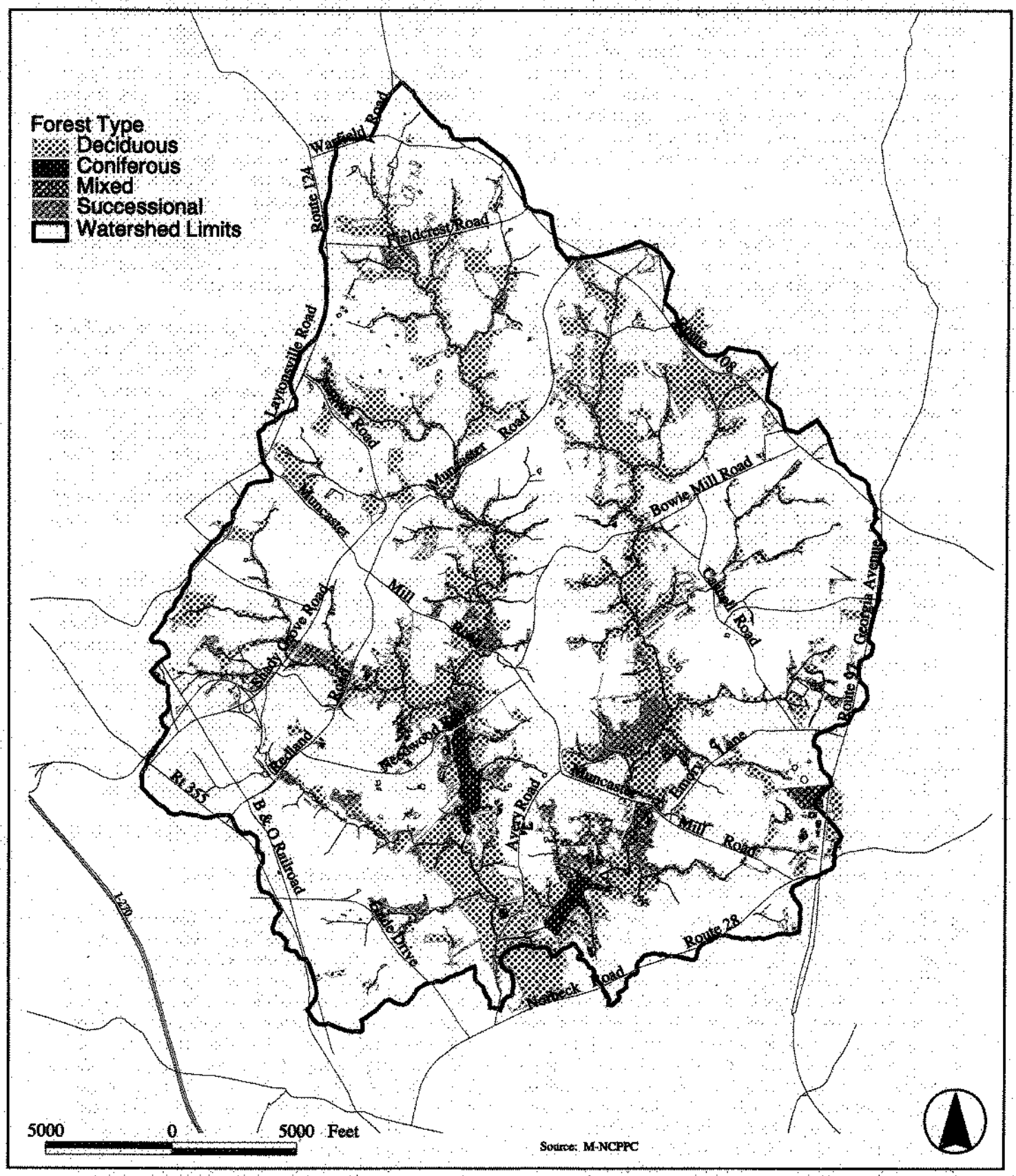
Forest resources are summarized by type in Table 3.

Important Forest Resource Areas

In a highly urbanized area such as Montgomery County, conservation of all remaining forest resources is important. High quality forest stands may warrant preservation (see Figure 7). 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. High quality stands have diverse forest structure which contains varying layers of tree canopy with associated understory trees, shrubs and herbaceous plants.

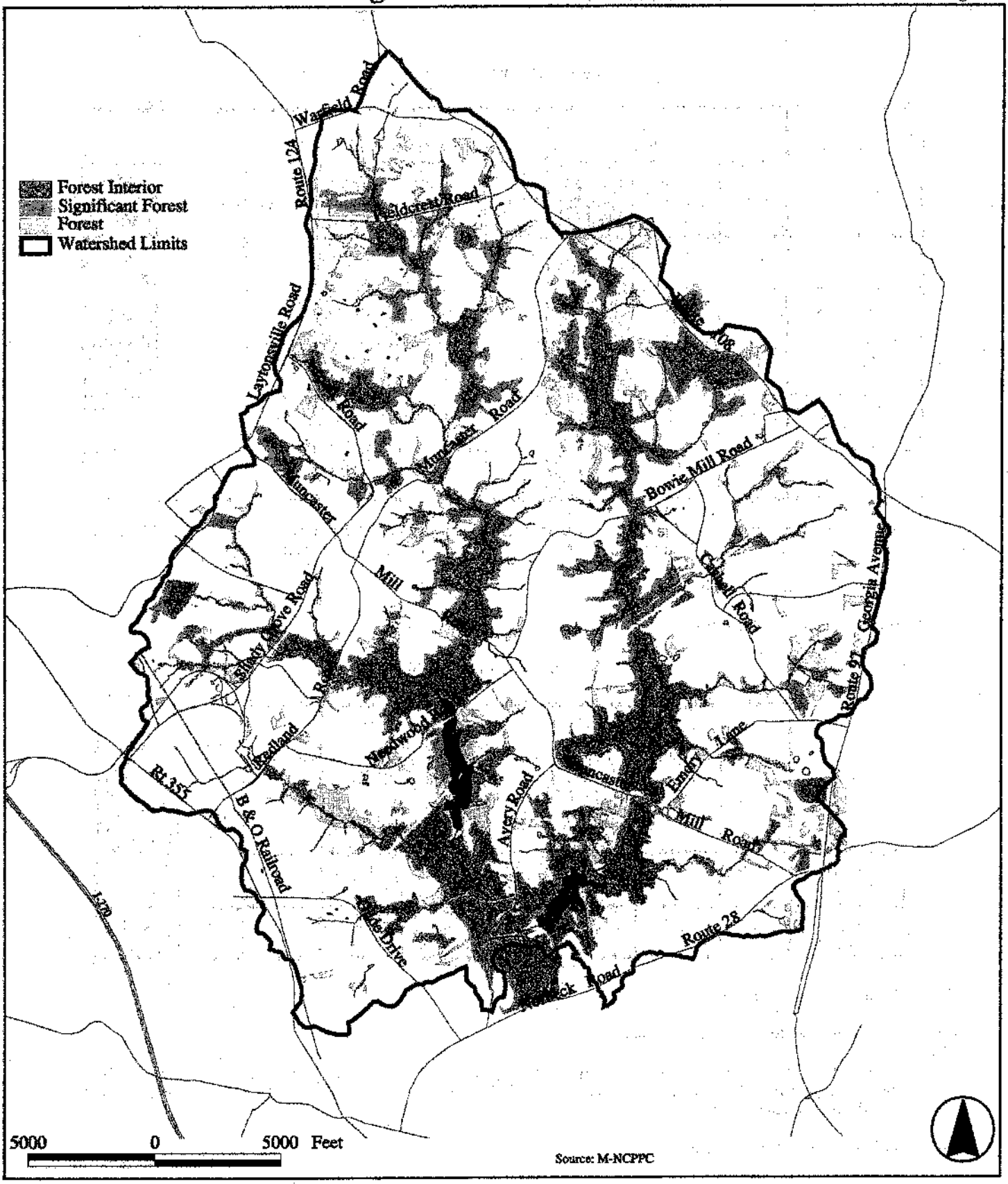
Forest Resources by Type

Figure 6



Significant Forest Areas

Figure 7



Forest stands which are in good health and have a small percentage of non-native or invasive vegetation are also high quality. Several forest areas which exhibit one or more of these characteristics are present in the upper Rock Creek watershed.

Forest Areas[1] by Type

Table 3

Forest Type	Forest Area in Parkland			Forest Area outside Parkland			Total Forest Area		
	Acres	% of total watershed[2] area	% of total forest area[3]	**Acres**	% of total watershed[2] area	% of total forest area[3]	**Acres**	% of total watershed[2] area	% of total forest area[3]
Deciduous	2,495	13.2	50.3	1,885	10.0	38.1	4,380	23.2	88.4
Coniferous	70	0.4	1.4	85	0.5	1.7	155	0.8	3.1
Mixed	20	0.1	0.4	20	0.1	0.4	40	0.2	0.8
Successional	245	1.3	5.0	135	0.7	2.7	380	2.0	7.7
Total	2,830	15.0	57.1	2,125	11.3	42.9	4,955	26.2	100.00

(1) GIS coverage of forest interpreted from 1994-1995 aerial photography and M-NCPPC planimetrics, M-NCPPC 1999. The forest categories used represent generalized forest types recognized by the Maryland State forest inventory.

(2) Total watershed area is 18,860 acres.

(3) Total forest area is 4,955 acres.

Significant Forest Areas

Table 4

	Significant Forest Area in Parkland			Significant Forest Area outside Parkland			Total Significant Forest Area		
	Acres	% of total forest[1] area	% of total significant forest area[2]	**Acres**	% of total forest[1] area	% of total significant forest area[2]	**Acres**	% of total forest[1] area	% of total significant forest area[2]
Significant Forest[3]	2,489	50.2	63.5	1,428	28.8	36.5	3,917	79.0	100.0
Forest Interior[4]	778	15.7	20.0	218	4.4	5.6	996	20.1	25.4

(1) Total forest area is 4,955 acres.

(2) Total significant forest area is 3,917 acres.

(3) Consists of forest areas that contain forest interior (300 feet) and riparian corridors (600 feet). Based GIS coverage of forest interpreted from 1994-1995 aerial photography and M-NCPPC planimetrics, M-NCPPC 1999. For a discussion of Significant Forest Areas, see the Appendix.

(4) Included under significant forest.

Within existing parkland, important forest areas include:

Rock Creek Regional Park
- the area north and west of Lake Needwood, and
- the area south of Lake Frank and north of Norbeck Road

North Branch Stream Valley Park
- the area south of MD 108 and west of Olney Mill Road, and
- the area within the stream valley between Bowie Mill Road and Muncaster Road

Outside parkland, the forest stand between the North Branch Stream Valley Park area south of MD 108 and west of Olney Mill Road and the power line right-of-way is also an important resource.

The successional forest areas and old fields offer the best opportunities for expansion of the better 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 old field and successional forest are also present in the Crabbs Branch Stream Valley which offers an opportunity for increasing 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.

Information on wetland acreage in the upper Rock Creek watershed is derived from the Maryland Department of Natural Resources Digital Ortho Quarter Quad (DOQQ) wetland maps[2]. This inventory, completed in 1998, used interpretation of 1993-94 aerial photographs to identify forests and wetlands. Additional information has been gained from field work done by M-NCPPC staff during a functional assessment of wetlands in the watershed.

Based on the DOQQ information, wetlands account for approximately five percent of the total acreage of the upper Rock Creek watershed (see Figure 8). According to the most widely accepted standard for wetlands classification in the United States[3], most of the upper Rock Creek wetlands (about 60 percent) are palustrine forested (PFO) wetlands, meaning that they occur in low areas adjacent to streams and that trees are the dominant vegetation. Palustrine emergent (PEM) wetlands, which lie near streams and are dominated by emergent vegetation, account for a little more than 10 percent of the watershed'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 over five percent of upper Rock Creek'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 15 percent and 5 percent, respectively, of wetlands in the watershed (See Table 5).

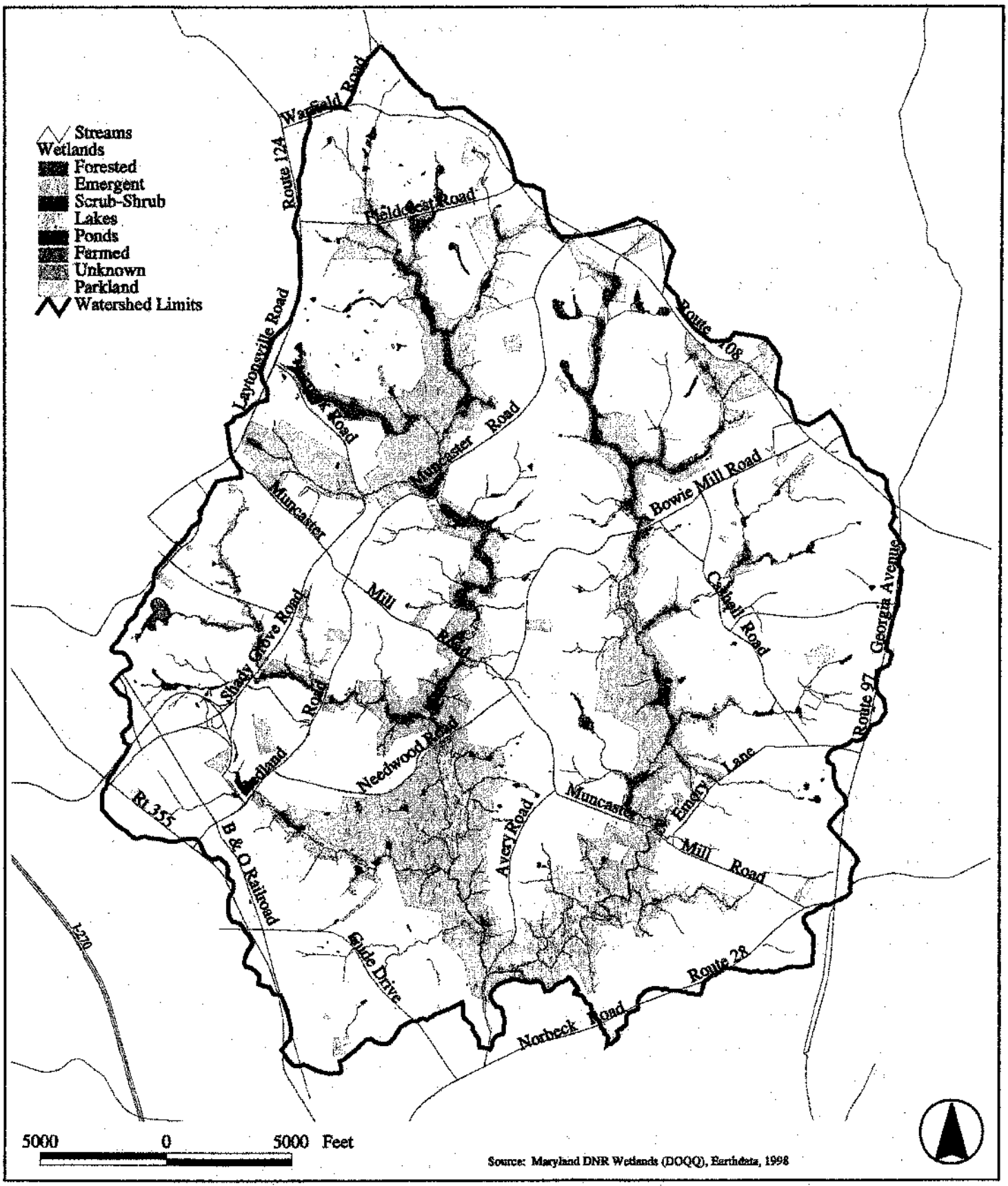
None of the wetlands in the upper Rock Creek watershed are currently listed as wetlands of Special State Concern in

[2] DOQQ study funded by DNR, MCDEP, M-NCPPC, and WSSC.

[3] Cowardin *et al.* 1979, *Classification of Wetlands and Deepwater Habitats of the United States.* U.S. Fish and Wildlife Service publication FWS/OBS-79/31, Washington, D.C. 131 pp.

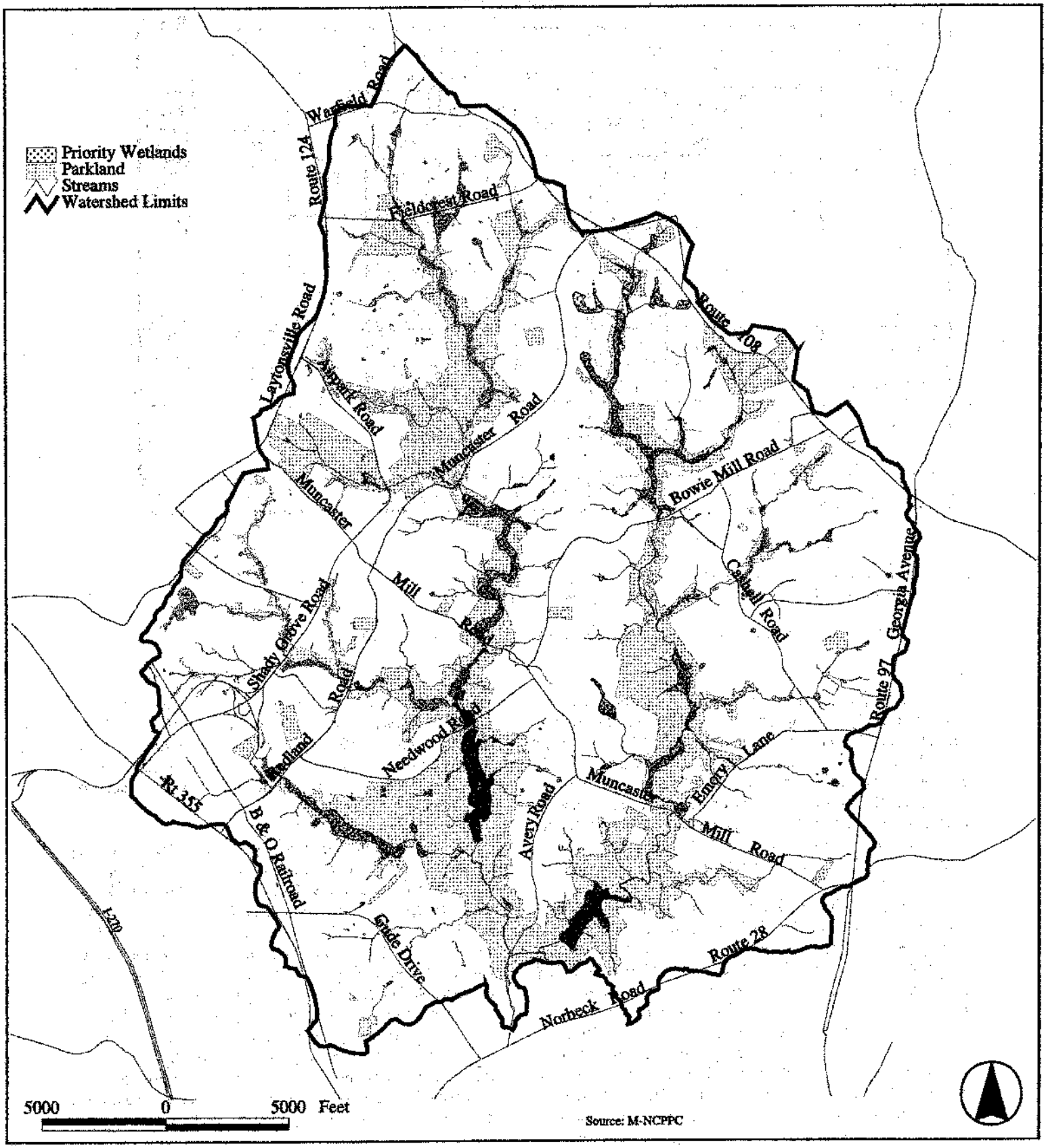
Wetlands By Type

Figure 8



Wetland Assessment Groups and Priority Wetlands

Figure 9



Wetlands[1] by Type

Table 5

Wetland Type [2]	Wetlands Area in Parkland			Wetlands Area outside Parkland			Total Wetlands Area		
	Acres	% of total watershed[3] area	% of total wetlands area	Acres	% of total watershed[3] area	% of total wetlands area	Acres	% of total watershed[3] area	% of total wetlands area
Forested (PFO)	**415**	2.2	44.1	**128**	0.7	13.6	**543**	2.9	57.7
Emergent (PEM)	**106**	0.6	11.2	**30**	0.2	3.2	**136**	0.7	14.4
Scrub-Shrub (PSS)	**35**	0.2	3.7	**18**	0.1	1.9	**53**	0.3	5.6
Lakes (L)	**138**	0.7	14.7	**0**	0	0	**138**	0.7	14.7
Ponds (PU)	**10**	<0.1	1.1	**42**	0.2	4.4	**52**	0.3	5.5
Farmed (Pf)	**0**	0	0	**13**	<0.1	1.4	**13**	< 0.1	1.4
Unknown (U)	**3**	<0.1	0.3	**4**	<0.1	0.4	**7**	< 0.1	0.7
Total	**707**	3.8	75.1	**235**	1.2	24.9	**942**	5.0	100.0

(1) GIS coverage of wetlands, 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) Total watershed area is 18,860 acres. Percentages rounded to the nearest 0.1 percent.

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, most of the wetlands in this drainage area qualify as wetlands of Significant Plant and Wildlife Value by virtue of their position adjacent to Use III or Use IV waters.

The Digital Ortho Quarter Quad (DOQQ) wetland inventory prepared for the Maryland Department of Natural Resources formed the basis for the representation of wetland resources in the upper Rock Creek watershed. 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 commit 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. The DOQQ inventory was modified by the addition of significant wetlands missed by the DOQQ but inventoried by staff during field work for the functional assessment of wetlands.

Most of the wetlands in the Upper Rock Creek planning area are concentrated in the headwater areas and floodplains of Upper Rock Creek, the North Branch of Rock Creek, and the tributaries to these two streams. While both Upper Rock Creek and the North Branch contain many excellent wetlands, the North Branch in particular harbors 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.

Wetland Functional Values[1]

Table 6

Wetland Assessment Group (WAG)	Wetland Function					Weighted Composite[1]
	Groundwater Discharge	Floodflow Attenuation	Nutrient Removal/ Sediment Retention	Aquatic Habitat	Wildlife Habitat	
BMT-1	2.33	1.88	2.50	1.75	1.17	12.54
CB-1[2]	3.67	2.13	2.90	2.33	2.00	18.36
CMT-1	2.67	1.75	2.60	1.83	1.17	13.02
MC-1	1.67	1.75	2.20	1.50	1.33	11.28
MC-2	2.00	1.75	2.50	1.67	1.58	12.75
MC-3	3.00	2.13	2.90	2.50	1.83	16.69
NB-1[2]	3.33	1.75	2.40	2.33	2.25	17.65
NB-2[2]	3.67	1.75	2.80	3.17	2.42	19.38
NB-3	3.00	1.88	2.40	2.17	1.75	15.11
NB-4	3.00	1.75	2.40	2.25	1.92	15.48
NB-5[2]	3.33	2.13	2.70	2.33	2.25	17.33
NB-6	1.33	1.75	2.60	1.67	1.33	12.68
URC-1	3.33	1.88	2.90	2.33	2.08	16.94
URC-2	1.67	1.75	2.60	1.58	1.50	12.18
URC-3	3.33	1.75	2.60	2.58	2.17	17.18
URC-4	3.67	1.75	2.30	2.50	2.17	17.05
URC-5	3.00	1.75	2.50	2.17	1.67	14.92
URC-6[2]	3.67	2.00	2.80	3.17	2.58	19.97
URC-7	3.00	2.00	2.10	2.67	1.83	17.10
WB-1	3.00	2.00	2.80	2.00	1.67	16.13
WB-2	2.67	2.00	2.40	1.92	1.67	14.23

(1) Based on field survey and analysis by M-NCPPC staff 1999.

(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) This WAG contains one or more priority wetlands.

As part of the Environmental Resources Inventory for the *Upper Rock Creek Master Plan*, a functional assessment of wetlands was conducted by M-NCPPC staff. The functional assessment uses indirect indicators to estimate the potential for the wetlands in the Wetland Assessment Group (WAG) to perform each of five different wetland functions: attenuation of flood flows, reductions in sediment and nutrient loads, groundwater discharge, provision of aquatic habitat, and provision of terrestrial habitat. **Please note that these represent only estimates of the ability of each wetland assessment group to perform the five wetland functions. These are not measures of actual functional performance.**

For the purposes of the functional assessment of wetlands, the wetland resources of Upper Rock Creek were combined into Wetland Assessment Groups (WAGs). WAGs are groups of wetlands which are proximate to 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 with the concurrence if the Maryland Department of the Environment's Wetlands and Waterways Program.

Following definition of the WAGs, staff conducted field work from the spring of 1998 to the spring of 1999 to gather data for input into the functional assessment calculations. (For details see the *Functional Assessment of Wetlands for the Upper Rock Creek Planning Area,* MNCPPC 1999.) The field data were combined with mapped information and data from Montgomery County's Geographic Information System database to produce estimates of the five wetland functions for each WAG.

The WAGs with the highest combined scores for all functions were designated priority wetlands (see Figure 9). Because the wildlife habitat and aquatic habitat functions are the most difficult functions to recreate, results from these two functions were weighted to give them greater importance in determining priority wetlands. Portions of three additional WAGs were also designated priority wetlands based on special attributes beyond the consideration of the functional assessment protocol. These special attributes were observed by staff during field data collection.

Wetland Assessment Groups recommended as priority wetlands in the upper Rock Creek watershed based on the results of the field survey and the functional assessment are URC-6, NB-2, CB-1, NB-1, NB-5, and portions of URC-5, URC-1, and MC-3. The combined acreage for these wetlands is 356 acres, or about 38 percent of the wetlands in the upper Rock Creek watershed. Slightly more than eighty percent of all priority wetlands occur on Montgomery County park property. Priority wetlands are predominantly forested (75%) and emergent (21%).

Results of the functional assessment will be used to inform land use decisions during the master planning process. Special attention will be given to the protection of priority wetlands.

Results of the functional assessment are summarized in Table 6. A detailed description of each WAG is included in the Appendix. The wetlands assessment methodology is fully documented in the Upper Rock Creek Wetlands Functional Assessment Study report (M-NCPPC, 1999).

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

The probability of finding rare, threatened, or endangered (RT&E) species or unusual biological communities increases in wetland areas, in areas underlain by certain bedrock types such as ultramafic and diabase rock formations, in areas of serpentine soils, and in close proximity to the Potomac River. There is one large ultramafic bedrock formation underlying the headwaters of Mill Creek and the Pope Farm Branch in the western portion of the Upper Rock Creek watershed.

Most of the known locations of rare, threatened, or endangered species of plants and animals occur in Montgomery County's park system. Portions of the stream valleys of Rock Creek and its tributaries have been acquired and protected as parkland. Prior to their acquisition, some of these areas were protected by their steep topography or by excessive wetness. Besides providing important habitat for plants and animals, stream valleys historically have served as important migration corridors for many species.

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. RT&E species reported in the subregion include plant, bird, and reptile species. Few detailed surveys for RT&E species have been conducted on private lands.

In Rock Creek Regional Park in the vicinity of Lake Frank, two State endangered, one State threatened, and four watchlist plant species have been documented, as well as six plant species which are rate in the County. One State endangered, six watchlist, and one locally rare plant species have been found in the park north of Lake Needwood, and four watch-list species are documented from the Crabbs Branch area southwest of Lake Needwood.

North Branch Stream Valley Park north of Muncaster Mill Road harbors four watchlist plant species. There also have been reports of one State threatened reptile, but these reports have not yet been confirmed by either DNR or M-NCPPC biologists.

One regional rare plant species has been reported in the Pope Farm area of Rock Creek Stream Valley Park.

Wildlife and Fish

There have been few comprehensive wildlife inventories conducted in the study area. There are, however, several wildlife habitats and species known to occur in the study area that should be noted because they are declining regionally or they can have a direct impact on humans and land development.

Numerous fish surveys have been conducted in the upper Rock Creek watershed since the beginning of this century. A list of the fish species found in the upper Rock Creek tributaries as reported in the *County-wide Stream Protection Strategy* (DEP, 1998) is presented in the Appendix (see Table A-2).

No trout have been found in the stream water Use III portion of Upper Rock Creek (north of Muncaster Mill Road) since 1992. In 1998, a small number of brown trout *(Salmo trutta)* were stocked in the upper portion of the Rock Creek mainstem by M-NCPPC. Streams in the water Use IV portion of Upper Rock Creek (south of Muncaster Mill Road) are not routinely stocked with trout, but each year the Maryland Department of Natural Resources stocks Lake Needwood with rainbow trout *(Oncorhynchus mykiss)*.

Both Lake Needwood and Lake Frank are managed by the Maryland Department of Natural Resources as recreational fisheries, and have been stocked with largemouth bass *Micropterus salmoides)*, tiger muskies *(Esox lucius x masquinongy)*, channel catfish *(Ictalurus punctatus)*, and several species of panfish. These species are occasionally found in the mainstem of Rock Creek or the North Branch.

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 FID habitat. As forested land throughout the east and central U.S. has been fragmented by development, FID species have declined dramatically. Approximately 996 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.

Grassland and Edge Habitat

Current land use in parts of the upper Rock Creek watershed support large areas of grassland and edge habitat. Pasture land, hayfields, large estates and golf courses provide grassland habitat for several specialized species of birds that are declining regionally. Species include bluebirds, eastern meadowlarks, grasshopper sparrows, kestrels (a small falcon), and other grassland or open country specialists. The edges where these fields meet other habitats, particularly forest, provide important habitat for other uncommon species including Baltimore orioles, and red-tailed and red-shouldered hawks.

Wildlife Management Concerns

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

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. With support from the County Council, the Deer Management Work Group (DMWG) was established to develop a deer management plan for the county and to oversee the implementation of a County-wide deer management program. The DMWG is a multi-agency committee with representatives from M-NCPPC, DNR, the Montgomery County Cooperative Extension Service, Montgomery County Police Department, and U.S. Geological Survey. In 1995, the DMWG developed and began implementing a comprehensive deer plan that includes data collection, public education, and implementation of management options including population management. Given the juxtaposition of parkland, housing communities and large estates which creates more desirable habitat, deer populations in the area are likely to continue increasing for some time.

Beaver now are 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 affect private and public lands. No studies of beaver populations or habitat usage have been undertaken in the study area but casual observations and the monitoring of citizens' complaints indicate that sites often are colonized for a short period of time, usually several months to a year, and then abandoned. Impacts on private property are limited to structures built close to, or within, the floodplain before prohibitions were in effect. 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 and regulations should minimize problems on private land.

Large numbers of Canada geese have taken up residence in the County over the past decade. These resident geese 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, institutional properties and large estates can

Rare, Threatened, and Endangered Plants in the Upper Rock Creek Watershed

Table 7

Plant Species	Common name	Official Status
Arisaema dracontium	green dragon	watchlist [1]
Aristolochia serpentaria	Virginia snakeroot	watchlist
Carex hirtifolia	pubescent sedge	endangered [2]
Carex radiata	stellate sedge	endangered
Castanea pumila	chinquapin	watchlist
Castanea dentata	American chestnut	state rare/watchlist [3]
Chamaelirium luteum	devil's bit	watchlist
Coreopsis verticillata	whorled coreopsis	watchlist
Galium trifidum	small bedstraw	undetermined - thought to be extirpated
Geum laciniatum	rough avens	watchlist
Geum vernum	spring avens	watchlist
Heteranthera dubia	water stargrass	infrequent in Montgomery County [4]
Iris cristata	crested iris	endangered
Linderna dubia	false pimpernel	infrequent in Montgomery County
Lysimachia terrestris	swamp loosestrife	infrequent in Montgomery County
Melica mutica	narrow melicgrass	threatened [5]
Ostrya virginiana	ironwood	infrequent in Montgomery County
Penthorum sedoides	ditch stonecrop	infrequent in Montgomery County
Potamogeton diversifolius	variable pondweed	infrequent in Montgomery County
Quercus muhlenbergii	chinquapin oak	watchlist
Quercus imbricaria	shingle oak	watchlist
Rotala ramosior	toothcup	watchlist
Scutellaria serrata	showy skullcap	watchlist
Senecio anonymus	Small's ragwort	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) ***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.

(3) ***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.

(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.

attract large numbers of geese, resulting in interference with activities including golf, picnicking and swimming, and in waste buildup on land areas and in ponds.

Watershed Character

The upper Rock Creek watershed consists of roughly the upper half of the entire Rock Creek drainage area in Montgomery County. It includes approximately 95 miles of streams that drain 30.3 square miles (20,000 acres) of land upstream of Norbeck Road/MD 28 in central Montgomery County.

The mainstem of Rock Creek originates from a small spring in the Laytonsville area. As it flows south, the mainstem collects water from side tributaries in the upper and lower Rock Creek watersheds before ultimately discharging in the Potomac River. The mainstem is paralleled to the east by North Branch Rock Creek which it ultimately joins north of Norbeck Road. Floodplain areas are largely undeveloped. Wetlands are often present within the floodplain and may extend beyond floodplain boundaries.

Based on the M-NCPPC 1993-94 plainimetric data, agricultural land uses are concentrated in the northern headwaters of the watershed. One thousand nine hundred acres of mostly pasture and crop land occupy almost one-third of the watershed north of Bowie Mill Road and Muncaster Mill Road. About 80 percent of the agricultural areas in the upper Rock Creek watershed are privately owned.

The upper reach of the mainstem is the most rural of the streams in the study area. The rolling landscape is dominated by farm fields and forested areas punctuated by large-lot development. The Agricultural History Farm dominates the stream's environment from Fieldcrest Road to Muncaster Road. This predominantly rural area promotes stream resource protection goals and objectives endorsed in previous master plans (M-NCPPC 1968). Imperviousness in this portion of the watershed ranges from 6 to 11 percent (MCDEP, 1998, see Figure 8).

Between Muncaster Road and Muncaster Mill Road, 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 two mainstems range from 2 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 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 confluences of four of the watershed's larger tributaries - Mill Creek, Crabb's Branch, Southlawn Branch, and Manor Run. This region of the watershed contains Lake Needwood on the mainstem and Lake Frank on North Branch. Downstream of the lakes, North Branch joins the mainstem which flows south to Norbeck Road thereby entering the lower Rock Creek watershed. The land surrounding the lakes, the North Branch, and the mainstem is mostly undeveloped parkland with low imperviousness. However, the tributaries collect waters from impervious lands ranging from 12 to 38 percent, with municipalities in the southwest corner of the watershed contributing high 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 and Lake Bernard Frank.

In 1977, a water quality management study (CH2MHill, 1997) presented an overview of water quality conditions in the upper Rock Creek subwatershed. The report concluded the upper Rock Creek mainstem generally met the criteria related to pH, channel widening, nutrients, and biochemical oxygen demand. However, upper Rock Creek mainstem occasionally failed to meet the following Maryland water quality criteria: temperature, dissolved oxygen, fecal coliform, turbidity. These violations occurred less than 25 percent of the time, and were therefore assigned a "medium" problem severity value. Along with the mainstem, major tributaries of Upper Rock Creek failed to meet the water quality criteria. Crabb's Branch and Southlawn Branch were assigned "high" problem severity for frequently failed fecal bacterium levels (>25 percent of the time). In addition, Southlawn Branch frequently failed turbidity criteria (>25 percent of the time).

North Branch 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 levels, temperature.

In 1981, the Montgomery County Department of Environmental Protection determined that water quality in the mainstem, North Branch, and Mill Creek had improved from permissible to good. Water quality improvements were attributed to decreases in turbidity, BOD (biochemical oxygen demand), and fecal coliform levels. However, water quality in Crabbs Branch deteriorated. The report also concluded that Southlawn Branch contributes heavily to the BOD of Rock Creek mainstem below Lake Needwood, whereas Crabbs Branch heavily contributes nutrients (nitrogen and phosphorus, MCDEP 1981 p. 37).

Between 1991 and 1993, Maryland Department of the

Environment's bioassessment of upper Rock Creek indicated an apparent water quality impact. Unimpaired habit conditions were observed, but the biological community was moderately or severely impaired. Increased levels of nutrient and sediment flow into Lake Frank and Lake Needwood 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 mainstem and individual tributaries (Galli, see Figure 13). Most streams were rated either good or fair. This was interpreted as evidence of slight to moderate levels of degradation. The sections of stream with the lowest ratings (rated as "poor") were in Southlawn Branch, one of the most heavily developed portions of the watershed. The highest rating of excellent was observed in the uppermost section of the stream. Measurements of physical and chemical parameters were generally consistent with the State of Maryland stream water Use III and Use IV designations.

Current Conditions

County-wide Stream Protection Strategy

Current conditions of the natural stream waters in Upper Rock Creek are summarized in the *County-wide Stream Protection Strategy* (CSPS) document. The CSPS is based on a biological monitoring program (1994-1996 data) that assesses all County streams according to the same methodology (MCDEP in cooperation with M-NCPPC), 1998).

According to the CSPS, the stream condition in the upper Rock Creek watershed ranges from good to poor (see Figure 11). Brown trout still survive in some portions of Rock Creek, but they are becoming increasingly harder to find. Southlawn Branch exhibits poor stream biological conditions primarily due to an existing industrial area in the headwaters. Poor stream biological conditions were also reported in Manor Run and the upper portion of Mill Creek where higher density developments were built with little or no stormwater management controls.

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

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 waterbodies 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.

Rock Creek is one of several Montgomery County streams identified in 1996 in the 303(d) list. 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 and Lake Needwood to the list of waterbodies impaired by nutrient pollution from non-point sources.

The 1998 DNR 305(b) report indicates 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 which 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 Needwood and Lake Frank are listed as partially supporting aquatic life use. The lakes experience seasonally low oxygen levels in the deeper portions as a result of accelerated eutrophication due to nutrients from unspecified non-point source runoff (DNR, 1998).

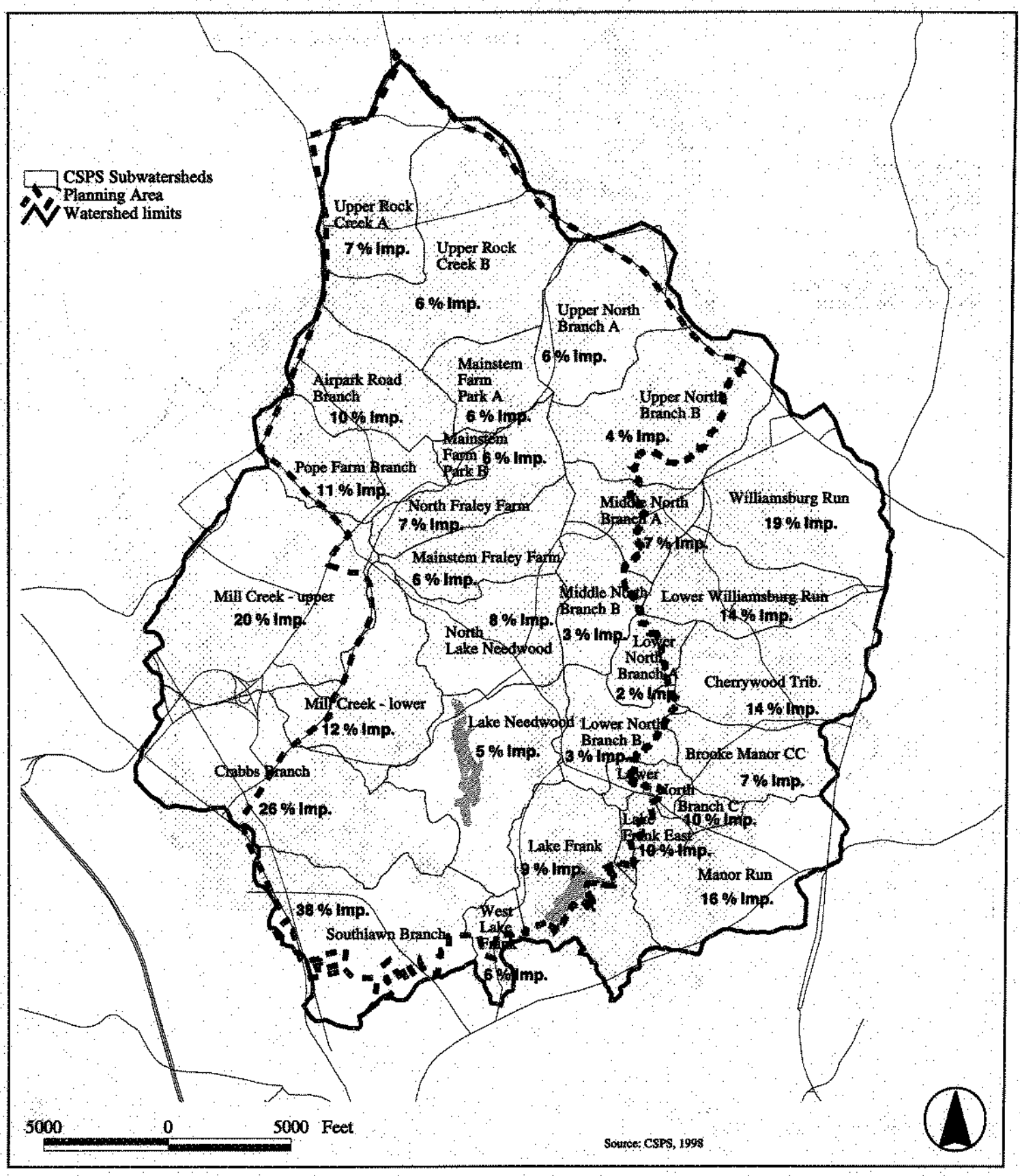
The 1996 DNR 305(b) report indicates that water quality in the Rock Creek watershed varies from *good* in the headwaters (upper Rock Creek) to *fair* in the lower portion (lower Rock Creek). High bacteria, nutrient (phosphorus) and suspended sediment levels are due to agricultural runoff in the upper areas, and to suburban development and urban runoff. Some unimpaired habitats' conditions were observed, but the biological communities were moderately to severely impaired. Lakes Needwood and Frank are classified as eutrophic due to nutrients and sediments from upstream areas. The eutrophication of Lake Needwood has resulted in the proliferation of nuisance submerged aquatic vegetation (SAV), requiring chemical controls to maintain lake uses (DNR 1996).

Originally built to control flooding and trap eroded sediments from upstream, Lakes Frank and Needwood have become important as recreational facilities and wildlife habitats.

In order to preserve these uses, a lake management plan would be desirable to help reduce and mitigate the impacts of excessive sedimentation and nutrient enrichment.

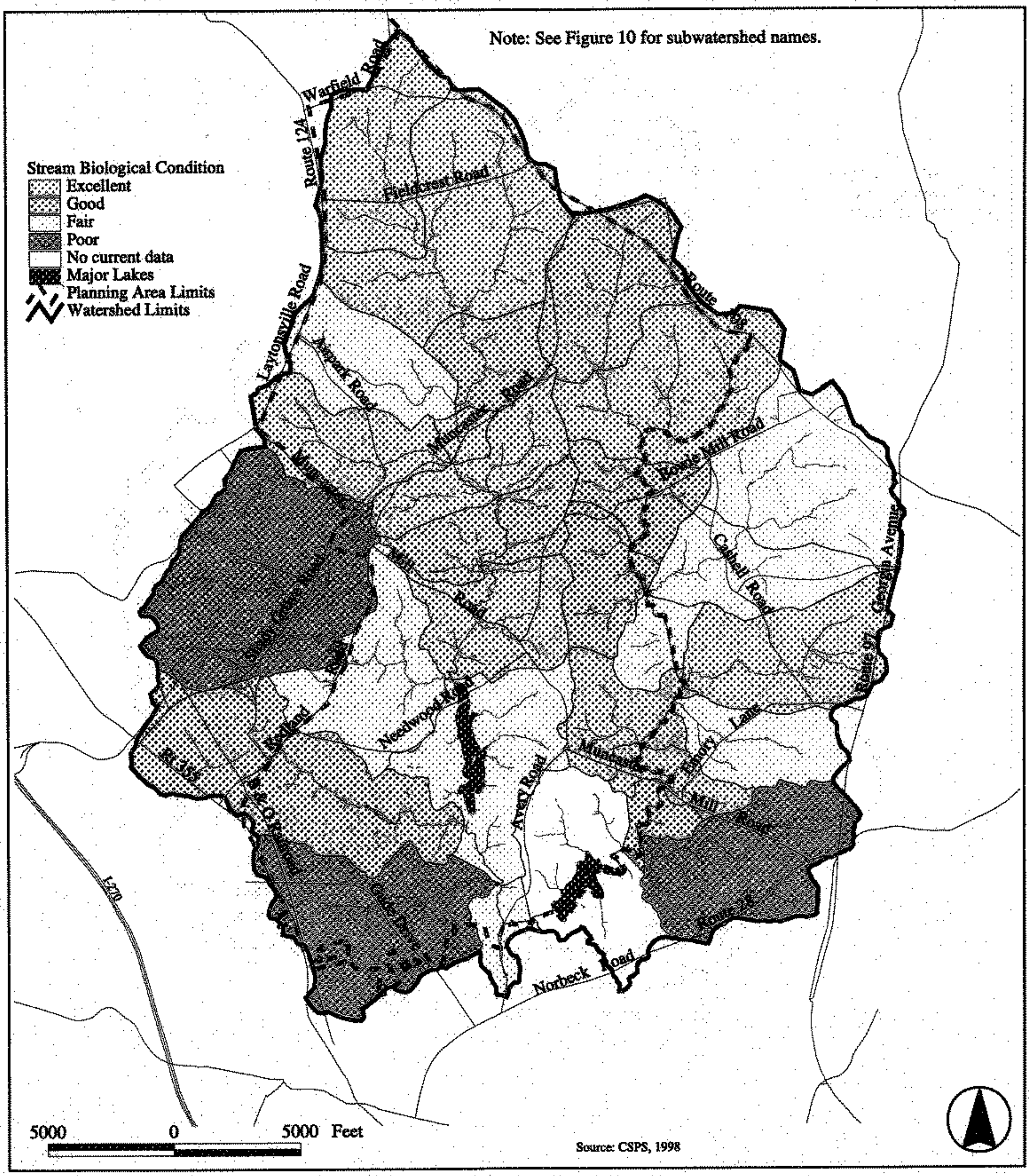
Subwatersheds and Existing Impervious Cover

Figure 10



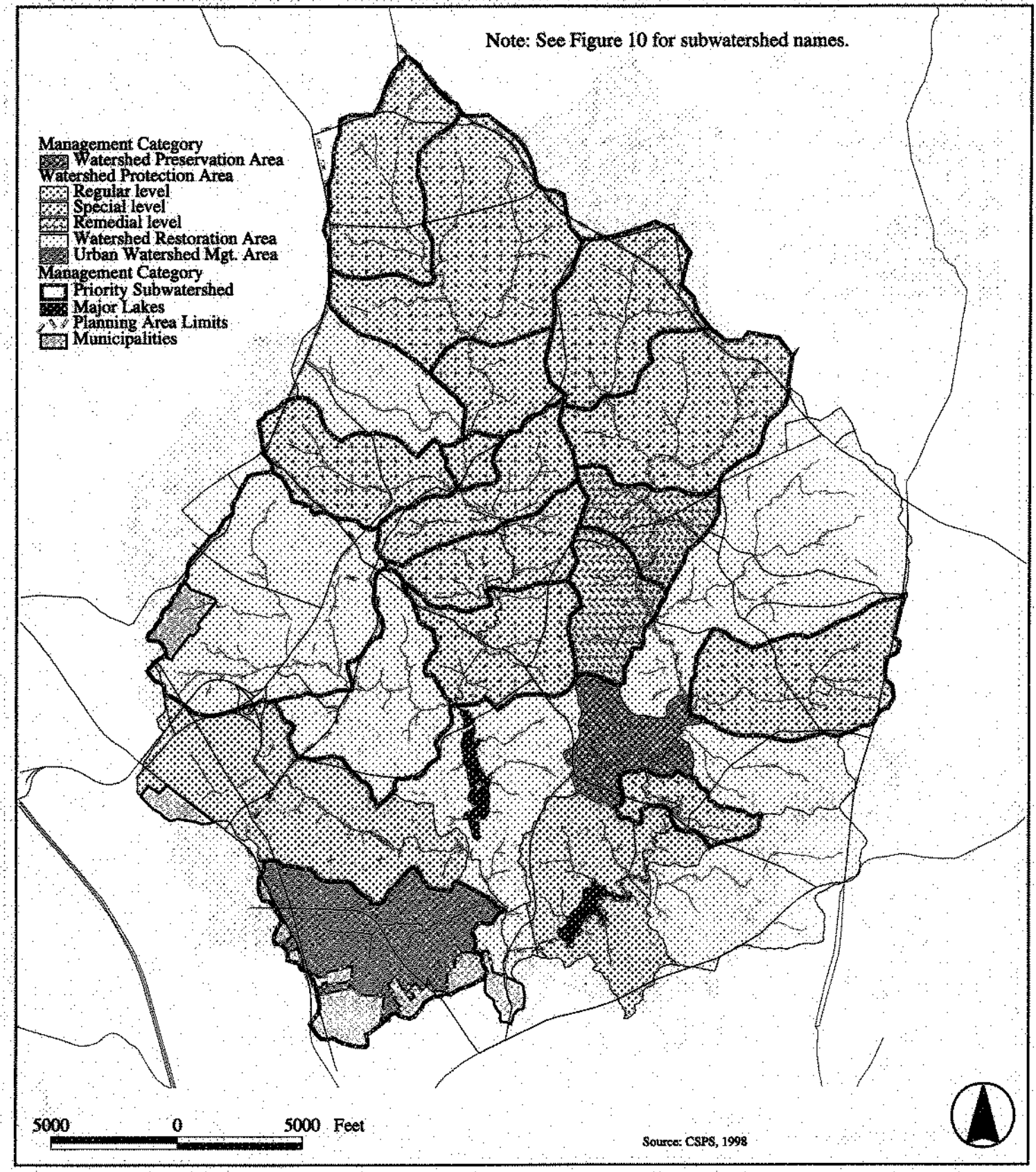
Countywide Stream Protection Strategy - Subwatershed Condition

Figure 11



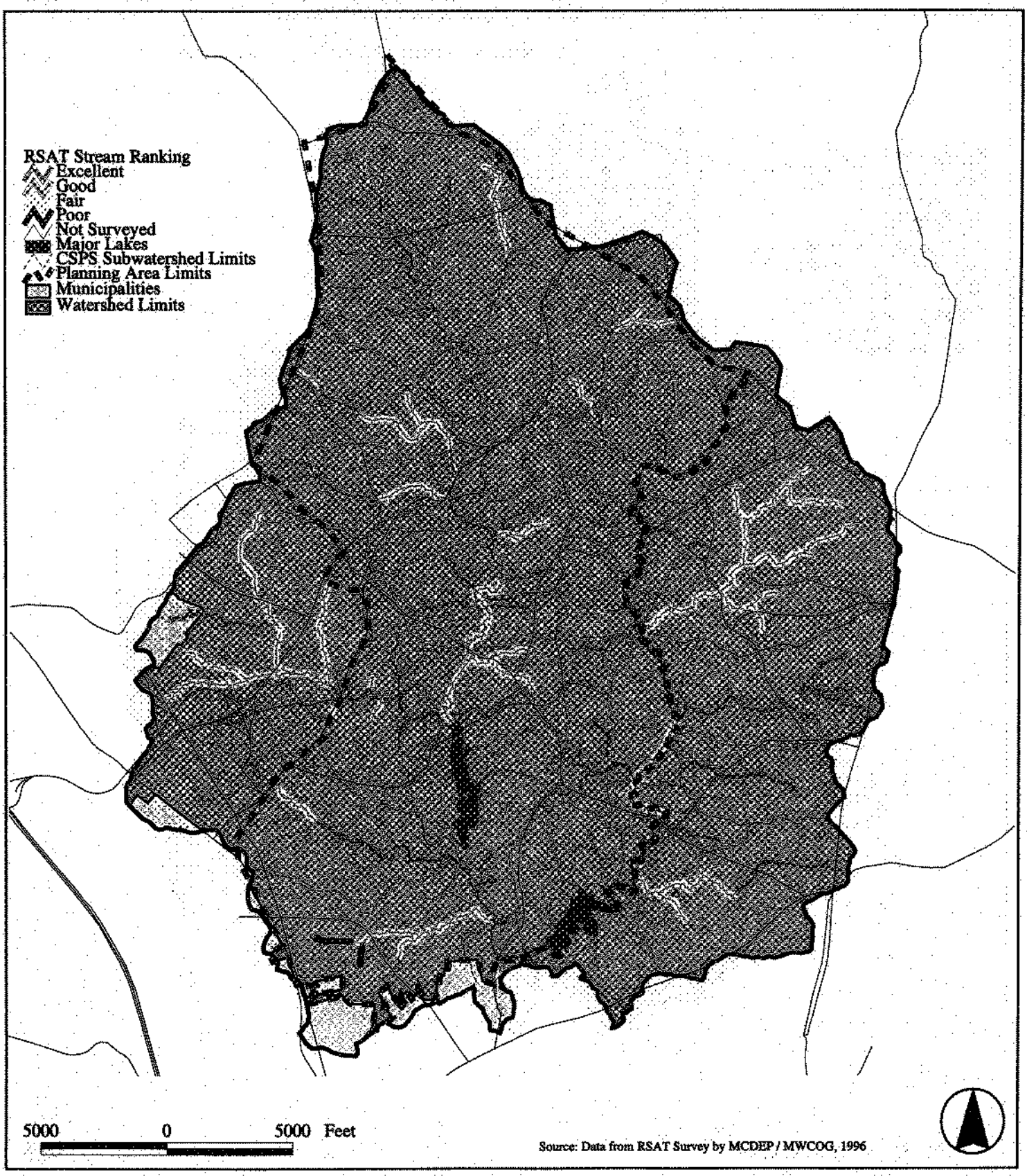
Countywide Stream Protection Strategy - Management Categories

Figure 12



RSAT Stream Assessment

Figure 13



Maryland Clean Water Action Plan

The Maryland Clean Water Action Plan identifies Rock Creek as one of several watersheds in Montgomery County that needs restoration and that deserves priority consideration.

The Rock Creek watershed is in *Category 1* of the Maryland Unified Watershed Assessment (UWA) under the 1998 Clean Water Action Plan (see Chapter 2 of this report). The UWA considers components of the watershed related to aquatic systems including biological, physical, and chemical characteristics and related landscape factors. *Category 1* watersheds are those found not to meet clean water and other natural resource goals and are in need of restoration.

Rock Creek is also designated a *priority* watershed under the Maryland Clean Water Action plan. *Category 1 priority* watersheds are those most in need of restoration during the next two years. These are defined as *Category 1 Priority* watersheds. The schedule for these restorations and protection actions must be coordinated with the State's schedule to determine Total Maximum Daily Loads (TMDLs) for pollutants from watersheds.

Watershed Management

Based on the assessments and projects of potential development (with existing zoning), the CSPS assigns a management category for each subwatershed (see Figure 12), and a set of management tools is identified 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 description of the management categories from the CSPS.

The CSPS divides the upper Rock Creek watershed into 31 subwatersheds. Except for Southlawn Branch and 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 12).

The CSPS also identifies seventeen *priority* subwatersheds, representing nearly three quarters of the entire upper Rock Creek watershed area. They include ten *special level* Watershed Protection Areas in the north central portion of the upper watershed (see Figure 12). The *special level* designation reflects the need to protect sensitive resources in headwater areas where projected increases in imperviousness are high.

The Montgomery County Department of Environmental Protection (DEP) is currently developing a watershed restoration action plan for addressing stormwater retrofit, stream restoration, and habitat improvements comprehensively throughout the watershed. The Upper Rock Creek restoration project is described in Chapter 2 of this report.

Lakes Needwood and Frank

In the late 1960s, Lake Needwood and Lake Bernard Frank were built to protect downstream park property from increased flooding and erosion, and to provide additional recreational capabilities in parkland. Both lakes are located in the Rock Creek Regional Park. The M-NCPPC management plan for the Rock Creek Regional Park (M-NCPPC 1998) provides detailed information on the park and lakes. Following is a brief summary of the current condition of the lakes.

Lake Needwood is located on the mainstem of Rock Creek between Mill Creek and Crabbs Branch. Under normal conditions, the water surface of Lake Needwood covers approximately 74 acres. The lake was designed to detain up to 3,690 acre-feet (1.2 billion gallons) of floodwaters, and retain up 303 acre-feet (490,000 cubic yards) of sediment from upstream tributaries to the mainstem.

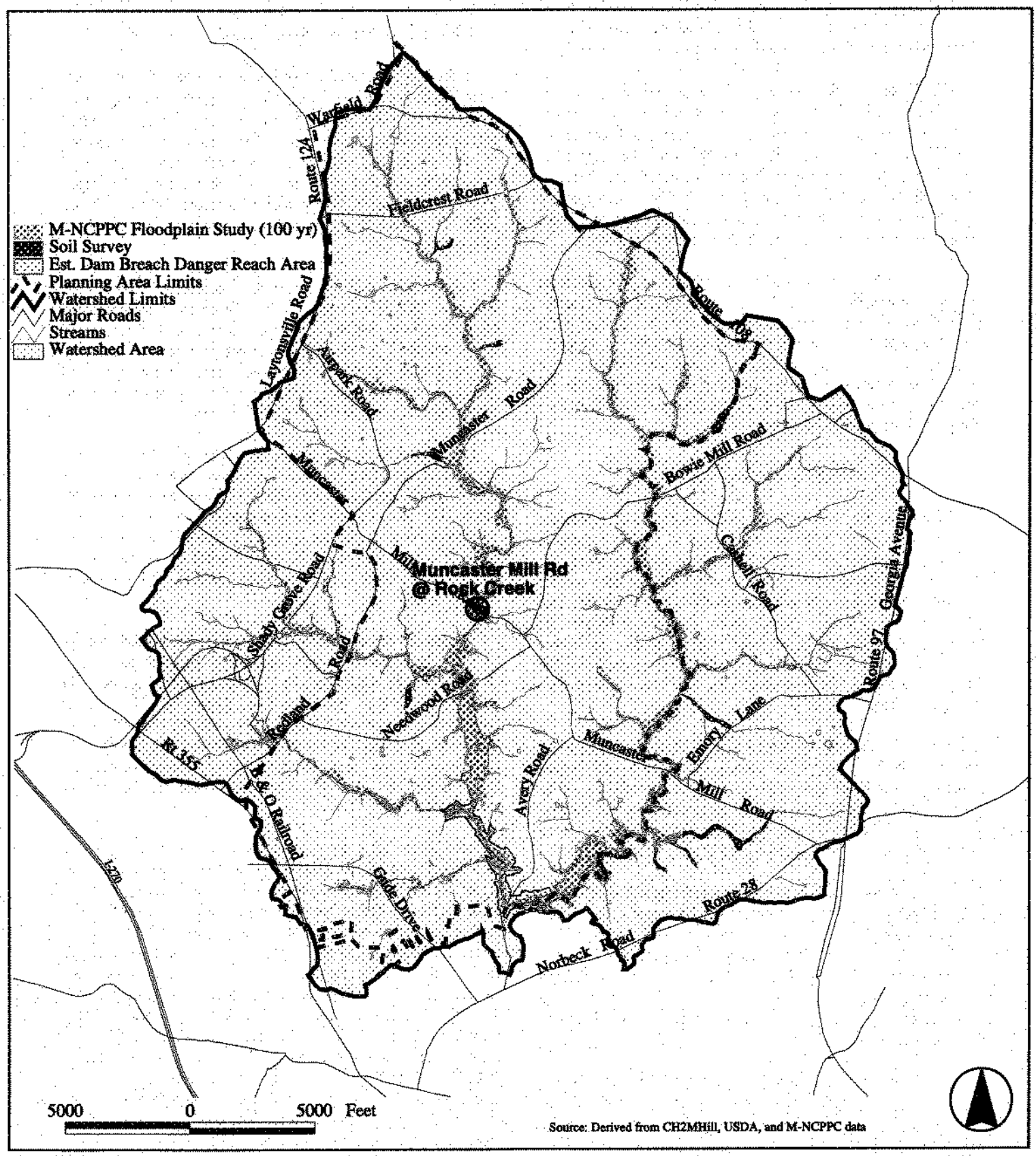
Lake Frank is located on the North Branch of Rock Creek between Manor Run and the Rock Creek mainstem. Under normal conditions, the water surface of Lake Frank covers 54 acres. The lake was designed to detain up to approximately 3,400 acre-feet (1.1 billion gallons) of floodwater, and retain up to 261 acre-feet (420,000 cubic yards) of sediment from upstream tributaries to the North Branch (Montgomery County 1962).

The lakes were originally designed to reduce flood damage to park facilities, roadway crossings, utilities and other structures by 62 percent, and to reduce sediment deposition in Rock Creek and the Potomac River by 50 percent (Montgomery County 1962). They mitigate the effects of increased flooding and erosions, which is attributed to uncontrolled runoff generated mostly by older developments built prior to the County stormwater management requirements.

The lakes were designed with a 50-year life span for sediment retention. However, increased erosion and sediment transport due to upstream land use have resulted in premature filling of the lakes. The present condition of both lakes is eutrophic. Increased nutrient and sediment deposition in the lakes is threatening water quality and gradually decreasing their functionality for both recreation and stormwater management. Periodic dredging and removal of sediment is required to maintain the lakes in good condition. This particular issue is addressed in the M-NCPPC Master/Management Plan for the Rock Creek Regional Park (M-NCPPC 1998). Among the recommendations of the Master/Management Plan is that a lake management plan be developed for lakes Frank and Needwood in order to address the sedimentation and eutrophication of both lakes.

Floodplain and Dam Breach Danger Reach Area

Figure 14



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, soil 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 on Upper Rock Creek consists of the M-NCPPC ultimate land use 100-year floodplain maps. These maps were developed in the late 1970's, 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 M-NCPPC floodplain maps depict in detail 1,328 acres of calculated 100-year floodplain area in the upper Rock Creek watershed. The floodplain maps are based on a detailed hydrologic study of larger tributaries. The study is documented in the *Rock Creek Stormwater & Water Quality Management Study* report (CH2MHill, 1977). 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 study. Approximately 70 acres of additional floodplain soils are depicted on the soils maps, bringing the total identified floodplain areas to nearly 1,400 acres.

The 100-year floodplain areas are contained mostly within parkland. Based on the 1997 M-NCPPC GIS coverages of parks, about 1,160 acres, or 83 percent, of the identified floodplain areas are contained within parklands. The known or estimated 100-year floodplain outside parkland consists of areas associated with smaller headwater tributaries.

The 1977, CH2MHill study included the only comprehensive floodplain analysis of Rock Creek. It identified seven roadway stream crossings in Upper Rock Creek that were subject to frequent flooding. Since then, structural improvements at several of these crossings, most notably Avery Road at Rock Creek, Southlawn Lane at Rock Creek, and Redlands Road at Crabbs Branch have substantially reduced flooding frequency.

Today, the Montgomery County Department of Public Works and Transportation (DPWT) and the Maryland State Highway Administration (SHA) maintain a list of roadway locations in Montgomery County that experience frequent flooding. According to the DPWT list, one crossing which was identified in the CH2MHill report, Muncaster Mill Road at Rock Creek, still floods too frequently and should be improved.

Dam Breach

Lake Needwood and Lake Frank are classified by Maryland Department of the Environment (MDE) as high hazard dams. This classification recognizes the potential damage downstream should the dams fail. According to the Emergency Action Plan approved by MDE for the two lakes, the dam breach danger reach area, as determined by DNR in 1983, extends downstream of the lake to the District of Columbia/Montgomery County line. Figure 14 depicts the approximate danger reach are within the Upper Rock Creek planning area only.

Groundwater

Groundwater and surface streams are interconnected by the constant recharge of surface water into the ground, and discharge of groundwater to the surface. Fluctuations in the quality and quantity of groundwater usually impact surface waters, and vice versa.

In areas 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) which may contribute to groundwater pollution. Known sources of groundwater pollution include excessive application of fertilizers and pesticides, improper land disposal of hazardous substances, and recharge from heavily contaminated surface streams.

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.

The *Rock Creek Stormwater & Water Quality Management Study* report (CH2MHill, 1977) provides a summary of the information available relative to groundwater quantity in the Upper Rock Creek area. The report indicated that the highest groundwater yields are generally associated with the thick saprolite of topographically elevated areas over gneiss and schist formations. Lower yields are encountered in topographically depressed areas, and areas overlying mafic rocks and quartz bodies (see Figure 3).

Montgomery County has recently initiated a County-wide

groundwater protection strategy to guide public and private sectors in watershed planning. The results of this major effort were not available at the time this report was completed. In the absence of a County-wide groundwater protection strategy, watershed specific issues pertaining to groundwater in the upper Rock Creek watershed will be examined during the environmental analysis phase following this inventory and will be documented in a separate report.

Sensitive Areas and Wetlands

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. The sensitive area definition includes undeveloped areas, as well as existing conforming and non-conforming development. Sensitive area statistics in this report represent wetlands and sensitive areas that meet the State definition regardless of development status and/or conformance with local and State environmental guidelines and regulations. They do not represent a direct measure of protected or undisturbed sensitive areas in the watershed.

Sensitive areas in the Upper Rock Creek are uniformly distributed across the watershed, and are generally contained within the stream valleys (see Figure 15). Sensitive areas cover roughly 3,900 acres extending over approximately 20 percent of the watershed area. About 55 percent of all sensitive areas, including 69 percent of wetlands and wetland buffers (75 percent of wetlands exclusive of wetland buffers), 83 percent of floodplain, and 75 percent of steep and erodible soils in the upper Rock Creek watershed are contained within parkland (see Table 8). The majority of sensitive areas outside parkland consist of headwater stream buffers.

Chapter 2 provides a detailed definition of sensitive areas and associated policies under Sensitive Area Protection and Biodiversity.

The Appendix provided a description of the components that make up the sensitive area coverage.

Air Quality

The entire Washington metropolitan region, which includes all Montgomery County, is currently classified as a "serious" non-attainment area with regard to ground-level ozone. Exposure to excessive ground-level ozone can pose significant health risks to humans.

Ground-level ozone is an invisible gas formed when two pollutants – volatile organic compounds (VOCs) and nitrogen oxides (NOx) -- react to sunlight. The primary sources of these pollutants are emissions from power plants of utilities and other industries, motor vehicles, small gasoline powered engines, and small businesses that use solvents and cleaning solutions, paints, cleaners and insecticides.

On a typical summer day, over half the pollutants that cause ozone in the Washington region come from sources outside the region. Some sources are in 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.

Since 1990, the Washington metropolitan region has exceeded the federal one-hour ozone standard, on average, six days every summer. Today, the region faces the challenge of meeting stricter 1997 EPA standards for ozone and particulates.

To achieve air quality attainment goals, development needs to concentrate in areas served by public infrastructure and transit as stated in the General Plan. Other policies include promotion of transit, trip mitigation measures, cluster and mixed use development, carpool lanes, etc. The main approach used in master planning is to reinforce and implement the General Plan by emphasizing access to transit, bikeways, and sidewalks.

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

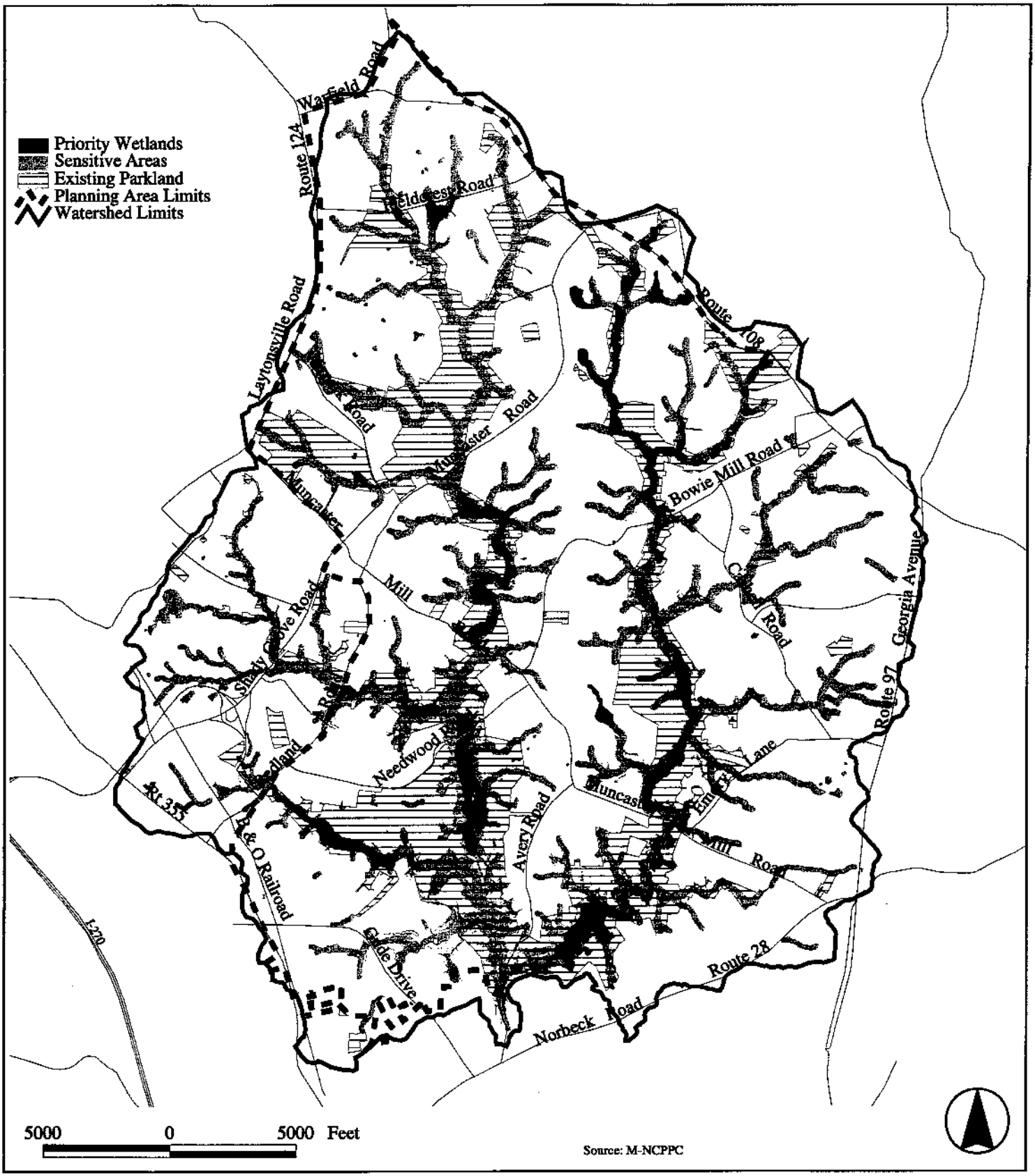
Noise

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 individual and by the type of noise. Mobile sources of nuisance noise in the upper Rock Creek watershed include traffic-generated noise along major roadways and aircraft noise near the Montgomery County airpark (north of the intersection of MD 124 and Muncaster Mill Road). General motor vehicle traffic volume is the most prevalent noise source due to the distribution of roads throughout the upper Rock Creek watershed. Aircraft noise from the airpark continues to be a nuisance to surrounding areas rather than a health problem.

Noise is expressed in 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 night time noise. Humans experience increased levels of interference with sleep, speech and communication at an Ldn level between 55 and 65 dBA.

Sensitive Areas and Priority Wetlands

Figure 15



Sensitive Areas, Forest, and Agriculture[1]

Table 8

Resource Type	Resource Area in Parkland[2]			Resource Area outside Parkland			Total Resource Area	
	Acres	% of total watershed[3] area	% of total resource area	Acres	% of total watershed[3] area	% of total resource area	Acres	% of total watershed[3] area
Combined Sensitive Areas[4]	**2,166**	**11.5**	**55.7**	**1,721**	**9.1**	**44.3**	**3,887**	**20.6**
Wetlands & Wetland Buffers[5]	985	5.2	69.0	442	2.3	31.0	1,427	7.5
Floodplain[6]	1,162	6.2	83.2	234	1.2	16.8	1,396	7.4
Minimum Stream Buffer[7]	1,470	7.8	51.5	1,386	7.3	48.5	2,856	15.1
Steep slopes & Erodible soils[8]	471	2.5	74.6	160	0.8	25.4	631	3.3
Forest[9]	**2,830**	**15.0**	**57.1**	**2,125**	**11.3**	**42.9**	**4,955**	**26.2**
Agriculture[10]	**425**	**2.2**	**21.7**	**1,532**	**8.1**	**78.3**	**1,957**	**10.3**

(1) Parkland, sensitive areas, forest, and agricultural areas overlap significantly (e.g., forest may be partly within sensitive areas). The corresponding acres and percent figures in each column should not be arithmetically summed as this may result in double counting of the same geographic area.

(2) GIS coverage of existing Parkland, M-NCPPC 1997.

(3) Total watershed area is 18,860 acres. Rounded to nearest 1 percent.

(4) 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). The corresponding acres and percent figures in each column should not be arithmetically summed as this may result in double counting. See Appendix for a more detailed definition of sensitive areas.

(5) GIS coverage of wetlands on DOQQ base, Earth Data,1998. Wetlands buffers range from 25 feet to 100 feet depending on state designated stream water Use, stream order, adjacent slopes and erodibility of adjacent soils per M-NCPPC *Environmental Guidelines*.

(6) GIS coverage of M-NCPPC 100-year floodplain maps (ultimate land use), and GIS coverage of floodplain soils from 1995 *Soil Survey of Montgomery County*.

(7) Minimum stream buffer width is 150 feet for state designated Use III streams, and 125 feet for Use IV streams, per M-NCPPC *Environmental Guidelines*.

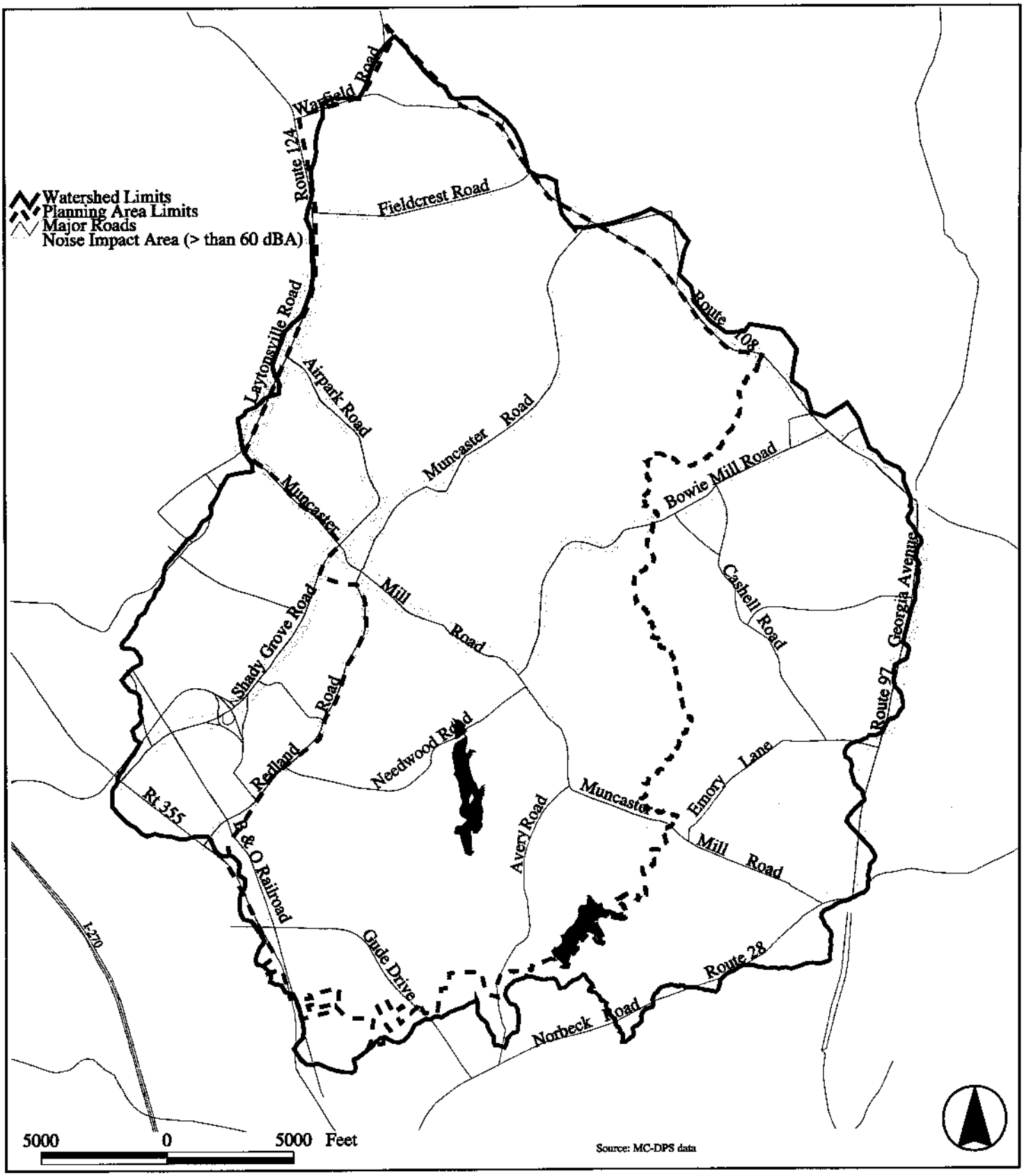
(8) GIS coverage of slopes interpreted from 1993-1995 aerial topography, M-NCPPC 1997. Steep slopes defined as slopes 25% or greater that are adjacent or intersecting the minimum stream buffer. Soil erosion potential obtained from GIS coverage of 1995 *Soil Survey of Montgomery County*. Erodible soils are defined as soils with high erosion potential located on a 15% or greater slope adjacent to the minimum stream buffer.

(9) GIS coverage of forest interpreted from 1994-1995 aerial photography, M-NCPPC 1999.

(10) GIS planimetric coverage of crop land, nurseries/orchards, and pasture land, M-NCPPC 1993-94.

Traffic Noise Impact Areas

Figure 16



Aircraft Noise

Aircraft noise at the Montgomery County airpark is in compliance with the Federal Aviation Administration (FAA) regulations. The type of land use within the flight path of the runways in the upper Rock Creek basin has taken into consideration noise generated by incoming and departing flights. East of MD 124, the Pope Farm Nursery has been maintained, in part, to serve as a buffer for air traffic. The placement of industrial zones in this area also limit human exposure to high noise levels. A study conducted in July 1991 indicates that the aircraft noise levels in the vicinity of the airpark are within the limitations set by FAA regulations. Air traffic, however, remains a source of nuisance noise.

Roadway Noise

The *Noise Guidelines* (M-NCPPC, June 1983) set attainable goals for all areas of the County. For the upper Rock Creek watershed, an attainable goal of 60dBA Ldn has been selected given its medium to low density residential 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 were computer-generated using an approved Federal Highway Administration model. The 60dBA Ldn contours that extend beyond the right of way are depicted in Figure 16. The noise model does have limitations as it does not account for the influence of existing noise barriers.

The noise contour map can be used to identify where existing houses and other noise sensitive uses are currently impacted by excessive noise. The map also identifies those vacant or redevelopable properties that will be affected should they develop or redevelop in the future. The master plan process allows planners to 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 afflicted areas, i.e. special exceptions.

The noise contour map will be used during the revision to the Upper Rock Creek master plan to determine appropriate land uses for properties within the contour lines. It is intended to serve as a planning level map only. It does not provide the level of accuracy needed to determine site specific noise impacts.

Solid Waste/Landfills

The Upper Rock Creek planning area has no operating landfills within its boundaries. The Gude landfill was closed in June 1982. The Oaks landfill, which is adjacent to but outside the upper Rock Creek watershed in Laytonsville, was closed in October 1997. No other County solid waste facilities are planned in the upper Rock Creek watershed.

An existing methane recovery system at the Gude landfill site collects methane gas generated by the break-down of organic matter and produces electricity. Plans for future uses of the site, including recreational opportunities, have not been finalized. Continued ground settling in areas of the site where refuse was entrenched precludes the construction of permanent facilities.

The Oaks landfill ceased operation by action of the County Council in October 1997. The landfill site is located just outside the planning area, but Fieldcrest Road, MD 124 and Airpark/Shady Grove Road were haul routes for truck traffic between the landfill and the solid waste transfer station at the intersection of Shady Grove Road and MD 355.

During the past year, trucks have hauled cover material into the landfill to cap the work areas. This closure process will continue for another 18 months. Future use of the site has not been determined, but some type of recreational use is possible, especially in the buffer area surrounding the landfill.

Water Supply and Sewerage Systems

The community water and sewer systems in the Upper Rock Creek are operated and maintained by the Washington Suburban Sanitary Commission (WSSC). The lines were incrementally extended into this basin to serve the growth areas identified in the master plan under the policies of the *Montgomery County Comprehensive Water Supply and Sewerage Systems Plan* (Water and Sewer Plan). This plan governs the extension of the County's water and sewer lines and generally provides for service to property zoned for one-half acre lots or denser. Exception to this general policy will be discussed further in this report.

Given the high stream water quality in the upper Rock Creek basin, the 1985 master plan chose to place the upper basin (north of Muncaster Mill Road), in a zoning category that did not require sewer service in order to: 1) limit the impacts of impervious land cover, and 2) avoid destruction of riparian habitats due to sewer construction. Areas not served by water and/or sewer depend on individual water wells and/or individual, on-site, waste disposal (septic) systems. The concept of maintaining a low density area is consistent with the vision of the green wedge in the General Plan. To date, the stream water quality in the green wedge has

remained good to excellent.

Service Areas

The current water and sewer envelopes are depicted in figures 17 and 18. Most properties zoned R-200, PD, commercial or industrial have received community water and sewer service. This includes specific properties immediately abutting the north side of Muncaster Mill Road and the east side of Woodfield Road, with the exception of properties within the triangle formed by Dorsey Road, Warfield Road and MD 108, where sewers have not been extended. Water service has been extended to much of the basin. The Keys and Barnsley properties, in the Olney planning area on the west side of the watershed, have been provided service.

Water Service

Potable water is provided by the WSSC from the Patuxent and Potomac water treatment plants. A number of water storage facilities and pumping stations are located in the planning area to transmit water.

Sewer Service

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. The mainstem of Rock Creek and the North Branch have large trunk lines that convey flows from the planning area south to the District of Columbia's Blue Plains sewage treatment plant.

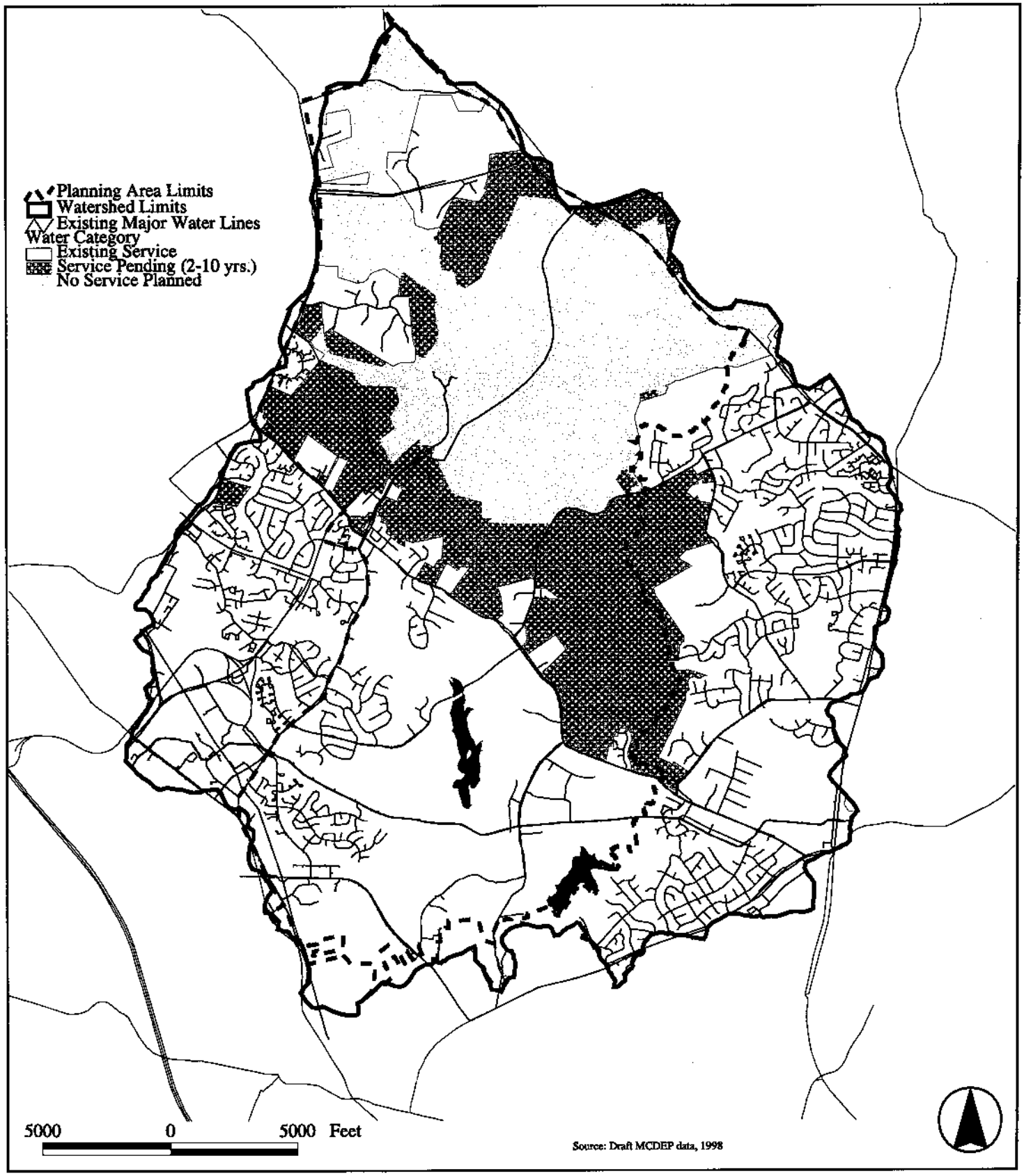
Sewer Constraints

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 meet the capacity limitations. While this does not directly affect the Upper Rock Creek watershed, it is a system-wide concern.

The WSSC has also identified segments of the North Branch 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.

Water Service Areas

Figure 17



Sewer Service Areas

Figure 18