

Cedar Creek Revealed:



*A Study of the Ecological and Historic
Context of Cedar Creek*



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Introduction

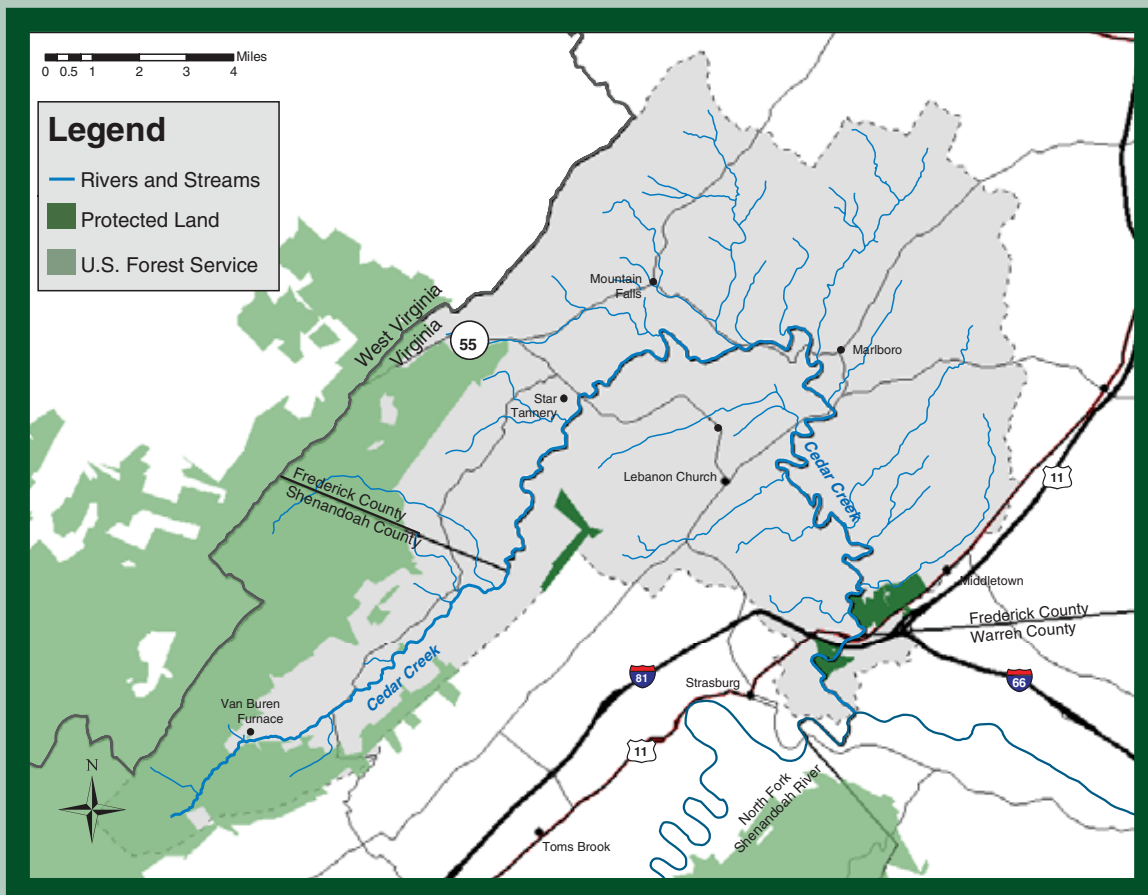
In the Shenandoah Valley, the landscape reigns supreme. Abundant with creeks and meadows and dotted with family farms, the Shenandoah Valley stretches down the spine of western Virginia like a picturesque painting from an earlier time. Framed by the central Appalachians on either side, lush green farmlands carpet the Valley floor, where small towns feel as neighborly as they did 150 years ago. Yet the Valley is slowly changing. Sprawling development and road construction have increasingly threatened the historic sites and natural areas that characterize this region.

Since 2002, the Potomac Conservancy has been meeting with landowners, restoring and protecting the land, and working with community partners in the Shenandoah Valley. To inform its work, the Conservancy sought to better understand what resources are important to Valley citizens. It asked landowners, local donors and supporters, businesses, realtors, citizen leaders, other conservation organizations, and scientists about those places in the Valley that have unique and special natural resources—particularly related to water

resources—but are also threatened. Cedar Creek came up on just about everyone's list.

The Cedar Creek watershed remains among the least disturbed areas in the Shenandoah Valley. Located in the northern part of the Valley, Cedar Creek winds through a scenic 157-square-mile watershed with a dominant land cover of agriculture and forests, as well as rich historic resources, such as Cedar Creek Battlefield and Belle Grove Plantation. Covering portions of Frederick, Shenandoah, and Warren counties, the watershed is only about 75 miles west of Washington, D.C., yet it remains remarkably unspoiled.

To better understand where the Potomac Conservancy should focus its efforts, it initiated an ecological study of the Cedar Creek watershed in partnership with Shenandoah University and other partners. The intent was to gain a snapshot of the existing conditions regarding water quality, aquatic life, and plants in the watershed. This information will be used to help the local community build an understanding of the special resources located right in its backyard.



The gray area above represents the Cedar Creek watershed, composed of 157 square miles of land that drain ultimately into Cedar Creek.

Blending Nature and History



WOODWARD BOUSQUET

Nature and history combine uncommonly well in the Cedar Creek watershed. Visitors to the Shenandoah Valley are often first struck by its exceptional natural resources. The Valley floor provides views of picturesque farmlands, rolling hills and dales, and rocky outcrops. On clear days, the surrounding mountains are either blanketed in a rich green or bursting with autumn color. On days when the haze thickens, the mountains take on a bluish hue that gives the Blue Ridge its famous name.

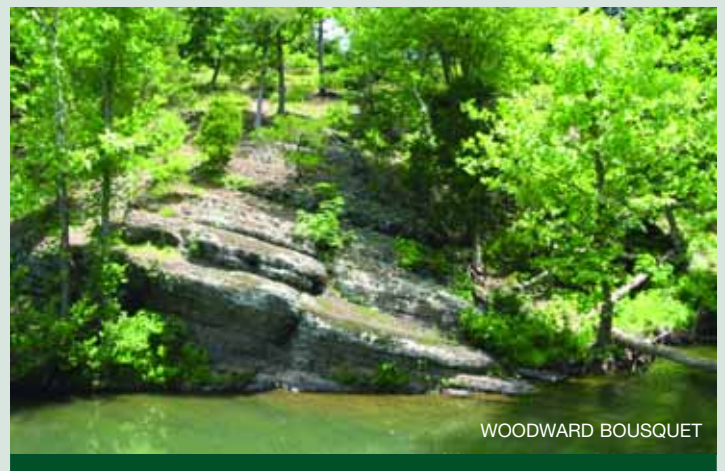
Natural Diversity

The Cedar Creek watershed is rich in geologic and topographic diversity, abundant with cliffs and boulders, sinkholes and caves, high Shenandoah slopes, and low-lying rocky protrusions. Upper-elevation ridges contain mostly sandstone, while stream valleys and foothills are rife with shale, mudstone, and siltstone. Typically, low-lying areas are underlain with limestone and dolomite. As a result of this unique combination of geological conditions, the Cedar Creek watershed is home to an astonishing variety of terrestrial and aquatic habitats. The forests bordering the creek on the Belle Grove Plantation and Cedar Creek Battlefield, for example, contain some of the best displays of spring wildflowers in all of Frederick County.

Because Cedar Creek's terrestrial habitats vary greatly from one another, the watershed has great potential to harbor rare plant and animal species. Large colonies of Virginia bluebells and pale green orchids can be spotted in various locations in the creek's floodplain, interspersed with uncommon tree species such as the shumard oak. Other notable tree species found in the watershed include red oak,

hickory, tulip poplar, American sycamore, and chinquapin oak. Limestone bedrock areas contain such distinctive plant species as the prairie ragwort and the pubescent sedge.

Wildlife abounds here, as well. The watershed is located on the Atlantic flyway, providing many protected stopover points for migratory birds. Black ducks, Canada geese, and mallards frequent wetland ponds, while bluebirds, goldfinches, and other songbirds flit among the trees. Glittering streams teem with fish and other aquatic life, and the watershed's numerous small caves shelter rare invertebrate and vertebrate species. Beavers are evident on the floodplain. In addition, Cedar Creek harbors a rare population of wood turtles. The creek is on the southeastern edge of the wood turtle's habitat, making it a truly special resource for this part of the state. The semi-aquatic wood turtle lives along forested



WOODWARD BOUSQUET

Cedar Creek provides habitat for a diverse array of plants and animals.



Wood turtles are abundant throughout the Cedar Creek watershed.

streams and rivers, so maintaining good water quality and healthy forest buffers is paramount to the survival of this reptile. It is hoped that future studies will shed more light on Cedar Creek's special wood turtle population.

Living on the Land

The human story in the Cedar Creek watershed is equally compelling—stretching from Native American times to the cataclysm of the Civil War and beyond. The first Native Americans were thought to have peopled the Shenandoah Valley some 12,000 years ago. By the 17th century, several Iroquois tribes inhabited the area, drawn to the region's fertile farmlands and thick forests. Over the next century, German and Scotch-Irish settlers developed small farms up and down the Valley, which differed greatly from the large, slave-dependent plantations that characterized the eastern and southern parts of the state. Protected by the Blue Ridge, these small family farmers established thriving trade routes to the north and south.

Historic resources in the Cedar Creek watershed include old farmhouses, limestone quarries, churches, forts, inns,



Cedar Creek's forests and fertile soils drew many Native Americans to inhabit it.

cemeteries, and an old iron furnace. Frye Fort—just one example—is a remnant of the defenses erected during the 18th-century French and Indian War along the Appalachian border of Virginia, a heavily contested region. The watershed also contains several unincorporated settlements that embody the bucolic charm for which it is known. Star Tannery, for one, is a pastoral country village nestled into the shadow of the mountains not far from the West Virginia border—and a beloved focal point of the watershed.

The impressive Belle Grove Plantation and Manor House, probably the best known historic resource in the area, was built by Revolutionary War patriot Isaac Hite, who was related by marriage to President James Madison. Aiding Hite in the design of the house was none other than Thomas Jefferson. Today, the house has remained virtually unchanged since it was built in 1797, a living landmark of plantation life in the 18th and 19th centuries. The watershed's centuries-old farming heritage is also manifested in its many pastures, orchards, hayfields, and homesteads.

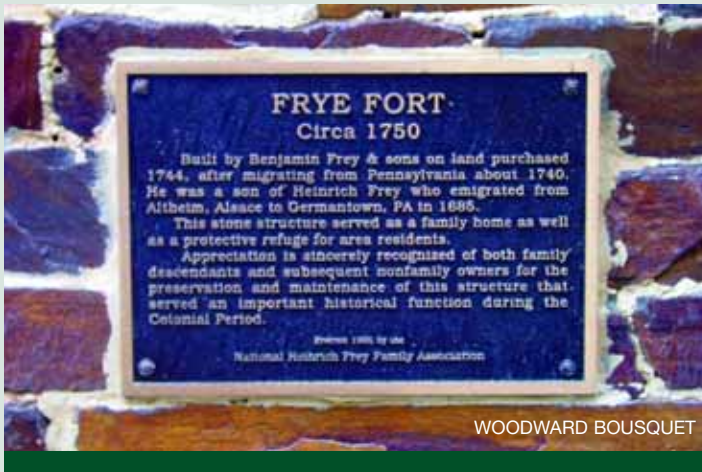


This silent Civil War cannon illustrates the richness of Cedar Creek's history.

A Civil War Legacy

By the 1860s, the Shenandoah Valley had become the richest agricultural area in the state, so much so that it was termed "the Breadbasket of the Confederacy" during the Civil War. Control of these resources was so critical that two major Civil War campaigns were staged in the Valley in 1862 and 1864, culminating in the Battle of Cedar Creek in October 1864. Cedar Creek was a major late-war victory for Union forces. It was the final clash of the 1864 Shenandoah Valley campaign, in which Confederate General Robert E. Lee had hoped to divert attention from his weakening forces around Richmond and Petersburg.

In the foggy dawn of October 19, as Union soldiers camped out on the fields near Middletown, Confederate General Jubal Early launched a surprise attack on Union forces. By forcing the federals to retreat, Early's attack might have secured the Shenandoah Valley for the Confederates



WOODWARD BOUSQUET

Frye Fort dates from the Colonial period, when it served as both a family home and a protective structure for area residents.

once and for all, had Union General Phil Sheridan not famously arrived to turn the tide. Riding his legendary horse Rienzi, Sheridan rallied his retreating troops and successfully counterattacked the Confederates. With the Union victory at Cedar Creek, the Confederates never gained the high ground again, and the end of the war was only a few months away.

Preserving Past and Present

Today, a unique partnership of public and private organizations is working to preserve the historic resources of the Cedar Creek watershed. In late 2002, Congress established the Cedar Creek and Belle Grove National Historical Park to preserve the lands associated with the 1864 battle and to interpret the rural and agricultural history of the Shenandoah Valley. With an approximately 3,500-acre boundary, the park is managed by the National Park Service and its four primary partners—the Cedar Creek Battlefield Foundation, Belle Grove, Inc., the Shenandoah Valley Battlefields Foundation, and the National Trust for Historic Preservation. Together, these entities own about 900 acres of



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Today, the Shenandoah Valley is a vibrant patchwork of towns, working farms, and working forests.

land within the park boundary, and they may continue to acquire land from willing sellers and manage property within the park. The popular Cedar Creek Civil War reenactment—which draws thousands of participants and spectators each year—will continue to be held on park property.

With proceeds from the annual reenactment, the Cedar Creek Battlefield Foundation is working to restore significant sites such as the antebellum Heater House. The house, once the centerpiece of a typical Shenandoah Valley farm, is envisioned as a contrast to the grander Belle Grove plantation. In 2003, the National Park Service and the Shenandoah Valley Battlefields Foundation also purchased a 142-acre historic farm within the park boundary, which includes earthworks and trenches used by Union troops, as well as Native American archaeological sites.



COURTESY OF BELLE GROVE PLANTATION, A NATIONAL TRUST HISTORIC SITE

Dating from 1797, Belle Grove Plantation stood at the center of the Civil War's decisive Battle of Cedar Creek.

In 2003, the Cedar Creek area was deemed so significant that a portion of it was designated a national historical park. In turn, Cedar Creek is part of the larger Shenandoah Valley Battlefields National Historic District—which was established to protect both historic resources and the natural landscape features that contributed to historic events. Finally, the Potomac Conservancy has designated the watershed of the North Fork of the Shenandoah River—into which Cedar Creek drains—as a high priority “signature landscape.”

Although these designations help to protect the natural wonders and historic sites of the Cedar Creek watershed, much more needs to be done. Every day, encroaching development, as well as the absence of long-range planning and management, threaten Cedar Creek's natural and historic resources—the backbone of the beloved Shenandoah lifestyle. In addition to highlighting the ecological and cultural significance of the Cedar Creek area, this report offers recommendations to landowners on what they can do to help protect their unique watershed. These tools range from conservation agreements and sensitive land management to the development of scenic trails and public access points that protect natural and historic resources.



Ecological Resources

WOODWARD BOUSQUET

In 2004, a team from Shenandoah University led by Dr. Woodward Bousquet—with assistance from the Potomac Conservancy, the Virginia Department of Game and Inland Fisheries, and the Virginia Division of Natural Heritage—studied aquatic and terrestrial communities in the Cedar Creek watershed. Their assessment concluded that the watershed contains remarkable biological diversity, including some species that are rarely documented anywhere else in the world. The team studied a range of aquatic habitats, including cold seeps and springs, shaded mountain streams, warmer valley streams, and numerous ponds, riffles, and pools. Terrestrial communities studied ranged from upland forests and rocky shale barrens to farm fields and sunny meadows.

Water Quality

Despite the presence of increasing threats to the watershed, the good news is that Cedar Creek itself retains high water quality and is minimally degraded. However, some sites—including one that was sampled for this study—have significant degradation, resulting in dramatic decreases in water quality and stream bank condition. That said, implementing best management practices such as planting streamside forests and installing stream fencing and hardened cattle crossings can restore nearly all of these sites.

Throughout the study, the team rated creek sampling sites according to the Index of Biotic Integrity (IBI). This index measures such things as the extent to which species are tolerant or intolerant to human-caused stresses or are dependent on stream-bottom vegetation for survival. Overall, the team found that Cedar Creek boasted an IBI score of 4.25

on a 5-point scale, which is in the “good” category—the highest category possible. This means that Cedar Creek’s water quality is comparable to other streams that are relatively clean and pristine, and classifies it as one of the two cleanest streams in Shenandoah County.

But the study also found that some areas of the watershed are impaired. For example, the Meadow Brook site rated only a 2.1 on the IBI scale, which translates to poor quality. The poor grade was attributed to the surrounding agricultural setting and presence of cattle, which scar the stream banks and occasionally wade into the stream. In addition, the U.S. Environmental Protection Agency has included portions of the Cedar Creek watershed in its most recent listing of impaired waterways in Virginia. Cedar Creek, according to the EPA, suffers from abnormal temperatures and general standard impairment due to emissions from Midwestern coal-burning power plants. Other smaller creeks in and near the watershed suffer from elevated levels of fecal coliform and other bacteria, as well.

Aquatic Habitats

The researchers investigated six aquatic sites in the Cedar Creek watershed, offering a representative sample of habitats extending from Cedar Creek’s headwaters in the Allegheny Mountains to its mouth near Strasburg, where it empties into the North Fork of the Shenandoah River. Five sites were located on the main creek: the Headwaters site, situated at an elevation of 1,400 feet near the originating source of Cedar Creek; Gravel Springs, where cultivated hayfields abut the creek bed; Moore’s Ford and Beeler’s Ford, where the creek riffles through wooded areas and eroded stream banks; and

Hupp Hill, only about two miles upstream from the mouth of Cedar Creek. The sixth site was located on Meadow Brook, a tributary that enters Cedar Creek near the historic Belle Grove plantation.

Altogether, the research team captured more than 2,500 fish that represented 30 species. Aquatic species ranged from the relatively large brook trout to the small bluntnose minnow. Commonly seen species included the Potomac sculpin and red-breasted sunfish, but the assessment also uncovered rarer fish such as the American eel and the margined madtom. Some sites yielded relatively few fish species, while others, such as Moore’s Ford, yielded more than 700 fish of 22 species.

For a list of fish species found at all six aquatic sites, please refer to Appendix A on page 13.

Terrestrial Habitats

In addition to examining aquatic habitats, the Shenandoah University team studied nine diverse sites in seven different terrestrial communities. The team documented an astonishing 268 species of plants in the Cedar Creek watershed, including 12 species never before reported in Frederick County, and four new records for Shenandoah

County. Significantly, there was one particularly noteworthy botanical discovery—the Canby’s mountain lover, a globally imperiled plant species. For a list of all vascular plant species found within the nine surveyed sites, refer to Appendix B on page 14.

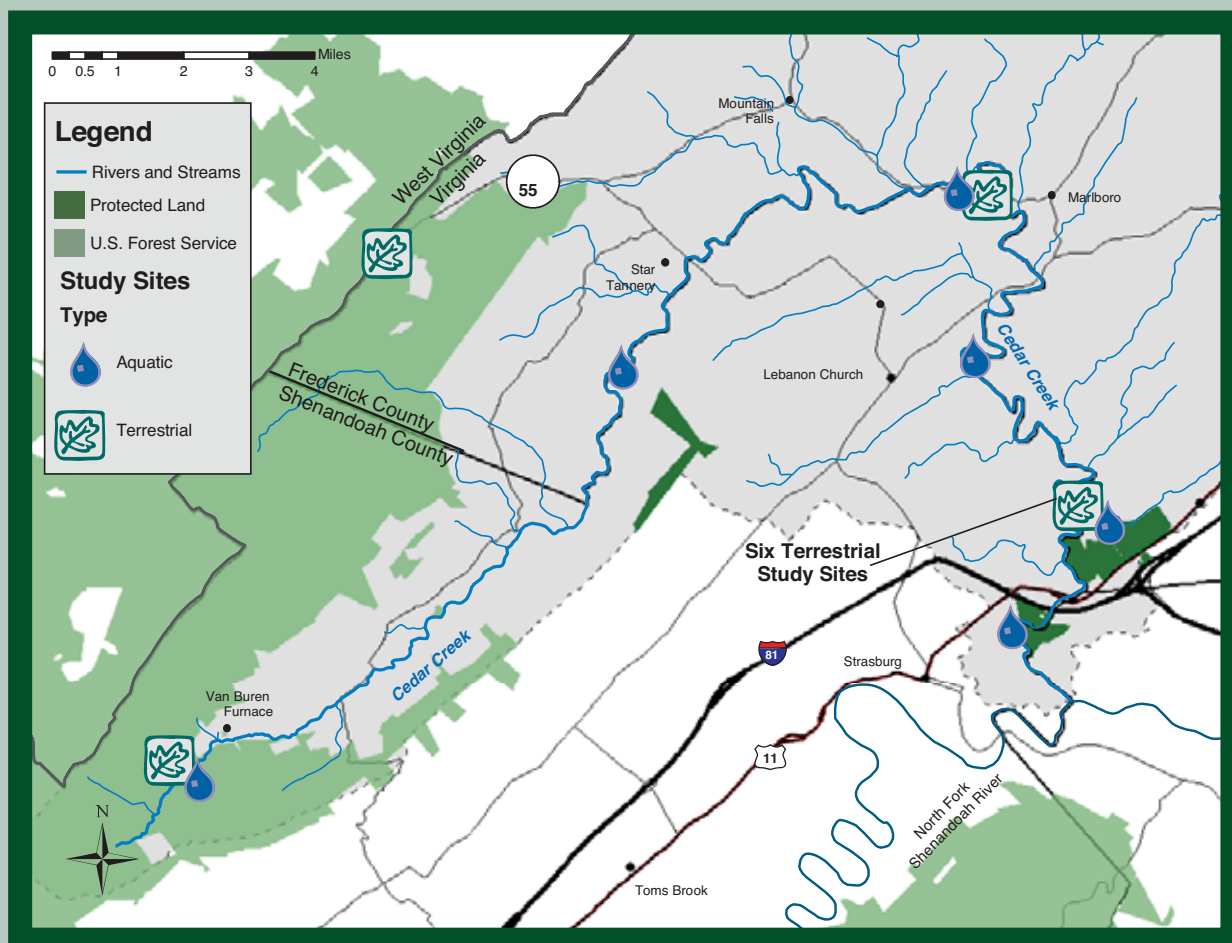
Brief descriptions of the seven terrestrial communities follow:

Upland Seep

Springs and seeps are uncommon in the Cedar Creek watershed. However, the Oriskany Formation, located along the base of Great North Mountain and Little North Mountain, allows groundwater to emerge at the surface as seeps and springs through series of folded and faulted permeable bedrock. Also found within the Upland Seep are large, arching leaves of skunk cabbage and cinnamon fern, royal ferns, three-seeded sedges, and small green wood orchids.

Mountain Slope Forest

Extending across large swaths of the upper and middle slopes of Great North Mountain and Little North Mountain, the mountain slope forest is the most extensively distributed ecological community in the Cedar Creek watershed.



Shenandoah University researchers sampled six aquatic and nine terrestrial sites throughout the Cedar Creek watershed, as indicated on this map.

Dominant trees in this community include hickories, and red, white, black, and chestnut oaks. The oval-leaf sedge and black-edge sedge—two new records for Frederick County—were found in this community. Unfortunately, the invasive species Japanese honeysuckle and multiflora rose also thrive here.

Floodplain Wetland

Because of its mountain topography—in which slopes end very close to the banks of Cedar Creek—the watershed does not have many wetlands. However, one important floodplain wetland was discovered about a mile to the southeast of Moore's Ford. Here, knee-high specimens of the pale green orchis—a species of orchid—can be found along with skunk cabbage, hummock sedge, and spotted jewelweed. A nearby pond attracts great blue herons, green herons, an American bittern, black ducks, and mallards. Goldfinches and bluebirds frequent the wetland, as well.

Limestone Bluffs

Dramatic limestone outcrops rise steeply above parts of Cedar Creek. Most of the limestone bluffs are covered with vegetation, representing some of the watershed's most biologically diverse communities. Fragrant sumac, redbud, and red cedar can be found on the limestone bluffs, along with an intriguing herb layer.

This herb layer features vegetation, such as the shale-barren goldenrod and the nodding onion, that is suited to the very dry conditions of the exposed stone bluffs. Most dramatically, the globally imperiled Canby's mountain lover was found growing in small clumps at the brow of partially shaded limestone cliffs.

Bottomland Forest

Cedar Creek watershed's bottomland forest represents a rare terrestrial community. Most bottomland forests in the Shenandoah Valley have been cleared and converted to farms,

but a key tract of bottomland forest can still be found in the western corner of the Cedar Creek battlefield. Trees in this plot grow to be 60 feet tall. Key species include tulip poplar, red oak, American sycamore, and chinquapin oak. Wildflowers, including Virginia bluebells, are abundant. New records for Frederick County include shumard oak, Canadian violet, and pubescent sedge. Unfortunately,

disturbances in the bottomland forest include logging, exotic plants, gypsy moth damage, deer browsing, and several footpaths.

Mesic Upland Forest

Open fields cover most of Cedar Creek Battlefield, but surrounding the property are deciduous upland forests with canopies that are 40 to 100 feet high. Here, immense trees include white oak, red hickory, bitternut hickory, and sizeable specimens of white ash, chinquapin oak, American basswood, and mockernut hickory. Enchanter's nightshade dominates the dense herb layer, while the shrub layer is populated with flowering dogwood and downy serviceberry. Despite some signs of disturbance, such as logging, gravel roads, and exotic plants, the mesic upland forests contain a wide assemblage of native plants.

Dry Upland Forest with Limestone Outcrops

Steeply sloping rock outcrops that face into drying winds of a southern exposure often develop distinct plant populations that are adapted to dry conditions. Several of these outcrops can be found along the western boundary of the Cedar Creek battlefield. Here, trees are stunted and the canopy is thick. The herb layer boasts an impressive 109 plant species, including the shale-

barren goldenrod, fragrant sumac, and two ragwort species. Five species were newly recorded for Frederick County: the shumard oak, Carolina leaf flower, hairy bedstraw, few-fruit sedge, and pubescent sedge. Despite the effects of past cattle grazing, tree cutting, and exotic species, this forest represents the best remnant of a xeric (very dry) limestone woodland in the Cedar Creek Battlefield area.



Shenandoah University researchers utilized special sampling equipment to assess the fish living in Cedar Creek.



Colorful Virginia bluebells are abundant throughout the Cedar Creek watershed.



Threats to the Watershed

WOODWARD BOUSQUET

Precisely because of its natural and historic riches, the Shenandoah Valley is becoming an increasingly popular place to live. A significant percentage of new residents reside in northern Valley areas like the Cedar Creek watershed, commuting east to the greater Washington, D.C., area. This influx has meant new roads, buildings, and infrastructure, all of which can threaten natural and historic resources if not carefully planned. Civil War battlefields are particularly imperiled. According to the Civil War Preservation Trust, one acre of battlefield land is lost to development every ten minutes.

The greatest threats to the Cedar Creek watershed include land fragmentation, expansion of transportation corridors, management of natural resources on private lands, invasive species, and impacts from human recreation.

Land Fragmentation

Although the Shenandoah Valley has become an increasingly popular place to live in recent years, the post-September 11 era has led even more D.C.-area residents to move away from the metropolitan region in favor of a more bucolic and low-key lifestyle. The resulting development,

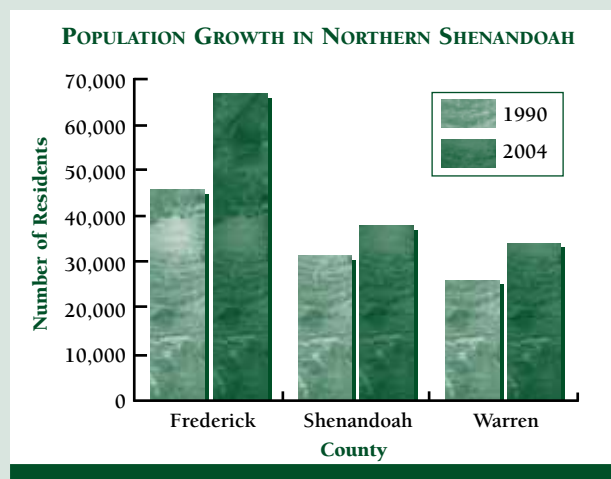
however, has fragmented the very forests and farm fields that give the Valley its character. Land fragmentation is caused by both a reduction in average parcel size and an increase in the number of independent landowners. For example, a 100-acre farm may be subdivided into five 20-acre farmettes, each with a different landowner. Instead of one landowner making decisions, these five landowners might manage their land differently. As a result, land fragmentation can have a devastating effect on free-roaming wildlife and disrupt the natural ecosystem upon which numerous plants and animals depend.

Recent polls, such as those commissioned by the Valley Conservation Council, have found that managing growth is a top concern for Valley landowners. Shenandoah, Frederick, and Warren counties all experienced between 10

and 20 percent population growth between 1990 and 2000. Since then, all three counties have grown another six to nine percent.

Expansion of Transportation Corridors

With increased development comes the expansion of existing transportation corridors to accommodate new residents. Corridor H, to cite one example, is a proposed 100-



A significant influx of residents into the northern Shenandoah Valley has introduced pressures on its natural resources, including those of Cedar Creek.

Source: U.S. Census Bureau, 2004 Population Estimates, 1990 Census

mile highway being built through scenic eastern West Virginia, originally planned to stretch from Elkins, West Virginia, to Strasburg, Virginia. Ten years ago, Virginia transportation officials voted not to build the 14-mile eastern section in the state. However, as the West Virginia portions near completion, Corridor H could dump an unprecedented amount of traffic onto two-lane Route 55, which cuts through the heart of the Cedar Creek watershed. In addition to threatening air and water quality and destroying wildlife habitat, the construction of the highway and increased development pressure could change the watershed's rural character forever.



MATTHEW LOGAN

The completion of Corridor H threatens to significantly increase development, negatively impacting Cedar Creek's natural resources.

Management of Natural Resources on Private Lands

Many of the natural and historic resources that characterize the Cedar Creek watershed are found on private property. Often, landowners are unaware that their property includes these resources or how their actions might be impacting those resources. For example, landowners in the Cedar Creek watershed are likely to have springs, furnaces, or forts on their grounds, and their properties might even contain rare, threatened, or endangered species such as the Canby's mountain lover. Many of the watershed's limestone bluffs are located on private land. Even if landowners have an understanding of the wildlife, plants, or historic resources on their property, they may not be sure of the best way to manage their property so that the watershed is protected.

Invasive Species

Although not a widespread problem yet, invasive plant species such as garlic mustard and Japanese stilt grass are crowding out native plant species. Japanese honeysuckle and multiflora rose can be found on mountain slopes, while exotic wineberry grows on limestone bluffs. Thankfully, at this point, the spread of invasive plant species can still be easily



CHUCK BARGERON

Japanese honeysuckle is one of the many invasive plants that threaten Cedar Creek's natural diversity.

monitored and controlled. However, in the face of escalating development, which can also increase the prevalence of introduced and invasive species, rare species such as the Canby's mountain lover are at serious risk of extinction.

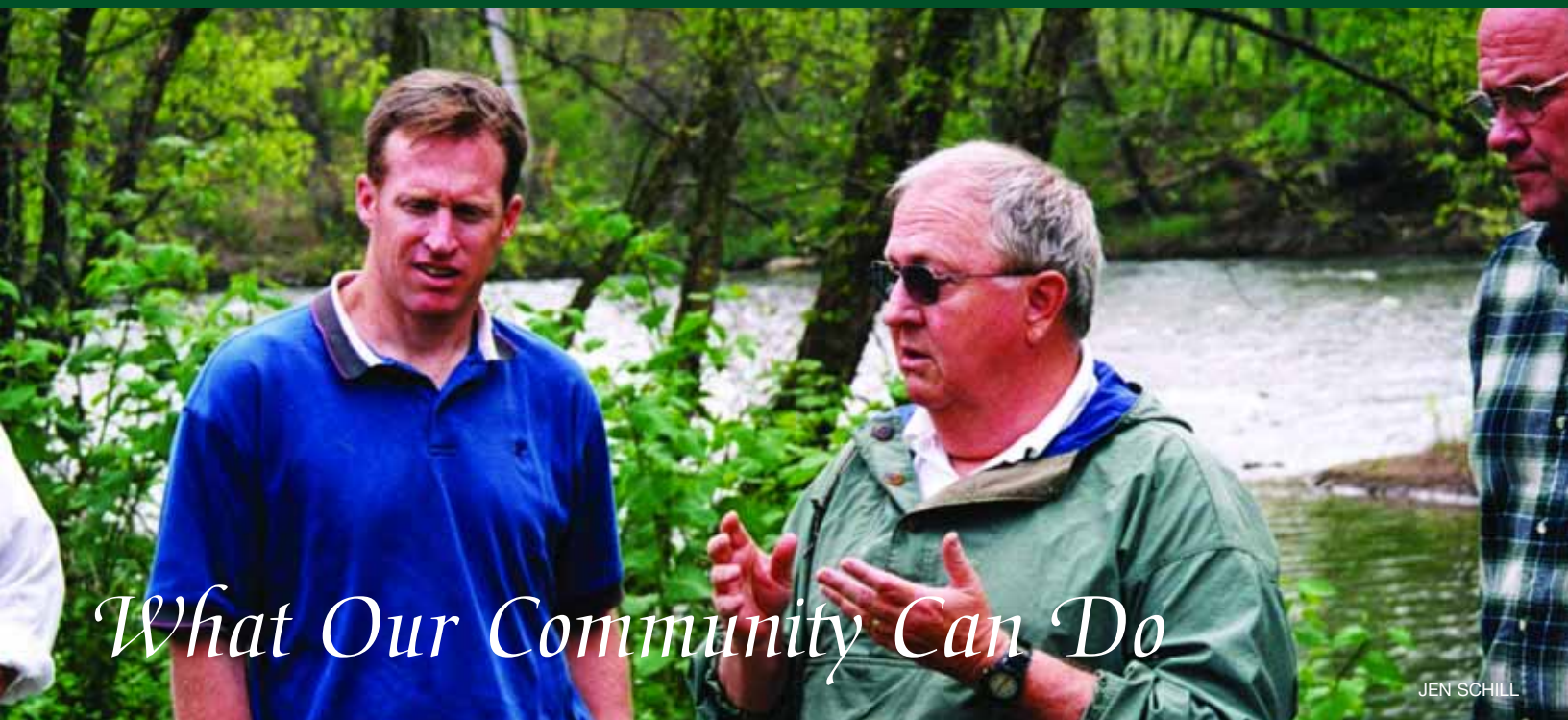
Recreation

The Cedar Creek watershed offers tremendous potential for recreation and tourism. Yet this opportunity has not been fully realized. The watershed has a few markers that point out its historic features, but no markers that indicate the value of its scenic wonders and natural resources. Few hiking and biking trails, and even fewer road pull-offs, have been designated to encourage proper and safe enjoyment of the Cedar Creek watershed. Left to their own devices, outdoor enthusiasts run the risk of trampling rare plants or spreading invasive species. Ongoing management planning should include a recreational component, plans for well-designated trails to avoid this potential impact, and "Leave No Trace" principles and signage.



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With proper management plans, Cedar Creek can be enjoyed, while at the same time being protected from recreational impacts.



What Our Community Can Do

JEN SCHILL

For thousands of years, people have been drawn to the Cedar Creek area by its picturesque natural beauty, fertile landscapes, diverse wildlife, and abundant streams and forests. As this report illustrates, Cedar Creek's unique combination of ecological and historic diversity makes it worthy of protection. Without proper stewardship, the watershed runs the risk of being overdeveloped or improperly managed, undermining the quality of life for all its residents. Landowners, lawmakers, and other decision makers all have a stake in the future health of the Cedar Creek watershed. To this end, several easy steps can be taken to protect Cedar Creek's natural and historic resources—those very things that make the watershed such a wonderful place in which to live, work, and visit.

Managing Mature Forests

The Cedar Creek watershed is known for its mature hardwood forests that grow in limestone soils, which support a wide variety of plant and animal species. This forest community is one of the rarest and most rapidly declining ecosystems in the watershed, and it is vitally important to migrating birds. Landowners of mature woodlands have a special responsibility to be good stewards of these important landscapes. This responsibility includes managing woodlots with specific conservation objectives in mind and working to achieve those goals with the help of professional land managers. The first step to good stewardship is for landowners to learn about the species of plants and trees that are found on their property. Secondly, landowners can work with local foresters or conservation groups to obtain an ecological assessment of the trees on their property. Local

foresters can be extremely helpful in offering advice on how to manage trees. Often, a few simple steps—including controlling invasive species, protecting against erosion, and re-planting native species—are all that it takes to ensure healthy woodlands.

Protecting Water Quality

In the Cedar Creek watershed, as in so many other places, there is an inextricable link between land and water. Because whatever happens on land almost always affects water quality, landowners have a key role to play in protecting the health of the watershed. In addition to keeping creeks and streams clear and free-flowing, the numerous springs and seeps in the watershed provide havens for invertebrate and vertebrate species. Landowners should ensure that springs, seeps, and streams on their properties are kept clean and unpolluted and are not impeded by structures or trash. Landowners should also engage in the careful planning and management of pastures and cropland, so that agricultural activities do not have a negative impact on water quality. A key method to achieving this includes maintaining healthy streamside forest zones and vegetated stream banks, which not only prevent erosion and sedimentation, but also provide an essential buffer between cattle grazing areas and local waterways. Such vegetation would also boost the existence of woody debris in Cedar Creek, which is beneficial for fish habitat.

Landowners who are concerned about protecting water quality have a variety of tools at their disposal. State and federal agencies, including Soil and Water Conservation Districts and the Natural Resources Conservation Service, as

well as the Potomac Conservancy, offer free technical assistance to landowners. Cost-share assistance is also available for those landowners who implement voluntary Best Management Practices for water conservation. In addition, legislation such as the Farm Bill provides money for landowners who want to protect their properties and ensure a high level of water quality for years to come.

Finally, local decision makers should not overlook the watershed's many small aquatic habitats when planning for new development and transportation corridors. Care should be taken to protect those wetland and streamside areas that are most vital to key plants and animals in the region.

Providing Proper Public Access

Currently, the watershed lacks sufficient trails and public access points that would ensure proper and safe enjoyment of Cedar Creek. Landowners with significant resources should post signs or other barriers to protect sensitive plant and animal species, as well as scenic areas such as the wildflower meadows for which the watershed is known. Even better, landowners should work with local lawmakers and decision makers to build trails or other access points to scenic areas, which would encourage tourism and public recreation while protecting sensitive resources. Through improved recreation, tourism, and education, the Cedar Creek watershed will attract a larger and more diverse population of stakeholders, which will allow for further enhancement of the area's unique natural resources.



Landowners can protect water quality by enrolling in cost-share assistance programs that help in implementing various Best Management Practices, including planting seedlings—like the ones pictured above, sheltered in tree tubes—along streams.

Implementing Conservation Agreements

One particularly beneficial option for landowners is to place a conservation agreement on their property. A conservation agreement is a legal relationship between a landowner and a conservation organization, such as the Potomac Conservancy, that protects the natural, scenic, or historic values of a property by placing guidelines on its uses. Landowners who have placed a conservation agreement on their property can continue to own and live on their property. Because conservation agreements apply to all future landowners, thereby protecting the land in perpetuity,

individuals who protect their properties in this way can feel confident that they have made an important step toward its long-term protection.

In addition, landowners can gain several tax benefits for placing conservation agreements on their properties. Virginia has some of the strongest tax incentives in the nation. Landowners can not only claim a tax credit for open space preservation—whether the property is a battlefield, family farm, or wetland—they can also transfer or sell their tax credits if their credit is higher than their tax liability. Virginia is one of only three states that allow tax credit transfers.

Long-Range Land Use Planning

Currently, the National Park Service and its partners are developing a general management plan for the Cedar Creek Battlefield, which will guide and unify preservation goals for the disparate properties within the park boundary. But the planning process may take three to five years to complete. In the meantime, various entities are doing their best to preserve the lands and structures associated with the battlefield. It is hoped that the ongoing planning process will result in a holistic management plan for the watershed that will encourage citizen involvement. Landowners can also take their cues from the management planning process and apply complementary management planning on their own properties.

Furthermore, lawmakers and decision makers can do their part to advocate for continued funding for the completion and implementation of a Cedar Creek management plan. Community leaders can take other steps to protect the widespread natural and historic resources of the watershed, including its numerous aquatic and terrestrial habitats and its lesser-known historic resources, such as farmhouses and pasturelands. Land use planning, including zoning and subdivision review policies, can be used to decrease development pressures on sensitive landscapes in the Cedar Creek watershed. Finally, the counties' Comprehensive Plans should recognize Cedar Creek as a vitally important resource and provide special protection for its streamside resources.

Summary List of Fish Species

Tolerance is used as an indicator for stream health. Because intolerant species are less able to withstand pollution, their presence signifies that a stream is relatively healthy.		Tolerant/Intolerant	Native/Introduced	Feeding Category**	Headwaters	Gravel Springs	Moore's Ford	Beeler's Ford	Meadow Brook	Hupp Hill
**Key to Feeding Categories:										
AL = Algivore		IV = Invertivore								
GE = Generalist		OM = Omnivore								
HE = Herbivore		TP = Top predator								
IS = Insectivore										
FAMILY AND SPECIES	COMMON NAME									
Anguillidae	Freshwater Eels									
<i>Anguilla rostrata</i>	American Eel	n/a	N	GE			X	X		X
Cyprinidae	Minnnows									
<i>Campostoma anomalum</i>	Central Stoneroller	I	N	AL		X	X	X	X	X
<i>Clinostomus funduloides</i>	Rosyside Dace	I	N	IV	X					
<i>Cyprinella spiloptera</i>	Spotfin Shiner	I	N	IV				X		X
<i>Exoglossum maxillingua</i>	Cutlips Minnow	I	N	IV		X	X	X		
<i>Luxilus cornutus</i>	Common Shiner	I	N	OM		X	X	X		
<i>Nocomis leptocephalus</i>	Bluehead Chub	T	N	OM		X				
<i>Nocomis micropogon</i>	River Chub	I	N	OM		X		X		X
<i>Nocomis sp.</i>	Chub species	-	-	-					X	
<i>Notropis rubellus</i>	Rosyface Shiner	n/a	N	IV	X					
<i>Pimephales notatus</i>	Bluntnose Minnow	T	N	OM		X	X	X		X
<i>Rhinichthys atratulus</i>	Blacknose Dace	T	N	OM	X	X	X		X	
<i>Rhinichthys cataractae</i>	Longnose Dace	I	N	OM		X	X	X	X	X
<i>Semotilus atromaculatus</i>	Creek Chub	T	N	GE		X				
<i>Semotilus corporalis</i>	Fallfish	I	N	GE		X	X	X		X
Catostomidae	Suckers									
<i>Catostomus commersoni</i>	White Sucker	T	N	OM			X	X		X
<i>Erimyzon oblongus</i>	Creek Chubsucker	n/a	N	IV		X	X			
<i>Hypentelium nigricans</i>	Northern Hogsucker	I	N	IV		X	X	X		X
Ictaluridae	Bullhead Catfishes									
<i>Ameiurus natalis</i>	Yellow Bullhead	n/a	N	OM			X	X		X
<i>Noturus insignis</i>	Margined Madtom	I	N	IV		X	X	X		
Salmonidae	Trout									
<i>Oncorhynchus mykiss</i>	Rainbow Trout	n/a	I	TP			X	X		X
<i>Salvelinus fontinalis</i>	Brook Trout	I	N	GE	X	X				
Cottidae	Sculpins									
<i>Cottus bairdi</i>	Mottled Sculpin	I	N	IS						X
<i>Cottus cognatus</i>	Slimy Sculpin	n/a	N	IS						X
<i>Cottus girardi</i>	Potomac Sculpin	n/a	N	IS	X	X	X			X
<i>Cottus spp.</i>	Sculpin spp.	n/a	N	IS				X		
Centrarchidae	Sunfishes									
<i>Ambloplites rupestris</i>	Rock Bass	n/a	I	GE		X	X	X	X	X
<i>Lepomis auritus</i>	Red-breasted Sunfish	I	N	GE		X	X	X		X
<i>Lepomis cyanellus</i>	Green Sunfish	T	I	GE			X	X	X	X
<i>Lepomis cyanellus x auritus</i>	Sunfish Hybrid	-	-	-			X	X		
<i>Lepomis macrochirus</i>	Bluegill	T	I	IV			X		X	
<i>Micropterus dolomieu</i>	Smallmouth Bass	n/a	I	TP		X	X	X		X
Percidae	Perches									
<i>Etheostoma flabellare</i>	Fantail Darter	n/a	N	IS		X	X	X		
Undetermined species										
Unknown species	Unknown	-	-	-					X	
Total Species: 30										
Total Families: 8										

FAMILY AND SPECIES	COMMON NAME	US	MSF	FW	LB-1	LB-2	BF	MUF-1	MUF-2	DUF	Other	Fred Co	Shen Co	Va Status*
<i>Carex eburnea</i>	Ivory sedge					X								
<i>Carex granularis</i>	Meadow sedge					X								
<i>Carex hirsutella</i>	Hirsute sedge					X								
<i>Carex hirtifolia</i>	Pubescent sedge						X	X		X		X		W
<i>Carex lupulina</i>	Hop-like sedge			X										
<i>Carex lurida</i>	Lurid sedge			X										
<i>Carex nigromarginata</i>	Black-edge sedge		X									X		
<i>Carex oligocarpa</i>	Few-fruit sedge									X		X		
<i>Carex planispicata</i>	Flat-spiked sedge							X		X				
<i>Carex stricta</i>	Tussock sedge			X										
<i>Carex tribuloides</i>	Blunt broom sedge			X										
<i>Carex trisperma</i>	Three-fruited sedge	X											X	W
<i>Carex willdenowii</i>	Willdenow's sedge					X		X	X			X		
<i>Carex</i> sp.	unidentified sedge		X	X										
Dioscoreaceae	Yam Family													
<i>Dioscorea villosa</i>	Wild yam						X							
Poaceae	Grass Family													
<i>Brachyelytrum erectum</i>	Bearded shorthusk				X	X								
<i>Calamagrostis</i> sp.	Reedgrass	X												
<i>Danthonia spicata</i>	Poverty oatgrass									X				
<i>Eragrostis</i> sp.	Love grass			X										
<i>Festuca</i> sp.	Fescue		X	X										
<i>Glyceria melicaria</i>	Slender manna-grass	X												
<i>Leersia oryzoides</i>	Rice cutgrass	X												
<i>Microstegium vimineum</i>	Japanese stiltgrass	X												
<i>Panicum clandestinum</i>	Deertongue grass		X	X										
<i>Panicum</i> cf. <i>macrocarpon</i>	Small-fruited panic grass			X										
<i>Poa compressa</i>	Canada bluegrass				X	X				X				
<i>Poa sylvestris</i>	Sylvan bluegrass					X								
<i>Sphenopholis nitida</i>	Shining wedgegrass					X								
<i>Poaceae</i> sp.	unidentified grass						X							
Iridaceae	Iris Family													
<i>Sisyrinchium mucronatum</i>	Blue-eyed grass				X					X				
Juncaceae	Rush Family													
<i>Juncus effusus</i>	Common rush			X										
Liliaceae	Lily Family													
<i>Allium cernuum</i>	Wild onion			X	X		X			X				
<i>Asparagus officinalis</i>	Garden asparagus				X	X				X				
<i>Maianthemum canadense</i>	Wild lily-of-the-valley					X								
<i>Medeola virginiana</i>	Indian cucumber root	X											X	
<i>Polygonatum biflorum</i>	Common Solomon's seal		X		X	X		X	X	X				
<i>Smilacina racemosa</i>	Solomon's seal		X											
<i>Smilax herbacea</i>	Carrion flower					X		X						
<i>Smilax rotundifolia</i>	Common greenbrier	X				X			X					
<i>Smilax tamnoides</i>	Hispid greenbrier					X		X						
<i>Trillium sessile</i>	Toadshade trillium						X							
<i>Uvularia perfoliata</i>	Mealy bellwort					X		X						
Orchidaceae	Orchid Family													
<i>Cypripedium acaule</i>	Pink lady's slipper										X			
<i>Habenaria clavellata</i>	Small green wood orchis	X												
<i>Habenaria flava</i>	Pale green orchis			X									X	W
<i>Habenaria lacera</i>	Ragged fringed orchis										X			

FAMILY AND SPECIES	COMMON NAME	US	MSF	FW	LB-1	LB-2	BF	MUF-1	MUF-2	DUF	Other	Fred Co	Shen Co	Va Status*
<i>Solidago arguta</i>	Cutleaf goldenrod					X				X				
<i>Solidago caesia</i>	Wreath goldenrod				X	X		X						
<i>Solidago ulmifolia</i>	Elm-leaf goldenrod					X		X		X				
<i>Vernonia glauca</i>	Broad-leaf ironweed					X		X		X				
<i>Verbesina alternifolia</i>	Wingstem			X			X							
Balsaminaceae	Jewelweed Family													
<i>Impatiens capensis</i>	Spotted touch-me-not	X		X										
Berberidaceae	Barberry Family													
<i>Berberis thunbergii</i>	Japanese barberry							X						
<i>Podophyllum peltatum</i>	May-apple						X	X						
Betulaceae	Birch Family													
<i>Alnus serrulata</i>	Smooth alder			X										
<i>Betula lenta</i>	Sweet birch	X												
<i>Ostrya virginiana</i>	Hop hornbeam	X			X	X		X	X	X				
Boraginaceae	Borage Family													
<i>Hackelia virginiana</i>	Beggar's lice							X						
<i>Cynoglossum officinale</i>	Hounds-tongue				X									
Brassicaceae	Mustard Family													
<i>Alliaria officinalis</i>	Garlic mustard								X		X			
<i>Dentaria laciniata</i>	Cutleaf toothwort								X					
<i>Draba ramosissima</i>	Rocktwist				X									
<i>Hesperis matronalis</i>	Dame's rocket						X							
<i>Lepidium virginicum</i>	Wild peppergrass									X				
Cactaceae	Catus Family													
<i>Opuntia humifusa</i>	Prickly pear cactus									X				
Caprifoliaceae	Honeysuckle Family													
<i>Lonicera japonica</i>	Japanese honeysuckle		X		X	X		X	X	X				
<i>Symphoricarpos orbiculatus</i>	Indian currant				X	X		X		X				
<i>Triosteum perfoliatum</i>	Tinkers weed				X					X				
<i>Triosteum angustifolium</i>	Feverwort					X		X						
<i>Viburnum acerifolium</i>	Maple-leaf arrowwood					X								
<i>Viburnum dentatum</i>	Roughish arrowwood					X								
<i>Viburnum prunifolium</i>	Black haw			X		X		X		X				
Caryophyllaceae	Pink Family													
<i>Arenaria serpyllifolia</i>	Thymeleaf sandwort									X				
Celastraceae	Stafftree Family													
<i>Paxistima canbyi</i>	Canby's mountain lover				X									R
Cornaceae	Dogwood Family													
<i>Cornus amomum</i>	Silky dogwood			X										
<i>Cornus florida</i>	Flowering dogwood					X		X	X					
Ebenaceae	Ebony Family													
<i>Diospyros virginiana</i>	Persimmon				X					X				
Ericaceae	Heath Family													
<i>Gaylussacia baccata</i>	Black huckleberry	X												
<i>Kalmia latifolia</i>	Mountain laurel	X												
<i>Vaccinium corymbosum</i>	Swamp blueberry	X												
<i>Vaccinium pallidum</i>	Upland low blueberry					X								
<i>Vaccinium stamineum</i>	Deerberry		X											
Euphorbiaceae	Spurge Family													
<i>Euphorbia commutata</i>	Wood spurge					X		X		X				
<i>Euphorbia corollata</i>	Flowering spurge									X				
<i>Euphorbia dentata</i>	Tooth spurge									X				
<i>Phyllanthus caroliniensis</i>	Carolina leaf flower									X		X		

FAMILY AND SPECIES	COMMON NAME	US	MSF	FW	LB-1	LB-2	BF	MUF-1	MUF-2	DUF	Other	Fred Co	Shen Co	Va Status*
Oleaceae	Olive Family													
Chionanthus virginicus	Fringetree					X								
Fraxinus americana	White ash					X	X	X	X	X				
Fraxinus pennsylvanica	Red ash			X										
Onagraceae	Evening-primrose Family													
Circaea lutetiana	Enchanter's nightshade							X						
Orobanchaceae	Broomrape Family													
Conopholis americana	Cancerroot					X			X					
Oxalidaceae	Wood Sorrel Family													
Oxalis dillenii	Yellow wood sorrel				X	X				X				
Oxalis europaea	European wood sorrel						X		X					
Oxalis sp.	unidentified oxalis		X											
Papaveraceae	Poppy Family													
Sanguinaria canadensis	Bloodroot				X	X				X				
Phrymaceae	Lopseed Family													
Phryma leptostachya	Lopseed							X						
Platanaceae	Sycamore Family													
Platanus occidentalis	American sycamore						X							
Polygonaceae	Buckwheat Family													
Polygonum arifolium	Halberd-leaved tearthumb	X												
Polygonum orientale	Prince feather			X										
Polygonum sagittatum	Arrowleaf tearthumb			X										
Polygonum scandens	Climbing false buckwheat	X					X							
Primulaceae	Primrose Family													
Dodecatheon meadia	Shooting star					X								
Lysimachia quadrifolia	Whorled loosestrife		X											
Pyrolaceae	Wintergreen Family													
Chimaphila maculata	Pipsissewa	X							X					
Ranunculaceae	Crowfoot Family													
Anemone virginiana	Thimbleweed				X	X				X				
Aquilegia canadensis	Wild columbine													
Cimicifuga racemosa	Black snakeroot						X							
Clematis viorna	Leatherflower				X	X								
Hepatica americana	Liver leaf					X		X		X				
Ranunculus bulbosus	Bulbous buttercup									X				
Thalictrum dioicum	Early meadow rue						X	X	X					
Thalictrum pubescens	Late meadow rue			X										
Thalictrum revolutum	Meadowrue									X				
Thalictrum thalictroides	Rue anemone					X		X		X				
Rhamnaceae	Buckthorn Family													
Rhamnus lanceolata	Lanced-leaved buckthorn				X					X				W
Rosaceae	Rose Family													
Agrimonia paviflora	Small-flowered agrimony			X										
Agrimonia pubescens	Soft agrimony					X				X				
Agrimonia rostellata	Woodland agrimony					X		X						
Amelanchier arborea	Common serviceberry		X			X			X					
Crataegus sp.	Hawthorn		X											
Geum canadense	White avens							X		X				
Geum virginianum	Virginia avens							X		X				
Potentilla canadensis	Canada cinquefoil		X											
Prunus serotina	Black cherry			X		X		X	X	X				
Rosa carolina	Pasture rose					X			X	X				
Rose multiflora	Multiflora rose		X	X				X	X					
Rubus flagellaris	Dewberry					X		X		X				

FAMILY AND SPECIES	COMMON NAME	US	MSF	FW	LB-1	LB-2	BF	MUF-1	MUF-2	DUF	Other	Fred Co	Shen Co	Va Status*
Rubus occidentalis	Black raspberry			X	X	X		X						
Rubus phoenicolasius	Wineberry				X	X	X	X	X	X				
Rubus sp.	unidentified Rubus		X											
Rubiaceae	Madder Family													
Galium aparine	Cleavers		X					X	X					
Galium circaezans	Wild licorice				X	X	X	X						
Galium concinnum	Shining bedstraw					X		X						
Galium pilosum	Hairy bedstraw				X					X		X		
Galium sylvaticum	Scotchmist						X							
Galium tinctorium	Clayton's bedstraw			X										
Galium triflorum	Sweet-scented bedstraw						X	X		X				
Galium cf. virgatum	Southwestern bedstraw		X											
Houstonia longifolia	Long-leaved bluets									X				
Rutaceae	Rue Family													
Ptelea trifoliata	Water-ash					X				X				
Saxifragaceae	Saxifrage Family													
Heuchera americana	Alumroot				X									
Scrophulariaceae	Figwort Family													
Veronica officinalis	Common speedwell		X											
Simaroubaceae	Tree-of-heaven Family													
Ailanthus altissima	Tree-of-heaven					X			X	X				
Solanaceae	Nightshade Family													
Physalis heterophylla	Common ground-cherry									X				
Solanum carolinense	Horse-nettle				X									
Staphyleaceae	Bladdernut Family													
Staphylea trifolia	Bladdernut					X	X							
Eleagnaceae	Oleaster Family													
Elaeagnus umbellata	Autumn olive									X				
Tiliaceae	Linden Family													
Tilia americana	Basswood	X						X						
Ulmaceae	Elm Family													
Celtis occidentalis	Hackberry				X	X		X						
Celtis tenuifolia	Dwarf hackberry									X				
Ulmus americana	American elm					X		X						
Ulmus rubra	Slippery elm			X	X	X	X	X	X	X				
Urticaceae	Nettle Family													
Boehmeria cylindrica	False nettle			X			X							
Verbenaceae	Vervain Family													
Verbena simplex	Narrow-leaf vervain									X				
Violaceae	Violet Family													
Viola canadensis	Canada violet						X					X		
Viola cucullata	Marsh blue violet	X												
Viola palmata	Palmate-leaved violet									X				
Viola papilionacea	Common blue violet		X											
Viola pubescens	Downy yellow violet							X						
Viola sororia	Downy wood violet					X				X				
Viola tripartita	Three-parted violet		X											
Vitaceae	Grape Family													
Parthenocissus quinquefolia	Virginia creeper	X	X	X	X	X	X	X	X	X				
Vitis labrusca	Fox grape			X										
Vitis vulpina	Winter grape					X		X	X	X				

Total Species: 268 (12 never before recorded in Frederick County; 4 never before recorded in Shenandoah County)

Total Families: 75



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