

Appendix A: Watershed Workbook

The watershed workbook is a reader-friendly document that is designed to provide the residents and stakeholders of the Nichol Run and Pond Branch watersheds with information about their watersheds. The watershed workbook describes the watershed study methodology and summarizes the County-wide goals and objectives. The watershed workbook characterizes the existing state of the watersheds and describes the various methods and tools used in the evaluation of all the watershed management areas within the Nichol Run and Pond Branch watersheds. The watershed workbook is a draft document that contains the information and modeling results available at the time and has not been, and will not be, updated or finalized.

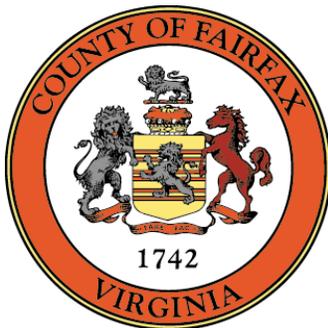
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Nichol Run and Pond Branch Watersheds

Watershed Workbook

DRAFT

January 2009



Fairfax County Department of Public
Works and Environmental Services

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**NICHOL RUN
AND
POND BRANCH
WATERSHED WORKBOOK**

DRAFT

January 2009

Prepared for:

County of Fairfax
Watershed Planning and Assessment Branch
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1.0 Introduction

1.1 Background, Goals and Objectives

Fairfax County is located in the Northeastern part of the Commonwealth of Virginia. Thirty watersheds comprise Fairfax County, including the Nichol Run and Pond Branch watersheds, as shown in Figure 1.1. In order to comply with the Chesapeake Bay 2000 Agreement, the Fairfax County Department of Public Works and Environmental Services Stormwater Planning Division is in the process of developing and implementing watershed management plans for all 30 watersheds. The watershed management plans aim to evaluate the interactions between pollutant sources, watershed stressors, and conditions within streams and other waterbodies. The county will use the information from these plans to prioritize watershed restoration and protection projects.

The county has developed goals and objectives to be applied to all watersheds during the watershed management plan development process. The countywide goals and objectives will allow plan recommendations to be linked to the Countywide Watershed Assessment. The Countywide Watershed Assessment methodology will be used to measure and track future achievement of watershed management plan goals and objectives. According to the Fairfax County WMP Subwatershed Ranking Approach (Tetra Tech, 2008), the countywide watershed planning goals are to:

1. Improve and maintain watershed functions in Fairfax County, including water quality, habitat, and hydrology.
2. Protect human health, safety, and property by reducing stormwater impacts.
3. Involve stakeholders in the protection, maintenance and restoration of county watersheds.

The county has developed countywide objectives that are linked to the above goals, as presented in Table 1.1. This table also shows how each objective is linked to the three watershed planning goals.

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0 0.5 1 2 3 Miles

Fairfax County Boundary
 Watershed Boundaries

Figure 1.1
Fairfax County Watersheds

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Table 1.1 Fairfax County Watershed Planning Final Objectives

Objective	Linked to Goal(s)
CATEGORY 1. HYDROLOGY	
1A. Minimize impacts of stormwater runoff on stream hydrology to promote stable stream morphology, protect habitat, and support biota.	1
1B. Minimize flooding to protect property and human health and safety.	2
CATEGORY 2. HABITAT	
2A. Provide for healthy habitat through protecting, restoring, and maintaining riparian buffers, wetlands, and instream habitat.	1
2B. Improve and maintain diversity of native plants and animals in the county.	1
CATEGORY 3. STREAM WATER QUALITY	
3A. Minimize impacts to stream water quality from pollutants in stormwater runoff.	1, 2
CATEGORY 4. DRINKING WATER QUALITY	
4A. Minimize impacts to drinking water sources from pathogens, nutrients, and toxics in stormwater runoff.	2
4B. Minimize impacts to drinking water storage capacity from sediment in stormwater runoff.	2
CATEGORY 5 STEWARDSHIP	
5A. Encourage the public to participate in watershed stewardship.	3
5B. Coordinate with regional jurisdictions on watershed management and restoration efforts such as Chesapeake Bay initiatives.	3
5C. Improve watershed aesthetics in Fairfax County.	1, 3

Source: Fairfax County WMP Subwatershed Ranking Approach, Tetra Tech, 2008.

1.2 Watershed Workbook Organization

This watershed workbook is designed to provide the residents and stakeholders of the Nichol Run and Pond Branch watersheds with information about their watersheds. This will help create a more informed public and encourage participation in the watershed planning and restoration process.

This watershed workbook contains the following information in each chapter.

- Chapter 1 Introduction** - Compilation of Overall Watershed Condition Data
- Chapter 2 Watershed Study Methodology** – Description of Methodologies Used
- Chapter 3 Nichol Run Watershed Study** – Nichol Run Preliminary Results
- Chapter 4 Pond Branch Watershed Study** – Pond Branch Preliminary Results
- Chapter 5 Glossary**

1.3 Watershed History and Condition

1.3.1 General Watershed Characteristics

The Nichol Run and Pond Branch watersheds are located in the Northern portion of Fairfax County, as shown in Figure 1.2. Both watersheds are described in detail below.

Nichol Run

The Nichol Run Watershed is comprised of Nichol Run, Harkney Branch, Jefferson Branch, and the Potomac Headwaters. Nichol Run flows north from its origin near Georgetown Pike and discharges to the Potomac River. Harkney Branch originates near Beach Mill Road and flows east to its confluence with Nichol Run. Jefferson Branch originates near Seneca Road, flows north and east, and discharges into Nichol Run. The Potomac Headwaters flow northeast discharging into the Potomac River. The Nichol Run Watershed has a drainage area of approximately 8.2 square miles and a total of approximately 31.8 miles of perennial streams.

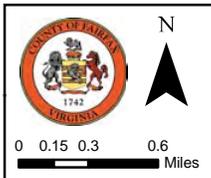
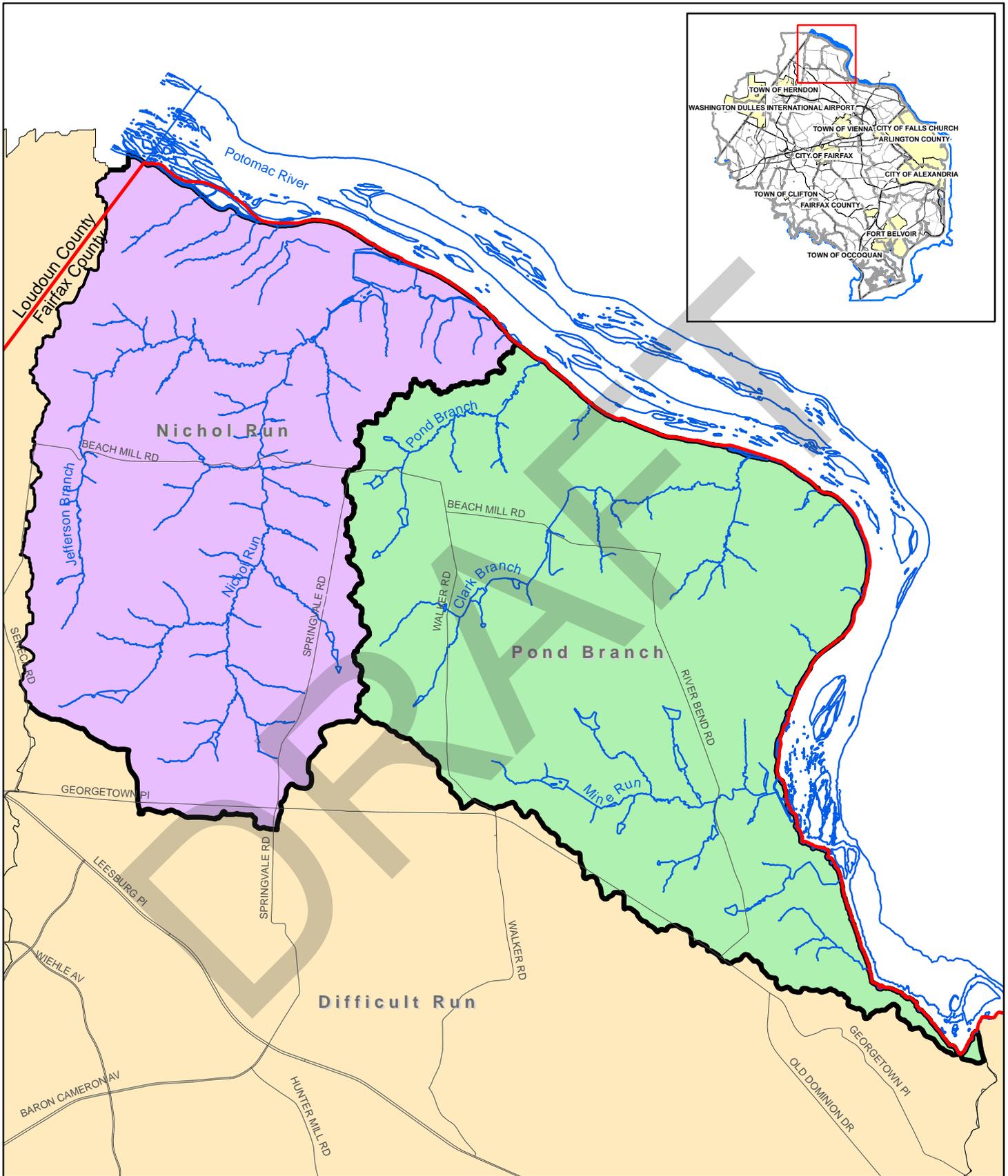
Pond Branch

Pond Branch Watershed is comprised of Pond Branch, Mine Run Branch, Clarks Branch, and Potomac Headwaters. Pond Branch flows northeast from its headwaters near Beach Mill and Springvale Roads and disperses into the Potomac River. Mine Run Branch originates near Walker Road and Georgetown Pike and flows eastwards into the Potomac River. Clarks Branch originates to the west of Walker Road and flows northeast into the Potomac River. The Pond Branch Watershed has a drainage area of approximately 8.5 square miles and a total of approximately 23.8 miles of perennial streams.

1.3.2 Watershed History and Population Growth

Watershed History

The Nichol Run and Pond Branch watersheds have an interesting history. The earliest public works project undertaken in the watersheds of northwestern Fairfax County was the construction of the “Potowmack Canal”. The proposed canal consisted of locks at Great Falls and Pond Branch. George Washington submitted the canal proposal and it was called “the first major public improvement project in the Nation’s history.” The canal was built between the years of 1785 and 1789. George Washington and his business partner, General Richard Lee, established a town strategically situated near the canal in Pond Branch watershed which would grow into a major trade center. In the late 1700’s, the settlement of Matildaville (after General Lee’s first wife) was founded near the Great Falls of the Potomac River. After commerce along the town dwindled, the town was abandoned (Parsons, Brinckerhoff, Quade, and Douglas, 1977).



-  Perennial Streams
-  Fairfax County Boundary
-  Pond Branch
-  Nichol Run
-  Other Fairfax County Watersheds

**Figure 1.2
Nichol Run and
Pond Branch
Watershed Location Map**

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Population Growth

There was very little growth within the Nichol Run and Pond Branch watersheds toward the end of the 19th century. A Bureau of topographic Engineers map from 1862 shows cultivated fields in the Pond Branch watershed and large forested areas in the Nichols Run watershed. In 1879 the Pond Branch and Nichol Run watersheds were among the least densely settled in the entire county with 0.0019 and 0.0015 houses per acre, respectively. In the 1970s there was some development of moderate and low density housing in the Nichol Run and Pond Branch watersheds (Parsons, Brinckerhoff, Quade, and Douglas, 1977).

In 1900 Fairfax County was largely agricultural, with dairy farming being the most important single industry. The population was just over 12,000. Four decades later, the population was still under 50,000. Beginning in the early 1940s, the county's economy shifted from agriculture to largely commercial. After World War II many people moved into Fairfax County from Washington, D.C. During this time the population grew from roughly 50,000 to 500,000. In the 1970s the population of Fairfax grew to almost 900,000 residents. This dramatic suburban expansion was driven by technology-based businesses which were less dependent on urban centers than conventional industry (Fairfax County, 2001). Today, Fairfax County is the most populous jurisdiction in Virginia and the Washington D.C. metropolitan area, with the 2005 population estimated at 1,047,500, with 387,700 households (Fairfax County, 2006a).

Infill Development in Fairfax County

In July 2000, the Fairfax County Departments of Planning and Zoning, Transportation and Public Works, and Environmental Services prepared a report that evaluated issues and provided recommendations for improving the manner in which residential infill development occurs in the county, with the primary focus being the impacts of new residential development on the immediate surroundings (Fairfax County, 2006b). "Infill development" in Fairfax County refers to activities such as demolishing an existing home and building a larger home on the same lot; subdividing a single lot into two or more building lots; developing one or more new residences on an undeveloped or underutilized site within an existing, established neighborhood; developing a relatively large subdivision that is surrounded by other recently developed subdivisions; or redeveloping an existing subdivision. The report includes recommendations to address the compatibility of infill development with the existing neighborhood/area, traffic flow and cut-through traffic, tree preservation and the preservation of open space in the neighborhood, and stormwater management and erosion and sediment control.

1.3.3 Existing and Future Land Use

Fairfax County encompasses an area of approximately 395 square miles. The land use is primarily residential, with smaller areas of commercial, recreational, and open land uses. The county is largely developed, and is approaching maximum build-out conditions (Fairfax County, 2006a). According to the 1999 Demographic Reports Document, only 17.3 percent of the land area is considered underutilized residential, vacant residential or nonresidential land (Fairfax County, 2001).

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The Fairfax County Stormwater Planning Division has created standard land use categories to unify watershed management planning throughout the county. The categories are assigned a code for easy identification. The Fairfax County land use categories are presented in Table 1.2.

Table 1.2 Generalized Land Use Categories

<i>Land Use</i>	<i>Code</i>	<i>Description</i>
<i>Open Space</i>	OS	Open space, parkland, or vacant land
<i>Estate Residential</i>	ESR	Single-family detached greater than 2 acres per residence
<i>Low Density Residential</i>	LDR	Single-family detached 0.5-2 acres per residence
<i>Medium Density Residential</i>	MDR	Single-family detached less than 0.5 acres per residence and multifamily residential less than 8 dwelling units per acre
<i>High Density Residential</i>	HDR	All residential less than 0.125 acre per residence (8 or greater dwelling units per acre)
<i>Low Intensity Commercial</i>	LIC	Commercial uses including low rise and limited offices and neighborhood retail
<i>High Intensity Commercial</i>	HIC	Commercial uses including high density offices and highway retail
<i>Industrial</i>	IND	Industrial uses
<i>Golf Course</i>	GC	Golf courses, originally considered open space
<i>Water</i>	WATER	Perennial streams buffered 10'
<i>Institutional</i>	INT	School or institutions, originally considered LIC
<i>Transportation</i>	TRANS	Transportation, areas not represented by parcels

Source: County of Fairfax Department of Public Works, 2003

According to Technical Memorandum No. 3, prepared by County of Fairfax Department of Public Works (Fairfax County, 2003), the Nichol Run Watershed comprises 4,918 acres, of which 1,222 are vacant and 311 are underdeveloped. Approximately 31 percent of the watershed is not fully developed. The Pond Branch Watershed comprises 5,366 acres, 605 of which are vacant and 271 of which are underdeveloped. Approximately 16 percent of the watershed is not fully developed. Figure 1.3 shows the existing and future land use by category in the Nichol Run and Pond Branch watersheds.

The future land use conditions are defined by the planned land use and the zoned land use. If the planned and zoned land uses conflict, the classification with the greatest density was used to evaluate future conditions. The results derived from these maps will be discussed in greater detail in future chapters.

1.3.4 Aquatic Environment

The overall quality of aquatic environments is dependent on many interconnecting factors. Major factors include water quality, stream habitat, and vegetative cover. Due to the changing

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relationship of these factors, the analysis of aquatic life, including benthic macroinvertebrates and fish populations, can better represent overall stream health.

Habitat Studies

An Environmental Baseline report was prepared by Parsons, Brinckerhoff, Quade, and Douglas in 1977 to assess changes within the Fairfax County watersheds, provide a general environmental framework for the development of the master plan for flood control, and aid in predicting the environmental effects of proposed improvements. According to the report, areas with upland hardwood forests, softwood forests, abandoned fields, floodplain forests, floodplain meadows, tidal fresh marshes, and hemlock cove forests (considered good to excellent wildlife habitats) were the most common throughout the Nichol Run and Pond Branch watersheds, with particularly high terrestrial habitat quality. Due to the high habitat quality, animal population and diversity were high, with more wood turtles found in the area than anywhere else in the county. The aquatic field studies were also very favorable. The test sites within the Nichol Run Watershed ranged from good-very good on the Jefferson Branch, Nichol Run ranked fair-good and the Pond Tributary was ranked as good. The Pond Branch sites ranged from good-very good on the Clarks Branch, ranked good on Mine Branch and along the Potomac River ranking was good-fair. Overall the ranking of the Nichol Run and Pond Branch watersheds is good.

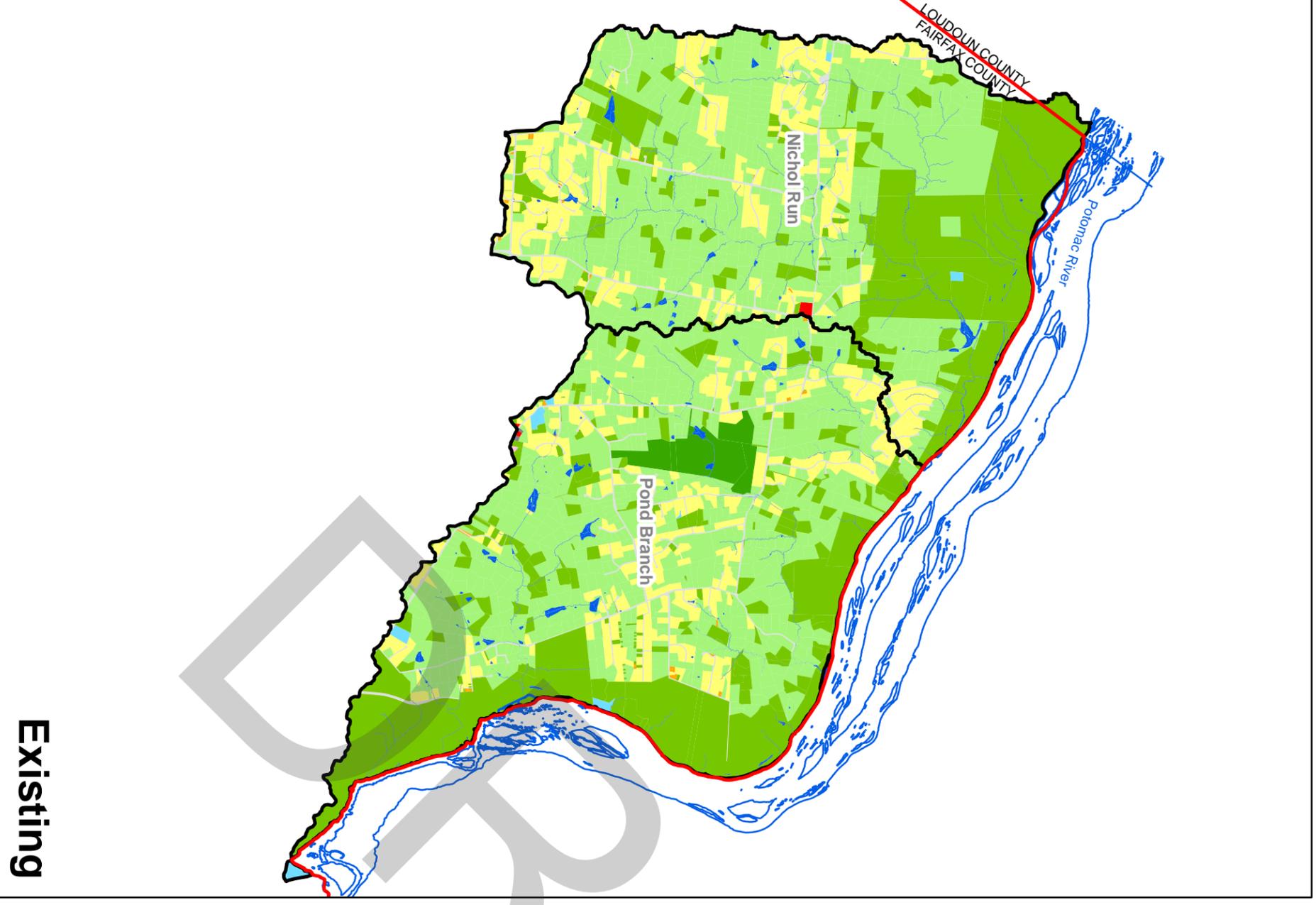
The Fairfax County Stream Protection Strategy program (Fairfax County, 2001) focused on recommendations for protection and restoration activities on a subwatershed basis, prioritization of areas for allocation of limited resources, establishment of a framework for long-term stream quality monitoring, and support for overall watershed management. Detailed biological and habitat data were collected in 2001 from three testing sites located within the Nichol Run watershed and three sites in Pond Branch watershed. All of the sites surveyed received ratings of good, with the exception of the Mine Run Branch in the Pond Branch Watershed which received a rating of excellent. The watersheds represent some of the least degraded systems in Fairfax County. Based to their exceptional nature, the Nichol Run and Pond Branch Watersheds have been designated as Watershed Protection Areas. The goal for the watersheds is to preserve biological integrity by taking active measures to identify and protect, as much as possible, the conditions responsible for current high quality ratings (Fairfax County, 2001).

Stream Physical Assessment

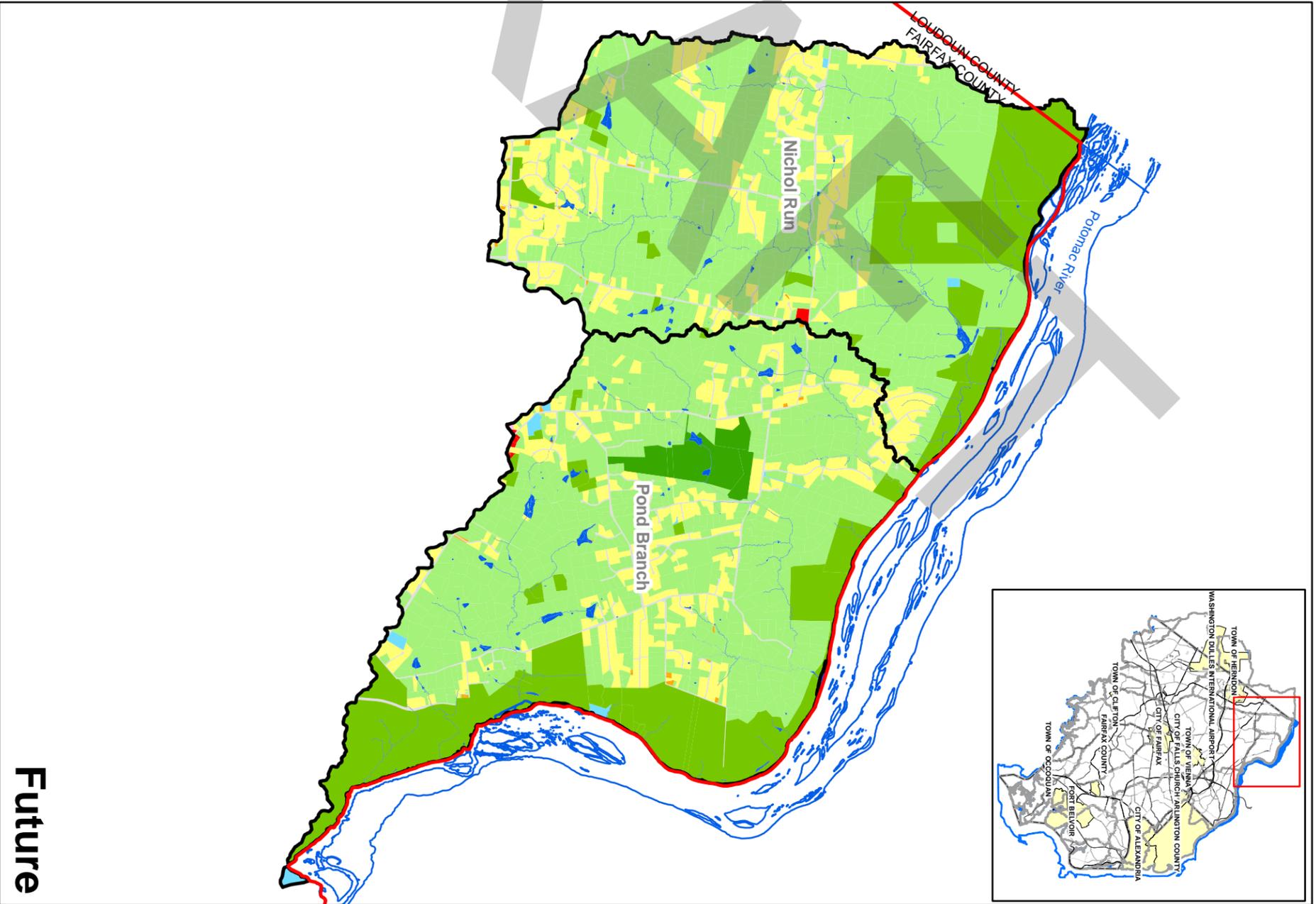
Fairfax County conducted a stream physical assessment in 2005 to obtain baseline data for county streams (CH2MHill, 2005). The streams were evaluated based on habitat conditions, impacts to the stream from infrastructure and problem areas, general stream characteristics and geomorphic classification. The overall goal of the stream assessment program was to provide a consistent basis for protecting and restoring the receiving water systems and other natural resources in Fairfax County.

Approximately 13.7 miles of Nichol Run were assessed. Over half of the miles assessed were placed in the good category. The rest of the stream miles were categorized as poor, fair, or excellent. Nichol Run is placed in the good overall habitat category. Approximately 17 miles of the Pond Branch were assessed, and the habitat quality covered the entire range. The majority of the stream was categorized as fair, but portions of the stream were poor, very poor, and good. The Pond Branch watershed is given a fair overall habitat classification.

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Existing



Future

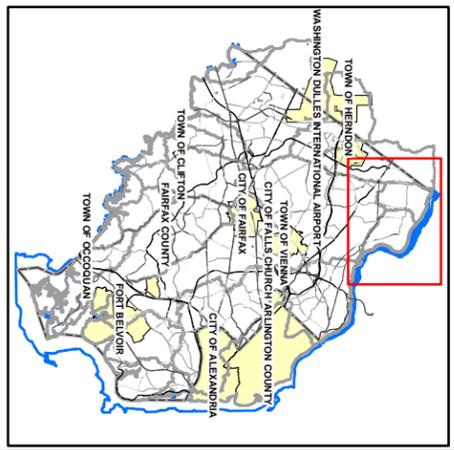


Figure 1.3
Existing and Future Land Use Map

	County
	Watershed
	Land Use
	ESR
	GC
	HDR
	HIC
	IND
	INT
	LDR
	LIC
	MDR
	OS
	TRANS
	WATER

0 0.2 0.4 0.6 Miles

N

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Stream geomorphology was also investigated as part of the stream physical assessment in 2005 to obtain baseline data for the county's streams. Stream geomorphology is the study of forces of water as it travels through the landscape. These forces create channels, floodplains, terraces and drainage patterns. They can help explain erosion, sediment transportation and sediment deposition. Geomorphic channel classifications were based on the Channel Evolution Model (CEM) developed by Schumm et al. (1984). The CEM characterized over 90% of the Nichol Run Watershed to be in Evolutionary Stage 3. This is the widening stage and is characterized by streambank sloughing, erosion on insides of bends, accelerated bed migration, and exposed bedrock. The majority of channels in the Pond Branch Watershed are also in Evolutionary Stage 3.

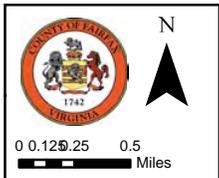
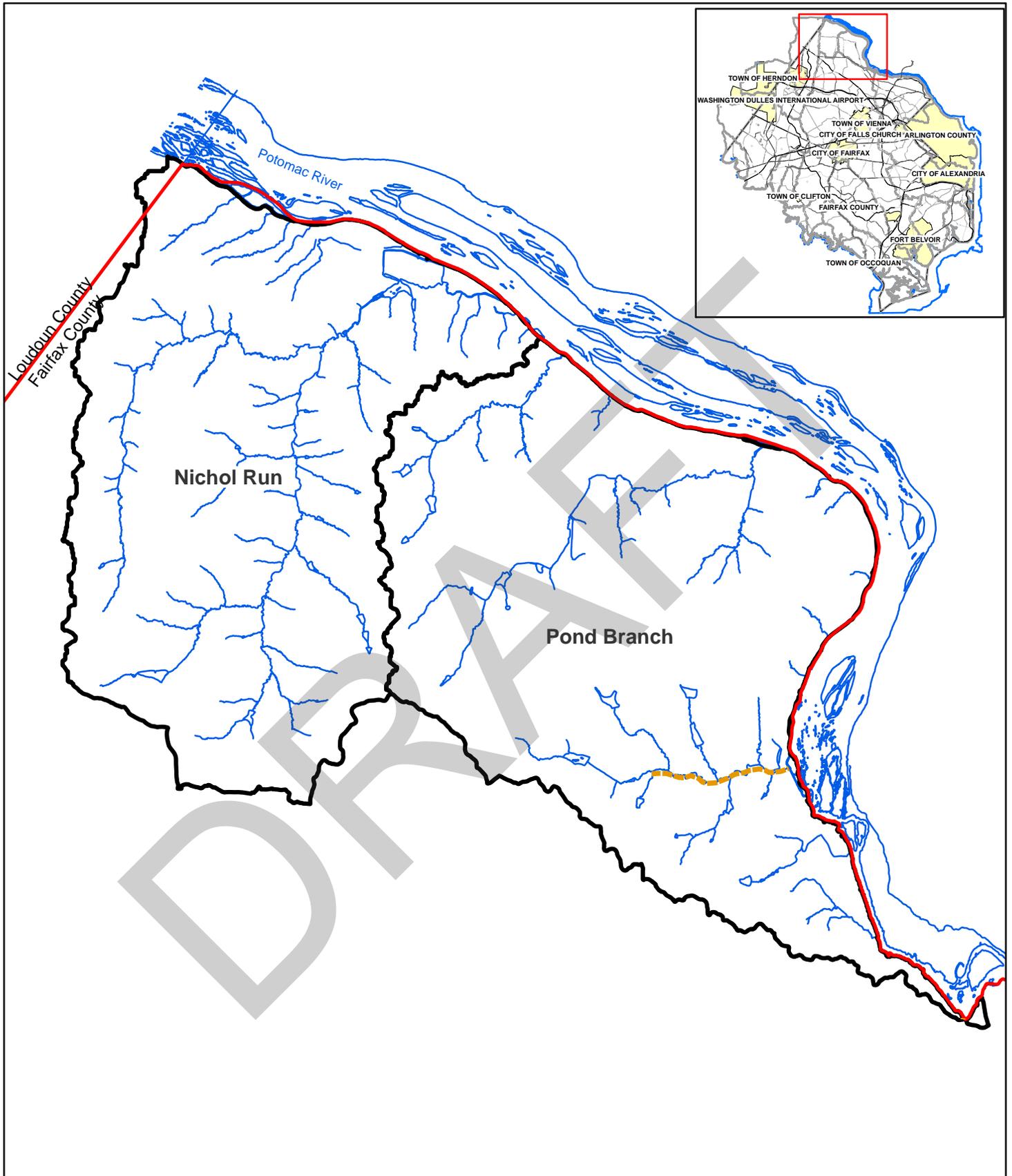
An infrastructure inventory was conducted as part of the 2005 stream physical assessment to identify impacts on the stream from specific infrastructure and problem areas. The study identified and characterized deficient riparian buffers, ditches, dump sites, erosion areas, head cuts obstructions, road crossings and pipes. Within the Nichol Run Watershed, 113 infrastructure points were identified with the most significant problems being headcuts and an obstruction. There were 143 infrastructure points within the Pond Branch Watershed with the most significant problems including a headcut, a deficient buffer, and an obstruction.

Impaired Waters

Section 305(b) of the U.S. Clean Water Act requires each state to submit a report on all information regarding its waters once every two years. Section 303(d) of the Clean Water Act requires a list of waters with impaired water quality for each state. Waters that are impaired due to human activities and pollutants require a total maximum daily load (TMDL) plan to restore their water quality. Once a TMDL is approved, a TMDL Implementation Plan is developed to restore impaired waters and maintain their improved water quality. The Virginia 2004 Integrated Water Quality Assessment Report (Virginia Department of Environmental Quality, 2004) provides information about the water quality conditions in Virginia from January 1, 1998 to December 31, 2002, and the Virginia 2006 Integrated Water Quality Assessment Report (Virginia Department of Environmental Quality, 2006) provides information about the water quality conditions in Virginia from January 1, 2000 to December 31, 2004.

The 2006 Integrated Report presents water quality assessment results for approximately 14,265 miles of free-flowing streams and rivers, or about 28.3 percent of Virginia's streams and rivers for which sufficient data were available. The leading cause of impairment of designated use was violation of the bacteria standards. Agricultural practices appear to be one of the primary sources contributing to bacteria standards violations. However, urban runoff, leaking sanitary sewers, failing septic tanks, domestic animals, and wildlife can be significant contributors. Figure 1.4 shows 303(d) impaired waters within the Pond Branch watershed, based on the 2006 Integrated Report. A total of 0.9 miles of Mine Run Branch is impaired along the main stem and continues downstream until the confluence with the Potomac River. Mine Run Branch was first listed as impaired for *Escherichia coli* bacteria (*E. coli*) in 2006, and therefore did not support the recreational use goal. There are no impaired waters in the Nichol Run Watershed.

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-  County Boundary
-  Watershed Boundary
-  Perennial Streams
-  303(d) Impaired Stream
Listed in 2006 for Exceedances
of E.coli Bacteria

Figure 1.4
Impaired Waters Map

11

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Wetlands

Wetlands are vital to the watershed ecosystem because they filter pollutants and sediments from stormwater, reduce flooding, provide wildlife habitat and function as a nursery for aquatic life food chains. There are approximately 13,000 to 18,000 acres of wetlands in Fairfax County. Non-tidal wetlands comprise approximately 7,000 to 10,000 acres of Fairfax County. The portion of Nichol Run Watershed located in Fairfax County contains 204 acres of non-tidal wetlands and the portion of the Pond Branch Watershed located in Fairfax County contains 52 acres of non-tidal wetlands (U.S. Fish and Wildlife Service, 2008).

In the Nichol Run Watershed, a majority of the wetlands are forested freshwater/shrub wetlands. These types of wetlands are dominant on the Potomac Headwaters, but are also found at the headwaters of Nichol Run and Jefferson Branch. Freshwater pond wetlands occur at a majority of the headwaters of all the streams in the Nichol Run Watershed.

In the Pond Branch Watershed, a majority of the wetlands are freshwater ponds and freshwater emergent wetlands forested freshwater/shrub wetlands. These types of wetlands can be found on the Pond Branch, Clarks Branch, Mine Run Branch and the Potomac Headwaters. Wetlands such as forested freshwater/shrub wetlands are located at the confluence and main stem sections.

1.3.5 Terrestrial Environment

Forest Resources

In the early 1600s, the Chesapeake Bay region was estimated to have 95 percent of its landmass covered by tree canopy. By the middle of the 19th century, historic evidence suggests that timber harvesting, agriculture, and fuel and military activities had reduced tree canopy levels to about 30 percent in Northern Virginia. With a sharp decrease in farming activities and an increase in land development in the early 1970s, Fairfax County's canopy cover rose to approximately 80 percent. Currently, the county's tree canopy cover is estimated at approximately 41 percent, or 104,000 acres of the county's 252,828 acres. The current tree canopy is comprised of 68 percent (70,720 acres) native forests and 32 percent (33,280 acres) planted landscape trees. There are areas with early succession-stage tree communities and areas dominated by invasive trees and non-native plant species. The present level of tree canopy corresponds closely to the 40 percent that is recommended by American Forests for communities east of the Mississippi River (Tree Action Plan Work Group, 2006).

The vision of the Fairfax County Tree Commission's Tree Action Plan is to leave the land, water, and air quality better than it was found. The recommended actions proposed within the plan are based on three framework goals.

1. Commit to preserving current tree assets by fostering health and regeneration of specimen trees and urban forest.
2. Enhance the legacy for future generations by increasing the quantity and quality of trees and wooded areas.
3. More effectively integrate urban forestry in planning and policy making (Tree Action Plan Work Group, 2006).

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Terrestrial Flora and Fauna

The Virginia Department of Conservation and Recreation's Natural Heritage Program (DCR-DNH) maintains a statewide inventory of plants, animals, natural communities, and other biological resources that are rare, threatened, endangered, or of special concern within the Commonwealth of Virginia. The database is updated annually as information becomes available to the department. In the Nichol Run and Pond Branch watersheds, many rare, threatened and endangered species were noted. They include species such as: Regal Fritillary (*Speyeria idalia*), Stripe-winged Baskettail (*Epithea costalis*), Midland Clubtail (*Gomphus fraternus*), Wood Turtle (*Glyptemys insculpta*), Smartweed Dodder (*Cuscuta polygonorum*), Wild Mock-cucumber (*Echinocystis lobata*) and Smooth Azalea (*Rhododendron arborescens*). See Table 1.3 for complete list of rare, threatened and endangered species within these watersheds.

Table 1.3 Rare, Threatened, and Endangered Species

Species	Occurrences Statewide	Species	Occurrences Statewide
COLEOPTERA (BEETLES)		LEPIDOPTERA (BUTTERFLIES & MOTHS)	
<i>Lordithon niger</i> (Black Lordithon Rove Beetle)	2	<i>Speyeria idalia</i> (Regal Fritillary)	34
COMMUNITIES		NON-VASCULAR PLANTS	
Black Mesic Forest	41	<i>Sphagnum subtile</i> (Delicate Peatmoss)	2
Black Oak-Hickory Forest	26	ODONATA (DRAGONFLIES& DAMSELFLIES)	
Coastal Plain/Piedmont Basic Seepage Swamp	17	<i>Epithea costalis</i> (Stripe-winged Baskettail)	4
Eastern Hemlock-Hardwood Forest	23	<i>Gomphus fraternus</i> (Midland Clubtail)	3
Floodplain Pond / Pool	3	<i>Gomphus ventricosus</i> (Skillet Clubtail)	3
Low-elevation Boulderfield Forest / Woodland	16	<i>Stylurus laurae</i> (Laura's Clubtail)	9
Mesic Mixed Hardwood Forest	27	REPTILES	
Montane Mixed Oak / Oak-Hickory Forest	19	<i>Glyptemys insculpta</i> (Wood Turtle)	39
Mountain / Piedmont Acidic Woodland	14	VASCULAR PLANTS	
Piedmont / Mountain Floodplain Forest	7	<i>Amelanchier nantucketensis</i> (Nantucket shadbush)	1
Riverside Outcrop Barren	2	<i>Arabis shortii</i> (Short's Rockcress)	4
Riverside Prairie	10	<i>Carex davisii</i> (Davis' Sedge)	1
Rocky Bar and Shore	5	<i>Carex straminea</i> (Straw Sedge)	1
Sand / Gravel / Mud Bar and Shore	4	<i>Carex tenera</i> (Slender Sedge)	1
CRUSTACEA (AMPHIPODS, ISOPIIDS & DECAPODS)		<i>Cerastium arvense ssp. velutinum</i> (A Field Chickweed)	5
<i>Stygobromus phreaticus</i> (Northern Virginia Well Amphipod)	3	<i>Cirsium altissimum</i> (Tall Thistle)	3
<i>Stygobromus pizzinii</i> (Pizzini's Amphipod)	6	<i>Cirsium carolinianum</i> (Carolina Thistle)	3
<i>Stygobromus sp. 15</i> (A Groundwater Amphipod)	3	<i>Cuscuta polygonorum</i> (Smartweed Dodder)	7

Table 1.3 Rare, Threatened, and Endangered Species (Con't)

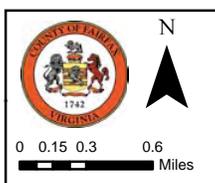
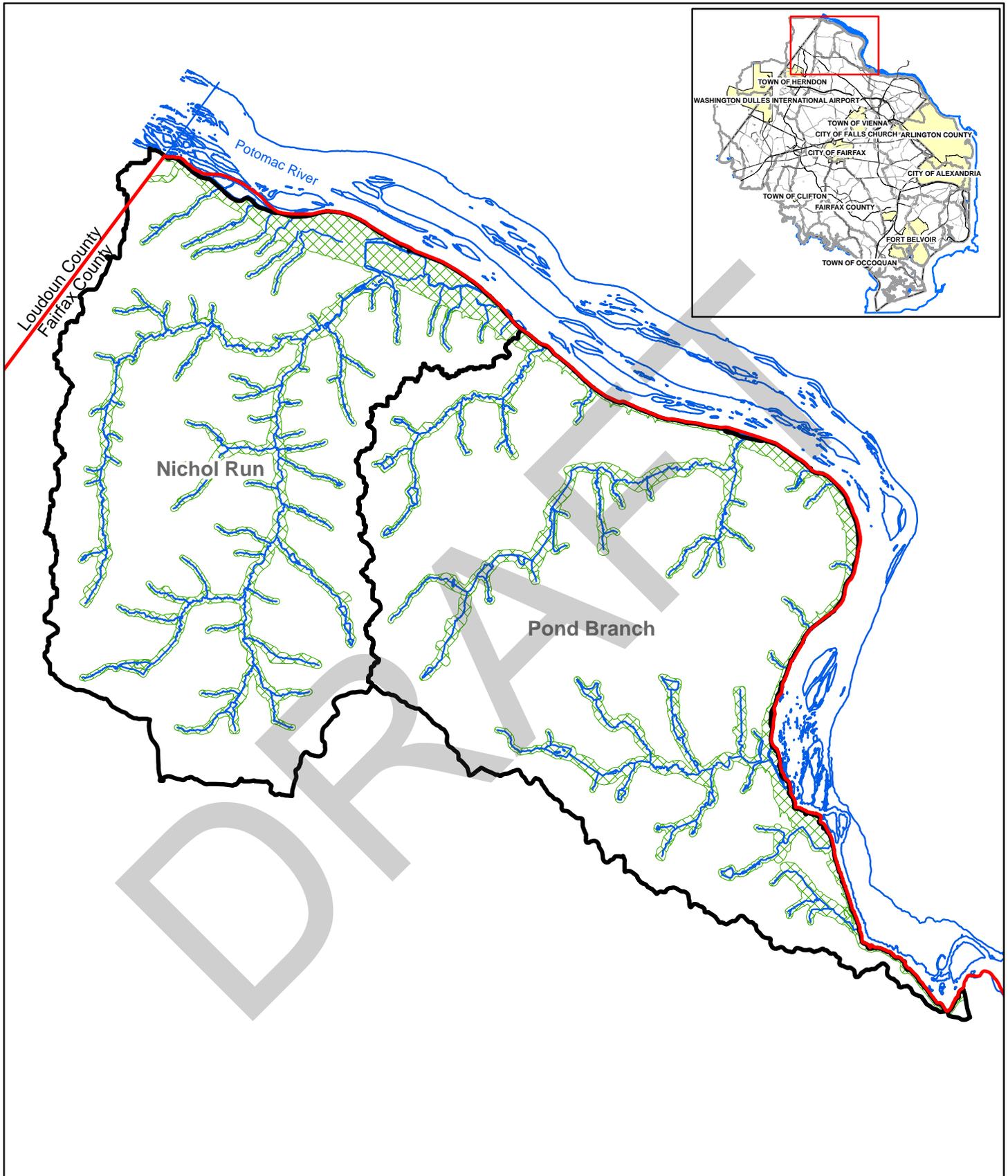
Species	Occurrences Statewide	Species	Occurrences Statewide
<i>VASCULAR PLANTS, cont.</i>		<i>VASCULAR PLANTS, cont.</i>	
<i>Desmodium cuspidatum</i> var. <i>cuspidatum</i> (Toothed Tick-trefoil)	1	<i>Orthilia secunda</i> (One-sided Wintergreen)	2
<i>Diarrhena obovata</i> (A Beakgrain)	1	<i>Phacelia ranunculacea</i> (Blue Scorpion-weed)	3
<i>Dichantherium annulum</i>	8	<i>Platanthera peramoena</i> (Purple Fringeless Orchis)	4
<i>Echinocystis lobata</i> (Wild Mock-cucumber)	2	<i>Prunus pumila</i> var. <i>susquehanae</i> (Sand Cherry)	4
<i>Eleocharis compressa</i> (Flat-stemmed Spike-rush)	8	<i>Ranunculus hederaceus</i> (Long-stalked Crowfoot)	6
<i>Enemion biternatum</i> (False Rue-anemone)	2	<i>Rhododendron arborescens</i> (Smooth Azalea)	12
<i>Eryngium yuccifolium</i> var. <i>yuccifolium</i> (Rattlesnake-master)	17	<i>Rorippa sessiliflora</i> (Stalkless Yellowcress)	9
<i>Erythronium albidum</i> (White Trout-lily)	7	<i>Sida hermaphrodita</i> (Virginia Mallow)	6
<i>Hasteola suaveolens</i> (Sweet-scented Indian-plantain)	10	<i>Silene nivea</i> (Snowy Champion)	3
<i>Helianthus occidentalis</i> (McDowell Sunflower)	1	<i>Solidago racemosa</i> (Sticky Goldenrod)	1
<i>Hemicarpha micrantha</i> (Dwarf Bulrush)	5	<i>Solidago rupestris</i> (Rock Goldenrod)	5
<i>Lathyrus palustris</i> (Vetchling)	6	<i>Spartina pectinata</i> (Freshwater Cordgrass)	15
<i>Maianthemum stellatum</i> (Starflower False Solomon's-seal)	6	<i>Triphora trianthophora</i> (Nodding Pogonia)	9
<i>Matteuccia struthiopteris</i> var. <i>pennsylvanica</i> (Ostrich Fern)	2	<i>Valeriana pauciflora</i> (Valerian)	2
<i>Onosmodium virginianum</i> (Virginia False-gromwell)	13	<i>Vitis rupestris</i> (Sand Grape)	7

1.3.6 Resource Protection Areas

Resource Protection Areas are vegetated riparian buffer areas that include land within a major floodplain and land within 100 feet of the water body in the floodplain. These buffer areas are important in the reduction of sediments and nutrients, as well as the other adverse effects of human activities. Under the county's old Chesapeake Bay Preservation Ordinance, if streams were not identified as perennial on the U.S. Geological Survey map, they did not warrant being in a Resource Protection Area (Fairfax County, Virginia, March 23, 2007).

The Perennial Stream Mapping Project was initiated to address concerns that all perennial streams were not being protected under the county's Chesapeake Bay Preservation Ordinance. At that time, the county's ordinance only listed perennial streams as those streams which were depicted as perennial on the U.S. Geological Survey topographical maps. To ensure compliance with the state's revised Chesapeake Bay Preservation Area Designation and Management Regulations, Fairfax County began the process of accurately mapping all streams in the county in 2002. By October 2003, the field work was completed and the new Resource Protection Area maps were generated, as shown in Figure 1.5 (Fairfax County, Virginia, March 23, 2007).

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-  Perennial Streams
-  Resource Protection Areas
-  Watershed Boundary
-  County Boundary

Figure 1.5
Resource Protection Areas
Map

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1.3.7 Stormwater Management

Regional stormwater management prior to the late 1970s had been achieved in Fairfax County through developer cooperation, rezoning proffers and joint county/developer projects. The Fairfax County Regional Stormwater Management Plan (Camp Dresser & McKee, Inc., 1989) was developed to identify the most appropriate locations for regional stormwater detention facilities. The recommended regional basin network for the plan was developed through a multi-step process with criteria that included land availability, topography and available storage. Once sited, the detention basins were modeled using hydrologic models to determine watershed-wide impacts.

The Fairfax County Drainage Master Plan (Fairfax County, January 2007) is a database of stormwater and drainage projects that are derived from the following sources: basin drainage plans by Parsons, Brinkerhoff, Quade and Douglas from the late 1970s, a Regional Pond Plan by Camp, Dresser, and McKee from 1989, citizen drainage complaints, recorded maintenance problems, and localized drainage studies. Within the Nichol Run Watershed, the database lists a total of 6 projects, 1 was completed, 4 were found to be incomplete and the last was not found. The 4 projects not yet completed were all culvert replacements or repairs. Within the Pond Branch Watershed, the database lists a total of 6 proposed projects; all 6 projects were not yet completed. All 6 projects were culvert addition, replacements or repairs.

The Basin Plan (Parsons, Brinckerhoff, Quade, and Douglas, 1979) was created as a part of the overall stormwater management program for Fairfax County. The plan includes an analysis of stormwater problems throughout the watersheds and recommended solutions. The solutions were weighted according to cost, construction feasibility, and environmental and aesthetic considerations. The Watersheds consist of steep slopes (5-15 percent), with channel slopes between 1 and 3 percent. The problems identified within the Watersheds include sediment and debris accumulations, flooding of adjacent sewer lines, bank erosion, channelization, or the need for detention ponds. The problems identified within the watersheds included sediment and debris accumulations, flooding of adjacent sewer lines, bank erosion, channelization, or the need for detention ponds. Twelve total projects were recommended in the Nichol Run and Pond Branch Watershed, with six in each watershed. The proposed cost of the proposed projects totaled \$677,000.

Fairfax County approved the use of stormwater detention ponds (Regional Ponds) in 1987. This idea of regional ponds was reviewed by the Fairfax County Board of Supervisors and was adopted in 1989 as the Regional Stormwater Management Plan (Fairfax County, 2003). The plan was to provide regional detention for rapidly developing areas of Fairfax County. The purpose was to promote safety and reduce the county's liability exposure for stormwater management facilities within residential areas. The implementation of 134 regional ponds was proposed as a preferred type of stormwater management. A Regional Pond Subcommittee was developed in 2002 to re-evaluate this type of stormwater management practice. This subcommittee compiled a comprehensive list of issues and organized them into categories. They then considered what would be an ideal stormwater program within the subject area. The subcommittee determined that although regional ponds are not the preferred stormwater management alternative, they

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should be considered one of many tools that can be used to manage stormwater in Fairfax County (Fairfax County, 2003.).

A Forested Wetland Committee was also developed to determine methods to minimize the disturbance of wetlands, primarily forested wetlands, during the implementation of regional stormwater management ponds. The following are the recommendations of the subcommittee regarding wetlands and regional stormwater management facilities.

1. A regional pond wetlands protection policy should be instituted which will examine all regional sites for wetland impacts and will locate stormwater facilities strategically to avoid wetland areas.
2. The design and construction of innovative and state-of-the-art Best Management Practices (BMPs) should be encouraged.
3. The maintenance and efficiency of BMPs should be a top priority.
4. Protection must be addressed for stream channels and associated riparian wetlands before the stormwater facilities are built.
5. Each site should be evaluated on a case-by-case basis to determine the appropriate BMP.
6. The Fairfax County BMP program should be re-evaluated every four years.
7. Regional ponds located in the Chesapeake Protection Areas should be moved outside the major floodplain.

The watershed management plan that is developed as a result of this project will be used by Fairfax County to select watershed management projects for future construction. These watershed management practices will be carefully selected to make the best use of county resources and at the same time provide the most benefit to the largest area of the county.

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