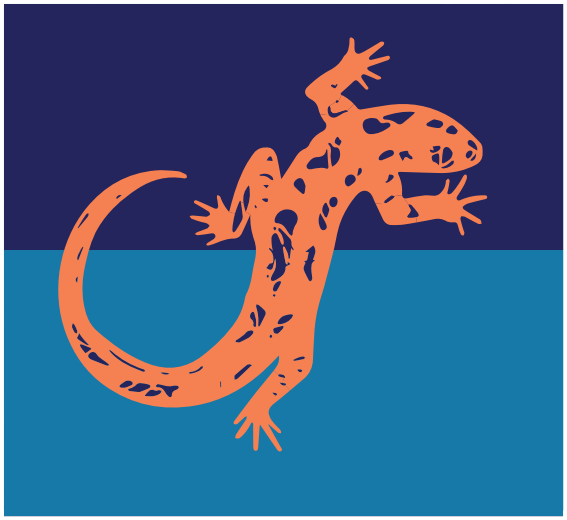
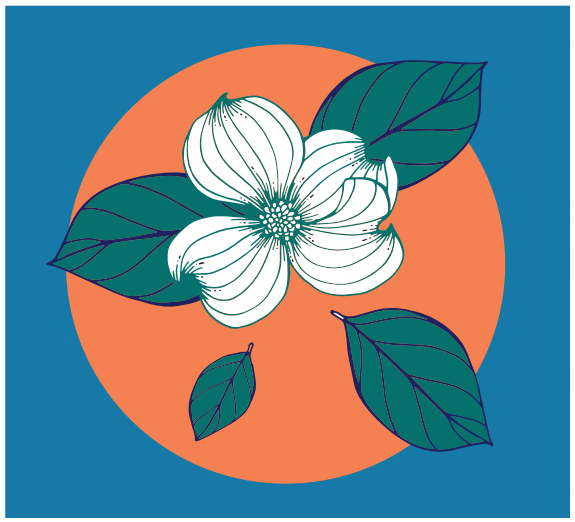
Forestry and Natural Resources Plan

An element of Arlington County's **Comprehensive Plan**



ARLINGTON COUNTY FORESTRY AND NATURAL RESOURCES PLAN



ARLINGTON
VIRGINIA

ARLINGTON COUNTY FORESTRY AND NATURAL RESOURCES PLAN

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CONTENTS

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EXECUTIVE SUMMARY

Every aspect of Arlington's natural resources is connected in a complex network of interdependent relationships that supports our community's quality of life, from the ecosystem services provided by trees and pollinators to the mental health benefits afforded by easy access to parks and green space. Though resilient, our natural resources are threatened by the impacts of a changing climate, increasing urbanization, invasive species and indifference driven by an artificial division between nature and the human world. Building on past progress, the Forestry and Natural Resources Plan (FNRP) provides a policy framework to address these threats, reconnect nature to our daily lives, and ensure the benefits of a healthy ecosystem are maintained for future generations of all species.

For the first time, the County is planning for all aspects of natural resource management holistically, and the success of this approach rests not only with the County government, but on the entire community. From elected officials to private property owners; community groups to school-age children; on residents, visitors and workers alike; everyone connected to Arlington has a role to play. With this principle in mind, the FNRP includes not just operational guidance for County staff and goals for habitat protection in public parks, but also recommendations for conservation and restoration on private property, a focus on environmental justice and equitable access to nature, as well as a collaborative approach to community conservation emphasizing education, volunteerism and incentives that reach beyond the scope of traditional environmental regulation.

The 2023 FNRP replaces the 2004 Urban Forest Master Plan and the 2010 Natural Resources Management Plan and is one of 12 elements of Arlington County's Comprehensive Plan. The Comprehensive Plan is an important decision-making tool used by the County Board, Commissions and staff to ensure that interconnected challenges, from managing growth to improving our parks and public spaces, are met effectively.

The FNRP's recommendations are organized into four interconnected Strategic Directions: Conservation; Climate Mitigation, Adaption and Resilience; Biodiversity; and Operations. Each strategic direction sets high-level policy goals and makes recommendations as to how they can be achieved. Together, the Strategic Directions are a road map to a greener future where Arlington's ecosystem thrives and the benefits of nature are available for all our residents and visitors.

These recommendations are supported by the Appendices, which include additional detail and analysis that provide context for the vision described in the document. The Glossary is included to make the technical aspects of the document easier for readers to understand and embrace. To make sure the plan becomes action, the Implementation section identifies time frames, cost ranges, responsible parties, potential partners and funding sources for each recommendation in the plan.

Though Arlington's ecosystem faces many challenges, there is reason to be optimistic. The love of the outdoors that blossomed during the COVID-19 pandemic continues to grow, and with that so does the realization that these benefits are not accessible to everyone. The increasingly visceral reality of climate change's impacts is accompanied by the County's deepening commitment to mitigate, adapt and innovate to minimize the effects. Finally, the progress to incorporate nature into our built environment demonstrates the benefits of biophilic design and reinforces the desire for better access to natural spaces. The FNRP was developed with an understanding that though much progress has been made towards a greener Arlington, there is still much more to do. The FNRP is written to build on past achievements and harness that momentum towards lasting environmental action. By promoting a renewed relationship to nature that is rooted in reciprocity, community and collaboration, we have an opportunity to transform Arlington for the better.

NATURE BELONGS IN ALL OUR NEIGHBORHOODS

Arlington's natural resources are an essential element of what make the County a great place to live, work and play. Every component of these resources, from air, water and soil to plants, animals and fungi, are intertwined in a complex web of relationships that we rely upon for our quality of life and that touch each of us daily. These resources provide immense benefits — from improving our physical and mental health, to making us resilient to the impacts of climate change like increased heat and heavier rains, to making our neighborhoods more comfortable, inviting and prosperous, and providing valuable habitat for sensitive species.

While resilient, this ecological web is threatened by the intersecting pressures of climate change, increasing urbanization, industry and invasive species. As Arlington continues to grow, it is essential that we continue to protect, enhance and manage our natural resources to maintain it, and the benefits it provides, for future generations.

The Forestry and Natural Resources Plan (FNRP) provides a comprehensive policy framework designed to address these challenges. With a blend of long-term, aspirational goals and pragmatic, near-term actions, the plan includes policy recommendations, innovative best practices for public and private development, and the application of new science and public outreach strategies designed to sustain and enhance our urban ecosystem and the services it provides for generations to come.

A NATURAL HISTORY OF ARLINGTON

Prior to colonization, the area that became Arlington County was abundant with wildlife, with vast tracts of forest, rich with plant and animal resources. Native American communities supported themselves on the land by seasonal harvesting of native plants, low-impact farming, hunting and fishing from nearby streams. The native communities were driven from Arlington within 100 years of European settlement through war, disease and treaties that deprived them of their ancestral lands, and the introduction of more intensive European methods of cultivation began large-scale changes to Arlington's environment.

Through the 1800s, most forested land was cleared for fuel, agriculture and then almost entirely during the Civil War to create clear sightlines for the ring of forts defending Washington, D.C. At the end of the 19th century, Arlington County was still predominantly rural with a heavily altered ecosystem. Entering the 20th century, this character began to change. African Americans migrated northward; later, immigrants arrived from Central America and Southeast Asia. From the 1920s through the present, the County has experienced continuing growth, development and the associated environmental impact.

By mid-century, Arlington had taken on many of the characteristics of major urban centers, confronting the same environmental challenges faced by most East Coast cities.

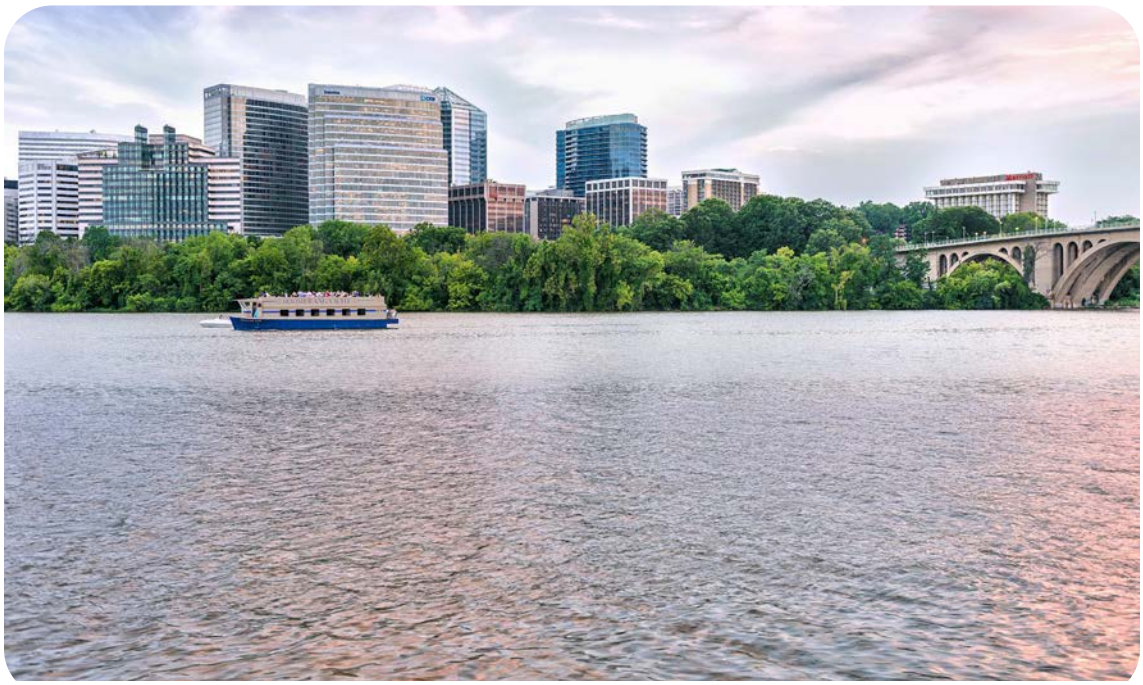
The County has long recognized the importance of nature in the built environment. That recognition was first reflected in the establishment of the park system in the 1940s, and most recently through a series of focused plans and policies to conserve, protect and enhance Arlington's trees and natural resources, including:

In 2004, the County created an innovative Urban Forest Master Plan that, among many other provisions, committed to maintaining the overall tree canopy at 40 percent. The plan established programs to foster the conservation and replacement of trees after development.

In 2010, the County adopted a Natural Resources Management Plan that called for new dedicated staff, designated critical Natural Resource Conservation Areas (NRCAs), and required development of resource management plans for County parks containing them. In this plan, Arlington formally pledged to ensure zero loss of natural land across the County.

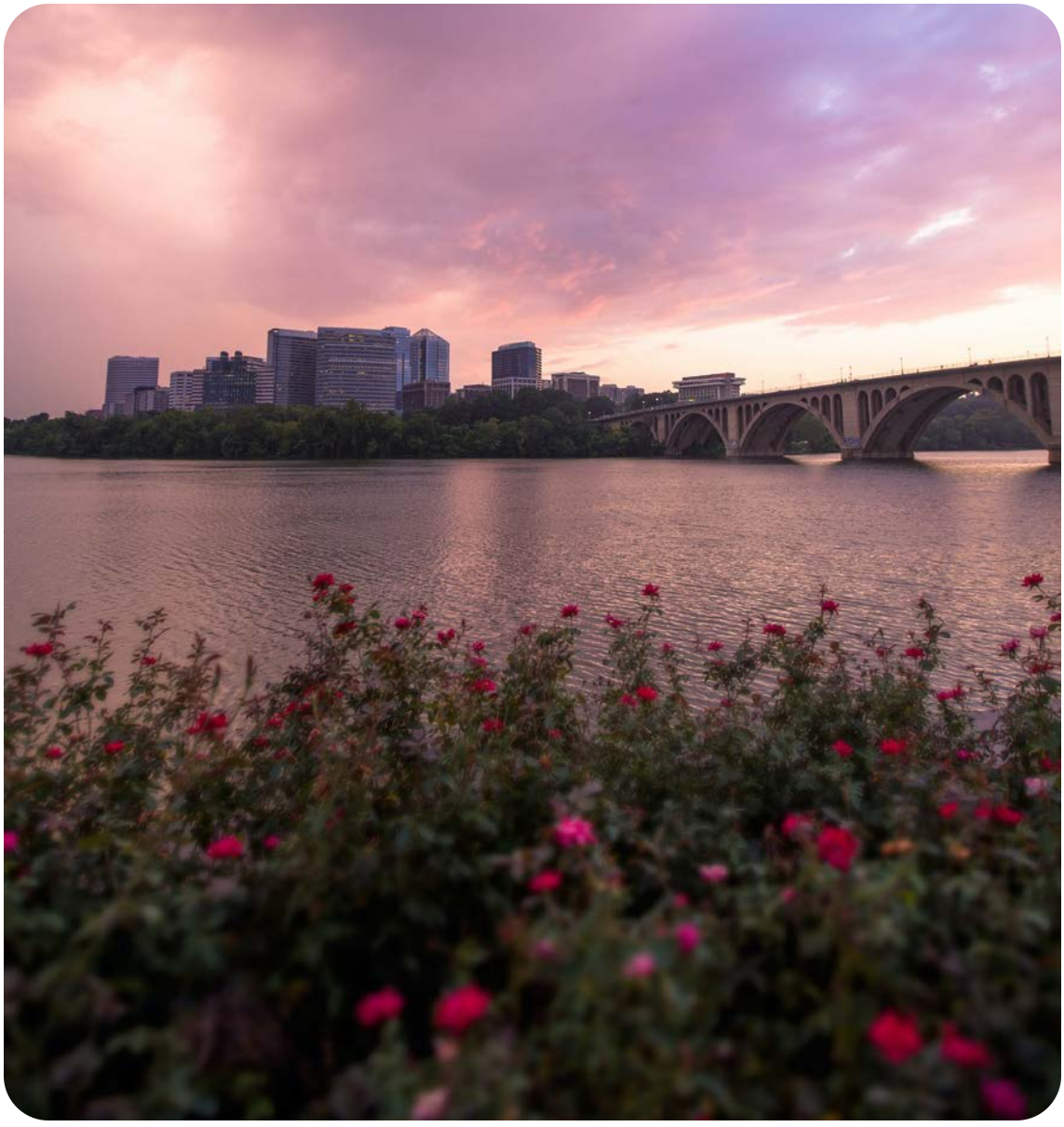
In 2019, the County adopted the Public Spaces Master Plan, including robust guidance for resource stewardship. This plan articulated the link between a healthy ecosystem, public spaces and the physical, mental and economic health of Arlington and introduced biophilia into County planning.

In 2020, the County joined the Biophilic Cities Network. Biophilic principles call for sustaining our innate connection to nature and making nature a priority in urban planning, zoning and management functions throughout government. Nature must be integrated into public and private developments, including site plans. And all projects should strive to conserve natural elements regardless of ownership or type of development.



VISION

Arlington values nature and manages its natural and built environments holistically as an integrated urban ecosystem and seeks to provide abundant and accessible nature to all residents, workers and visitors. From the wilder spaces in our parks to our urban streets, green corridors connect healthy forests and provide habitat for wildlife and respite for people. Arlington's urban areas are enhanced with biophilic design and function as essential parts of the ecosystem. Our parks and other green spaces are managed to maximize their ecosystem value and improve resilience in the face of climate change. The benefits of a healthy environment are available to everyone across the County, and Arlingtonians recognize that maintaining a healthy and thriving ecosystem into the future depends upon our collective stewardship.



PRINCIPLES

Photo Credit: David Howell

These principles, rooted in the benefits of nature described above, have guided the planning process:

1. **Natural ecosystems support human health and vibrant communities.**

   Trees, native plants and natural places provide measurable benefits to our residents and visitors. They help improve air and water quality, human well-being and public health; and provide beauty, environmental and economic benefits, wildlife habitat, food, and places for families and others to gather.

2. **Nature is valuable in and of itself.**

   It provides priceless ecological services, many of which we imperfectly understand. Nature is a source of aesthetic gratification and spiritual inspiration — and the deep wellspring of genetic diversity that guarantees future evolution and adaptation.

3. **The benefits of Arlington's natural assets should be shared fairly across neighborhoods.**

   Decisions should be guided by diverse perspectives based on mutual trust, including those of communities poorly served by past policies, as well as residents with language or income barriers to participation. Renters and property owners all have a voice. All residents and visitors, wherever they live, should have direct access to the benefits of our community's natural assets.

4. **The impacts of climate change must be addressed.**

   Urban forestry and stewardship of natural resources help communities adapt to and soften the impacts of climate change and other stressors on our natural resources.

5. **An engaged community drives positive action.**

   The Arlington community, including all people, organizations, institutions and businesses, can work together to sustain the urban forest and the community's natural resources. We strive to help all understand and support initiatives to sustain our community's natural assets.

6. **The County should invest wisely to achieve maximum returns.**

   The County recognizes that it acts not only as a steward of its natural environment but also as a disciplined and prudent steward of the financial resources entrusted to it — cooperating with other institutions and jurisdictions where possible to magnify the impact of its investments.

PLANNING CONTEXT

Photo Credit: David Hills

The FNRP replaces the Urban Forestry Master Plan and Natural Resources Management Plan and serves as one of 12 elements of Arlington's Comprehensive Plan. Among the County's most important decision-making and priority-setting tools, the Comprehensive Plan guides coordinated development and sets high standards for public services and facilities in the County.

THE COMPREHENSIVE PLAN

The initial plan was first adopted on August 27, 1960 and included five elements. The Comprehensive Plan has been amended over time and now includes 12 elements, including the FNRP, that touch on a wide-ranging set of community needs, including land use, transportation networks, transportation modes, parking, historic preservation, affordable housing, sanitary sewer system, recycling, public spaces, natural resources, urban forestry, public art, community energy, water distribution, Chesapeake Bay preservation and stormwater management.

The Comprehensive Plan is supported by a series of sector, area and revitalization plans, as well as other plans, policy documents and compendia. Taken together, these planning documents reflect Arlington-specific expectations on many issues, among them: land use, public spaces, transportation, affordable housing, historic preservation, public safety and community services.

HOW THE FNRP RELATES TO OTHER PLANS AND COUNTY COMMITMENTS

EXISTING PLANS AND DESIGN PRINCIPLES

The FNRP updates and replaces the Urban Forest Master Plan (2004) and the Natural Resources Management Plan (2010) as a unified plan that lays out recommendations for the sustainability of public and private trees, conservation of natural assets, and implementation of biophilia in Arlington, and establishes how the County can help achieve these goals. As part of the Comprehensive Plan, the FNRP addresses many of the same intersectional environmental issues set as priorities in other elements of the Comprehensive Plan, including the Community Energy Plan (2019), the Chesapeake Bay Preservation Plan (2023), the Stormwater Management Plan (2014) and the Public Spaces Master Plan (2019). Though these issues are covered in depth in other Comprehensive Plan elements, actions recommended by the FNRP can foster energy conservation and carbon sequestration, mitigate the impacts of climate change, improve stormwater management, and enrich visitor experiences in the County's parks.

To support coordinated and cost-effective action by the County and ensure these interconnected challenges are met holistically, the issues and recommendations explored by the FNRP will inform future updates to other elements of the Comprehensive Plan.

Arlington's Stormwater Master Plan reflects the current state of stormwater management and the condition of storm sewers, streams and watersheds in Arlington County. It charts a path to a more sustainable community by providing a comprehensive framework for managing stormwater, streams and watersheds for the next 20 years.[1]

See Appendix F for how the FNRP intersects with other County planning efforts.

ART SERVES NATURE

Arlington's PSMP includes recommendations, like this one about public art, that enhance the public realm with environmental education and interpretation opportunities — a key goal of the FNRP — by embedding natural analogues to make public spaces more comfortable, inviting and calm.

Twelve Watermarks were installed as part of the Four Mile Run Restoration project on the multi-use trail. The Watermarks symbolically depict underground culverts as a way to focus attention on stormwater outfalls and highlight the need for environmental stewardship.

Photo Credit: Elman Studio

PLANNING FOR THE BIOPHILIC CITY

In March 2020, Arlington joined the Biophilic Cities Network — a group of communities around the world committed to infusing nature into the built environment.

As a Biophilic City Network Partner, Arlington has become an "early adopter" of biophilic principles, embedding them in its recently developed Public Spaces Master Plan. The scope of the plan has been recognized nationally by the American Planning Association new publication, "Planning for Biophilic Cities."[3] See page 58 of Biophilia In Action.

> A biophilic city is "a green city, a city with abundant nature and natural systems that are visible and accessible to urbanites. It is certainly about physical conditions and urban design — parks, green features, urban wildlife, walkable environments — but it is also about the spirit of a place, its emotional commitment and concern about nature and other forms of life, its interest and curiosity about nature, which can be expressed in the budget priorities of a local government as well as in the lifestyles and life patterns of its citizens."[2]
>
> *— Timothy Beatley*

Biophilic concepts are woven into many elements of the FNRP, including recommendations for building design, site plans, street layouts, parks and natural areas. All are intended to reflect the human instinct to connect with nature and other living things. The goal is for all Arlingtonians — regardless of where they live — to have regular, frequent interactions with nature because it is omnipresent, not just experienced in a remote destination far from where people live and work.

The Pentagon City Sector Plan (2022) illustrates how these principles have been implemented in recent County planning efforts, as shown in Biophilia in Action.

PLANNING FOR THE PUBLIC AND PRIVATE REALM

The future of development in the County and its ability to influence how property is developed, used and managed is largely determined by who holds ownership — a powerful responsibility that can shape the landscape for generations to come.

PUBLIC OWNERSHIP

These properties generally include parks, school sites, rights-of-way, streets and publicly owned facilities. For these public lands, owners comply with the standards and regulations of the underlying zoning district and guidance of the Comprehensive Plan. However, in cases of County ownership, the County can exercise influence over landscaping, maintenance and park design — informed by extensive public input. Through negotiations and formal agreements, the County can also influence, to some extent, practices on public spaces such as Northern Virginia Regional Park Authority (NOVA Parks) sites, state rights-of-way and federal property.

PRIVATE OWNERSHIP

For private lands, the County must use different tools to guide development that vary based on the size of the property, its use and ownership. The authority to regulate the maintenance and use of private property is limited except for larger developments. Property owners are limited to requirements such as those set for Resource Protection Areas (RPA), local historic districts and legally protected resources like Specimen Trees.

This may mean that removal of trees and other natural resources, outside of these spaces, may be permitted without notice or consequence. Collaboration, incentives, social pressure and education are often the best avenues to continue to conserve these privately owned resources.

At its most basic level, the Arlington County Zoning Ordinance (ACZO) distinguishes between uses permitted “by-right” and those which require a “special exception.”

BY-RIGHT DEVELOPMENT

All property owners are entitled to certain by-right development rights, based on the provisions of the underlying zoning district. They remain subject to land development codes and ordinances which have tree canopy and other vegetation requirements. These include Erosion and Sediment Control, Chesapeake Bay Preservation, Stormwater Management and Floodplain Management, as well as other elements of the zoning code that determine lot coverage, street trees, screening, landscaping and setbacks.

SPECIAL EXCEPTION DEVELOPMENT

Uses permitted by special exception are reviewed through a public process and include public hearings by the Planning Commission and County Board. The special exception process determines whether use permits or site plans are approved.

Use Permit

The use permit is one form of special exception often applied to uses which may have undesirable impacts if proper safeguards are not imposed. The County Board may approve use permit conditions particular to the character of the use. These conditions ensure that the use of the site conforms to all requirements and mitigates the impacts of the proposed use.

Site Plan Process

Several Arlington zoning categories permit development by site plan, another form of special exception under the ACZO.

The site plan review process provides for County review of such projects. It enables the County Board to vary the uses, heights, setbacks, densities and other regulations so that a specific project conforms to the ACZO; addresses other County goals, policies and plans; and comports with good planning practice generally.

Most site plan review proposals are for hotel, residential, office and mixed-use development located in certain zoning districts permitting greater intensity of land use. Permits are reviewed on a project-by-project basis and may require, among other conditions: conservation or provision of public open space, conservation or provision of affordable housing, conservation of historic structures, provision of improved infrastructure, conservation or provision of public cultural resources, conservation or provision of community facilities, promotion of sustainable development goals and provision of quality design.

Arlington has adopted new requirements for land-disturbing activities on single-family home projects. This change, referred to as LDA 2.0, is important as infill development continues and rainfall intensity increases, causing more lot-to-lot runoff and adding cumulative runoff impacts to downhill neighbors, the storm drain system and local streams. Single-family home projects are now required to manage more water on-site, along with de-compacting and amending disturbed soils. Other new requirements can be found at bit.ly/3FE3AKH.

Form-Based Codes

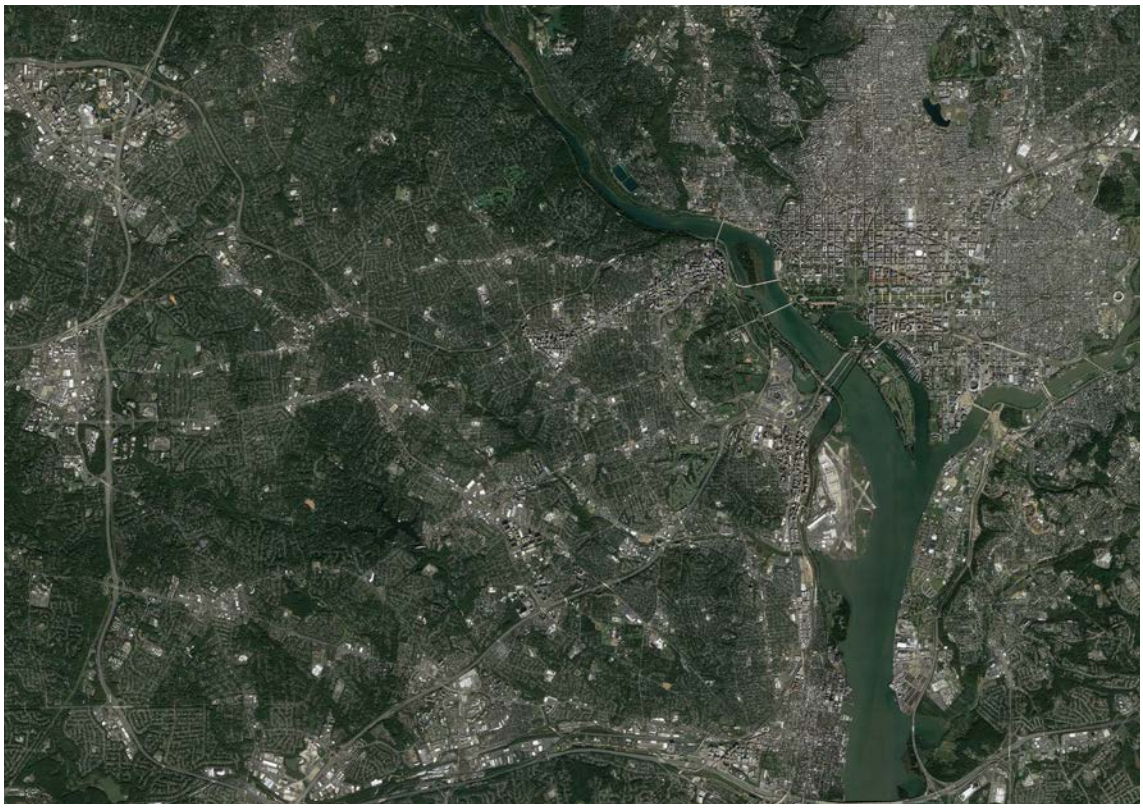
Form-based codes (FBCs) represent an alternative zoning district for regulating development that helps realize a community's vision for a specific area. They clearly define and illustrate requirements for building heights, building and parking placement, historic façades, windows, balconies and other architectural features, as well as standards for public sidewalks, street trees, parking and parks, civic greens and town squares. Similar to the site plan process, FBC use permits may require, among other conditions, conservation or provision of the features listed above.

Comprehensive, District and Sector Plans also guide development. County-wide and neighborhood-level planning can be oriented toward specific goals (including, for example, revitalized commercial districts, diversity of housing opportunities or protection of natural or cultural assets).

PLANNING AND DESIGNING WITH NATURE AS ARLINGTON GROWS

In 1900, Arlington County was still considered a rural community. That year's census counted only 6,430 residents, 379 small farms, several villages and few improved roads. But entering the 20th century, Arlington's mostly agrarian character began to reflect the impact of population growth driven by an expanding federal government. The federal workforce tripled during World War I, between 1916 and 1918, driving a 60 percent increase in the County population from 1910 to 1920. Between 1920 and 1930, the population grew another 40 percent, transforming a resource-rich rural community into a highly developed suburb.

The community continues to grow, and today Arlington is an urbanizing community where more than 2 out of every 5 acres is covered by buildings, pavement, parking lots and streets.



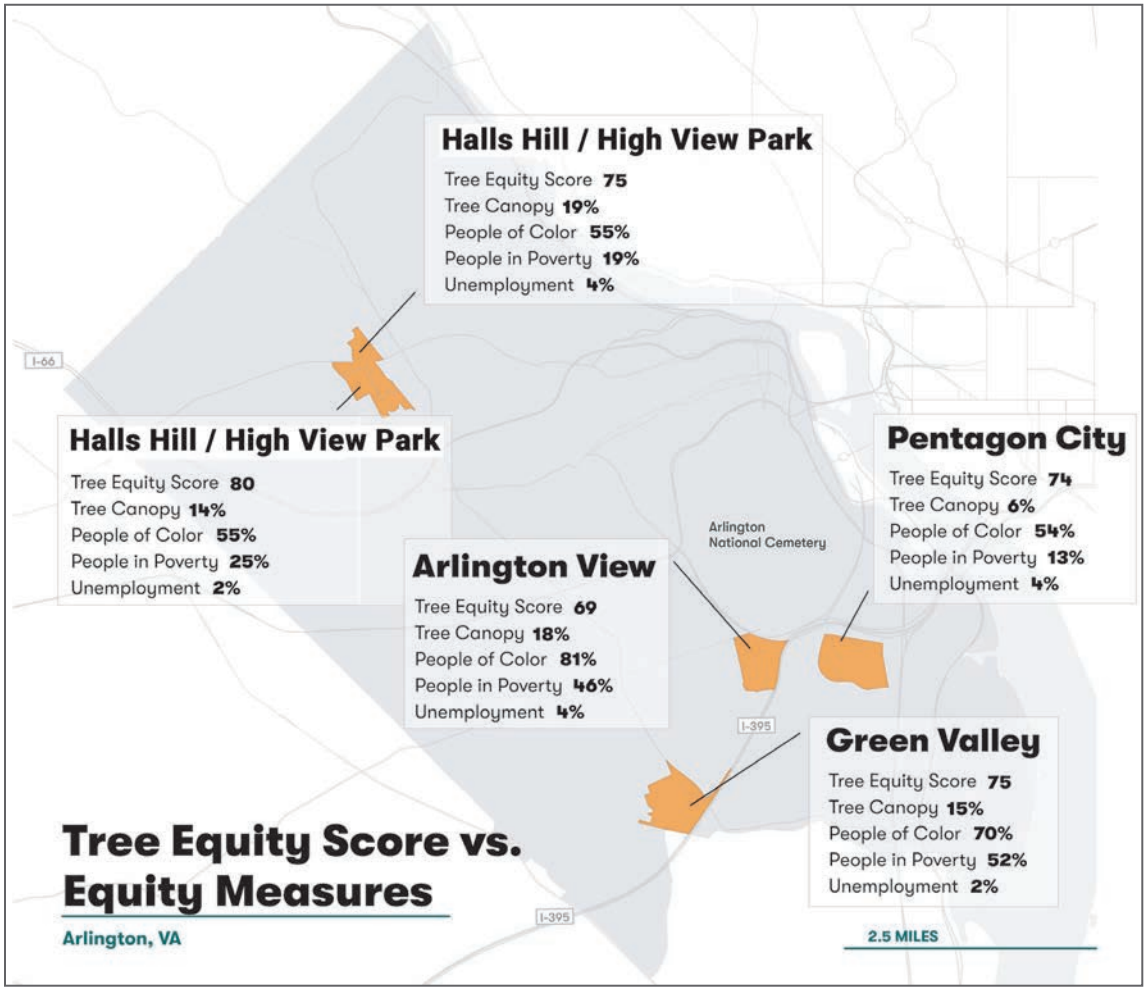
Aerial photo of Arlington County.

The need to accommodate continued population growth has long driven land use planning in Arlington County. Some 50 plans now guide the development of public and private properties of different sizes, ownerships and uses. Many reflect the County's early commitment to the principles of Smart Growth — the concentration of higher-density development around public transportation hubs to accommodate population and economic growth in more sustainable ways.

As Arlington continues to grow, the community is challenged to balance the need for maintaining space for nature and providing access to it with the need to house, educate and provide jobs for an ever-growing, increasingly diverse population. Quantifying and appropriately assessing the value of all the services provided by Arlington's natural resources will be critical to successfully balancing these needs.

RACE, EQUITY AND ACCESS TO NATURE

Like virtually all communities more than a century old, Arlington's neighborhoods reflect the impact of longstanding structural racism and segregationist policies and practices. Discrimination in housing not only prevented the creation of wealth and access to high-quality education, it also forced Black residents into neighborhoods devoid of many of the ecosystem benefits enjoyed by their White neighbors and plagued by unsightly, unhealthy land uses. This pattern is part of Arlington's history and is reflected in its geography.[4]



American Forests' Tree Equity Score National Explorer tool suggests that less affluent neighborhoods in Arlington offer less tree canopy — often half as much — than more affluent ones. These affected neighborhoods are characterized by higher percentages of people of color, households with incomes at or below the County median, foreign-born residents and renters.[5] Credit: American Forests

In September 2019, the County adopted an equity resolution and, subsequently, brought together stakeholders, including County government, to work toward achieving its goal. RACE — Realizing Arlington's Commitment to Equity — aims to close "race-based outcome gaps so race does not predict one's success while improving outcomes for everyone."[6] This commitment inspired the FNRP which seeks to ensure every one of its residents, workers and visitors have access to nature in Arlington.

EXISTING CONDITIONS

PEOPLE

Arlington County is highly urbanized. At just under 26 square miles, with a population that reached an estimated 235,500 people in 2022, Arlington County has one of the highest population densities among counties nationwide, and it continues to grow. The County estimates that by 2045, the population will have increased to almost 300,000 people. More than 8 in 10 of these new residents will occupy new or existing multifamily housing in the Rosslyn-Ballston, Columbia Pike and Richmond Highway Planning Corridors.

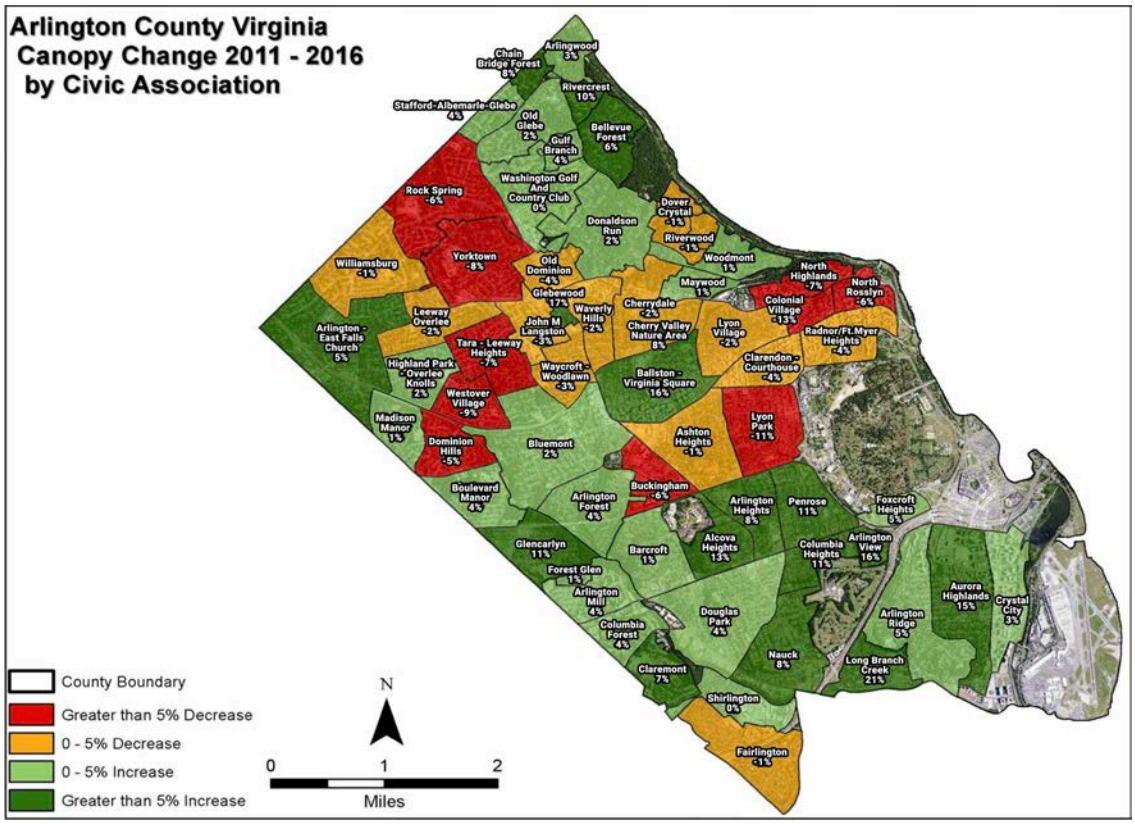
Population, Housing and Jobs in Arlington County

	Housing Units	Households	Population	Jobs
2020 Census	119,085	109,912	238,643	221,600
2025	126,500	118,200	245,800	223,200
2030	135,200	126,200	260,200	236,700
2035	142,800	133,300	272,900	259,200
2040	150,000	140,000	285,200	266,400
2045	157,400	146,900	298,000	275,300
2050	164,600	153,600	311,200	283,700

According to the 2020 American Community Survey, 22.6 percent of Arlington's 235,500 residents were born outside of the U.S., a rate that has been increasing over time and remains nearly double the national average.

TREES AND TREE CANOPY

In 2008, Arlington County conducted its first comprehensive study of its tree canopy coverage, which reported an estimated 43 percent coverage. However, subsequent Tree Canopy Assessment Reports in 2011 and 2016 have revealed a potential decline in coverage, estimating 40 percent and 41 percent, respectively. While these reports may suggest a straightforward reduction in coverage since 2008, the downward trend is more complex than these numbers indicate.



Tree loss has not been evenly distributed across Arlington, with many neighborhoods suffering greater canopy loss than others. Simultaneously, losses on private property during this period were partially offset by tree planting and conservation on parks and other public lands, slowing the decline of County-wide tree canopy cover.

Since 2016, additional measures, including increased net tree loss tracked through development permit review, i-Tree canopy studies[7] and tree maintenance requests, indicate that this trend of tree canopy loss likely continues. Ongoing, regular study of the tree canopy, as recommended in this plan, will help track these changes, plan localized interventions and assess the efficacy of County programs.

Tree Canopy of Arlington County

	2008		2011		2016	
	Acres	Percent	Acres	Percent	Acres	Percent
Tree Canopy Excluding DOD and Airport	6,349	43%	5,883	40%	6,015	41%
Tree Canopy Including DOD and Airport	N/A	N/A	6,191	37%	6,356	38%

Tree canopy of Arlington County excluding and including Department of Defense (Pentagon, Arlington Cemetery and other properties) and Airport Data.

ARLINGTON'S NATURAL RESOURCES BY THE NUMBERS

- 26 square miles
- 235,000+ people
- 42% impervious surfaces
- 66% loss of surface streams
- 400-mile storm drain system
- 41% tree canopy
- 18% general open space
- 4.4% remaining natural lands
- 30 miles of surface streams
- 70% loss of historic reptiles and amphibians
- 21% of plant species found in Virginia
- 150+ parks, 80% smaller than 10 acres

Arlington is home to **26** kinds of mammals, **400+** butterflies and moths, **198** birds, **44** dragon and damselflies, **29** fish, **16** amphibians, **15** reptiles, **12** mollusks and **600+** native plants.

13 state-listed rare plants.

One globally-rare community.

Numerous plants and wildlife have reappeared recently, including ravens, striped skunks, river otters, coyotes, bobcats, ray fox, yellow-crowned night-herons, Mississippi kites, wild turkey and little wood satyr butterflies.

Arlington County **strategically manages** its Public Spaces, Natural Resource and Urban Forest with dedicated plans and policies.

With little plantable space remaining on existing County-owned land, opportunities to offset future losses on public land are limited. According to an i-Tree Eco study in 2016, there are approximately 755,000 trees on all lands in Arlington.[8] The County owns and controls an estimated 120,000 of them, including about 19,500 street trees. The remainder grow on private property — including commercial, single-family and multifamily residential sites, and private institutions — or on public institutions, like schools and federal property, that are not under direct County Board management.

As much as **87%** of the trees in Arlington County are privately owned or managed by Arlington Public Schools and other large institutions. The County manages only 13%.

LAND AND NATURE

Most of the County's existing public space — 2,940 acres or 18 percent of the land area — is located on public parklands owned by Arlington County, the National Park Service (NPS) and NOVA Parks. This mosaic of diverse land managers makes a cooperative approach to stewardship of these limited resources vital.

These public spaces contain within them smaller areas of natural land, totalling 1,128 acres. These natural areas occur as several dozen isolated and fragmented parcels, and there are limited connective corridors that limit the movement of wildlife and negatively impact biodiversity. The most ecologically significant parcels occur on land where development would have been difficult or too costly: Barcroft Park, Glencarlyn Park and Bluemont Park along the mainstem of Four Mile Run, park land along the northern section of the Potomac, along with the stream valleys and floodplains contained within these areas. Most parcels occur as mature hardwood forests growing on land cleared during the Civil War or on property abandoned by farmers in the late 19th and early 20th centuries.

WILDLIFE

According to the Natural Heritage Resource Technical Report, wildlife continues to flourish in Arlington County. But many species have been lost. The Report identified 18 species as locally extirpated, and some 32 as "unknown" — that is, species historically found in the County but not found as part of the recent wildlife survey or documented in contemporary records. These are likely extirpated as well.[9]

Aside from protecting endangered and rare wildlife and plants, other common species require careful management. Native species are also capable of negatively impacting ecosystem health if their population exceeds the ecological carrying capacity of their environment.

COVID-19 AND THE BENEFITS OF NATURE

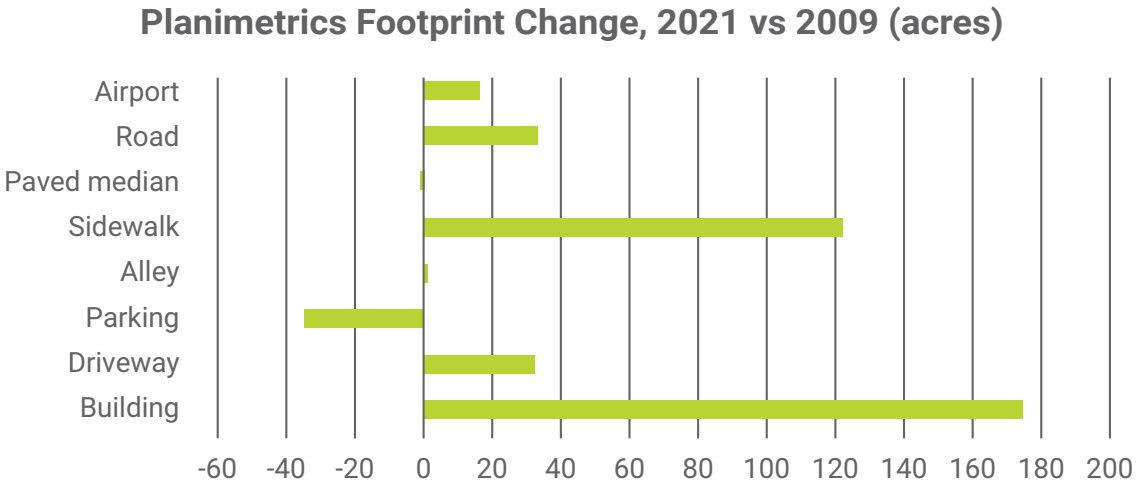
The FNRP reflects the disruption caused by the COVID-19 pandemic when parks across the world saw record-high visitation. Arlington, too, has seen its residents and visitors turn to County parks to recharge themselves both physically and mentally. They sought relief from pandemic restrictions in record numbers. This increase in visitation presents a challenge to park management and natural resource protection. At the same time, it offers an incredible opportunity to connect these benefits of nature to peoples' everyday lives, and to engage them as stewards of nature in Arlington.

Little Wood Satyr

WATER

STORMWATER MANAGEMENT

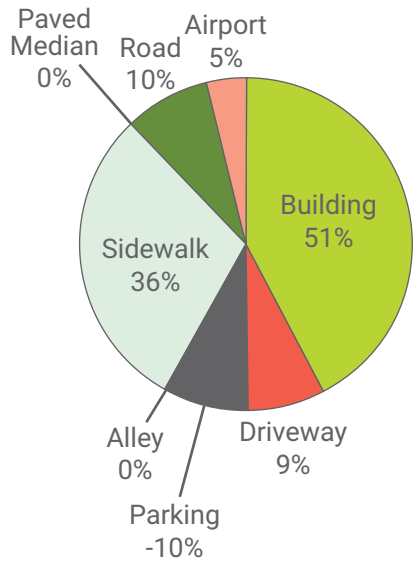
Development increases hard, impermeable surfaces and decreases the amount of water that soaks into the ground, or infiltrates. This increases the amount of runoff from storms. The growth of impervious surfaces — particularly streets, sidewalks, roofs, driveways, walkways and parking lots — represents not just a significant challnege for stormwater management, but to water quality, groundwater recharge and aquatic habitats and organisms that are critical to Arlington's ecosystem function.



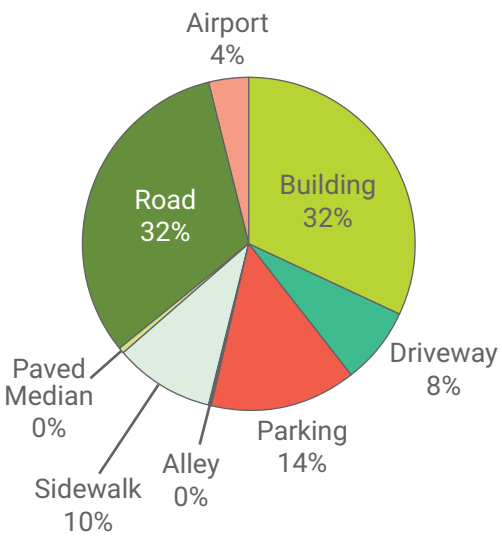
Increasing impervious surfaces over time. Note that GIS planimetric data captures most but not all impervious surfaces. The data includes buildings, roads, sidewalks, driveways, parking lots and alleys. Patios and residential walkways are not included. While some of the GIS-estimated increase can be attributed to increased mapping resolution over time, this is considered a relatively minor factor.

Impervious Surfaces by Type

Planimetrics Footprint Change, 2021 vs 2009 (proportion of total footprint change)

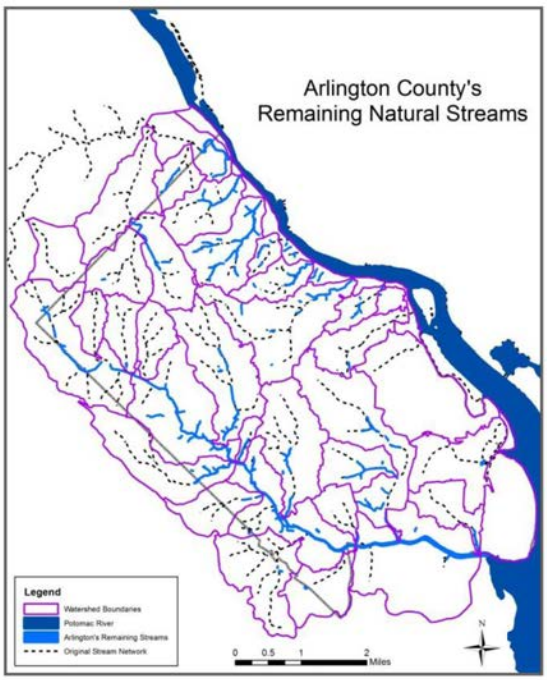


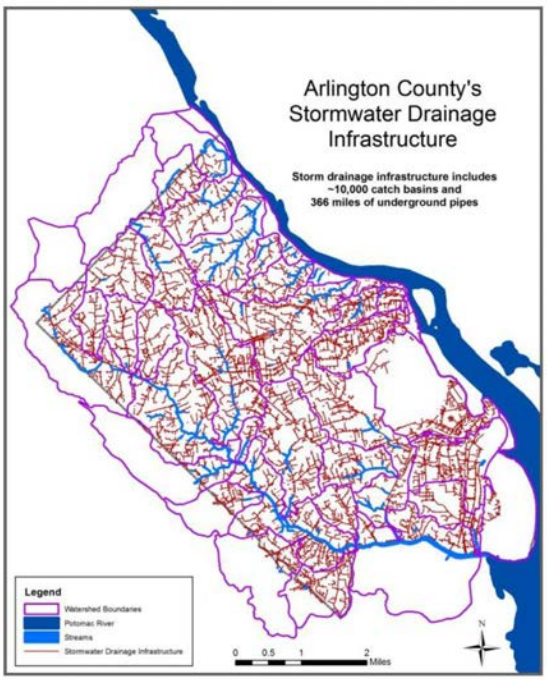
2021 Planimetrics



STREAMS, SPRINGS AND WETLANDS

Historically, an estimated 90 miles of streams flowed across the land that became Arlington. Today, some 60 miles have been buried to combine with storm pipes as a result of development over the past 75 years. Those that remain provide valuable ecosystem and biophilic services but are heavily impaired both physically and from a water quality standpoint. Urbanization has degraded water quality conditions, making it difficult for less pollution-tolerant aquatic (or invertebrate) species to persist. More than 400 miles of underground storm drainpipes carry stormwater to the remaining 30 miles of streams.





Side-by-side maps of the County's original drainage network and the current drainage network (as shown in the Stormwater Master Plan).

A small number of natural springs and remnant wetlands can be found within the remaining natural lands. Three wetland communities, while small, have been classified as state and/or globally rare plant communities and are historically and ecologically significant.

Other wetland areas, not listed by the Commonwealth, have been deemed by the County as biologically significant. Wetland resilience projects are occurring with stormwater pond retrofits and conversions to constructed wetlands, notably at Ballston and Sparrow Ponds, along with living shoreline installations along Four Mile Run.

As storm events increase in frequency and intensity, impaired streams with unstable banks will become even more vulnerable to heavier stormwater runoff, sedimentation and flooding, alongside impacts to public infrastructure and safety.

The County has undertaken significant projects to repair and reconfigure eroding streams and co-located infrastructure.

The term "stream restoration," while used regionally and nationally, does not capture the primary intent and objectives for these projects. Rather than restoring a stream back to a previous condition, these projects work to create a stream channel in balance with the increased flow from the County's urbanizing landscape. Accordingly, "stream resiliency" is now the overarching theme and emphasis for this body of work.

CLICK TO VIEW ARLINGTON'S STREAM RESILIENCE STORY MAP

SUMMARY OF COMMUNITY ENGAGEMENT

Arlington believes that achieving conservation goals rests on the efforts of all who live, work and play in the County. Public engagement ensures that planning decisions are rooted in public needs and interests. More importantly, it serves to inform and mobilize the grassroots action needed to ensure Arlington remains a vibrant, verdant community. Six priority areas for action emerged from surveys and a series of stakeholder focus groups.[10]

ACTION AREA 1: IMPROVE PLANTING PRACTICES

Some participants were critical of the County's current tree-planting and establishment practices. They noted that some trees are not able to develop through their intended lifecycle due to inadequate conditions of their environments and inadequate early care, such as watering or structural pruning.

ACTION AREA 2: DISCOURAGE OR LIMIT DEVELOPMENT

Participants recognized competing desires for more green space and the need to accommodate Arlington's growing population with more development. Community members voiced concern over excessive paving and construction primarily brought on by developers and single-family homeowners building large houses on small lots. Opinions ranged from wanting to limit development with policies and ordinances to discouraging development altogether.

ACTION AREA 3: STRENGTHEN ZONING ORDINANCES AND REGULATIONS

Community members encouraged the County to identify areas of opportunity where Arlington can work in partnership with developers to have a positive impact on trees and natural resources. By strengthening zoning ordinances and regulations, respondents believe that the County can enhance tree protection, increase planting areas, reduce impervious areas and improve replanting practices.

ACTION AREA 4: IMPROVED MAINTENANCE AND MANAGEMENT

Many respondents expressed satisfaction with maintenance and management practices. Still, there was general support for improvement in several areas: more funding for maintenance overall, stronger partnerships with volunteer community organizations, transitioning away from gas-powered equipment and raising awareness about the role people play in protecting — or damaging — natural resources.

ACTION AREA 5: MANAGE AND PROTECT BIODIVERSITY

While most Arlingtonians value the diversity of plants and wildlife in the County, many also noted the harmful impacts of expanding deer populations. General sentiment favors striking a balance between managing negative impacts of wildlife while also protecting habitats that benefit Arlington's ecosystem.

ACTION AREA 6: EDUCATE AND FOSTER STEWARDSHIP

Respondents favored both education and pathways for people to become better stewards as tools the County should favor. They recommended enhanced education for homeowners about maintaining natural environments on the properties where they live. Stronger partnerships with Arlington Public Schools (APS) and youth-related community programs could help impart to young people an enduring commitment to good stewardship.

This feedback helped to shape the plan's focus areas and recommendations; subsequent rounds of public engagement contributed to refining the recommendations and developing priority actions and the plan's implementation framework.

INTRODUCTION TO THE STRATEGIC DIRECTIONS

The FNRP is built around four Strategic Directions which, together, embody actions that protect our ecosystem, conserve Arlington's natural capital and ensure that the benefits of nature are well-understood and available for current and future generations of residents and visitors.

Each strategic direction states high-level policy goals and contains recommendations for how the County can achieve them. All four follow the same format:

1. STRATEGIC DIRECTIONS – GOAL

1.1 Actions – How the County can achieve the goal

1.1.1 Action Steps –
Specific programs, initiatives and policies

1. CONSERVATION

Increase and protect tree canopy, natural areas and biophilic features throughout the County

1.1 Sustain Arlington's tree canopy and natural areas

1.2 Expand spaces for trees and natural areas

1.3 Assess and account for all the benefits of trees and natural areas

1.4 Foster and strengthen Arlingtonians' commitment to conservation of trees and natural resources

2. CLIMATE MITIGATION, ADAPTATION AND RESILIENCE

Ensure Arlington's natural assets protect public health and well-being

2.1 Allocate resources to climate-vulnerable hot spots

2.2 Maximize climate protection capacity of trees and green space

2.3 Deepen Arlingtonians' commitment to the conservation of trees and natural resources

3. BIODIVERSITY

Sustain vibrant landscapes for people, plants and wildlife

3.1 Support healthy ecological communities of native plants and wildlife

3.2 Manage threats to ecological health and integrity from invasives and native species

3.3 Establish a County-wide natural infrastructure and conservation connectivity network

3.4 Restore and manage water resources with a holistic, ecological approach

3.5 Foster biodiversity in the built environment

4. OPERATIONS

Manage organizational resources for maximum return

4.1 Set explicit outcome-oriented performance measures for maintenance activities and schedules for regular assessment

4.2 Develop and review partnerships with independent entities outside the County's boundaries or its direct control

4.3 Provide a single platform to coordinate, recruit, train and mobilize volunteers

4.4 Adopt regular, cyclical maintenance schedules for street trees and natural resources

4.5 Seek long-term, sustainable funding to support forestry and natural resource management activities

4.6 Practice and promote environmental responsibility in maintenance operations

REFERENCES

1 https://www.arlingtonva.us/Government/Projects/Plans-Studies/Environment/Stormwater-Master-Plan

2 Beatley, Timothy. 2011. Biophilic Cities: Integrating Nature into Urban Design and Planning. Island Press.

3 James Brown, Helen Santiago Fink, Planning for Biophilic Cities, American Planning Association, 2022. https://www.planning.org/publications/report/9255203/

4 See Appendix B: Race and Housing in Arlington County, and for timelines that track the history of segregation in Arlington, go to https://sway.office.com/LDWSWfLwS49GT0Af?ref=Link

5 Recent research by scientists from the USDA Forest Service and several universities confirm that the neighborhoods most vulnerable to impacts of climate change are those that suffer from historic discrimination in housing. Locke, D.H., Hall, B., Grove, J.M. et al. *Residential housing segregation and urban tree canopy in 37 U.S. Cities*. NPJ Urban Sustain 1, 15 (2021). https://doi.org/10.1038/s42949-021-00022-0

6 https://www.arlingtonva.us/Government/Topics/Equity?BestBetMatch=equity|d2f86bd7-6525-489c-b1eb-fbe9efd2bbfb|6244aa32-b2d4-441b-b20e-1096256a4671|en-US

7 https://treestewards.org/2022/08/29/tree-stewards-do-i-tree-canopy-measurement-from-their-desks/

8 https://www.arlingtonva.us/Government/Programs/Sustainability-and-Environment/Trees/Tree-Statistics/i-Tree-Eco

9 These wildlife numbers may have recently changed, with discovery of formerly extirpated fauna such as striped skunks, bobcat, slimy salamander and many others that come back or have been rediscovered since publication of the Technical Report. Others have also moved in recently such as eastern coyotes, and others have expanded their numbers such as white tail deer, raccoons, and red foxes.

10 A complete analysis of community feedback on the Forestry and Natural Resources Plan can be found on the County website https://www.arlingtonva.us/files/sharedassets/public/Projects/Documents/NRJAG-Presentation_3.1.2021.pdf

PRIORITY ACTIONS

1.1.1 Maintain 40 percent tree canopy County-wide through conservation and tree-planting programs tailored to local conditions and ecological contexts.

1.1.2 Ensure 70 percent of Arlington's trees are regionally native by 2035.

1.1.5 Advance urban forestry and natural resource goals through County public space acquisitions.

1.2.1 Seek legislative changes at the state level that provide Arlington County with a broader set of policy tools to promote the conservation and management of its natural resources.

1.2.3 Enhance development standards to optimize retention or replacement of tree canopy, natural vegetation, permeable surfaces and biophilic elements.

1.4.3 Recruit and train community, cultural and faith-community leaders in addition to existing partner groups to serve as nature ambassadors and proponents of grassroots conservation.

2.1.1 Identify Tree Equity Areas and work with these communities to direct resources to neighborhoods currently underserved by existing tree canopy or access to natural areas.

3.1.6 Adopt a native plant requirement for public and private sites to expand use and retention of local and regionally native plants.

3.3 Establish a County-wide natural infrastructure and conservation connectivity network.

4.4.1 Move from "reactive" to "proactive" maintenance of publicly owned natural assets, outside of extreme storm events and other emergencies.

STRATEGIC DIRECTIONS

STRATEGIC DIRECTION 1: CONSERVATION

INCREASE AND PROTECT TREE CANOPY, NATURAL AREAS AND BIOPHILIC FEATURES THROUGHOUT THE COUNTY

Arlington's trees, parks, streams, public spaces and natural areas define the character of our community. They lend vibrancy to neighborhoods, help mitigate the hazards of climate change, promote public health, foster habitats in which wildlife can thrive, and provide places for people to gather, play or simply enjoy the solitude found in nature. As Arlington grows, our commitment to connect people with these places requires that the County protect and sustain these natural assets and add others when possible.

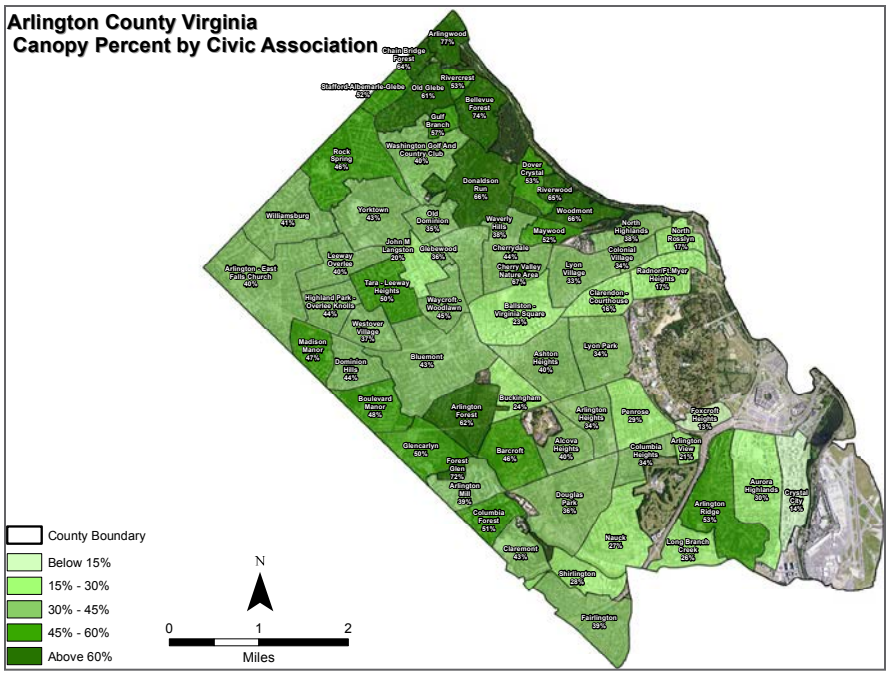
The County has long recognized the importance of this challenge. Arlington has created a park system deemed one of the best in the nation. The Public Spaces Master Plan commits to adding and protecting key public spaces. Maintaining natural areas will continue to be a key criterion for evaluating potential acquisitions to reach this goal.

See Appendix C for highlighted accomplishments for 2004 and 2010 plans.

Likewise, the County has adopted guidelines for public and private development that promote greener landscapes, more trees and richer habitats. On public lands, new planting matches or exceeds tree removals; natural areas are sustained through aggressive removal of invasives and protection of critical habitats. The County grows and plants native plant species for these public spaces.

The County employs a variety of tools to sustain tree canopy and natural areas on larger private development projects that require permits. On other, generally smaller properties, owners are entitled to remove trees and manage vegetation on their lot "by right." They remain subject to the Chesapeake Bay Preservation Ordinance, Stormwater Management Ordinance, Erosion and Sediment Control Ordinance and elements of the zoning code that determine canopy requirements, lot coverage and setbacks.

As part of these and other ongoing initiatives, County-led and volunteer-driven efforts have curbed invasive species — allowing the regeneration of plants, insects and wildlife native to our County. Stream improvement projects have helped increase stream resiliency, protect co-located infrastructure, create more sustainable streamside forest areas, and contribute to meeting water quality compliance requirements.

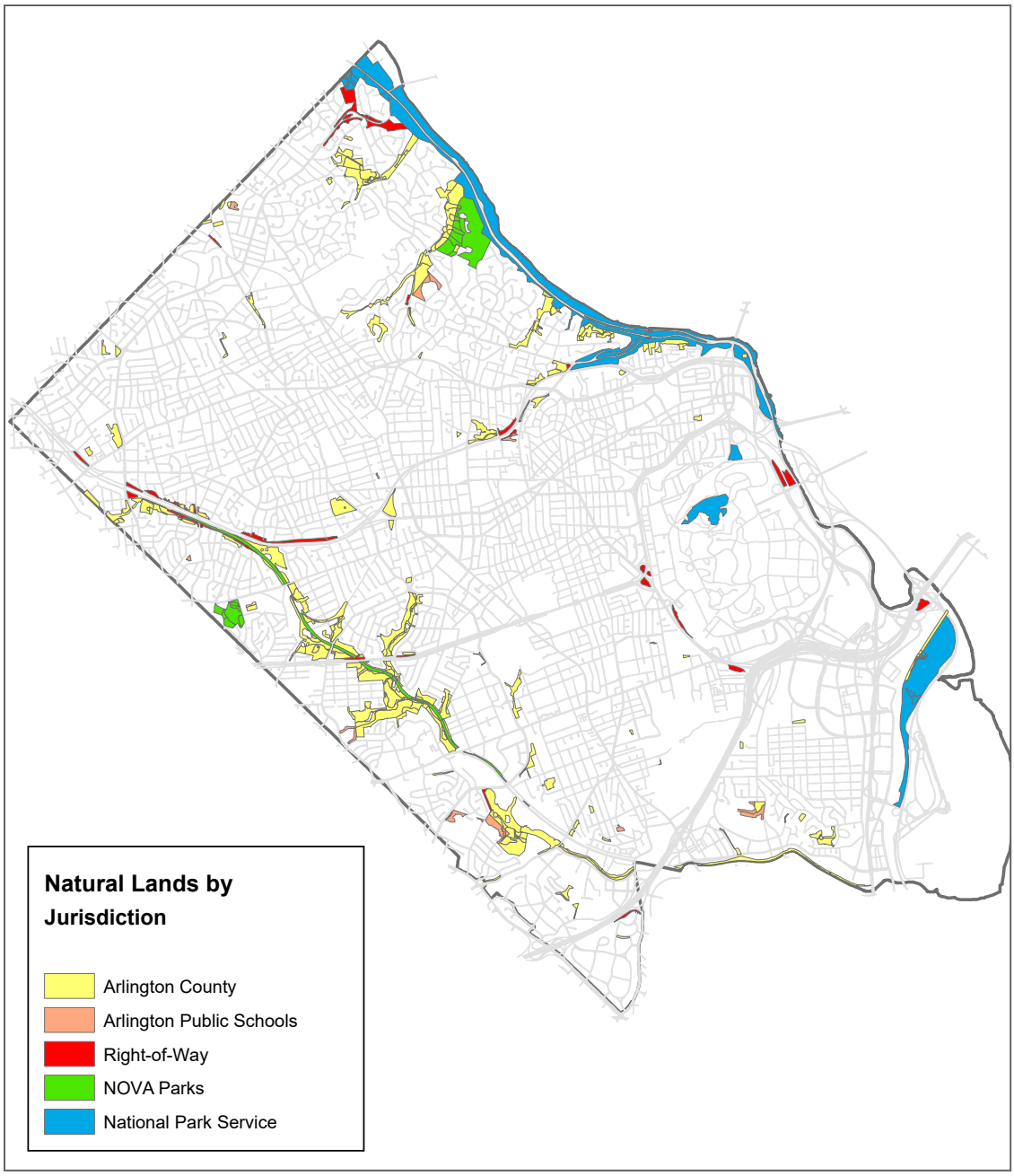


In 2021 — based on 1,441 development plans reviewed by the County — 2,270 trees were removed by developers while 1,169 were planted. While this amounts to only a fraction of the County's roughly 4.5 football fields of trees, if this same rate of loss continues annually, after 10 years that loss in canopy cover amounts to nearly 4.5 acres, or approximately the area of four football fields.[12]

Arlington's overall tree canopy appears to be declining, even with tree planting and conservation on public land helping to partially offset losses on private lands. Parks and public spaces serve many different purposes — limiting the County's ability to add more trees and conserve or create new natural areas. Given these constraints, the projected future development of privately and institutionally owned land poses complex challenges to tree and natural resource conservation.

But parks and public spaces serve many different purposes — constraining the County's ability to add more trees and conserve or create natural areas. Given these constraints, the projected future development of privately and institutionally owned land poses complex challenges to tree and natural resource conservation.

Some of the trees removed were dead, dying or were at high risk of failure. Newly planted trees — even if their number exceeds the number of trees removed — must grow for years before they can replace the ecosystem benefits provided by mature trees. More recent pressures from climate change have also led to novel syndromes like Oak Decline[11], threatening some of our oldest, highest value tree species, and may be exacerbated as the effects of climate change continue to mount.



Natural areas sit mostly on public property. This includes 525 acres of County parkland, 18 acres of County-owned land (not parkland), 32 acres of APS land, 379 acres of NPS land, 114 acres of NOVA Parks land and 60 acres of rights-of-way. Through its education and outreach programs, the County encourages private owners to "naturalize" their property and improve their habitat. Site development standards for special exception and site plan projects require some prescribed level of native plants.

With development driving additional tree losses on privately owned property and scant public space to accommodate new planting, the County must adapt and strengthen its urban forestry and natural resources policies and practices to assure the next generation of Arlingtonians enjoys the same quality of life we have today.

ACTIONS

1.1 Sustain Arlington's tree canopy and natural areas

1.2 Expand spaces for trees and natural areas

1.3 Assess and account for all the benefits of trees and natural areas

1.4 Foster and strengthen Arlingtonians' commitment to Conservation of trees and natural resources

1.1 SUSTAIN ARLINGTON'S TREE CANOPY AND NATURAL AREAS

Tree canopy and natural resources are not equally distributed among Arlington's neighborhoods. Currently, neighborhoods with many standing trees are most likely to see more planted. Development density, lack of permeable space on rights-of-way and the steep cost of recovering it, all impede efforts to increase tree canopy in less advantaged neighborhoods. There, people are more vulnerable to climate change, negative health effects and accelerating heat island impacts.

The FNRP aims to protect, sustain and enhance vital natural assets on all types of land ownership in the County. But the County's ability to influence conservation practice varies according to different ownerships and land uses.

1.1.1 MAINTAIN 40 PERCENT TREE CANOPY COUNTY-WIDE THROUGH CONSERVATION AND TREE-PLANTING PROGRAMS TAILORED TO LOCAL CONDITIONS AND ECOLOGICAL CONTEXTS.

The 2017 Tree Canopy report affirmed overall adherence to the 40 percent goal. The FNRP recommends that the canopy goal — set two decades ago — remain in place.

Action to achieve that goal is complicated by current patterns of land use in the County. Public property and rights-of-way constitute a significant proportion of tree canopy and existing natural lands. On private property, different neighborhoods experience vastly different levels of canopy and public space, often the result of historical inequities.

To support this goal, the FNRP recommends the development of Tree Equity Areas, detailed in **Action Step 2.1.1**, that will prioritize the conservation and enhancement of tree canopy in areas that are historically underserved by trees and green infrastructure.

MWCOG GUIDANCE:

As of the adoption of this plan, the Metropolitan Washington Council of Governments (MWCOG) is developing a long-term strategy to periodically assess how the trees and forests of Metropolitan Washington influence quality of life, health, social equity and the economy of the region.

This strategy:

- Establishes aspirational, regional tree canopy goals and guidance to inspire local communities to conserve, manage and expand their tree canopies.
- Fosters regional collaboration and interjurisdictional tree conservation strategies.
- Encourages MWCOG communities to adopt local goals that support regional priorities.
- Provides monitoring and reporting on canopy changes and the status of regional goals.

While framed as aspirational guidance to MWCOG communities, the draft strategy aligns with many of the recommendations of Arlington's FNRP. When finalized and adopted by MWCOG, Arlington will consult this guidance in the preliminary phases of relevant planning and development projects, including but not limited to Sector Plans, Park Master Plans, site plan review and future updates to the Comprehensive Plan to support progress toward the region's tree canopy goals.The site could include green infrastructure to manage stormwater runoff from surrounding public spaces.

The FNRP recommends these tools, as well as those in **Action Steps 1.1.2 and 1.1.3**, to guide implementation and ensure Arlington is able to meet the 40 percent County-wide tree canopy goal into the future. For more details on how progress towards this goal will be tracked, refer to **Action 4.1**.

1.1.2 ENSURE 70 PERCENT OF ARLINGTON'S TREES ARE REGIONALLY NATIVE BY 2035.

Canopy coverage is only one aspect of forest health. To ensure an ecologically healthy urban forest and provide a high level of ecosystem services, species diversity, habitat for native flora and fauna, and a high percentage of native species are critical. For more details on how progress towards this goal will be tracked, refer to **Action 4.1**.

1.1.3 ESTABLISH ASPIRATIONAL TREE CANOPY COVERAGE GOALS FOR NEW PUBLIC SITES.

Public spaces, including parks and school lands, offer important opportunities to increase Arlington's canopy. These sites must also provide space for other natural resources and habitats like meadows, as well as meet a variety of other important community needs from adequate space for educational, recreational and casual use opportunities to storm water management, in addition to providing opportunities for expansion of tree canopy. To balance these competing demands on public space while still providing aspirational targets for tree canopy, new public spaces should seek to achieve:

- A 20 percent canopy cover goal for the buildable areas of new APS facilities, excluding any existing, unbuildable forested areas on the parcel.
- A 40 percent canopy cover goal for new public parks.

Public spaces, regardless of their primary use, come in a variety of configurations with unique challenges and opportunities. In some instances, such as new acquisitions for the primary purpose of expanding, existing or creating new forested parkland or where the planting of trees can complement other County policy aims, these canopy goals can be exceeded. In others, such as spaces where meadows, wetlands or pollinator areas are prioritized, or in urban plazas and sports complexes where space is at a premium, these goals may not be fully achievable.

Where meeting these canopy coverage goals is not feasible or would conflict with the primary purpose of the public space, the County should strive for the highest feasible tree canopy coverage, emphasize other native plantings more appropriate to the context, and design spaces to incorporate natural infrastructure and biophilic features, as recommended in **Action Step 1.2.2**.

1.1.4 ENSURE NO LOSS OF COUNTY-OWNED NATURAL LANDS.

Virtually all of Arlington's natural areas exist on County, regional or federal land. The most ecologically significant parcels in County parks are found in Barcroft Park, Glencarlyn Park and the northern section of the Potomac, along with stream valleys leading to it. These lands occur as several dozen isolated and fragmented parcels where development would have been difficult or too costly and were later protected as parkland.[13] Those that remain are subject to pressure from invasive plants, the impacts of climate change, unauthorized uses, as well as increasing demands for more active recreational space.

The FNRP reaffirms the County's commitment to **zero loss** of existing natural areas, and to designate their protection as a priority objective for Arlington parks. **Action Step 3.1.3** provides additional context for managing and providing public recreational access to County-owned natural lands.

1.1.5 ADVANCE URBAN FORESTRY AND NATURAL RESOURCE GOALS THROUGH COUNTY PUBLIC SPACE ACQUISITIONS.

The 2019 Public Spaces Master Plan sets clear guidelines for land acquisition, identifying priority areas for acquisition, offering a comprehensive list of future public spaces identified in other County plans and studies, and providing objective criteria for evaluating whether potential natural resources will be added to the public space system.

PSMP CRITERIA FOR NATURAL RESOURCE ACQUISITION:

- The site could be used to enhance, protect or expand natural resources, such as tree canopy, meadows, stream valleys, forested natural areas or other appropriate ecosystems.
- The site could protect or expand a Natural Resource Conservation Area.
- The site includes one or more of the following:
  - Stream valley/floodplain
  - Wetlands and seeps
  - Unusual habitat type (e.g., relatively undisturbed soils, uncommon plant/animal colony, etc.)
  - Champion tree site
  - Natural geological outcrop
  - Meadow
  - Existing healthy tree canopy
- The site could increase the diversity of habitats for critical species.
- The site could facilitate adding or expanding natural lands that are needed based on the Level of Service Analysis (See 2019 Public Spaces Master Plan Level of Service Appendix).

Given development pressures on Arlington's ecosystem, the County should:

- When updating the Public Spaces Master Plan, evaluate currently identified and new potential natural resource acquisition areas to determine the extent to which individual tracts contribute to beneficial ecosystem services and current County conservation priorities.

– Consider partnerships that support other programmatic priorities, such as stormwater mitigation or improvements to public health, to augment land acquisition.

– Seek even small acquisition opportunities to re-establish habitat such as micro-forests and meadow areas.

Before and after photos of a recent small acquisition and reforestation project on North 24th St.

1.1.6 REFLECT FNRP-ADOPTED POLICIES IN FUTURE COMPREHENSIVE PLAN ELEMENTS, SECTOR AND AREA PLANS.

Plans provide an accessible platform for the County to influence development policies and practices. Arlington worked with other jurisdictions in the Metropolitan Washington Council of Governments to draft regional guidelines for tree canopy and forest health.

While not binding, with appropriate stakeholder input, these plans can identify actions that will sustain tree canopy, protect natural resources and provide equitable distribution of these assets. As part of the Comprehensive Plan, the FNRP sets an overall policy for natural resources and the urban forest in Arlington. As other plans are established or updated, the FNRP's guidance should inform elements of those plans that touch on natural resources, trees, biophilia and access to nature. For example:

- New or revised sector and area plans should identify areas on private property where permeable surfaces should be restored and replanted with trees and wildlife-friendly native vegetation.
- In higher density development areas, the County should specify the use of other biophilic elements, including green roofs and street-side planters to maintain pre-development levels of ecosystem services.

1.1.7 EXPAND AND FORMALIZE THE RELATIONSHIP BETWEEN APS AND DPR TO ENSURE SCHOOL SITES MEET COMMUNITY OBJECTIVES FOR TREE CANOPY AND NATURAL SPACES.

Outside of parks, public buildings, streets and rights-of-way, Arlington controls very little land that could accommodate new trees, rain gardens or grow into natural areas such as meadows. A substantial part of the public land available for natural resource conservation or restoration (347 acres including school buildings) is owned by APS. The Public Spaces Master Plan calls for collaboration with APS to identify, conserve, enhance and maintain natural and historic resources on school properties.

DPR assists APS with a variety of tasks including education activities as well as limited tree planting and maintenance. Because school sites provide significant areas of plantable space, APS and DPR should:

- Undertake a review of existing school sites to identify landscape changes that maximize tree cover and natural areas consistent with schools' education objectives.
- Coordinate during the planning and design of new or expanded facilities to provide adequate space for conservation, planting of trees and forests, and natural resources; to limit changes in hydrology and biophilic elements; and to assure adequate maintenance.
- Explore conveyance of existing contiguous forested areas on APS sites to DPR to encourage consistent management of Arlington's public forests.
- Assess need for training in tree inspections for APS staff and provide it where needed.

1.1.8 BUILD MOMENTUM FOR THE FNRP'S POLICY RECOMMENDATIONS THROUGH PUBLIC COMMITMENTS OF SUPPORT FROM POTENTIAL PARTNERS.

Protecting the County's current tree canopy and expanding natural areas requires active cooperation by the County with federal and state agencies, neighboring jurisdictions, and large property owners including institutions, hospitals and universities.

The County should seek formal recognition of Arlington's FNRP goals and pledge to address them in the policies and practices of potential partners. Those goals include, but are not limited to:

- 40 percent tree canopy
- Zero loss of natural lands
- Equitable access to the benefits of Arlington's tree canopy and natural lands

The County could host periodic meetings to review the status of these commitments.

1.1.9 IDENTIFY AND RECRUIT LEADERS OF LARGE PRIVATE, INSTITUTIONAL, EDUCATIONAL AND FAITH-BASED PROPERTIES TO SUPPORT THE COUNTY'S ENVIRONMENTAL GOALS.

Committed leaders accelerate efforts to promote the implementation of a forest and natural resources plan. These high-profile leaders can serve as influencers in their respective professional and personal networks. The County should identify prominent individuals, as well as leaders of major businesses and institutions, willing to implement programs that support FNRP goals and express their support publicly. With their visible support, others in their networks can be inspired to undertake similar efforts.

1.1.10 MONITOR AND ASSURE ADEQUATE CARE OF SIGNIFICANT TREES ON DESIGNATED HISTORIC SITES OR TREES THAT HAVE INTRINSIC HISTORICAL SIGNIFICANCE.

Through local historic district designation, historic trees and landscapes are often protected. The most prominent examples of these are the Maywood neighborhood and garden apartment complexes such as Colonial Village and Buckingham. Oversight, assistance and permitting the removal of these trees and changes to these landscapes could be enhanced through improved internal and external collaboration and regular education sessions.

1.2 EXPAND SPACES FOR TREES AND NATURAL AREAS

Development on privately owned sites in Arlington is governed through a web of federal, state and local laws, regulations, plans and policies. Individually and together, they determine what's built and how on each development site.

- Arlington County Zoning Ordinance (ACZO)
- Chesapeake Bay Preservation Ordinance
- Chesapeake Bay Preservation Act for streamside protection, tree canopy rules and stormwater management facility guidance
- Virginia Wildlife Action Plan
- Virginia Wildlife Corridor Action Plan
- Virginia Wildlife Viewing Plan
- Virginia Outdoors Plan
- Stormwater, erosion and sediment control, floodplain and wetland management laws, regulations and associated manuals
- Herbicide and pesticide use

Unfortunately, these same Commonwealth laws do not always afford the flexibility the County needs to address emerging issues specific to Arlington.[14]

1.2.1 SEEK LEGISLATION AT THE STATE LEVEL THAT AUTHORIZES ARLINGTON COUNTY TO DEVELOP LOCALLY-APPROPRIATE POLICIES TO CONSERVE AND MANAGE ITS NATURAL RESOURCES.

While recent developments have increased opportunities for local governance,[15] the County should support further legislative action that offers localities the flexibility to enhance requirements or establish incentives to:

- Expand tree canopy limits and advocate for local control over tree canopy minimums on development.
- Reduce land disturbance thresholds to enable County oversight or reporting requirements of smaller projects.
- Protect ecological communities, including migratory birds and insects.
- Expand protections within RPAs.
- Control invasive species.

1.2.2 ESTABLISH AND IMPLEMENT GUIDELINES FOR NATURAL INFRASTRUCTURE ON PUBLIC SITES.

Natural infrastructure protects or restores key ecosystem elements; fosters use of native plants and removal of invasive species; and identifies specific actions proposed to maintain and sustain high-priority ecosystem benefits. Requiring natural infrastructure practices on public sites embodies and extends the commitment to biophilic principles.

Public sites and facilities — from libraries, office buildings and firehouses to sidewalks and median strips — should be designed to incorporate key natural infrastructure wherever possible. When the site does not permit tree planting or creation of natural areas, biophilic elements should be incorporated into the landscape design based on guidance from the County.

Natural landscaping is gaining widespread acceptance. Continuing care and maintenance will be needed to keep invasive plants and pests at bay and assure appropriate habitat for insects and birds.

1.2.3 ENHANCE DEVELOPMENT STANDARDS TO OPTIMIZE RETENTION OR REPLACEMENT OF TREE CANOPY, NATURAL VEGETATION, PERMEABLE SURFACES AND BIOPHILIC ELEMENTS.

1.2.3.1 BY RIGHT DEVELOPMENT

These rules determine how much land on each parcel can be devoted to buildings, how much must be devoted to tree canopy and green space, and what steps must be taken to protect habitat and water quality. The County has codified these policies in the Chesapeake Bay Preservation Ordinance, the Stormwater Management Ordinance, Erosion and Sediment Control rules, Floodplain Management and the Zoning Ordinance. All align with current Commonwealth law.

Impervious surfaces. Requirements of the Stormwater Management Ordinance are triggered by land disturbance of 2,500 square feet or greater on private property. But smaller projects — for example, driveway extensions, small additions, patios — when aggregated across a neighborhood may have a disproportionate impact on stormwater flow.

Tree canopy. State law requires between 10 and 20 percent tree canopy at maturity (i.e. after 20 years) for sites developed by right. The state code sets tree canopy requirements for residential development based on the number of dwelling units per acre and restricts municipalities from setting higher levels. Accordingly, the minimum canopy requirements for denser housing types, including duplexes, townhouses and multifamily housing (three or more units) is typically 10 or 15 percent.

Lot coverage. Lot coverage is a zoning concept that dictates what, and how much, can be built on a given parcel. Arlington's Zoning Ordinance determines the maximum proportion of a lot that can be "covered" by defined impervious surfaces or built structures — for example, buildings, driveways, parking pads and patios (8 inches or higher above grade). Lot coverage standards were last amended in 2005.

For duplexes, townhouses and multi-family buildings with 3–6 units allowed by-right through Expanded Housing Options Development, lot coverage is the same as for single-family development. For other land uses, including townhouse, two-family, multi-family and commercial permitted through special exception site plan approvals, the standard is a maximum 56 percent lot coverage, except when modified by the County Board.

Setbacks. The Zoning Ordinance also regulates setback distances from front, rear and side property lines. These open areas provide opportunities for tree conservation, plantings and RPA buffers, particularly in the rear yard and in areas adjacent to County rights-of-way.

Actions

- Pursue the state-level legislative changes outlined in section 1.2.1.
- Develop new tools to educate and encourage private property owners to conserve and plant trees and wildlife-friendly native vegetation beyond minimum requirements, in the absence of changes to state code.
- Continue efforts underway (e.g., through the new LDA 2.0 stormwater maintenance agreement provisions) to address the impacts of new impervious surfaces added after completion of LDA permits. This includes but is not limited to:
  - Requiring permits for new impervious surfaces.
  - Updated lot coverage definitions (more below).
- Explore options within present regulatory framework to maximize conservation on- and off-site by ensuring the use of the most current research on tree conservation during construction.[16]

Some jurisdictions add other factors that account for the ecological context in which the tree stands: location near a stream, adjacency to vulnerable natural features, location near areas to be shaded, and whether it is part of a contiguous stand or grove of trees.

- Consider changes to the Zoning Ordinance that better align it with the County's goals for forests and natural resources management while fostering diverse housing choices.

For lot coverage, re-evaluate:

- What does and does not count as lot coverage from today's perspective and policy priorities, including stormwater management and maximizing plantable space. Additional considerations of this analysis should include:
  1. Whether to set a square footage cap on lot coverage in addition to the percentage cap.
  2. Whether to tie lot coverage regulations to a lot size rather than its zoning district.

The Fairfax canopy credit system rewards planting of specific types of trees; it awards "extra credit" for planting or retention of trees that "will provide air quality, energy conservation, water quality and wildlife conservation benefits" or possess other desirable characteristics. Based on a species list issued by the County, the system primarily serves to influence design and species selection via credit preference.

For setbacks, determine:

- Whether enhanced standards could support additional tree canopy, conservation landscapes and RPA buffers.
- The extent to which some reductions in street setback requirements (in context of street tree and front yard tree space), with a commensurate increase in the size of rear yards, provide opportunities for additional trees, groves, corridors and native planting to support wildlife habitat.

For landscape quality and stormwater management, consider:

- What incentives might be offered to encourage planting of native species or retention of groves and stands, pollinator habitat and/or connective corridors to promote movement of wildlife.
- Improve compliance with permit conditions on private property to ensure compliance with permit conditions and explore mechanisms to ensure long-term adherence to requirements.

1.2.3.2 DEVELOPMENT UNDER SPECIAL EXCEPTION SITE PLANS AND USE PERMITS

Special exception development includes site plans and use permits that are reviewed and approved by the County Board. These plans and permits afford the County more flexibility than by-right development to achieve natural resource objectives. Special exception conditions should continue requiring certain design standards, actions or regulations for individual site plan projects on a case-by-case basis.

Currently all Special Exception Site Plans adhere to the landscape requirements set forth in the County's Zoning Ordinance, ACZO 14.2. Particular zones may require additional landscape items related to screening or percentage of required open landscaped space, which are additionally noted under each separate zoning district.

A. Consider expanding strategies to support trees and tree canopy beyond the Chesapeake Bay Preservation Ordinance minimums during site plan review — including, for example, requiring on- or off-site mitigation through planting or conserving trees.

B. Consider revisions in policy and practice that will ensure that plans for new development offer the maximum feasible level of pervious plantable area consistent with approved plans. In special exception development, areas to consider opportunities include, among others:

   – Promoting or enabling additional building height coupled with decreased lot coverage and building footprints as a strategy to maximize plantable space at ground level.

   – Reducing required on-site parking on permitted properties in favor of incorporating additional space for natural resources and trees.

   – Encouraging biophilic elements — green roofs or walls, for example — in building features and structured parking.

   – Fostering maximum use of green stormwater infrastructure.

C. Develop design guidelines for small-scale biophilic interventions and offer as part of site development standards.

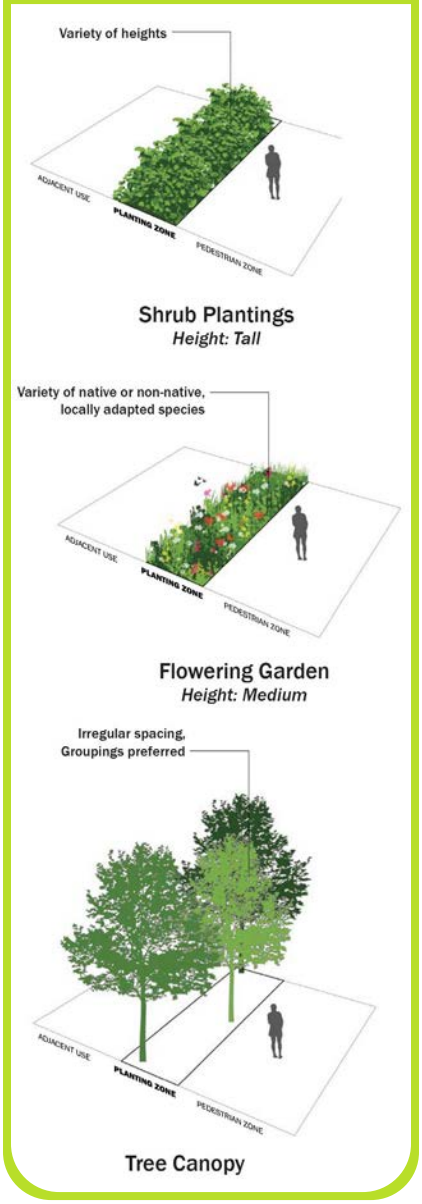
1.2.4 CONTINUE TO WORK WITH UTILITY INSTALLERS (PUBLIC AND PRIVATE) TO REDUCE IMPACT TO TREES FROM TRENCHING AND OTHER SOIL DISTURBANCE.

Utility installers often must go through valuable tree growing and planting space to connect their utilities. Preventing this damage through proper design and collaboration will keep these utilities in place, while allowing trees to be retained and planted.

1.2.5 EXAMINE HOW PREVALENCE OF TURF GRASS ON PRIVATE AND PUBLIC PROPERTY IMPEDES ACHIEVEMENT OF FNRP AND RELATED STORMWATER MANAGEMENT GOALS.

Conduct an estimate of lawn area would highlight the opportunity for expanding trees and other natural resources. Policies should reflect the circumstances where lawn is most appropriate, and not create conflict with other park uses that require turf.

Elements of the PCSP guidance — the Green Ribbon, the tree density and vegetation requirements, pedestrian access and street-front design — reflect strategies that might be adapted for other projects.[17]



1.2.6 REVIEW AND UPDATE CHAPTER 10, ARTICLE II OF THE ARLINGTON COUNTY CODE TO ALLOW AND ENCOURAGE NATURALIZED AREAS USING NATIVE PLANTINGS ON PRIVATE AND PUBLIC PROPERTY.

Currently, the Condition of Private Property section of the Arlington County Code does not contain definitions for native plants or managed natural landscapes, which potentially complicate code enforcement related to perceived overgrowth of native plants and food crops. To mitigate this and avoid future conflict with the FNRP's recommendations to encourage conservation and native planting on private property, this section of the County Code should be reviewed for potential conflicts with adopted County policy regarding native plantings and urban agriculture and revised to incorporate the appropriate definitions and other changes necessary to encourage conservation on private property.

1.2.7 PROVIDE TECHNICAL ASSISTANCE TO OWNERS — INCLUDING HOMEOWNERS ASSOCIATIONS AND INSTITUTIONS — WHO WISH TO ADD NATURAL LANDSCAPE AND BIOPHILIC FEATURES TO THEIR PROPERTY.

1.2.8 DELIVER PROGRAMS AND PROJECTS IN A MANNER THAT SUPPORTS EQUITABLE ACCESS TO NATURAL INFRASTRUCTURE.

Opportunities include, but are not limited to, prioritizing projects that incorporate an equity analysis; prioritizing "large impact" projects; expanding training programs for local landscaping firms to develop expertise in natural infrastructure installation, with an emphasis on providing ecological benefits; exploring potential synergies with DPR and the County's stormwater program to combine efforts and funding; and, more complex, integrating a market-based program with the County's regulatory programs for development (stormwater and trees).

Equity must be a key consideration in any program that provides financial incentives and/or reimbursement to private property owners. The people who need affordable housing also need access to nature.

The Chesapeake Bay Landscape Professional Program (CBLP) is a system of materials and consistent instruction across the region, creating a community of certified professionals that can become better stormwater partners and environmental stewards.

Photo Credit: https://cblpro.org/

1.2.9 REVIEW AND REFINE TREE RETENTION AND REPLACEMENT RULES TO ADDRESS ECOSYSTEM SERVICES PROVIDED BY TREES.

The County should review and refine its tree retention and replacement rules to address ecosystem services provided by trees to be planted or already growing in environmentally sensitive locations. Changes to be considered include:

- Preference for retention of mature trees, native species, natural areas and permeable space in sensitive locations — for example, on steep slopes, in contiguous groves or stands, adjacent to rights-of-way, shading buildings and parking areas, and supporting stormwater management.
- Enhanced replacement and recompense provisions to account for lost ecosystem services if these trees are removed.
- Implementation of a native plant standard for newly planted trees and vegetation.

1.2.10 ADDRESS COUNTY ENVIRONMENTAL PRIORITIES THROUGH ADDITIONAL SITE DEVELOPMENT REQUIREMENTS AND COMPLIANCE OPTIONS.

Currently, Arlington requires owners to meet a series of specific landscape requirements as outlined in the ACZO and the site development standards. Each address one or more actions required to receive a permit. Limited space often limits the extent to which owners can meet multiple County goals; not every parcel can serve all purposes.

As it considers future revisions to its site development standards, the County may wish to consider a goal-centered approach to landscaping based on desired future lot conditions. Goals could include, for example, energy conservation, heat island mitigation, habitat connectivity, species diversity and preference for natives. Developers would be allowed to choose which County-designated approaches are feasible to meet these goals — similar to the framework offered by Form Based Codes. To qualify for permits, they would need to meet minimum thresholds set in the Arlington site development standards.

Savannah, Ga. has successfully implemented such a system.

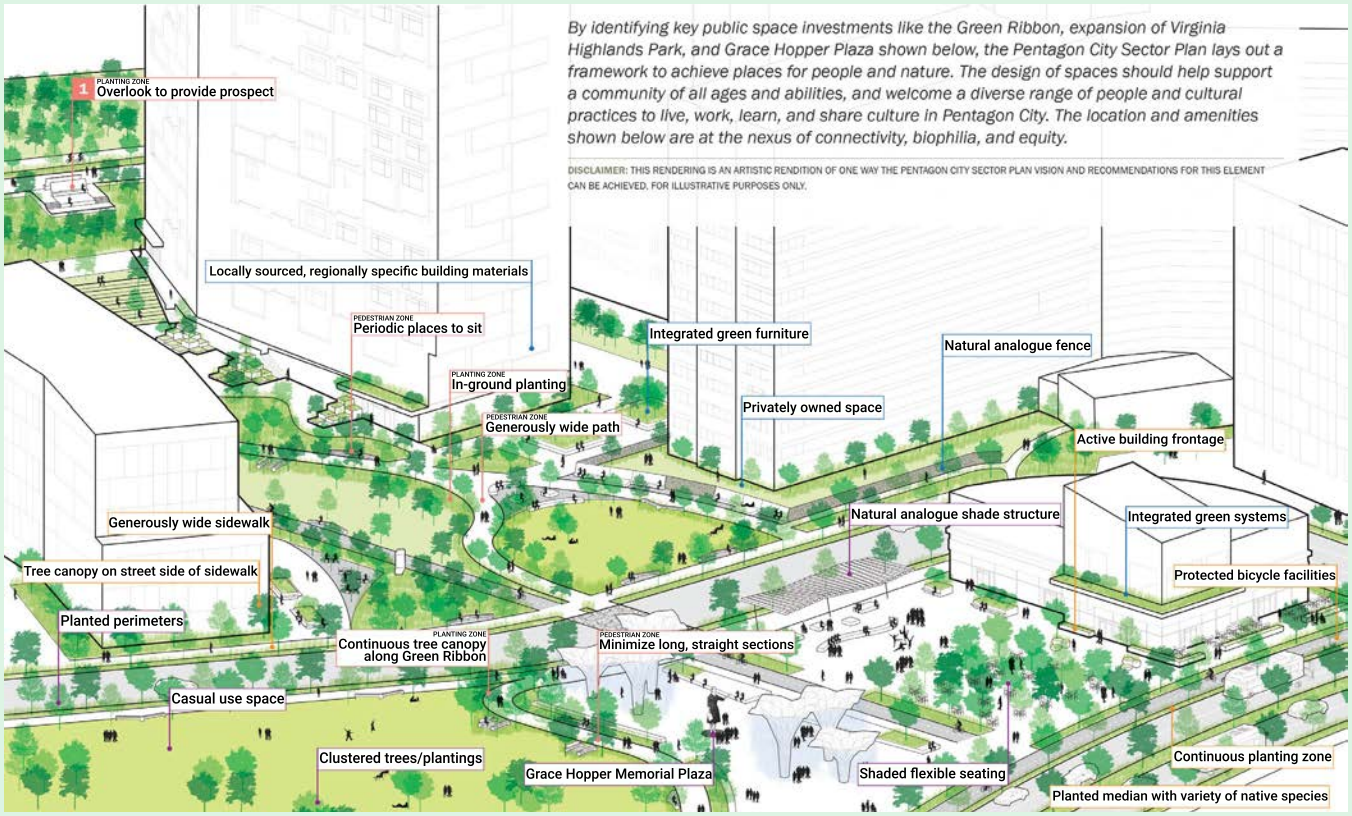
SUMMARY OF SAVANNAH, GA. TREE QUALITY POINTS (TQP) SYSTEM

- Savannah, Ga. assigns "quality points" to both trees and landscape plantings to retain the aesthetic, natural and cultural aspects of the historic city. TQP are based on the relative value of tree species that are retained or planted on a given site; the points quantify the desirable qualities of the species and the specific tree. Higher TQPs are awarded for trees retained on-site; fewer are awarded for new plantings.
- Except on developed single-family residential lots, trees counted toward meeting canopy requirements cannot be removed by subsequent owners without a permit from the city. Permits are required for the removal of "exceptional" trees from commercial, industrial, institutional or multifamily properties.

BIOPHILIA IN ACTION

THE PENTAGON CITY SECTOR PLAN (PCSP)

While limited in area, the PCSP demonstrates biophilic concepts that can be adapted for use in many different planning contexts — from site plan requirements to sector plans and form-based codes.



The Pentagon City Sector Plan (2022) applies biophilic design principles to open space and pedestrian corridors so that visitors, residents and workers experience nature both outdoors and in.

BIOPHILIC DESIGN

PLANNING FOR BIOPHILIA

As a Biophilic Cities Network partner, Arlington County is dedicated to creating, providing and enhancing nature-based connections for residents, workers and visitors through smart, nature-driven policies, design solutions, experiences and interactions that create access to nature and opportunities to enjoy all its wonders. The County has already incorporated biophilic principals into major policy documents, including the Public Spaces Master Plan, the Community Energy Plan, and the Pentagon City Sector Plan, among others. Similarly, biophilic design has already been integrated into several public projects, including parks, green streets, and school sites, as well as a handful of private developments across Arlington. Though more work remains to be done, these policies and projects form the foundation necessary to realize the vision of a biophilic Arlington.

Natural experiences in urban environments are essential for the emotional and physical wellbeing of humans and the ecological health of cities, they can increase happiness and quality of life as well as offering civic and economic benefits to entire communities. However, in urban communities like Arlington, the ability to access these experiences are often constrained by factors like design issues precluding those with differing abilities from comfortably accessing green space, and cultural and economic factors like systemic racism that make these spaces uninviting or difficult to visit. Incorporating biophilic design throughout the built environment, not just in parks, can help mitigate these equity issues and bring the benefits of nature to everyone in the community, regardless of their backgrounds.

IMPLEMENTING BIOPHILIC PRINCIPLES

To ensure biophilic experiences are impactful, it is critical to go beyond surface-level interventions such as random inclusion of native plants in landscaping, or the use of natural shapes in architectural details. Projects embracing biophilic design should demonstrate a concerted effort to create a series of repeated engagements to nature throughout the site. Biophilic design should create an immersive experience that provides a meaningful connection between the visitor and nature. The benefits of this approach are not limited to the aesthetic or recreational; the use of biophilic design to create these nodes and corridors of green space will be critical to the success of key goals of the FNRP, such as **Action 2.1: Allocate resources to climate-vulnerable hot spots and Action 3.3: Establish a County-wide natural infrastructure and conservation connectivity network.**

BIOPHILIC DESIGN CONSIDERATIONS

Successful biophilic connections should be built on the ability to engage and stimulate the five senses. Projects should take the following into consideration:

- Do built environments provide the user visual cues to see and interact with nature? *Seeing birds and bees because landscaping plans incorporate habitat value as well as aesthetic value, patterns of leaf shadows on pathways.*
- Can elements be touched, is nature tangible? *Community gardens allowing for soil-to-hand tending, or milkweed planted near playgrounds with pods bursting with fiber for whimsical play.*
- Are there opportunities to smell scents? *Blooming flowers, sun-warmed pine needles.*
- Are the sounds of nature or natural materials present? *Rustling of leaves in the wind, fallen leaves under foot, birds singing in the space.*
- Is there an opportunity to taste the landscape? *Native fruit trees such as persimmon, or mountain mint for tea incorporated into the landscaping, urban agriculture and community gardens integrated into the site.*

By thinking through these questions early in the design process, project managers can ensure biophilic design is central to how the finished space functions. Similarly, reviewing projects through the lens of the following key conditions and indicators can help determine its biophilic elements will be successful:

There are 5 key principles of effective biophilic design:

1. Biophilic design emphasizes human adaptations to the natural world that over evolutionary time have proven instrumental in advancing people's health, fitness, and wellbeing. Exposures to nature irrelevant to human productivity and survival exert little impact on human wellbeing and are not effective instances of biophilic design.
2. Biophilic design depends on repeated and sustained engagement with nature. An occasional, transient, or isolated experience of nature exerts only superficial and fleeting effects on people, and can even, at times, be at variance with fostering beneficial outcomes.
3. Biophilic design requires reinforcing and integrating design interventions that connect with the overall setting or space. The optimal functioning of all organisms depends on immersion within habitats where the various elements comprise a complementary, reinforcing, and interconnected whole. Exposures to nature within a disconnected space – such as an isolated plant or an out of context picture or a natural material at variance with other dominant spatial features – is NOT effective biophilic design.

4. Biophilic design fosters emotional attachments to settings and places. By satisfying our inherent inclination to affiliate with nature, biophilic design engenders an emotional attachment to particular spaces and places. These emotional attachments motivate people's performance and productivity, and prompt us to identify with and sustain the places we inhabit.

5. Biophilic design fosters positive and sustained interactions and relationships among people and the natural environment. Humans are a deeply social species whose security and productivity depends on positive interactions within a spatial context. Effective biophilic design fosters connections between people and their environment, enhancing feelings of relationship, and a sense of membership in a meaningful community.

Additional indicators of effective biophilic design that can be done found in Terrapin Bright Green 14 Patterns of Biophilic Design:

NATURE IN THE SPACE

the direct integration and experience of nature in a space

- visual + non-visual connection with nature
- non-rhythmic stimuli
- thermal + airflow variability
- presence of water
- dynamic + diffuse light
- connection with natural systems

Photo Credit: PWP Landscape Architecture, US Federal Courthouse–Seattle

NATURE ANALOGUES

the direct integration and experience of nature in a space

- biomorphic forms + patterns
- material connection with nature
- complexity + order

Photo Credit: Jamie Navarro, Patio de las Jacarndas

NATURE OF THE SPACE

the direct integration and experience of nature in a space

- prospect
- refuge
- mystery
- risk/peril

Photo Credit: OLIN, Long Bridge Park

Further in-depth guidance for County staff, developers, and other institutional land managers in Arlington can be found in the American Planning Association's 2022 PAS Report: *Planning for Biophilic Cities*.

BIOPHILIA IN ARLINGTON COUNTY

The following selection of completed projects demonstrate effective practice of biophilic design, and serve as models for future projects in Arlington, across public and private spaces:

PRIVATE PROPERTY

Above: The Sur in Crystal City

STREETSCAPES

Above Left: John Marshall Drive Green Street

Top Right: Williamsburg Boulevard Green Street
Bottom Right: 2nd Street South Green Street

SCHOOL SITES

Above: The Heights Building–Home of Arlington Public School's H-B Woodlawn and Eunice Kennedy Shiver Programs

PARK SITES

Above Left: Oak Grove Park

Above Right: Lubber Run Community Center

Effective biophilic design, like these examples, go beyond simple plantings or architectural details and demonstrate how, through thoughtful, deliberate application of natural elements, Arlington's built environment can re-connect the everyday lives of our residents and visitors to nature. This connection is critical to rebuilding the reciprocal relationship with our environment necessary to achieve the vision of a greener future laid out in the FNRP.

1.2.11 REVIEW AND STRENGTHEN TREE-PLANTING AND ESTABLISH GUIDELINES AND STANDARDS OF CARE WHERE APPROPRIATE.

Even after decades of research, studies continue to surface new practices to protect the health and extend the life of urban trees. While not applicable to every community, the principles remain the same.

Arlington should review its tree-planting and establishment guidelines to ensure they reflect current science and practice, including soil volumes, soil restoration, watering requirements, planting areas, species requirements, invasive plant control and tree placement. Outreach, education and available technical resources should be improved to confirm property-owner maintenance and replacement responsibilities (where applicable, such as in resource protection areas, local historic preservation districts and through special exception agreements).

1.2.12 EVALUATE ROADS AND RIGHTS-OF-WAY TO IDENTIFY OPPORTUNITIES FOR REDUCING IMPERVIOUS SURFACES AND EXPANDING PLANTABLE SPACE.

There are many streets in Arlington that may be wider than needed for their transportation and mobility functions, but may have emergency service access and needs. Likewise, on-street parking may be underutilized in some neighborhoods, and the County should assess transportation and parking assets during transportation planning and project development efforts to catalog where asphalt and concrete can be converted to tree-planting strips, managed meadow areas and biophilic elements. Where plantable space cannot be created, consider converting to permeable surfaces where appropriate. Collaborate with DES and other impacted departments to identify individual streets where these solutions may be possible, and incorporate into transportation capital projects as funding becomes available.

1.2.13 CONDUCT A SYSTEMATIC INVENTORY OF LAND ENCROACHMENTS THAT THREATEN TO DEGRADE PUBLIC LANDS.

Some areas within parks that could be sustained for tree canopy or conserved for native vegetation have been severely damaged by dumping or appropriated by adjacent owners or by noxious uses on land adjacent to natural areas. The 2010 Natural Resources Management Plan (NRMP) highlighted this concern and called for extensive education programs, then stepped-up inspection and enforcement activities. Once priorities are set, the County should take steps to either reclaim the land or halt adjacent uses that harm County land.

1.2.14 TEST AND DEPLOY A SITE CERTIFICATION SYSTEM, SUCH AS SUSTAINABLE SITES INITIATIVE (SITES) OR LEED[18] NEIGHBORHOOD DEVELOPMENT (LEED-ND), FOR PUBLIC AND PRIVATE PROJECTS (INCLUDING APS).

The County offers property owners the opportunity to use credible, independent certification systems to demonstrate compliance with contemporary best practices for sustainable, climate-friendly and biophilic building design. Similar systems

have been developed to certify site conditions and landscaping, with a strong focus on conserving critical ecosystem services. The Public Spaces Master Plan recommends that the County pilot test such a system (see **Action Step 1.9.3:** Explore using a rating system such as Sustainable Sites Initiative for a pilot project to design sustainable landscapes).

Some communities have already demonstrated the value of these systems as a means of reducing resources needed for permitting and inspection without compromising outcomes. The PCSP guidance draws in part on LEED-ND and includes a requirement for certification by LEED or other similar programs.

Developments, such as Boston's Old Colony, achieve LEED Neighborhood Development for public projects.

1.2.15 OFFER TRAINING TO CONTRACTORS AND TREE-CARE COMPANIES TO ENSURE COMPLIANCE WITH BEST PRACTICES FOR PLANTING AND MAINTENANCE OF TREES.

Efforts in other cities find that mandatory and voluntary programs can improve contractor performance and compliance with County planting and maintenance standards. Contractors that attend County-sponsored training may find it useful in promoting their services to private owners.

1.3 ASSESS AND ACCOUNT FOR ALL THE BENEFITS OF TREES AND NATURAL AREAS

Vibrant, verdant neighborhoods make a tangible difference in people's lives. And the impacts of cleaner air, cooler streets, better stormwater management and more can be quantified and expressed as dollars saved or earned.

BENEFITS OF TREES AND NATURAL AREAS:

- Remove pollutants from air and water
- Reduce the impacts of climate change
- Cool streets, buildings and homes
- Save lives from exposure to extreme heat
- Protect biodiversity, rare and threatened species
- Reduce stormwater runoff and improve water quality
- Serve as habitats for wildlife
- Promote human health and well-being

1.3.1 INCORPORATE ECOSYSTEM VALUATION METHODS THAT CAPTURE KNOWN ECOSYSTEM VALUES OF EXISTING TREES AND NATURAL AREAS INTO COUNTY PLANNING.

Various methods exist to calculate the value of ecosystem benefits; most are based on complex algorithms like those that power i-Tree tools.[19] Field verification of i-Tree data generally confirms model outputs within a reasonable margin of error.

Arlington County, as part of its ongoing tree inventory and monitoring efforts, should periodically measure changes in these ecosystem metrics at the County or neighborhood level. Beneficial changes can serve as a performance measure for investments in urban forestry.

Valuation of natural areas is more complex and requires data not often readily available. The value of stormwater protection and watershed health can be assessed and quantified. For other factors like the integrity of plant communities or wildlife diversity, only species counts and qualitative assessments informed by academics may be possible.

1.3.2 DETERMINE HOW THE "COMMUNITY VALUE" OF TREES CAN BE INCORPORATED INTO SITE PLAN REVIEWS AND APPROVALS.

While many communities have used ecosystem metrics to demonstrate the overall contribution of trees to healthy neighborhoods, few have attempted to create blended valuation systems that balance the loss (or conservation) of individual or groups of trees with the costs of losing (or conserving) the ecosystem services they provide.[20]

To establish tree replacement and recompense requirements, Arlington currently values trees based on formulas published by the Council of Tree and Landscape Appraisers (CTLA). These calculations are based on tree species, size and condition. The CTLA approach alone does not consider how tree conservation or removal affects the local environment, human health and well-being, or the wildlife that depend on the habitat at risk.

Arlington should continue to use the CTLA approach while explore revising site plan and site development standards to foster the conservation of trees and landscape features with significant ecosystem value. For example, using multipliers or incorporating data from other sources, such as plot-based surveys, depending on context. The concept of lost or retained "community value" can be woven into the County's special exception application package, environmental assessments, canopy cover requirements, tree replacement calculations and planted space regulations.

1.3.3 STRENGTHEN DEVELOPER REQUIREMENTS TO PROVIDE MULTI-YEAR MAINTENANCE OF TREES AND NATURAL RESOURCES ON SITE PLAN PROJECTS.

Planting properly is just the first step in reconstructing healthy landscapes. Trees and plants require continuing care after installation. The County should review and specify how medium-term (three to five years) bonding and escrow requirements can ensure landscape retention and maintenance after occupancy. Where site plan conditions or other maintenance agreements exist, work with property owners to stay in compliance.

1.3.4 ENSURE THAT SUCCESSIVE OWNERS OF PROPERTY ARE AWARE OF KEY LANDSCAPE FEATURES AND MAINTENANCE REQUIREMENTS.

For by-right development, the County should consider encouraging sellers to provide this information, perhaps using County-developed formats. Where activities had been subject to permitting, in addition to escrow and bonding requirements, the County may require that permit conditions follow the land and fall to successive owners.

1.4 FOSTER AND STRENGTHEN ARLINGTONIANS' COMMITMENT TO CONSERVATION OF TREES AND NATURAL RESOURCES

The future of Arlington's tree canopy and natural resources can never be assured solely by County policy. The values and actions undertaken by those who live and work in the community are essential. Together, businesses and individuals own more than 61 percent of Arlington's tree canopy. Private land management decisions have a profound influence on the future of Arlington's environment.

The County can refine existing programs and/or create new initiatives that support and extend these types of activities.

Bellevue, Wash. maintains a central office that deploys thousands of volunteers annually to different city agencies, including police, public health, parks and recreation. Organized environmental stewardship programs include:

- Botanical Garden Volunteer
- Canoe Guide Naturalist
- Eagle Scout Leadership Service Project
- Eco Fridays
- Habitat Steward
- Master Naturalist
- Stream Team
- Trail Steward
- Waterwise Garden

1.4.1 EXPAND AND ENHANCE THE GUIDANCE THE COUNTY PROVIDES TO RESIDENTS ON APPROPRIATE TREE CARE AND NATURAL RESOURCE MANAGEMENT PRACTICES, INCLUDING INVASIVE SPECIES, THE VALUE OF NATIVE PLANTING, CONSERVING AND EXPANDING STREAM BUFFERS, NIGHT SKY PROTECTION AND WILDLIFE BENEFITS.

Not all natural areas and trees in the County are owned and managed by the County; many are privately owned. Responsibilities of private owners with property in designated RPAs are already subject to conservation rules under the Chesapeake Bay Act. The County should assess whether these owners have access to the information they need to conserve the ecosystem values of RPAs.

But all owners, regardless of location, can be a valuable asset in helping protect and manage resources not under County purview. Many Arlington residents and employers acknowledge that nature — visible and accessible — is critical to ensuring Arlington remains a vibrant community. With tools, training and opportunities to engage, many will undertake improvements on their own property. Through its dedicated nature centers, the County already offers quality learning opportunities for people of all ages. In addition, Arlington County promotes and supports nonprofit and volunteer programs aimed at planting and protecting trees and promoting habitats for native species.

The Trees are Good website[21] is an excellent resource for homeowners seeking information on how to better care for their trees. The most comprehensive offering is the "Tree Owner's Manual" by the USDA Forest Service.[22]

LOCAL CONSERVATION ORGANIZATIONS ACTIVE IN ARLINGTON

MGNV Master Gardeners of Northern Virginia

Northern Virginia Conservation Trust

Tree Stewards Arlington · Alexandria

Sierra Club Virginia Chapter

Virginia Native Plant Society

Arlington Regional Master Naturalists

Plant NOVA Natives Naturally Beautiful!

Audubon Society Northern Virginia

ecoaction arlington

Often, in low-canopy residential neighborhoods, tree-planting initiatives fail to meet expectations. Researchers Morgan Grove and Dexter Locke studied tree-planting programs in Baltimore and Washington, D.C. They found that recruitment of property owners to plant trees was most successful where the need was least — in less diverse, more homogenous areas.[23]

1.4.2 REVIEW AND SELECT EXISTING NATIONAL AND LOCAL PROGRAMS THAT SUPPORT COUNTY ENVIRONMENTAL EDUCATION AND VOLUNTEER STEWARDSHIP GOALS.

The County can utilize and expand on materials already developed/provided by different organizations (including current County partners) to enhance education and outreach initiatives. Some efforts may be presented as County-wide initiatives; for example, "Recreate Responsibly" campaigns or Arlington's Backyard Habitat.

1.4.3 RECRUIT AND TRAIN COMMUNITY, CULTURAL AND FAITH-COMMUNITY LEADERS IN ADDITION TO EXISTING PARTNER GROUPS TO SERVE AS NATURE AMBASSADORS AND PROPONENTS OF GRASSROOTS CONSERVATION.

Arlington has planted a significant number of trees on public property and rights-of-way and supported organizations that plant them on private property. But the 2016–2017 tree canopy study and subsequent high-resolution data from American Forests confirm that many areas fall well below the County median. Data on tree removals suggest tree canopy may be declining in hitherto well-treed neighborhoods.

Arlington should formalize, expand participation and train a cadre of local leaders to educate residents about the benefits of neighborhood trees and natural spaces. With that foundation in place, these grassroots "ambassadors" can help enlist support for novel initiatives or to mobilize support for action.[24]

- Because of their strong connection to immigrants and people of color, special efforts should be made to recruit cultural and faith-community leaders for this role.[25]
- The County should consider offering stipends to support grassroots "ambassadors," or providing small grants to nonprofits that operate similar programs.[26]

Interfaith Partners for the Chesapeake[27] created a multi-state coalition of churches, temples and synagogues, and provided a toolkit for engaging and mobilizing their congregants. Often, coalition members used their own worship sites as models that others could emulate.

1.4.4 WORK WITH APS TO IDENTIFY AND, WHERE NEEDED, ASSIST IN PLANNING AND LANDSCAPING AREAS SUITABLE FOR OUTDOOR LEARNING ON EXISTING AND NEW SCHOOL SITES.

Significant research supports the correlation between outdoor learning and student well-being. Outdoor learning also promotes sustainability education and practices, which are embedded in the APS strategic plan. Opportunities for additional outdoor spaces are needed to realize this commitment; though the benefits of bringing the classroom to nature are clear, what's often missing is space on school grounds to do so.

1.4.5 INCREASE ENVIRONMENTAL EDUCATION OPPORTUNITIES BY EXPANDING PARTNERSHIPS WITH APS AND NONPROFIT ORGANIZATIONS

By collaborating with APS and environmental partners, Arlington can increase the quality, accessibility and effectiveness of educational programs. Currently, school-based environmental education and enrichment vary from school to school, dependent on parent-teacher organization funding or support. Programs that reach all students, such as the Animal Coverings nature center program that brings live animals and real artifacts to all first graders, could be expanded.

Providing more education and enrichment opportunities for teachers and support staff would enhance their ability to provide outdoor learning opportunities. Partnerships could also facilitate joint stewardship projects or afterschool programs, such as EarthForce or a Junior Master Naturalist program.

1.4.6 EXPLORE WAYS TO EXPAND THE GREEN JOBS WORKFORCE AND CAREER-DEVELOPMENT PROGRAMS, SUPPORTED BY A MULTI-SECTOR COALITION.

Labor shortages persist in the tree- and landscape-care businesses — especially among skilled workers who plant and water trees and plants, apply chemicals, and climb and prune trees. In the landscape industry, nearly 160,000 jobs open each year. As of 2021 data, the median U.S. salary for tree trimmers and pruners is $44,040 per year; the hourly wage can top $21.50.[28]

Often these jobs become available in lower-income communities with higher unemployment and greater needs for tree and landscape care. Arlington should explore opportunities for partnerships among vocational education providers, tree-care companies and workforce development nonprofits, as well as train internal staff on tree care and safety for advancement in the forestry industry.

These programs can be most effective when tied to wood recovery and reuse initiatives. Extensive research has demonstrated that wood reclamation programs can provide multiple social, economic and environmental benefits by training and hiring hard-to-employ individuals.

BALTIMORE WOOD RECOVERY AND REUSE PROGRAM: SAVINGS AND AVOIDED COSTS

14
new living wage jobs

$265,000
additional earnings in community

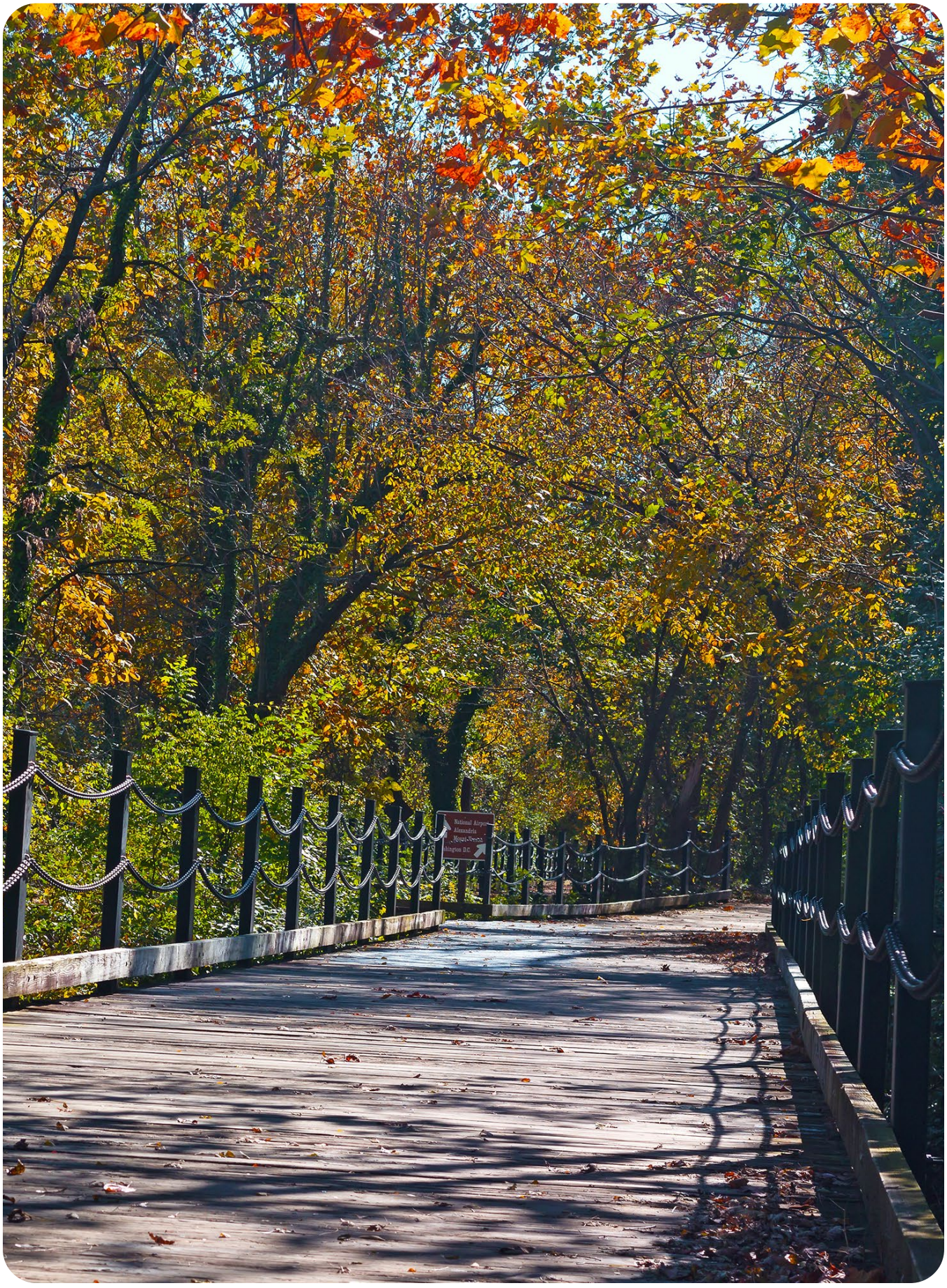
15,000
tons of wood for new projects

2,000
tons of carbon sequestered

>$2.5M
in municipal revenue or avoided costs*
**estimated potential savings*

$150,000
in tax benefits

In many jurisdictions, the hard costs of the program are outweighed by savings in other municipal social and environmental programs. Quantified Ventures estimated these benefits for Baltimore, compared them to costs and found considerable savings for the city.[29] While Arlington may not be able to sustain a wood recovery and reuse program of its own, as was done in Baltimore, the County may wish to explore regional partnerships that could serve larger areas while providing benefits to local residents and neighborhoods.



STRATEGIC DIRECTION 2: CLIMATE MITIGATION, ADAPTATION AND RESILIENCE

ENSURE ARLINGTON'S NATURAL ASSETS PROTECT PUBLIC HEALTH AND WELL-BEING

THE RELATIONSHIP BETWEEN HEALTH, NATURE AND A CHANGING CLIMATE

Human activity has led to accelerated levels of climate change — worldwide and in Arlington County. Like all developed communities, Arlington already suffers from an increasingly warmer climate, more severe storms and flooding, and a surging heat island effect. The Public Spaces Master Plan acknowledged this challenge, and the FNRP is designed to be a key component of a comprehensive, County approach to the complex challenge of climate change. Failure to act decisively poses severe risks to public health and to the vitality of Arlington itself.

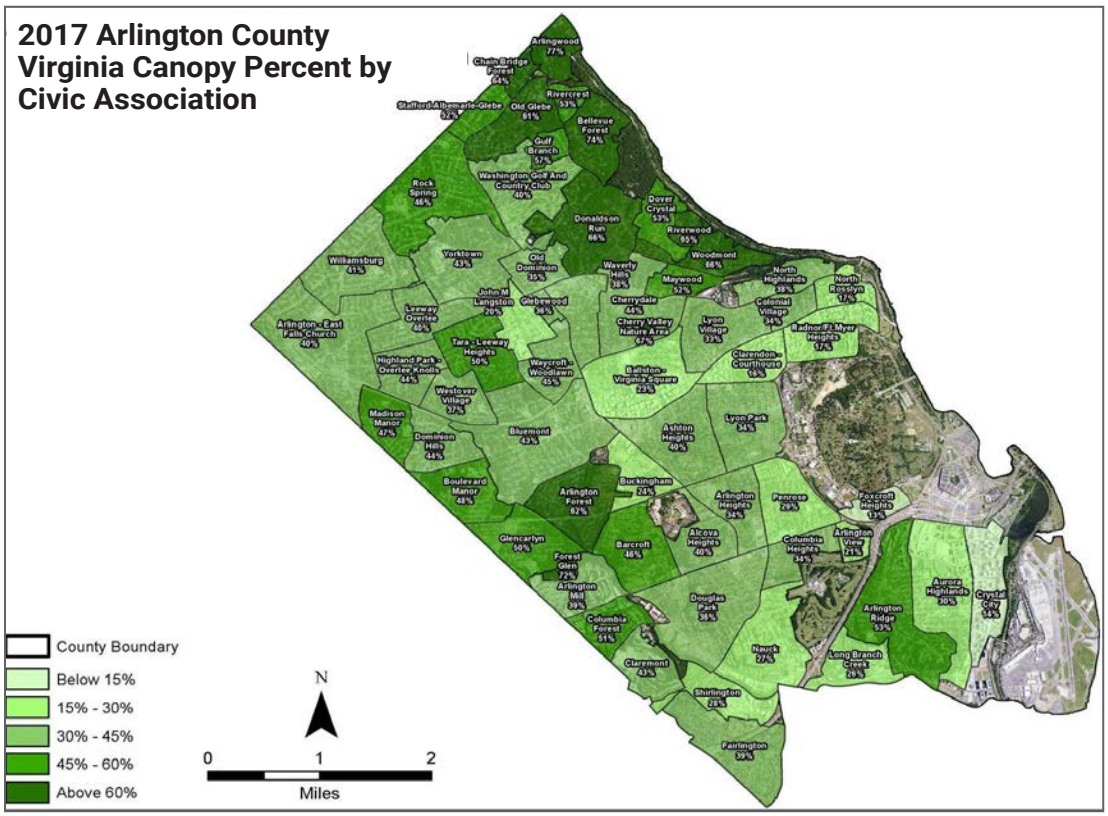
ACTIONS

2.1 Allocate resources to climate-vulnerable hot spots

2.2 Maximize climate protection capacity of trees and green space

2.1 ALLOCATE RESOURCES TO CLIMATE-VULNERABLE HOT SPOTS

Like most communities, the tree canopy in Arlington is not evenly distributed.



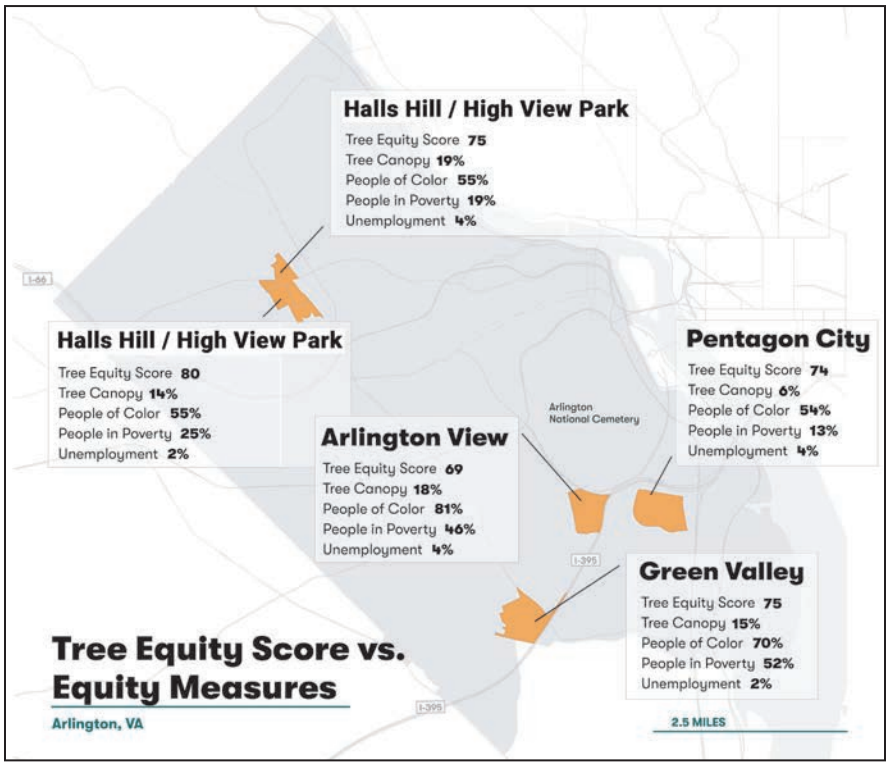
A recent study of 37 metro areas in the U.S. confirms that formerly redlined neighborhoods have, on average, about 23 percent tree canopy cover. Areas characterized by U.S.-born white populations living in newer housing stock have nearly twice as much tree canopy — roughly 43 percent.[30]

TREE EQUITY SCORE MAP

American Forests' Tree Equity Score map for Arlington uses updated (2021-2) tree density data and a range of socio-demographic indicators to assess where the lack of tree canopy exacerbates the human cost of climate change.[31]

2.1.1 IDENTIFY TREE EQUITY AREAS AND WORK WITH THESE COMMUNITIES TO DIRECT RESOURCES TO NEIGHBORHOODS CURRENTLY UNDERSERVED BY EXISTING TREE CANOPY OR ACCESS TO NATURAL AREAS.

In Arlington, commercial and multi-family neighborhoods — for example, the Metro corridor — feature more pavement, fewer trees and less access to natural areas. Densely populated neighborhoods — often home to people of color, non-English speakers and first-generation residents — suffer from a green deficit when compared to other neighborhoods in the County.



Arlington Tree Equity map highlighting highest-priority (based on socio-economic factors) lowest Tree Equity Score neighborhoods. Credit: American Forests

American Forests' Tree Equity Score analysis suggests that 44 of Arlington's 181 census block groups include tree canopy below Arlington's average. Populations in these areas range from

40–60%

for people of color. Tree canopy in 29 block groups with

20–40%

of the population in poverty also falls below Arlington's average.

To address these inequities, Arlington should work with the communities identified in the Tree Equity Score vs. Equity Measures map to improve, enhance and conserve tree canopy and other vegetation across both public and private sites. The County should report on progress toward increasing tree canopy in these Tree Equity Areas annually during the report to the County Board recommended in **4.1.4**.

Along with changes in planning requirements and site plan conditions, the County may consider voluntary partnerships with businesses, Business Improvement Districts and nonprofit organizations to support initiatives in neighborhoods with lower levels of tree canopy or access to natural areas.

To explore Tree Equity Scores for Arlington neighborhoods, click here.

Extreme temperatures on the hottest days of the year are projected to rise by 7 degrees Fahrenheit over the next three decades. Currently, Arlington's hottest days averaged 95 degrees Fahrenheit.

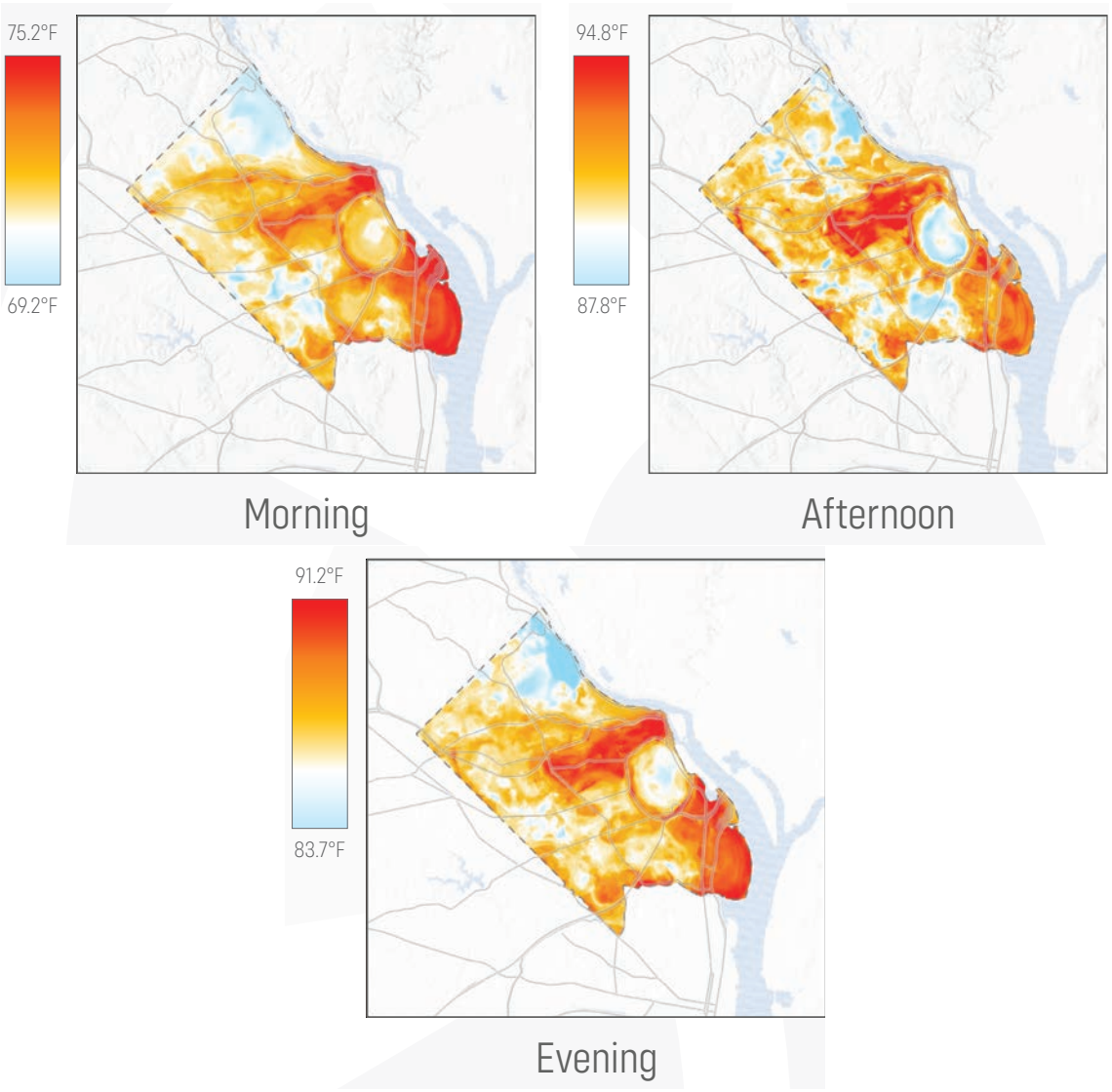
2.1.2 EXPLORE A COUNTY INITIATIVE THAT POSITIONS TREE AND NATURAL AREA CONSERVATION AS A HIGH-PRIORITY PUBLIC HEALTH ISSUE, IMPLEMENTED BY A CONSORTIUM OF LOCAL NONPROFITS, INCLUDING LOCAL HOSPITALS.[32]

In 2017, the Northern Virginia Health Foundation reported significant differences in overall health in certain Arlington neighborhoods. While Arlingtonians overall enjoyed good health, there was up to a decade difference in life expectancy depending on race, income and location of residence.

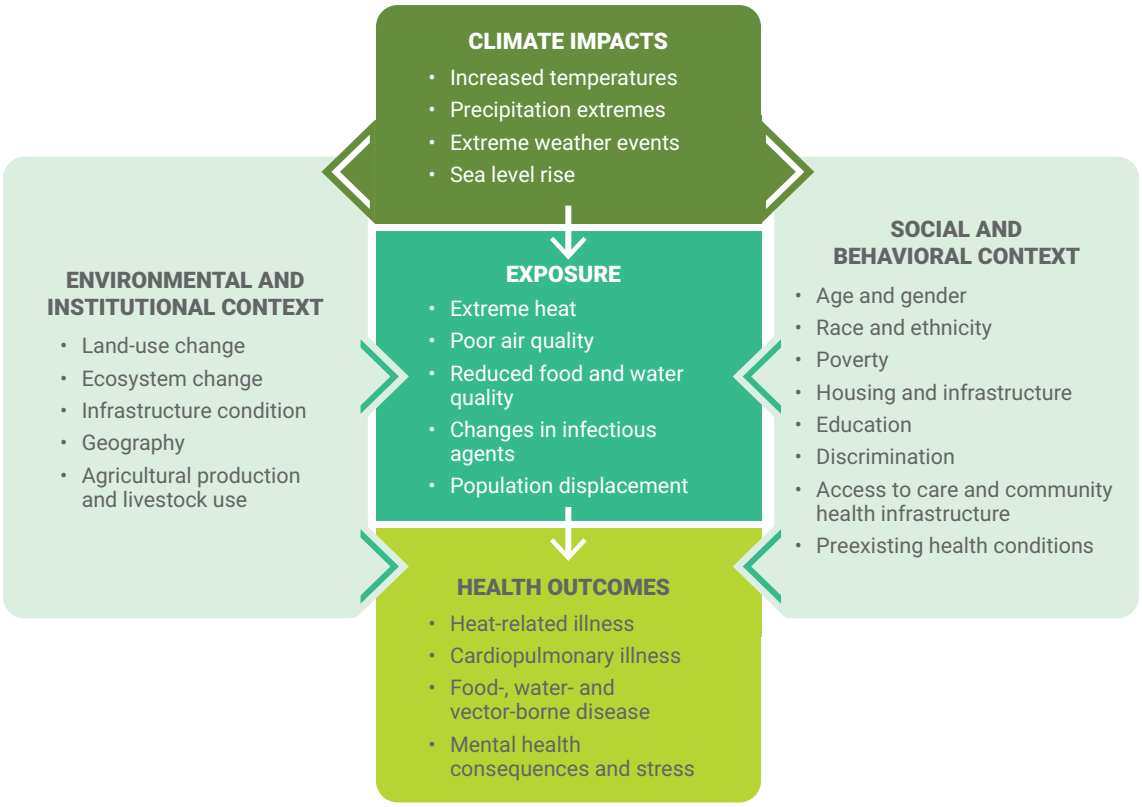
The County created a multi-stakeholder committee — the 2027 Destination Steering Committee — to plan how these differences could be addressed. In their recommendations, the Committee acknowledged the impact of local environments on individual health.[33] By addressing these root causes, the FNRP can play a substantial role in improving both physical and mental well-being.

The Virginia Federation of Independent Colleges sponsored a 2021 survey of summertime heat islands in Virginia. For Arlington, place-by-place temperature differences ranged from 5 degrees Fahrenheit in the morning to near 8 degrees Fahrenheit in the early evening.[34]

Temperature



CAPA Strategies Heat Watch report (2021) summarizes a coordinated data-collection campaign to provide snapshots of how urban heat varies across neighborhoods with landscape features.



The US EPA relates climate change to human health in terms of exposure to health threats and influencing factors that affect community health

Urbanized areas with high levels of impervious cover not only create and exacerbate heat island impacts, but they also generate more stormwater runoff in general and can contribute to more severe and dangerous flooding, especially for downstream areas where stormwater infrastructure and overland relief are limited.

Along with sequestering greenhouse gas emissions, trees remove air pollutants, thus lowering the incidence of respiratory disease, especially in children.

Many hospital systems have implemented community-wide programs to mitigate the impact of climate change, as well as promote physical and mental health. Some have taken larger, even leading roles in initiatives to improve community health by improving access to trees and green space.[35] Often among the largest and most prominent employers in a city, hospital systems can also serve as an anchor institution that brings stakeholders together, leads them toward consensus, and sustains the effort long term.[36]

> "We think of our mission in terms of what we call total health, which has multiple, interrelated dimensions. It includes the physical, emotional and spiritual health of every individual supported and sustained by the health of our total environment — our families, neighborhoods, workplaces, cities, the air we breathe, the food and water we consume, and all the delicate ecological balances that sustain life on this planet."
>
> *— Kathy Gerwig, Former Vice President and Environmental Stewardship Office, Kaiser Permanente*

2.2 MAXIMIZE USE OF TREES AND OTHER GREEN INFRASTRUCTURE TO SUPPORT CLIMATE RESILIENCE

2.2.1 CONSIDER REVISIONS TO DEVELOPMENT POLICIES THAT MAXIMIZE ENERGY CONSERVATION AND COOLING.

Intelligent, climate-sensitive design can drive energy conservation and curb the severe health impacts of extreme heat events. In addition to policies already adopted or referenced elsewhere in the FNRP, the Community Energy Plan and other County policies, the County should consider whether to:

- Recommend placement of trees in areas where they can cast maximum shade on buildings or other impermeable surfaces (such as nearby pavement) and significantly reduce ambient temperatures.[37]
- Recommend revising the ACZO and related compendia to include more prescriptive landscaping requirements for parking lots, commercial plazas and green spaces on multi-family developments. Specifically, these requirements should include bird- and wildlife-friendly native plants as well as more trees.
- Develop site development standards and/or incentives that provide ecosystem services in the form of natural infrastructure, including green roofs, green walls, water features, street-level planters and conservation lawns.

2.2.2 EXAMINE WAYS THAT BUSINESS IMPROVEMENT DISTRICTS (BIDS) MIGHT INITIATE OR ACCELERATE THE GREENING OF THEIR NEIGHBORHOODS.

All of Arlington's BIDs and partnerships have expressed a commitment to adding trees and plants to their communities. Some have developed plans that emphasize green streets and sidewalk and median-strip planting.

The County should consider how it can collaborate with BIDs and partnerships to continue and expand these activities — including, but not limited to, seeking grants, collaborative planning, flexibility on public use and activation, and creation of adjacent parklets in the right-of-way, as well as collaboration with private building managers and maintenance crews. Development or revision of sector plans — following the model demonstrated in the PCSP — can serve as a catalyst and framework for these efforts.


Arlington Regional

STRATEGIC DIRECTION 3: BIODIVERSITY

SUSTAIN VIBRANT LANDSCAPES FOR PEOPLE, PLANTS AND WILDLIFE

The natural resources of Arlington County, including plants, wildlife, wetlands, water resources, habitat, habitat corridors and more, are persistent reminders of the vibrant, interconnected systems upon which humans depend. Our collective stewardship of these resources expresses the values we place on health, life and natural beauty. The central focus of this Strategic Direction — recognizing the foundational value of connected habitat to ecological systems — is to increase and improve connected habitat throughout the County.

The Action Steps below do this by adding acres of natural land, improving habitat management on public and private lands, and blending habitat services into the built environment.

FOCUS ON NATURAL AREAS

Biodiversity — the richness of species in an ecosystem — looks beyond the benefits provided by singular trees, such as shade or aesthetic enhancement, and to the foundational systems of the natural world. It is maintained by the interactions among plants and animals such as seed dispersal, population control or the far-reaching effects of keystone species that shape their community. Because it is sustained by interactions, losing any element can disrupt the entire food web.

Protected areas in Arlington County host genetic, specific and ecosystem-level biodiversity. There is more variety of life where different ecological zones are adjacent to one another: meadows near forests near streams near rocky outcroppings. It is higher where native soils have accumulated over hundreds of years and lower on recently disturbed areas or construction sites.

Humans extend their influence over increasing areas yet continue to learn how to improve the ability to share space with other forms of life, whether by using bird-safe glass in buildings, replacing lawns with native plants, or promoting natural infrastructure through the development process. In an urban setting, biodiversity thrives if all areas are providing as much support for nature as possible. From medians to apartment courtyards, every site has the potential to support forms of life that can coexist with humans. Managed together, these spaces of the built environment can offer better support for living things to exist alongside humans as well as resting spots for animals traveling between larger natural areas.

Above: Restored meadow in Barcroft Park

Clockwise from top left: Eastern Amberwing, Green Heron in Bluemont Pond, Barred owl parent and owlet, and Eastern box turtle. Photo Credit: David Howell

Public Space System by Ownership

Primary Multi-Use Trails

Arlington's public space ownership and primary multi-use trails as depicted in the 2019 Public Spaces Master Plan.

Parks also offer the opportunity to manage forests that are biodiverse and provide foraging niches for a variety of organisms. Maintaining the structure and ecological function of forests in the challenging urban context of Arlington County will require active management that prevents ecological disruption by invasive or native species, encroachment from adjacent properties, and unsustainable physical damage such as erosion caused by visitation or stormwater.

The actions recommended below will help protect the diversity of species that live in Arlington and protect and expand the habitats they depend on — in our diverse natural areas and our yards, as well as in the biophilic features that make our built environment special.

ACTIONS

3.1 Support healthy ecological communities of native plants and wildlife

3.2 Manage threats to ecological health and integrity from invasives and native species

3.3 Establish a County-wide natural infrastructure and conservation connectivity network

3.4 Restore and manage water resources with a holistic, ecological approach

3.5 Foster biodiversity in the built environment

3.1 SUPPORT HEALTHY ECOLOGICAL COMMUNITIES OF NATIVE PLANTS AND WILDLIFE

In Arlington County, natural lands support healthy ecological communities of native plants and other living organisms and provide important ecological functions, such as cleaning our air and water, absorbing stormwater runoff and reducing the heat island effect.

As part of its natural resources program, the County employs a variety of techniques to support healthy ecological communities, including conservation of natural lands, maintaining inventories of natural resources and wildlife, and implementing a native plant policy.

3.1.1 EXPAND NATURAL LANDS IN THE COUNTY.

The County should expand its prior commitment from zero-loss of County-owned natural lands in the first recommendation of the 2010 NRMP, to expanding natural lands where possible. This may be accomplished through a diversity of actions, including habitat restoration, protecting more natural lands in the public and private realms, actively managing habitat areas in parks, collaborating with private landowners to improve habitat, continued retention and planting of native species, and applying the Public Spaces Master Plan's land acquisition criteria to identify critical parcels for acquisition. The County can explore tax credits for conservation easements on privately owned natural land, especially those that abut NRCAs and RPAs. The Northern Virginia Conservation Trust can partner on easements adjoining current park land.

3.1.2 UPDATE, MAINTAIN AND REPORT ON THE INVENTORIES OF NATURAL RESOURCES AND WILDLIFE ON COUNTY-OWNED LANDS.

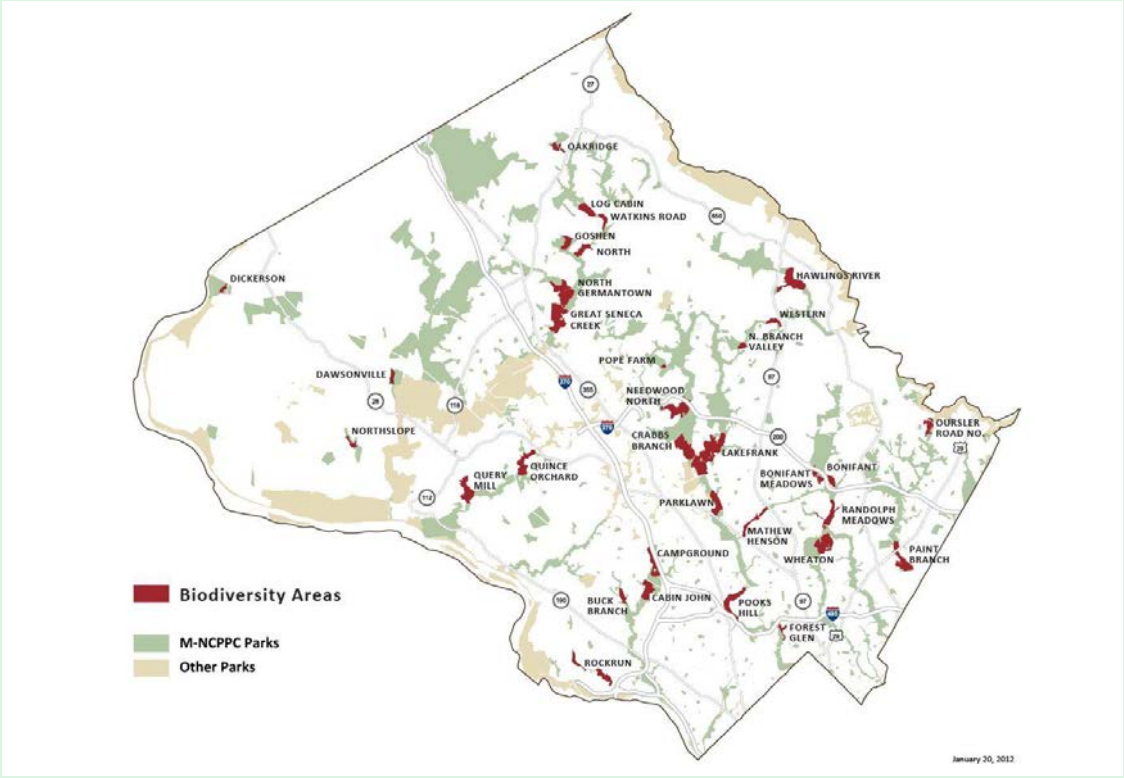
The Natural Resources Inventory complements the County's tree canopy studies and is maintained in a geographical information system (GIS) and includes riparian buffers, seeps, springs, rare plants, native plant communities, wetlands and unique geologic resources. The original inventory provides a foundational understanding of ecosystem diversity within public lands and establishes a baseline of natural resources and other living organisms on County-owned land. Resources should be revisited and the inventories updated on a regular cycle to effectively track changes. The technical report, 2011 Wildlife of Arlington: A Natural Heritage Resource Inventory Technical Report, should be revisited and updated on a 10-year schedule to assess the impact of climate change and other stressors on native species.

The County could consider enhancing the climate lens of this inventory by collaborating with the USDA's Northern Institute for Applied Climate Science with developing a 50-year vulnerability analysis.

3.1.3 IDENTIFY ADDITIONAL MANAGEMENT CATEGORIES FOR NATURAL PUBLIC LANDS TO ENABLE THE APPLICATION OF APPROPRIATE CONSERVATION MEASURES AND MAINTENANCE STRATEGIES.

The second recommendation of the 2010 NRMP established a new administrative category of County-owned public space, known as NRCAs, to protect the highest-quality natural areas. The County will build on the success of that measure, maintain the NRCAs and develop additional management categories in a more nuanced approach to managing public lands as natural infrastructure and expanding protections to additional high-quality or restored areas. Establishing appropriate use and levels of use for sensitive areas should be a component of the expanded management categories.

SUMMARY OF MONTGOMERY COUNTY, MD.'S LAND MANAGEMENT CATEGORIES



The Montgomery County Park system designates three categories of Priority Natural Resource Areas:

- Biodiversity Areas: Areas focused on unique or rare species and their habitats.
- Best Natural Areas: Larger areas that are the best examples of natural community types.
- Environmentally Sensitive Areas: Sites with more common features protected in the development process, such as 100-year floodplains and steep slopes.

3.1.4 PROTECT AND SUPPORT SENSITIVE POPULATIONS OF PLANTS AND WILDLIFE.

County staff coordinate management plans for each of the 10 parcels of NRCAs in seven parks, in accordance with the fifth recommendation of the 2010 NRMP. Several opportunities were identified to expand and improve stewardship of natural resources in the 2011 Wildlife of Arlington Report. These opportunities include forested or edge habitats that could be created or protected throughout the County that support pollinator populations that, in turn, benefit birds, bats and other living organisms. More diverse amphibian populations could be supported with additional seasonal breeding pools. The County could build on its existing commitments to supporting pollinators, such as the 2016 Monarch Pledge, by expanding efforts to focus on the establishment and maintenance of diverse pollinator habitats that supports multiple species.

Several parks support the only known Arlington location of a plant species, often in one patch or location. Establishing additional patches of these plants, an effort already underway, would decrease vulnerability to local events and increase resilience.

A variety of restoration projects and pollinator gardens in Arlington County Parks.

3.1.5 DEVELOP A MEADOW MANAGEMENT PLAN.

Meadows can enhance biodiversity by providing various plant types that support habitats for an array of wildlife such as birds and insects, including pollinators. Currently, there are 2.75 acres of meadow on County-owned lands. While forests take decades to reach their intended functionality, a meadow can provide unique habitats rare to the region within five years, or more gradually if restored via assisted natural regeneration. The County should develop a strategy to manage existing meadows and identify areas to create more. Continuing to convert turf to meadow should be prioritized for frequently mowed public open space that people rarely use and roadsides (See 1.2.11). Utility rights-of-way can be considered for meadow management. This plan should be developed to help address additional action strategies, including the increase of natural lands (see **Action Step 3.1.1**).

3.1.6 ADOPT A NATIVE PLANT REQUIREMENT FOR PUBLIC AND PRIVATE SITES TO EXPAND USE AND RETENTION OF LOCAL AND REGIONALLY NATIVE PLANTS.

Although the DPR currently follows a native plant *preferred* policy for public sites, the County should move toward a native plant *requirement* that expands use and retention of local and regional native plants — with an emphasis on private lands ranging from privately owned public spaces to special exception projects (See Appendix D for the draft Native Plant and Maintenance Standard.).

Along with incorporating the draft policy into Arlington's Landscape Standards, the County should assure key elements are reflected in other Department plans and programs. Final guidelines should also acknowledge potential changes to nursery availability and species hardiness with respect to urban conditions and climate change.

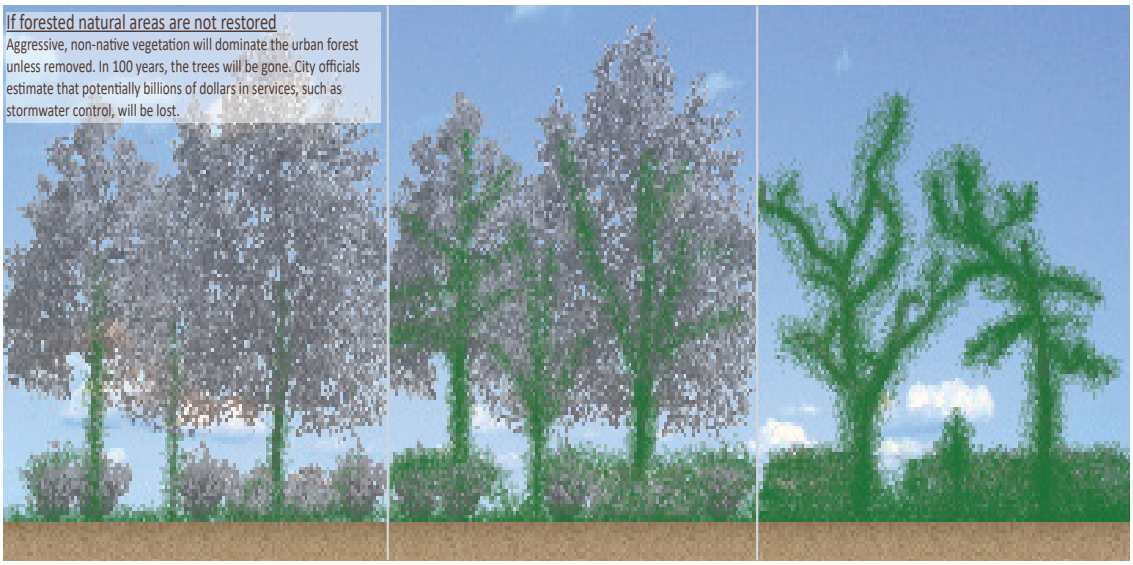
The County may partner with nurseries, educators and designers to help meet the goals in this standard, through education of private and County project designers, BIDs and their property managers, and public and private maintenance staff.

3.2 MANAGE THREATS TO ECOLOGICAL HEALTH AND INTEGRITY FROM INVASIVE AND NATIVE SPECIES

Non-native invasive species harm the local ecology by competing with native and adapted species for resources and disrupting established ecological cycles. Desirable native species can also degrade the health and integrity of their ecosystem, particularly if their population exceeds the ecological carrying capacity of their environment. These disruptive species can be any kind of living organism, including plants, animals, insects, fungi and bacteria. Populations of native and non-native species must be monitored and potentially actively managed to ensure that they do not harm the health and function of Arlington's ecosystems.

3.2.1 UPDATE ARLINGTON'S INVASIVE SPECIES MANAGEMENT STRATEGY.

Arlington created an Invasive Plant Management Strategy in 2011 as a result of the 13th recommendation of the NRMP. As part of the update, the County should remap invasive species infestations and update the invasive species lists. To prevent new non-native invasive species from becoming established, the County should continue to establish Early Detection Rapid Response (EDRR) actions for species of concern. Additional actions should be explored to address invasive species on private property and unmanaged rights-of-way, including a public information campaign. The strategy should also examine County operations for best management practices to prevent the inadvertent spread of invasive species.



Present
Forested natural areas are dominated by deciduous trees, mainly big-leaf maples and alders, nearing the end of their life. After decades of neglect, non-native invasive plants (such as Garlic mustard, English ivy, Kudzu or Porcelain berry) cover the ground and grow up into the tree canopy.

In 20 years
Invasive plants out compete and grow over existing native vegetation, blocking the sunlight plants and trees need to thrive. Invasives now dominate the tree canopy, making the trees weak, top heavy and susceptible to windfall. Eventually trees die or fall over.

In 50 years and beyond
The forest is destroyed. Native trees can no longer establish on their own. We are left with a dense "ivy desert." Very few plant species can live, and forest biodiversity is gone. Such conditions provide homes for rats and scarce habitat for more desirable urban wildlife.

Credit: Biohabitats

3.2.2 PARTICIPATE IN PARTNERSHIPS FOR INVASIVE SPECIES MANAGEMENT.

The County should continue to participate actively in Partnerships for Regional Invasive Species Management (PRISMs) to leverage knowledge, enhance capacity, allow unified cross-border action and deny invasive species a "safe haven" that jurisdictional edges often provide. Certain homeowners, such as those whose property abuts NRCAs, should be specifically encouraged to remove invasive plants. In addition to regional partnerships, participation in national programs provide shared language, making it easier to reach the public with a unified message. Agricultural extension offices can be important partners in citizen education.

3.2.3 SUSTAIN MOMENTUM IN INVASIVE SPECIES MANAGEMENT.

Since dedicated annual funding for invasive species removal began in 2011, approximately 115 acres of land are functionally free of invasive species and receive annual sweeps while in "maintenance" mode, though they require consistent attention. Another 200 acres of land are actively managed and will move into maintenance mode in the next few years. As progress is made, the County needs to ensure the capacity to maintain such areas, while still having resources to address invasive species at the remaining sites. This will require an increase in dedicated funding resources. Where the County undertakes capital plans for restoration, funding should be allocated for invasive plan treatment for longer periods. An additional challenge is that many of the remaining sites on County land are among the most heavily infested and will require a bigger lift to achieve restoration.

3.2.4 ENHANCE AND EXPAND INVASIVE PLANT DETECTION AND REMOVAL PROGRAMS.

Invasive plants are a manageable threat when management is swift, decisive and based on early detection. Taking such action requires a thoughtful, responsive team of trained people that can be mobilized quickly. County staff should continue to improve volunteer programs that address both regular maintenance (regular invasive species removal) and early detection and rapid response (EDRR) actions for species of concern. Volunteer activities are discussed in further detail in Section 4.4.

3.2.5 SUPPORT POLICIES RESTRICTING THE SALE AND USE OF INVASIVE PLANTS.

The proposed native plant policy, detailed in **Action Step 3.1.6**, would ban planting invasive plants in publicly owned spaces and in landscape plans for site-plan approved structures, and actively inform property owners what not to plant on their property to avoid off-site impacts. The draft policy is included as Appendix D.

3.2.6 MONITOR AND MANAGE NATIVE SPECIES WITH THE POTENTIAL TO HARM ECOLOGICAL HEALTH AND INTEGRITY.

While non-native invasive species are often the most salient threat to local ecological systems, desirable native species can also drive ecosystem change or negatively impact other natural resource goals. The County should monitor the population and impact of native species with the potential to significantly degrade the ecological function and integrity of its natural lands. If an issue is identified with a particular species, that species should be actively managed to bring its population back into balance with its environment and meet County objectives.

Arlington naturalists lead walks to the Magnolia Bog.

3.3 ESTABLISH A COUNTY-WIDE NATURAL INFRASTRUCTURE AND CONSERVATION CONNECTIVITY NETWORK

In addition to public land acquisition and management, biodiversity can be supported throughout the County using a data-driven prioritization of lands that are important to conservation. Although natural resources staff maintain an inventory of valuable natural areas, habitat connectivity in Arlington is a challenge. Without the ability to safely move for food, water and shelter, Arlington's wildlife may struggle, and important ecological processes, like seed dispersal and migration, suffer. Smaller areas, with limited habitat value on their own, can still contribute to habitat connectivity and make for a more integrated and resilient urban ecosystem. By including untraditional conservation targets and collaboration with willing private property owners, the County can protect and improve local biodiversity.

County Parks and Natural Resource Conservation Areas.

3.3.1 DOCUMENT EXISTING HABITAT ON PRIVATE AND PUBLIC LANDS AND IDENTIFY CONNECTIVE CORRIDORS.

An analysis should be applied across the County to prioritize site-based management and educational programs in areas that enhance ecological connectivity through natural infrastructure. Riparian corridors, for example, are important conduits for species movement. This analysis should include documentation of encroachment and other threats to habitat/ecological integrity. Areas needing improvement or restoration, as well as gaps in connectivity or corridors, could be identified.

Habitat hubs and corridor levels can be designated in relation to the local possibilities and target species. For example, pocket parks and roadside plantings may not support the movement of larger animals but could comprise a corridor adequate for pollinator movement if designed to meet the requirements for each stage of life.

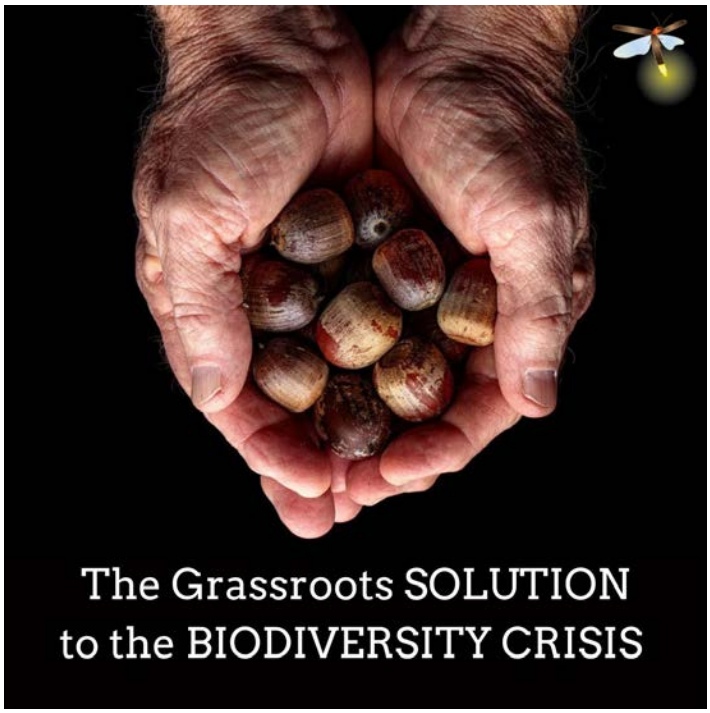
Connective corridors should be defined using natural infrastructure principles; they could include natural areas and semi-natural elements where it is not possible to dedicate land exclusively to this purpose. To ensure the ecological functionality of the corridors, priority should be placed on natural elements, such as riparian areas.

The focus of Flood Resilient Arlington on establishing overland relief pathways for floodwaters is another potential tool to increase and multi-task natural infrastructure. This represents an excellent opportunity to re-nature these areas and use them to establish habitat corridors. Flood-prone properties often lie above buried historic stream channels, which naturally connect to remaining streams.

3.3.2 IDENTIFY A SUITE OF INCENTIVES AND ACTIONS TO SUPPORT NATURAL INFRASTRUCTURE AND CONNECTIVITY ON PRIVATE LAND.

Private property owners maintain considerable rights for how their land is managed. This reality requires a creative approach to incentivize management on private lands that contributes to natural infrastructure that could include, but not be limited to, support through measures, site plan criteria and incentives for voluntary participation in land management for private landowners. Actions by private landowners can include replacing lawns with native plants and expanding and improving the RPA through tree conservation and plantings. Natural infrastructure expansion on private land can be encouraged through recognition and credit programs and actions.

Mechanisms to increase natural infrastructure on private land also include new setback or right-of-way requirements in Conservation Districts and incorporating natural infrastructure elements within Arlington County Landscape Standards.



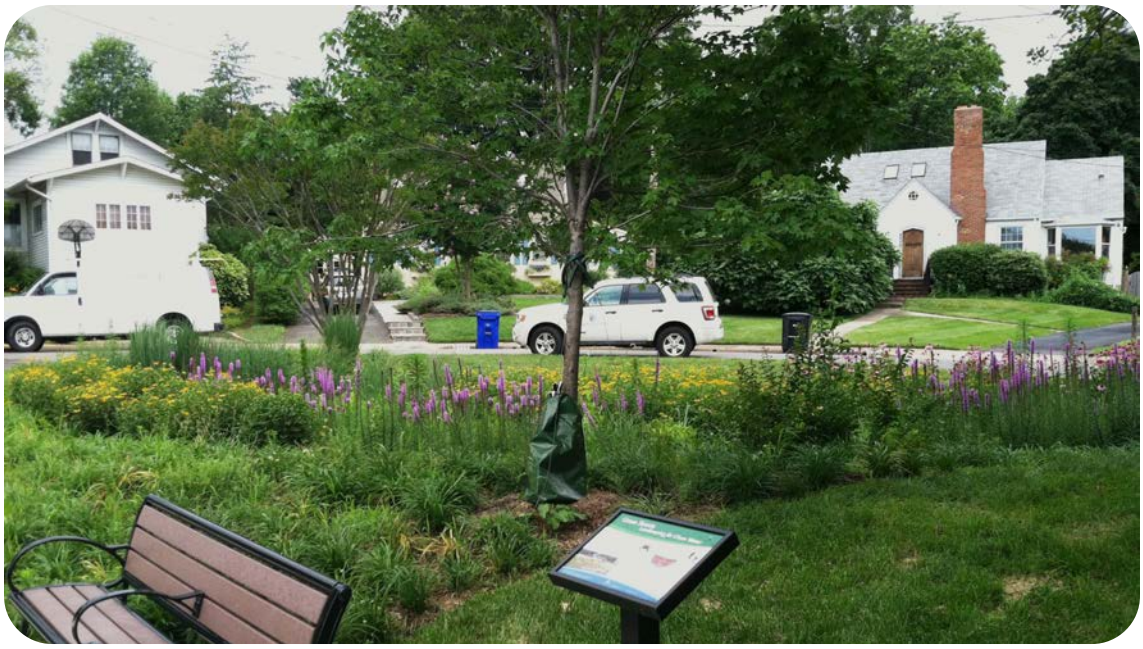
Homegrown National Park® is a grassroots call-to-action to support natural infrastructure by planting native plants and creating new ecological networks.

3.3.3 IDENTIFY BIODIVERSITY, NATURAL INFRASTRUCTURE AND CONNECTIVITY MANAGEMENT OPPORTUNITIES ON ALL UNDERUTILIZED OR UNPLANNED PUBLIC LANDS, REGARDLESS OF OWNERSHIP.

Unused areas of turf near schools, Virginia Department of Transportation (VDOT) rights-of-way, the unmanaged forest beyond a fence line, and even small patches of land can be activated to support bird and pollinator habitats, provide educational opportunities and bring people into contact with the natural world as they go about their everyday lives. Setting and following limits to the mowed buffers along paved trails would increase habitat. Several large patches of natural land exist that should be brought under management with appropriate and adequate resources. These places should be planned carefully to avoid excess unintended impacts to wildlife, such as leading them to places of conflict with other uses.

Potomac Overlook Regional Park is one of the larger connected patches of habitat in the county.

Many smaller patches, if converted to maintained natural areas, can enhance the County's ability to support biodiversity. These parcels are owned and operated by various County, regional, state and federal agencies. This effort should complement and leverage the County's existing efforts under the Green Streets program, which aims to reduce the water quality impacts associated with the streetscape and areas that drain to it through impervious surface (hardscape) reduction, increase of trees and native plantings in landscape strips, and incorporation of stormwater management through the use of such practices as rain gardens in the median and along curbs.



Even small patches can be activated into important stopover resources for pollinators and birds moving across the county.

Stakeholder collaboration and creating a memorandum of understanding (MOU) with partner entities should be put in place to protect these efforts and share their implementation. MOUs should identify management strategies and responsibilities, as well as the resources to inventory and manage them.

3.4 RESTORE AND MANAGE WATER RESOURCES WITH A HOLISTIC, ECOLOGICAL APPROACH

There are more than 30 miles of perennial streams in Arlington County. These streams drain to the Potomac River and, ultimately, the Chesapeake Bay. Stream systems provide a wide variety of ecological functions, including flood control, nutrient processing, habitat and recreation.

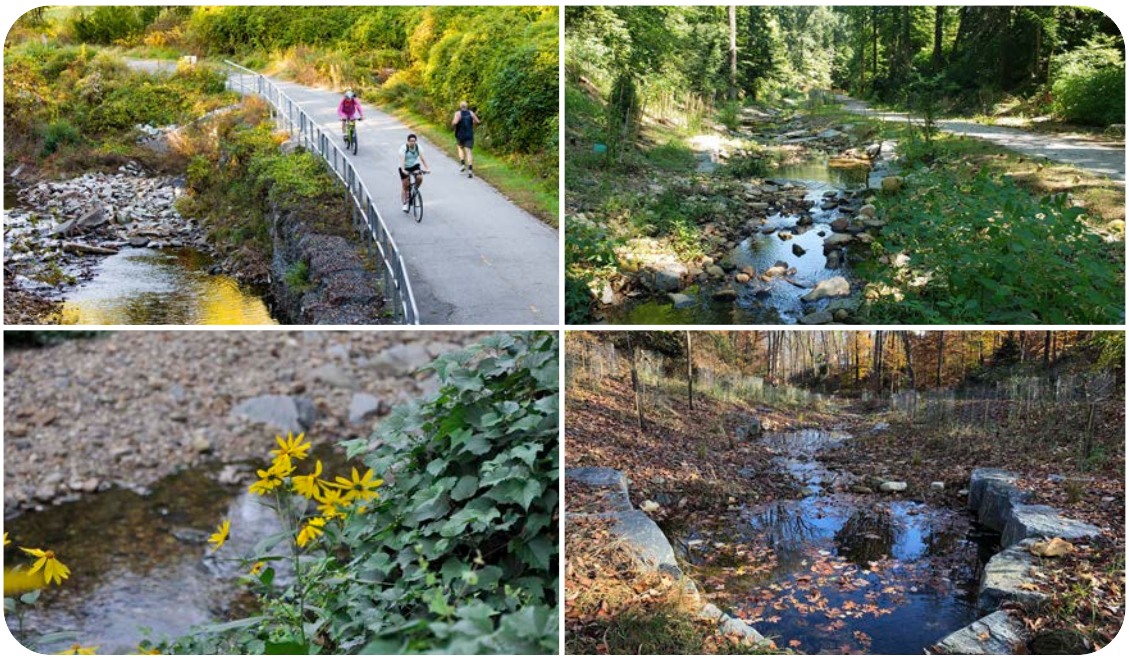
As part of its stormwater management program, the County employs a variety of techniques to reduce the impacts of stormwater runoff on streams and rivers, including stream resiliency projects and implementation of stormwater management facilities on existing developed land and for regulated development activities.

3.4.1 PRIORITIZE STREAM PROJECT OPPORTUNITIES THAT ADDRESS MULTIPLE GOALS.

Stream project identification and prioritization should consider the health of the existing plant and biological community, in addition to repairing eroded streambanks, protecting infrastructure and public safety, meeting regulatory targets for sediment and nutrient reduction, and providing overall resiliency to the increasing intensity of stormwater events. The County should formalize efforts to prioritize projects where there is an opportunity to improve the local plant community (e.g., increase/improve stream buffer, prevent further loss of streamside trees, remove invasive plants and use native plants to enhance habitat) and limit or modify projects where the existing vegetative community is in excellent condition. Stream projects also should address opportunities to restore and re-establish a hydrologic connection to floodplain wetlands.

3.4.2 DEVELOP A POND, SEEP, SPRING AND WETLANDS MANAGEMENT PLAN.

Ponds and wetlands enhance biodiversity and provide unique habitats. Currently, there are eight ponds and a few limited wetlands on County-owned lands. Seeps, springs, first-order streams and vernal pools also provide unique habitats rare to the region. The County should develop a strategy to regularly delineate and map, manage, protect, and interpret these, building on the eighth and nineth recommendations of the 2010 NRMP.



Arlington County's public spaces protect diverse water resources.

3.5 FOSTER BIODIVERSITY IN THE BUILT ENVIRONMENT

Urban ecology is a science of the margins. It is where surprising and inspiring pockets of life nestle into an urban context under heavy human influence. In this context, natural infrastructure can serve as a model of what landowners and residents can do to support all forms of life on their own property.

3.5.1 REDUCE LIGHT POLLUTION.

Light pollution in Arlington County degrades natural resources and the quality of life for humans and other species by disrupting the natural patterns of insects and wildlife, contributing atmospheric carbon dioxide, disrupting sleep and hiding the stars.

The County has taken steps to reduce these impacts. The Green Building Incentive Policy (GBIP) includes guidance on reducing light pollution from exterior fixtures, except County-required streetlights. Owners must implement this guidance on at least 90 percent of exterior fixtures to qualify for additional density on private development projects.

3.5.1.1 INCORPORATE THE INTERNATIONAL DARK SKIES ASSOCIATION'S (IDA'S) FIVE PRINCIPLES FOR RESPONSIBLE OUTDOOR LIGHTING IN THE REVIEW OF ALL SPECIAL EXCEPTION PROJECTS.

Adherence to the IDA's Five Principles will allow projects a measure of flexibility in practice, where this is relevant or warranted.

3.5.1.2 APPLY IDA'S FIVE PRINCIPLES TO COUNTY FACILITIES, PARKS AND TRAILS.

The County should follow the example set in the 2020 Streetlight Management Plan[38] and incorporate IDA's principles into the planning and operation of lighting to the extent practicable, while regularly evaluating new lighting technologies that may help further reduce light pollution from public lands and facilities. The County should apply them to currently exempted or overlooked infrastructure, such as field and trail lights, if feasible, especially at the time of bulb replacement.[39]

3.5.2 STRENGTHEN THE GUIDANCE OF THE BIRD-FRIENDLY MATERIAL OUTLINED IN THE GBIP.

As a baseline prerequisite to achieving additional density for private development projects, the Arlington County GBIP includes height requirements for the use of bird-friendly materials with a maximum threat factor of 15.[40]

Arlington should explore opportunities to expand stronger guidance into County contracts and facilities as appropriate and should seek to integrate bird-friendly design into future updates of Arlington's Facility Sustainability Policy.

The District of Columbia City Council is considering a bill, The Migratory Local Wildlife Protection Act of 2022, which will require all new construction or substantial alterations to exterior glazing of commercial buildings, multi-unit residential buildings, institutional facilities, or District-owned or operated buildings to construct each facade of the exterior wall envelope and any exterior fenestration with bird-friendly materials up to 100 feet above grade.

3.5.3 IMPLEMENT BEST PRACTICES FOR SUSTAINABLE NATURAL SURFACE TRAILS.

Public input received during the Public Spaces Master Plan process showed the public interest and high demand for natural surface trails. A significant increase in trail usage since the adoption of the Public Spaces Master Plan in 2019 reinforces the need to ensure the County's trail system is built and maintained to the highest standard of sustainability to conserve natural resources and enrich the visitor experience.

Photo Credit: David Howell

A TRAIL'S SUSTAINABILITY IS BASED ON FOUR FACTORS:

- Ecological Sustainability: Reducing and mitigating impacts on natural resources.
- Physical Sustainability: Ensuring longevity and ease of maintenance of each trail facility through proper planning and design.
- Social Sustainability: Meeting community need, minimizing user conflict and developing stewards to support the trail system.
- Managerial Sustainability: Providing adequate resources to staff and contractors tasked with maintaining and programming the trail system.

For a trail system to be truly sustainable, trails should be sited in areas that are not ecologically sensitive and all these factors should be addressed. For guidance, the County can look to best practices for the management of natural surface trails developed by the Forest Service and the National Park Service.

While it is most efficient to address long-term management during the design phase of new trails, the County's natural surface trails are already in place. Given the constraints posed by Arlington's compact geography, focusing resources on enhancing the quality and connectivity of the existing trail system, rather than increasing its footprint, may yield the most benefit for both user experience and resource protection.


ARLINGTON
FOREST
ESTABLISHED

STRATEGIC DIRECTION 4: OPERATIONS

MANAGE ORGANIZATIONAL RESOURCES FOR MAXIMUM RETURN

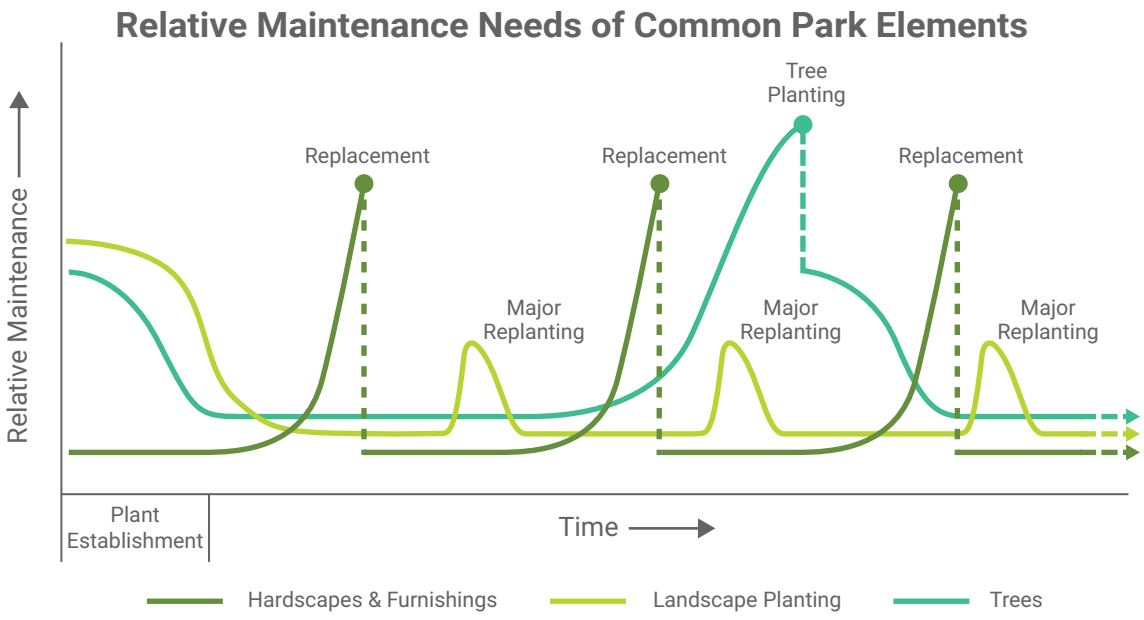
Trees and other natural resources are as critical and as valuable a part of Arlington as buildings, roads and bridges. When well-managed and healthy, they provide services on which all of us depend and enhance the County's quality of life. If not properly cared for, they may become a liability, even a potential threat to public safety, and can take decades to recover in full.

The FNRP aims to conserve and enhance our County's green infrastructure. Like gray infrastructure, developing and managing green infrastructure requires significant investment and continuing care. But "living assets" like trees and meadows can survive and thrive in nature with fewer, less expensive management activities.

Gray infrastructure depreciates over time. It requires ongoing maintenance, periodic repairs and, ultimately, reconstruction or replacement. This lifecycle is then repeated with the new asset.

Hardscapes, furnishings and other gray infrastructure elements tend to have maintenance costs increase with wear and tear over their lifespans. On the other hand, trees and planting areas tend to have more maintenance needs while they are establishing, fewer during their lifespan, and then more again if/when they go into decline.

Depending on where they're sited, urban trees have a life expectancy of between 19 and 28 years. Most urban trees (from 94.9 to 96.5 percent) survive from year to year without major intervention.[41]



Relative maintenance and replacement cycles for different types of park and public space features from the Grand River Corridor Strategic Asset Management Plan (2018). Credit: ETM Associates

In sum, as the Relative Maintenance Needs of Common Park Elements chart suggests, urban forestry and natural resource management are best described as an ongoing process rather than a succession of "one and done (for now)" projects.

While some tasks can be routine — such as street-tree pruning, watering of plants or scheduled invasive-plant treatment — many more tasks are performed on an as-needed basis, with varying schedules or differing scales at different locations. This includes work ranging from pest control to emerging invasive species management to removal of fallen, high-risk, dead or dying trees.

No work plan can correctly anticipate all these needs. While future costs may be estimated from past expenditures, where and how funds and staff are deployed requires sound operational structures and processes. Efficient and effective operational practices will help maximize any additional resources allocated to manage the County's trees and natural resources and can help maintenance be carried out more equitably across the County.

The actions described in the remainder of this section will help guide the County's operational procedures to improve return on investment in managing urban tree canopy and natural resources.

THE MANAGEMENT CHALLENGE

The County faces several challenges with current urban forestry and natural resource management and operations:

- Responsibility for trees and natural resource areas falls across different departments and different sections within departments.
- A variety of private entities and local, state and federal public agencies also have some land management responsibilities within the County's borders.
- Specialized skill sets are needed for forestry and natural resource staff positions.
- The County has limited jurisdiction over trees and natural resources on private property.
- There are few outcome and impact performance measures for the County's natural assets and trees; most existing performance measures are based on management efforts.

ACTIONS

4.1 Set explicit outcome-oriented performance measures for maintenance activities and schedules for regular assessment

4.2 Develop and review partnerships with independent entities outside the County's boundaries or its direct control

4.3 Provide a single platform to recruit, train and mobilize volunteers

4.4 Adopt regular, cyclical maintenance schedules for street trees and natural resources

4.5 Seek long-term sustainable funding to support forestry and natural resource management activities

4.6 Practice and promote environmental responsibility in maintenance operations

4.1 SET EXPLICIT OUTCOME-ORIENTED PERFORMANCE MEASURES FOR MAINTENANCE ACTIVITIES AND SCHEDULES FOR REGULAR ASSESSMENT

Careful, periodic inventories, monitoring and measuring are key to enhancing the County's understanding of its natural systems, tracking the County's progress toward its goals in this plan, and informing overall operations.

In addition to collecting data, the County should also ensure that adequate time and resources are invested in analyzing and assessing the data it collects. This will allow the County to adapt its management practices and resources to meet changing needs.

The County already has management-based performance measures. Additional performance measures — focused on outcomes and impacts — can support more efficient staff and resource allocation.

Outcome-Oriented Performance Measures

Performance Measure	What It Measures	Suggested Frequency	Related Action Step
Urban tree canopy assessment	Extent of tree canopy cover and change over time	3–5 years	4.1.1
Plot-based data collection (Urban Forest Inventory and Analysis)	Type, number and condition of trees across the County and change over time	Ongoing. Rolling data collection 3–5 years	4.1.4
Street-tree inventory data collection	Extent, condition and species composition of street-tree population	10 years	4.1.1
Flora and fauna inventories	Diversity and presence/absence of flora and fauna	5–10 year cycles; staggered over organism types	4.1.5 and 4.1.6
High-impact organism surveys	Presence/absence of organism, estimated population size, etc. as appropriate for organism	As needed	4.1.7

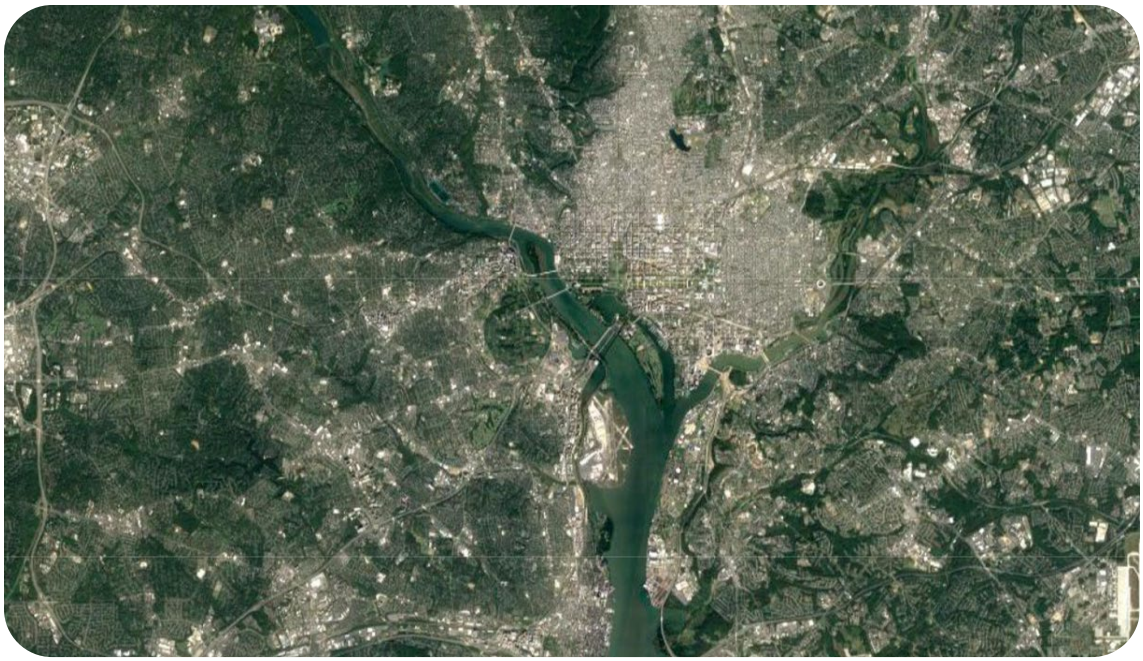
4.1.1 MONITOR CHANGES IN TREE CANOPY EVERY 3–5 YEARS, OR MORE FREQUENTLY IF TECHNOLOGY IMPROVES AND COSTS DECLINE.

With the availability of new high-resolution imagery every three years and the increasing availability of LiDAR data,[42] tree canopy assessments can be performed with higher frequency at less cost particularly compared to plot-based tools such as i-Tree. Tree canopy assessments should be used in conjunction with regular plot-based inventories of the County's trees (see 4.1.4) for a more thorough analysis of the condition of the County's trees.

Regular canopy assessments can provide critical trend information over the life of the plan. Often, they can be piggybacked on to LiDAR surveys conducted by other entities, for other purposes, in order to help reduce overall costs.

The County should also explore and deploy emerging technologies in addition to or in lieu of LiDAR, such as drone data collection, artificial intelligence (AI)-based tree inventory and vegetation mapping, and hyperspectral imagery, as appropriate and where legally permissible within the scope of evolving law. Google's Tree Canopy Lab[43] has piloted an AI-supported tool in Los Angeles. As it becomes available, software like this will make it easier to track canopy change and pinpoint areas where action is required.

Either as part of this process or separately, the County should also continue to update the inventory of street trees on a regular basis.



Remote sensing applications are rapidly improving tree inventories.

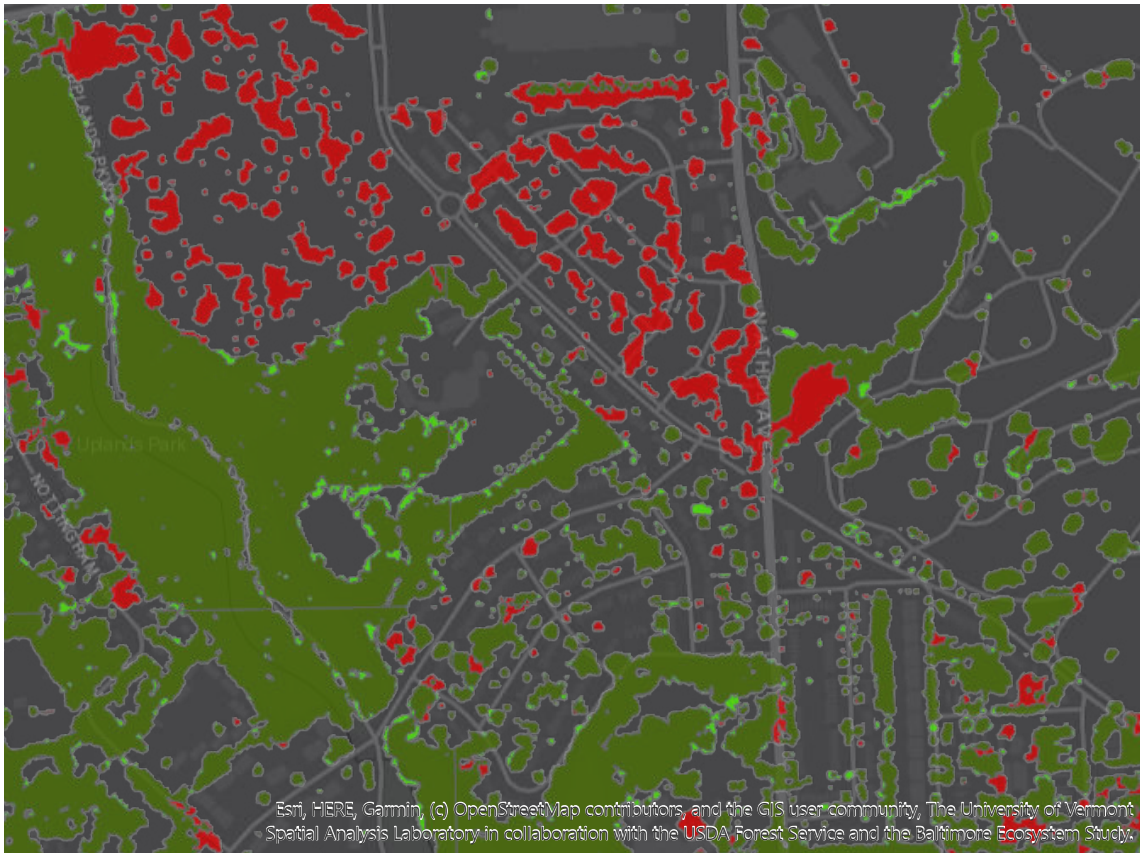
4.1.2. ESTABLISH LONG-TERM COOPERATIVE RELATIONSHIPS FOR DATA GATHERING.

Through agreements with other jurisdictions, agencies and institutions, Arlington can reduce costs and increase the "trend-spotting" value of aerial and ground-based surveys, as increased data assessments can allow for quicker identification of trends. This can include engaging private landowners as appropriate.

4.1.3. PUBLISH A WEB-BASED MAP OF THE COUNTY'S CURRENT TREE CANOPY AS ASSESSMENTS ARE PERFORMED AND REPORT REGULARLY ON CANOPY CHANGES.

By demonstrating to residents how the County's tree canopy changes over time, residents can assess for themselves where trees are, where they aren't, where they're being removed and where they're being planted. Having access to these sorts of interactive maps and dashboards can inform advocacy and help build support for County activities.

Tree Canopy Change 2007–2015



Baltimore maintains a public web-based map of tree canopy that tracks canopy loss and gain.[44]

4.1.4 REPORT ANNUALLY ON TREE REMOVALS AND PLANTINGS.

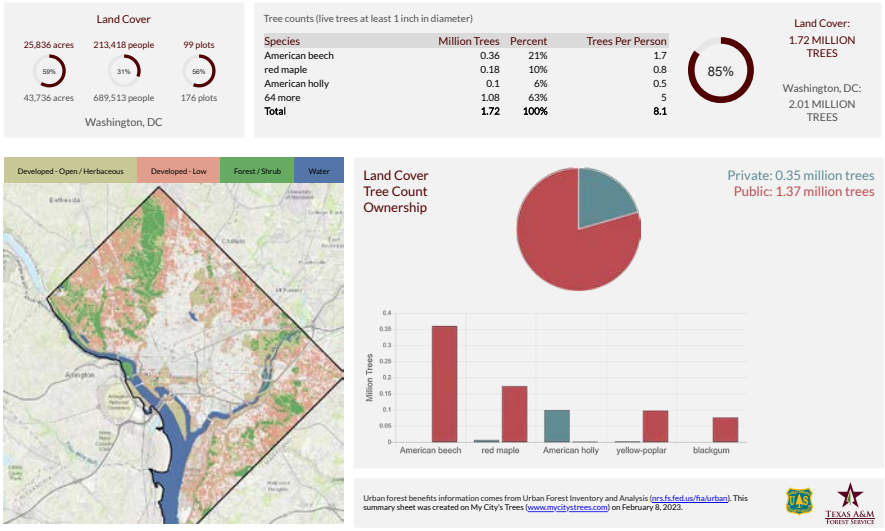
The County should report findings regularly on the number of trees removed, planted and included in restoration projects, at minimum, and, as appropriate, acres existing, conserved, removed and mitigated via development-related permitting processes. These reports should include updates on progress within the Tree Equity Areas identified in **2.1.1**. The measures reported on will vary year to year and will depend on their data collection interval as outlined in the Outcome-Oriented Performance Measures chart. Map updates would indicate what areas of the County were most affected. If possible, consider dividing data between public and private lands. Consider adding reporting on the five-year survival of County-planted trees.

4.1.5 UPDATE QUALITATIVE DATA ABOUT THE COUNTY'S URBAN FOREST THROUGH CONTINUED PLOT-BASED SURVEYS.

Plot-based data collection provides trending information about the number, size, type and condition of trees. Given Arlington's size, as many as 150 separate plots could be randomly selected across all land uses. On a three-year timetable, 50 plots could be assessed each year; over three years, every plot would be visited at least once.

Washington, D.C. Urban Forest Benefits: Tree Count

Land Cover: Developed - Open / Herbaceous, Developed - Low, Forest / Shrub, Water



Information of this sort can be an invaluable complement to ordinary canopy assessments, providing details on the type, species, condition and size of trees in the County. By noting site characteristics for each plot, the County can gather trend information on how the impacts of development, climate change and invasive species affect Arlington's landscape.

4.1.6 CONDUCT STAGGERED (NON-TREE) FLORA AND FAUNA INVENTORIES ON 5–10-YEAR CYCLES.

To measure biodiversity and track progress toward biodiversity goals, regularly conduct inventories on County-owned lands to record species diversity, invasive species, rare/threatened/endangered species and "additional ecological criteria" (see **Action Step 3.1.2**). Exact criteria will vary based on the flora or fauna tracked.

Inventories can be staggered so that different types of organisms are inventoried each year, allowing the collection of trend data based on results from previous and existing inventories.

PLOT-BASED SURVEY TOOLS:

Using tools like i-Tree Eco, plot-based data provide details on the type, condition and size of trees in the County. Data collected can be processed online to calculate the environmental benefits provided by the urban forest, such as carbon sequestration, storm water management and air pollution mitigation.[45]

The Forest Service offers another plot-based assessment protocol through its Urban Forest Inventory and Analysis (FIA) Program.[46] No southern state, except Texas, participates in this program. Even if the Southern Group of State Foresters[47] declines participation in this program, it does not prohibit Arlington County from buying into the program and joining a well-established and ongoing data collection effort.

4.1.7 ENLIST AND TRAIN MORE RESIDENTS TO PARTICIPATE IN MONITORING FLORA AND FAUNA.

Currently, the Master Naturalist program and the County's Nature Centers provide opportunities for residents to become involved in monitoring flora and fauna. The County can continue to encourage residents to use *iNaturalist*, or other online reporting tools, and participate in the City Nature Challenge, as well as other public-driven science efforts, in interim years for unofficial inventories and data. Local students can also be engaged and integrated into research and operations through ongoing school projects.

4.1.8 CONDUCT SURVEYS ON HIGH-IMPACT ORGANISMS AND EXISTING/ EMERGING PESTS, AS NEEDED.

Surveys like these will be especially important where otherwise desirable species can drive ecosystem change and negatively impact natural resource goals, or where invasive species, pests and diseases imperil the survival of desired species. Such surveys will be critical to identifying threats early, informing management efforts and can tie into education campaigns.

One example is a recent aerial survey of the white-tailed deer population in the County. The survey found that the population of white-tailed deer within County-owned natural lands potentially exceeded the ecological carrying capacity of those areas, threatening forest health and regeneration. The survey results prompted an assessment of deer impacts to desirable vegetation in County-owned natural lands, which is currently underway. *Placeholder for results of the vegetation impact assessment and outcomes*

4.2 DEVELOP AND REVIEW PARTNERSHIPS WITH INDEPENDENT ENTITIES OUTSIDE THE COUNTY'S JURISDICTION

When one entity doesn't have the resources — land, staff or money — others can be invited to help provide and enhance the County's existing services. Adding new partnerships to those already in place can help achieve the goals of the FNRP. Expanded services provided by partnerships may include:

- **Better, more varied experiences.** Jurisdictions and institutions working together frequently allow local agencies to utilize resources that aren't otherwise available, such as expanding access to different types of natural areas and amenities. They may also join together to create integrated, holistic experiences, such as connected regional trail systems and wildlife corridors. In turn, shared experiences and signage help users better navigate local nature and better understand and support responsible recreation.
- **Work where the County is not able**. Other jurisdictions and organizations may be held to different regulatory standards than the County and, as such, can have different opportunities for where and how they can work. For example, some organizations may more easily work across jurisdictional boundaries,

while others may be better able to organize tree plantings on private property.

- **Deeper engagement with the community.** Partners can promote work the County is doing and engage with constituents who typically may not hear about or seek out information on natural resources. Informed constituents are more apt to steward the County's natural resources. Other partners can help create advocates and educators of natural resources, parks and the urban forest across jurisdictional lines and on private property through attracting, training and mobilizing volunteers.
- **Capacity.** It's rare that a single park and natural resource agency can muster the staff to do all the things it needs to do, whether it's managing invasive species, protecting water quality or collecting information critical to sound decisions. Adjacent jurisdictions may partner to gather and share data for natural areas that cross boundaries. Additionally, public-driven science efforts — whether working individually or as part of a larger partner organization — can and do help many communities, and dozens of federal and state agencies rely on their work. The federal government catalogs as many as 491 citizen science projects; the U.S. Environmental Protection Agency, alone, supports 52.[48]

4.2.1 CONTINUE TO DEVELOP AND ENHANCE PARTNERSHIPS WITH ORGANIZATIONS THAT ALREADY OPERATE IN THE COUNTY.

Many organizations cooperate with the County. These relationships could be reviewed to determine how they relate to the FNRP and what goals are shared between these organizations and the FNRP. Such a review could be supported by the County and undertaken in tandem with each organization involved so they can help guide how any shared goals are met. As part of this process, the County can also revisit neighborhood-level conservation plans through partnerships with local groups (e.g., citizens' groups, faith groups and adjoining landowners).

PlayCleanGo promotes awareness, understanding, and cooperation by providing a clear call to action to be informed, attentive and accountable for stopping the spread of all invasive species. They invite any partner with similar goals to utilize our materials.

4.2.2 CONTINUE TO DEVELOP AND REVIEW REGIONAL PARTNERSHIPS.

Maintain participation in the Metropolitan Washington Council of Governments' (MWCOG) Agriculture and Forestry Committee, Housing Planning Areas committee, the Chesapeake Bay Protection committee and others relevant to forestry and natural resources. MWCOG's Green Infrastructure Program examines regional green space and public space land cover types; the Urban Forestry Program works through projects and workshops with member governments in cooperation with federal, state and local forestry program partners.

4.2.3 FORMALIZE PARTNERSHIPS WITH MOUS.

Effective partnerships are built on a clear and mutual understanding of roles, responsibilities and best practices for handling requests for support between organizations. These should be codified through an MOU or some other similar vehicle. Currently, some jurisdictions and institutions have had challenges with the MOU process; the County could seek ways to reduce the difficulty of the MOU process and/or establish an avenue for a different type of formal agreement. Through changes in organizations and their staff, formalizing a relationship promotes both continuity and accountability. The County should review periodically its agreements with both professional and volunteer organizations, and make adjustments as appropriate. These agreements and formal MOUs should be collected and made publicly accessible.

4.3 PROVIDE A SINGLE PLATFORM TO COORDINATE RECRUITMENT, TRAINING AND MOBILIZATION OF VOLUNTEERS

Like any scarce resource, volunteer energy should be carefully deployed and sustained. Arlington has taken many steps to accomplish that. But volunteer management takes resources, staff and time, which have not always been available. It takes focused, consistent (and persistent) effort to establish relationships, set mutually agreed-to priorities, and create systems to track activity and measure success. Dedicating efforts to volunteer management ensures it remains a priority; providing a centralized coordination platform, such as through a single point of contact at the County, helps minimize overlap and duplication of volunteer efforts. As part of this coordination, the County should assess the needs of existing volunteer organizations and individuals, and use that assessment to inform future initiatives.

4.3.1 STRENGTHEN COORDINATION WITH ORGANIZATIONS THAT VOLUNTEER IN THE COUNTY TO SHARE INFORMATION, PLAN JOINTLY AND MAXIMIZE THE IMPACT OF VOLUNTEER EFFORTS FOR NATURAL RESOURCES.

Relying on multiple channels of communication between the County and local volunteer organizations can hamper volunteer productivity — especially when different types of projects are underway. Many city agencies have formal relationships with a prominent local nonprofit that takes responsibility for recruitment, training and assigning volunteers to city projects. Philadelphia delegates volunteer management to the Fairmont Park Conservancy. The long-standing Green Seattle Partnership provides a useful model.

Alternatively, some communities designate a lead staff person to coordinate with external groups for natural resource volunteer work.

CHESAPEAKE BAY'S STORMWATER MANAGEMENT & RESTORATION TRACKING (SMART) TOOL

The Stormwater Management and Restoration Tracking (SMART) Tool was developed by the University of Maryland Extension Sea Grant Watershed Protection and Restoration Program, in partnership with the Alliance for the Chesapeake and the Center for GIS at Towson University. It provides the mechanisms needed to track, certify and report progress on small-scale, non-regulated best management practices, such as stormwater management mechanisms installed by private property owners in their backyards. This will allow for additional quantifiable water quality benefits to be documented across the Chesapeake Watershed.

Program Accomplishments

1,300+
acres in restoration

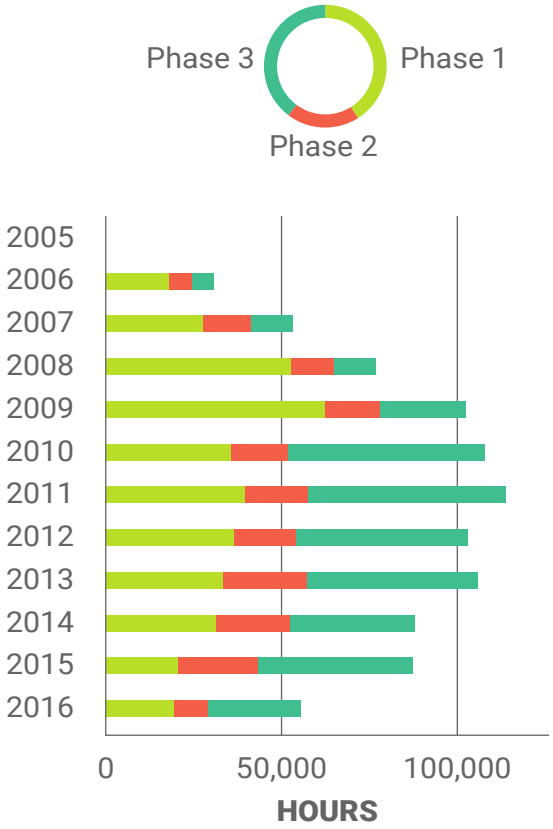
677,528
plants in the ground

167
acres mulched

2,151
acres weeded

879,752
volunteer hours

269,975
professional crew hours



GREEN SEATTLE PARTNERSHIP

In 1994, people in Seattle noticed that trees in the city were dying. They feared that in 20 years, some 70 percent of Seattle's trees would be gone. Over the years, self-organized volunteers, nonprofit efforts and city staff and crews had all tried to address the problems facing the parks. But piecemeal efforts placed a strain on the city's resources and couldn't get enough footing to be successful. In order to save the parks, a shared effort between community members, experts in forestry and local government were necessary.

In 2004, the Green Seattle Partnership was formed to arm citizens to help the city's trees in coordination with Forterra, Seattle Parks and Recreation, and many other nonprofits and community groups. The Partnership created a 20-year strategic plan to sustain Seattle's forested parks.

The Green Seattle Partnership remains one of the benchmark models for volunteer management. Many of the goals set almost two decades ago have been achieved, and the program has evolved to reach beyond the city's boundaries. See greenseattle.org.

4.3.2 IMPROVE TRACKING OF VOLUNTEER EFFORTS AND EXPAND RECOGNITION PROGRAMS.

The County could produce an Annual Volunteer Report — either as a standalone document or as a section for inclusion in a larger annual report — that recognizes volunteers and volunteer groups by the number of hours they contribute (similar to the way that many nonprofit groups recognize different tiers of donors) that builds upon current County volunteer tracking efforts. Some time tracking may already be done by existing organizations; the County should work with these organizations to avoid duplication of efforts. Annually tracking volunteer efforts will also allow the County to evaluate the work done by volunteers, looking to see if any tasks may provide a better return on investment if switched to in-house staff or contracted staff, or vice versa.

4.3.3 FORMALIZE VOLUNTEER ROLES FOR MAINTENANCE, RESTORATION, EDUCATION AND LEADERSHIP.

Creating defined roles supports better recruitment and focuses effort on the highest priority needs. Position descriptions will help volunteers assess time commitments, along with skills and abilities needed before making a commitment. Defining roles may attract additional volunteers who previously may not have realized they had skills that could be used for volunteer work. Identifying experienced volunteers to organize and support these programs alongside County staff will aid volunteer retention and education as well as maximize the impact of County staff time.

4.3.4 CONTINUE TO RECOGNIZE AND REWARD EXCEPTIONAL PERFORMANCE BY ORGANIZATIONS AND INDIVIDUALS AT THE NEIGHBORHOOD AND COUNTY LEVELS.

Recognizing groups for their outstanding performance can encourage repeat support, as well as inspire others to get involved. Consider creating additional awards or reviving existing dormant programs (e.g., beautification awards). New awards could be tied to specific types of volunteer work, such as a dedicated award for invasive species management efforts, honoring specific work by civic associations, etc. County staff can also explore ways to track and acknowledge/reward private property owners that create and/or steward natural resources on their properties. Awards should strike a balance between being numerous enough to encourage more volunteerism and limited enough to avoid diluting the honor of winning an award and putting excessive work on staff.

Public science volunteers can help monitor environmental conditions — from tree health to water quality.

Virginia's Working Landscape program maintains a volunteer force of 22 citizen scientists. Over the past 10 years, these volunteers have contributed more than 15,000 volunteer hours.

Arlington's stream monitors have contributed over 10,000 volunteer hours over the past 10 years. In that timeframe, this represented efforts from 345 volunteer monitors.

The County could underwrite part of the cost of signs that honor individuals' stewardship — as recognized by the County or by other organizations.

4.4 ADOPT REGULAR, CYCLICAL MAINTENANCE SCHEDULES FOR STREET TREES AND NATURAL RESOURCES

Creating and adopting maintenance schedules will increase accountability and give the County a greater ability to address potential concerns as part of routine maintenance before they become high-risk issues.

Ultimately, this approach could save money and improve the level of benefits to which Arlingtonians have become accustomed.

4.4.1 MOVE FROM "REACTIVE" TO "PROACTIVE" MAINTENANCE OF PUBLICLY OWNED NATURAL ASSETS, OUTSIDE OF EXTREME STORM EVENTS AND OTHER EMERGENCIES.

On-demand services favor residents with the time, technology and knowledge to access the system. Those without may be unaware, unable or unwilling to seek the County's assistance with neighborhood trees and other natural features like nearby ponds or steep slopes.

Reactive, on-demand maintenance tends to favor higher-income neighborhoods. As a result, potentially serious issues in other

REMOVAL COSTS OF DEAD TREES VERSUS MAINTENANCE OF OLD, DECLINING, YET STILL LIVING TREES.

Maintenance cost, safety concerns and ecosystem value (i.e., contribution to the local seedbank) can all affect the decision to remove declining trees. Healthy trees provide ecosystem and community services; however, planting and maintaining trees costs money and staff time. If maintenance is deferred or abandoned, benefits decrease and costs increase. The costs of maintaining versus not maintaining the urban forest can be significant, as outlined in reports by, and conferences from, the International Society of Arboriculture.[49]

neighborhoods may be overlooked. By reserving on-demand responses to address only higher-risk maintenance issues, the County can help address maintenance equity issues (see **Action Step 2.1.1**) while also improving fiscal responsibility.

Decreasing the annual budget for tree pruning led to an increase in emergency tree work.[50]

Communicating this change will be a critical part of the implementation. The timeframe for an expected response — as well as what defines proactive, regular maintenance — should be posted on an easily accessible page on the County's website and/or included as part of an automated response message for when an on-demand request is received to set clear expectations.

Proactive maintenance may also enable the County to incorporate increased inspections and care for urban trees, including preemptive mitigation for incoming pests and diseases, and reduce overall damage incidents from failing trees.

4.4.2. ESTABLISH A REGULAR CYCLICAL MAINTENANCE SCHEDULE.

As the foundation for proactive management, the schedule should identify the location and frequency of the tasks to be performed, as well as those tasks that should be performed on an as-needed basis. For some natural areas, the schedule may take the form of a management plan.

- Maintenance schedules may be modified by location, as appropriate; for example, high-use natural areas or those with heavier infestations of invasive species may receive more frequent care than established native areas with fewer visitors.
- "Low mow" areas and conservation lawns will receive less frequent mowing than traditional turf areas but may receive more frequent invasive plant management maintenance. Regular mowing can help reduce invasive species but some interim control may be needed depending on mowing frequency. Mowing can be timed to maximize environmental benefits — for instance, mowing in late winter or early spring to allow plants to support wildlife in the winter months.
- Over time, maintenance schedules and protocols should be refined as data on performance measures become available.

4.4.3. INFORM AND EDUCATE CONSTITUENTS ABOUT THE NATURE AND EXTENT OF MAINTENANCE ACTIVITIES. PUBLISH BASIC MAINTENANCE SCHEDULES SO THEY ARE VISIBLE TO EMPLOYEES AND CONSTITUENTS.

Engage the real estate community to provide all new homeowners and renters with information on:

- How to use the County's mobile app to make maintenance requests about County-owned trees and natural areas in the County.
- Where they can go on the County's website to learn more about current maintenance activities and schedules.

Post on the County website the basic maintenance schedules and include them in County publications, as appropriate. Schedules can be broad, noting how often maintenance is performed and in what season (i.e., street trees inspected on a five-year cycle and meadows mowed once a year).

On-site signage also may be used in some areas where maintenance practices may be different than visitors may expect, such as for "low mow" areas and conservation lawns that may have been previously managed as traditional lawns, or in some natural areas where debris may be left for ecological value.

Design of signage highlighting changing or new maintenance practices provide another opportunity for community engagement. In Colchester Borough, U.K., school children designed new butterfly signs for green space areas that recently had their mowing regime changed or that had been left to naturalize.[51]

Photo Credit: Lydia Wynter

4.5 SEEK LONG-TERM SUSTAINABLE FUNDING TO SUPPORT FORESTRY AND NATURAL RESOURCE MANAGEMENT ACTIVITIES

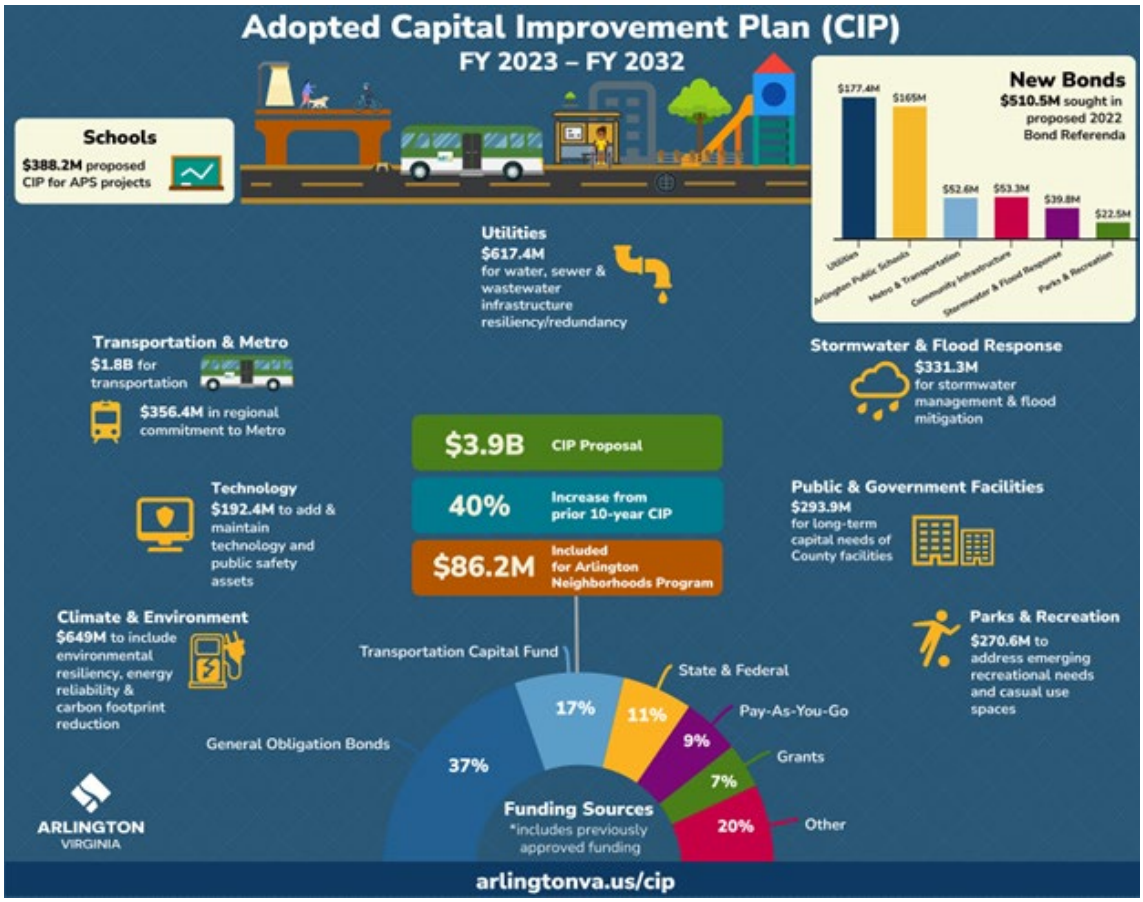
Even with increased operational and management efficiency, additional support will be needed to implement the goals of the FNRP. A robust network of partners may fill part of these needs, but not all. To adequately sustain internal resources, the County should continue to develop and support a range of different funding sources. Having a variety of revenue streams will contribute to long-term financial sustainability. It will be important to acquire funding for maintenance of existing resources and new projects, and not solely for implementation of new projects. For example, it is critical to the long-term success of restoration projects to ensure funding to maintain and manage them so the restored area does not degrade over time.

4.5.1. PURSUE FUNDING SUPPORT FOR URBAN FORESTRY AND NATURAL RESOURCE MANAGEMENT ACTIVITIES THROUGH THE CAPITAL IMPROVEMENT PLAN (CIP).

Trees, natural areas, wildlife and plants are invaluable County capital assets and should be funded and planned for as such. Over time, this green infrastructure evolves differently than other physical assets. Roads, bridges, buildings and pipes deteriorate as they age until they are replaced or repaired, typically using capital funds. Instead of aging out of service, most natural assets grow, decline and regenerate; street trees are more similar to other “gray” assets in that they are typically removed and replaced when they noticeably decline or become a safety hazard. Economic and social value multiplies as natural assets mature, and care must be taken to conserve the services they provide over their lifecycle.

Adequate funding is a key step in ensuring these services. While capital budgeting typically is aimed at sequestering funds that will be needed to replace gray infrastructure at the end of its useful life, it can also provide an avenue for funding the development of green infrastructure, another vital community asset.

In 2022, the County adopted a 10-year CIP that included a new Natural Resiliency Program,[52] aimed at providing funding for the conservation and renovation of Arlington’s natural resources and the design and installation of modifications within existing parks to allow temporary inundation of parkland to disperse flood waters safely and naturally.



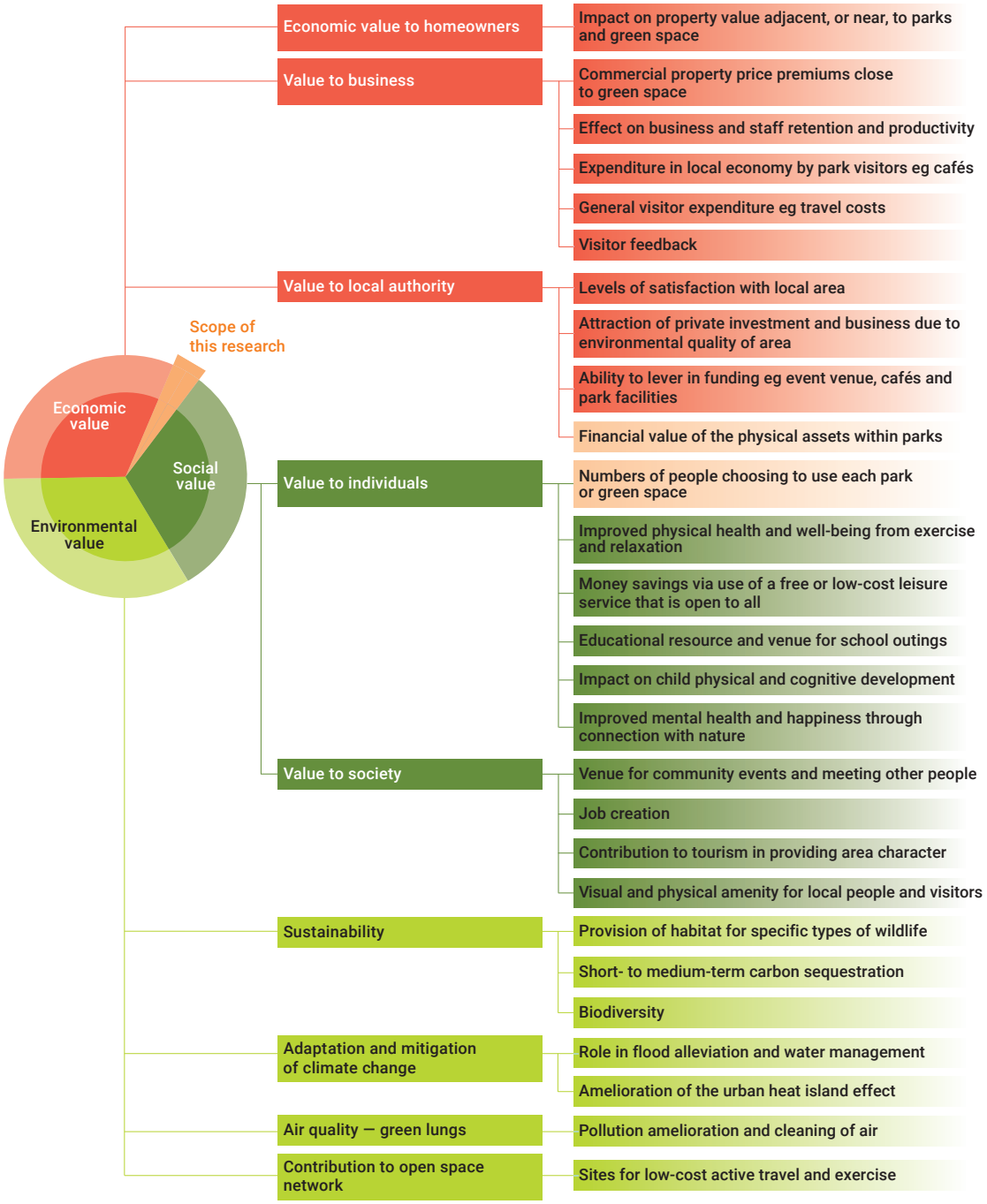
Arlington's 10-year CIP includes a new Natural Resiliency Program.

4.5.2. IDENTIFY ACTIVITIES THAT WOULD BENEFIT FROM LONGER-TERM CONSISTENT FUNDING.

By reviewing current and future conditions, as well as spending and budgeting patterns, the County may find it is more cost effective to provide sustained support for some functions, outside the unpredictable nature of year-to-year budgeting. These might include planting and restoration of degraded ecosystems, as well as monitoring and maintenance activities. If deferred, the County could face higher overall expenses and reduced ecosystem services as natural environments further degrade, species diversity suffers, high-risk trees go undetected and unmaintained, and living trees transition from maturity to decline without proper care.

4.5.3. CONSIDER TOOLS TO CALCULATE THE VALUE OF ARLINGTON'S GREEN ASSETS THAT CAN THEN BE USED FOR COUNTY BUDGETING.

Plot-based surveys remain the most widely used tools for measuring the value of ecosystem services delivered by trees, from carbon sequestration to stormwater runoff mitigation (see **Action Step 1.3.1**). The County can use other tools to estimate the impact of management decisions on other resources. Valuing these natural assets can help inform County budget discussions and strike the right balance among development, conservation and protection.



Summary of ways to measure the diverse values provided by parks and green spaces. Credit: Design Council Report

Some tools exist that help value other green assets. Of note is the Design Council's 2008 report, The Real Value of Park Assets.[53] The report provides recommendations for how the value of natural assets in parks can be measured. A 2015 white paper on valuing Arlington's Community Parks and Open Space can provide additional context[54] and may serve as the starting point for refining the County's valuation frameworks.

4.5.4 EXPLORE MULTIPLE SOURCES OF FUNDING — FEDERAL, STATE AND PRIVATE — TO COVER HIGHER COSTS FOR TREE PLANTING, MAINTENANCE AND NATURAL AREA CONSERVATION ON PUBLIC LAND AND RIGHTS-OF-WAY IN UNDERSERVED NEIGHBORHOODS.

The County assesses natural features as part of neighborhood and sector plans and reviews these elements during site plan review. To expand on these efforts, the County should consider creating a multi-department process for directing resources to, and shaping development in, areas where needs are greatest and prior investment in nature on public property and rights-of-way has lagged.

Current and potential federal funds available from U.S. agencies such as the Departments of Housing and Urban Development, Transportation, and Energy, as well as the Forest Service, have served as important vehicles for local initiatives in other communities. Many federal programs already support green infrastructure investments; even greater levels of funding are anticipated to combat climate change. The Nature Conservancy published a useful guide on Funding Trees for Health.[56]

Accordingly, County Departments should institute a formal process to collaborate on introducing "green" elements in federal and state funding proposals, as well as through private funding opportunities. Another option the County could explore, if permitted by state code, is a possible transfer tax on property sales specifically allocated to fund natural areas maintenance. Some underserved areas also may be eligible for additional funding sources that seek to address inequity.

Urban forest carbon credits, such as those offered through City Forest Credits, can provide ongoing funding to support maintenance over 25 years for tree-planting projects and 40 years for tree protection projects.

Lower-income areas with greater amounts of impervious surfaces, greater development densities and fewer areas for immediately planting trees pose greater infrastructure constraints, which can exacerbate inequities in the consideration of costs when expanding tree canopy.[55]

DEDICATED OPEN SPACE FUNDS

New Jersey has implemented state and County open space trust funds which have helped conserve more than 1.5 million acres of open space (including farmland) in the state. The Garden State Preservation Trust Act (N.J.S.A. 13:8C-1 et seq.) was signed into law in 1999, and provides a framework for the state and its counties to set aside an amount of sales tax revenues for open space, farmland and historic resource preservation, as well as recreational development. The trust funds are typically established for a set period, after which they can be re-authorized. All of New Jersey's 21 counties assess a tax for land conservation, park and recreation projects and historic preservation. These increased assessments, mostly 1 or 2 cents, go into an open space trust fund that can be used for maintenance, repairs and acquisitions, depending on how the assessment is written. It has been quite successful in purchasing and conserving farmland and open space in New Jersey. The added assessment is minimal, and there has not been one open space trust fund bond vote that has been turned down by voters. In addition, under the New Jersey Open Space Preservation Funding Amendment, a portion of the revenue from the Corporate Business Tax Act (C.54:10A-1 et seq.) is dedicated to Green Acres, Blue Acres, Farmland Preservation programs and historic preservation.

4.6 PRACTICE AND PROMOTE ENVIRONMENTAL RESPONSIBILITY IN MAINTENANCE OPERATIONS

Arlington has adopted Standard Operating Procedures (SOPs) that establish protocols for many ongoing tasks and activities undertaken by DPR and other departments. What SOPs require — and how they are implemented — can have significant impact on environmental conditions and progress toward FNRP goals.

4.6.1 CREATE, REVIEW AND REFINE EXISTING SOPS AND CONSIDER CONSOLIDATING THEM INTO A SINGLE GUIDE.

SOPs present an opportunity to codify environmental responsibility into official practice. Most local governments adopt SOPs and continue to refine them based on their own experience, as well as on what they've learned from other communities. During a periodic review of SOPs, Arlington may wish to assess how other communities have addressed both content and format to improve compliance and adapt management practices to meet current and future needs.

4.6.2 REDUCE NEGATIVE IMPACTS TO CONSTITUENTS, NATURAL AREAS AND WILDLIFE.

The County can take a variety of actions to reduce the impacts its maintenance practices have on County constituents, as well as on the natural areas and wildlife located within the County's boundaries. Some of these actions may include:

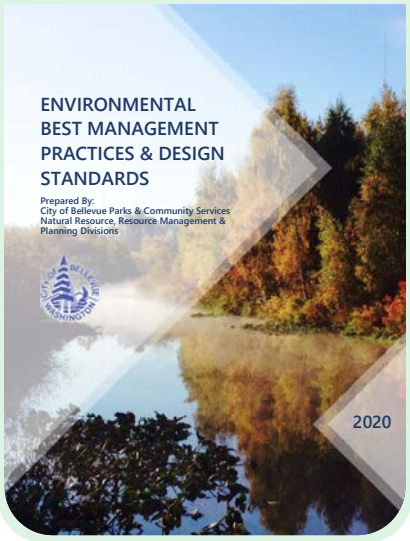
- Increasing the use of electric equipment, including battery-powered lawn mowers, to help the community reach its Community Energy Plan (CEP) goals, with a long-term goal of replacing County-owned small gas-powered equipment by 2025.
- Working with the Equipment Bureau to evaluate opportunities to transition the County fleet to carbon-neutral transportation, and promote and encourage electric vehicle usage in the private and commercial sectors, including supporting convenient charging stations throughout Arlington.
- Preventing or mitigating excessive noise and lighting impacts on wildlife and lighting impacts on flora (see **Action Step 3.5**: Foster Biodiverity in the Built Environment).
- Expanding integrated pest management into all maintenance operations.
- Training staff to use the lowest-impact methods to access sites, avoid soil compaction and destruction from equipment, and avoid newly planted restoration areas.
- Designing spaces that work with maintenance needs to reduce unintended impacts on soil and vegetation.
- Continuing to retain snag trees and downed wood for wildlife benefit, where the risk of failure and impact is low, particularly in Natural Lands.
- Reducing air pollution from park management by investing in cleaner equipment, reducing mowing and incorporating other best practices.
- Protecting the native ground layer in forests, edges and trails by retaining leaf litter, woody debris, etc.
- Ensuring trails are designed sustainably with resource protection in mind.

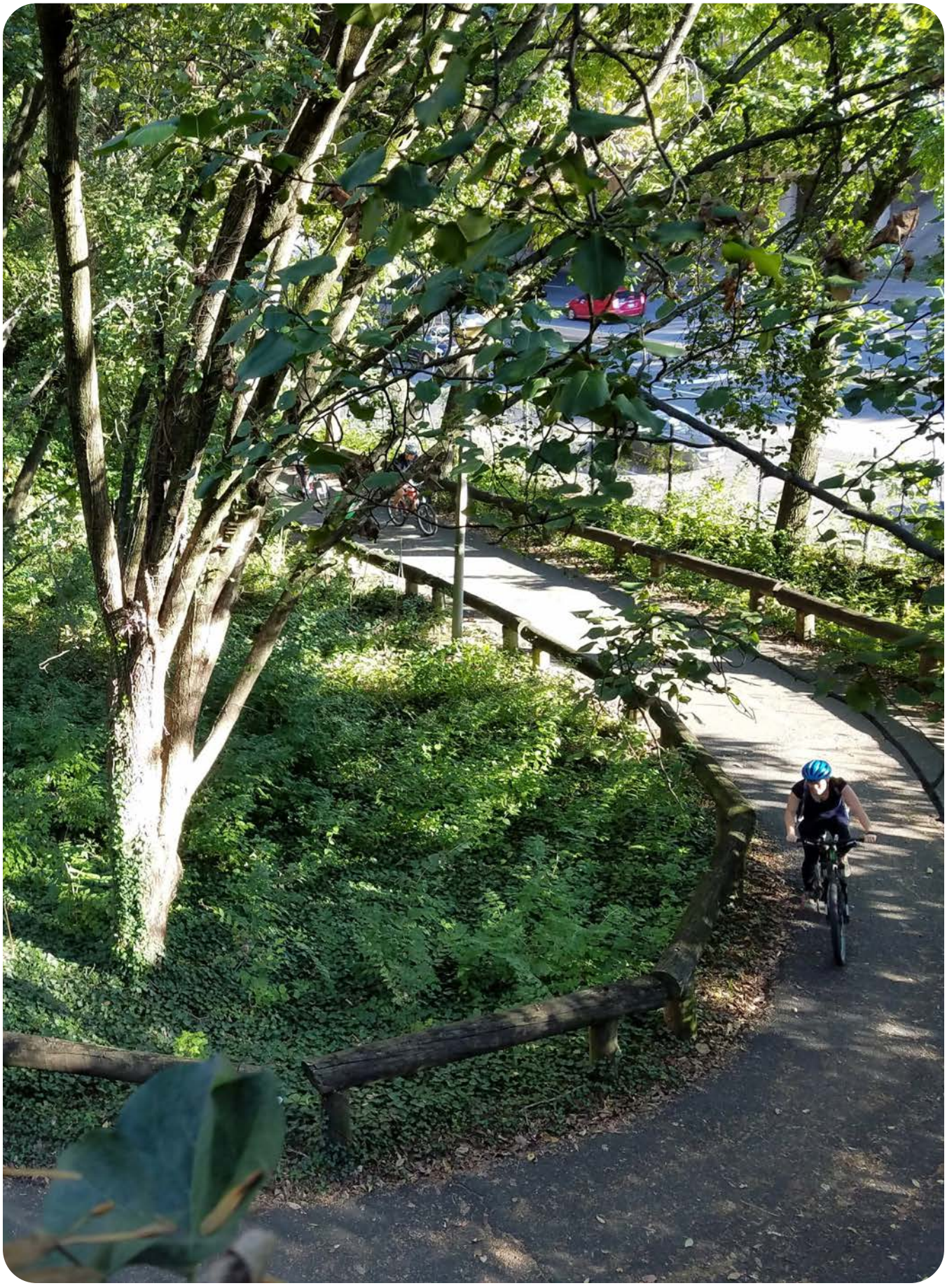
- Mitigating unavoidable impacts from construction and maintenance projects and requiring restoration or rehabilitation of impacted natural resources.
- Restoring impacted natural resources when the use of parkland causes damage.
- Protecting trees and soil.

4.6.3 DEVELOP AND REGULARLY REFINE BMPS THAT PROMOTE ENVIRONMENTAL RESPONSIBILITY.

These internal BMPs would be developed most productively in cooperation with County Departments where work affects natural resources and forestry. These departments should promote environmentally friendly and beneficial practices to the extent practicable and periodically be reviewed and revised. BMPs may cover both general County-wide operating practices, such as integrated pest management, invasives species control, or stormwater management, and more specific management plans for the various natural resources in the County, such as wetlands, vernal pools and urban forests. In some cases, BMPs may be aspirational — designed to promote long-term behavior changes. BMPs can also be updated as technology improves, such as using smart irrigation systems to reduce excessive water use. Coordinate with other stakeholders as appropriate.

Bellevue, Wash., emphasizes connections between parks, trees, natural resources and other city functions. While the specific practices in these documents may not be directly duplicative for the County, they can be used to inspire and inform the creation of additional BMPs for Arlington County.





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13 In Arlington County, documented natural lands occur primarily as variations of mid-late successional hardwood forest aging from 85-200 years old, generally exhibiting historically undisturbed soils and displaying a complete and diverse native vegetation structure (canopy, sub-canopy, shrub and herb layer). Few non-forested natural lands remain in Arlington but would include several documented remnant woodland meadows (glens), bogs, seeps, and tidal marsh.

14 All Virginia localities are subject to the Dillon Rule. Arlington's powers are limited to those expressly granted to it by the General Assembly, those necessarily or fairly implied or incident to those powers, as well as, essential or crucial to the existence of local government. Unless it is clear that a locality has been granted a power by the General Assembly, it cannot exercise that power.

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20 The most commonly used framework for assessing tree characteristics is the Council of Tree & Landscape Appraisers Guide for Plant Appraisal, now in its 10th edition.

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22 USDA Forest Services' *Tree Owner's Manual:* https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5368392.pdf

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IMPLEMENTATION FRAMEWORK

Item	Description	Time Frame Ongoing, Short, Medium, Long	Responsible Parties	Potential Partners	Cost Range Estimate $-$$$	Potential Funding Sources
1. Conservation						
1. Sustain Arlington's tree canopy and natural areas						
1.1.1	Maintain 40 percent tree canopy County-wide through conservation and tree-planting programs tailored to local conditions and ecological contexts.	Ongoing	DPR, CPHD, DES	NVCT, NVRC, EcoAction Arlington, nonprofits, VDOT, NPS, NOVA Parks, DOD, DOS, private property owners, County commissions, BIDs, development community	$$$	Operating budget, capital budget, federal funding, state funding, private funding
1.1.2	Ensure 70 percent of Arlington's trees are regionally native by 2035.	Long	DPR, CPHD, DES	NVCT, NVRC, EcoAction Arlington, nonprofits, VDOT, NPS, NOVA Parks, DOD, DOS, private property owners, BIDs, development community	$$	Operating budget, capital budget, federal funding, state funding, private funding
1.1.3	Establish aspirational tree canopy coverage goals for new public sites.	Short	DPR, APS, CPHD	Private property owners, NOVA Parks, NPS, DOD	$	Operating budget
1.1.4	Ensure no loss of County-owned natural lands.	Ongoing	DPR, DES	Nonprofits, County commissions	$	Operating budget
1.1.5	Advance urban forestry and natural resource goals through County public space acquisitions.	Ongoing	DPR, DES	NVCT, private property owners, nonprofits, County commissions	$$$	Capital budget, federal funding, state funding
1.1.6	Reflect FNRP-adopted policies in future Comprehensive Plan elements, sector and area plans.	Ongoing	CPHD, DPR, DES	Nonprofits, County commissions	$	Operating budget
1.1.7	Expand and formalize the relationship between APS and DPR to ensure school sites meet community objectives for tree canopy and natural spaces.	Medium	DPS, APS	PTAs, nonprofits	$$	Operating budget, capital budget
1.1.8	Build momentum for the FNRP's policy recommendations through public commitments of support from potential partners.	Ongoing	DPR, DES, CPHD	NVCT, NVRC, EcoAction Arlington, nonprofits, VDOT, NPS, NOVA Parks, DOD, DOS, private property owners, BIDs	$	Operating budget, private funding
1.1.9	Identify and recruit leaders of large private, institutional, educational and faith-based properties to support the County's environmental goals.	Ongoing	DPR, DES	Private property owners, nonprofits, religious institutions, private schools	$	Operating budget, private funding

Key: Short-term: 1-3 years; Mid-term: 5-10 years; Long-term: 10-20 years; Ongoing: Long-term collaberations, operational changes, aspirational changes. $: Less than $250,000; $$: $250-1,500,000; $$$: $1,500,000+

1.1.10	Monitor and assure adequate care of significant trees on designated historic sites or trees that have intrinsic historical significance.	Ongoing	DPR, CPHD	County commissions, private property owners	$	Operating budget
1.2 Expand spaces for trees and natural areas						
1.2.1	Seek legislative changes at the state level that enable Arlington County to enact and enforce rules designed to fit local circumstances, needs and expectations.	Ongoing	DPR/PNR, Legislative Liaison, DES, CPHD		$	
1.2.2	Establish "low mow" areas, meadows and conservation lawns on public spaces with applicable monitoring, appropriate signage and maintenance schedules.	Medium-Long	DPR, DES		$$$	
1.2.1	Seek legislation at the state level that authorizes Arlington County to develop locally-appropriate policies to conserve and manage its natural resources.	Ongoing	DPR, DES, CPHD	Nonprofits, County residents	$	Operating budget
1.2.2	Establish and implement guidelines for natural infrastructure on public sites.	Medium	DPR, DES, CPHD	Biophilic Cities Network, NPS, NOVA Parks, DOD	$$$	Operating budget, capital budget
1.2.3	Enhance development standards to optimize retention or replacement of tree canopy, natural vegetation, permeable surfaces and biophilic elements.	Short	CPHD, DPR, DES	Development community, Biophilic Cities Network, County commissions, development community, BIDs, private property owners	$	Operating budget
1.2.4	Continue to work with utility installers (public and private) to reduce impact to trees from trenching and other soil disturbance.	Ongoing	DPR, DES, CPHD	Utility companies	$	Operating budget, private funding
1.2.5	Examine how prevalence of turf grass on private and public property impedes achievement of FNRP and related stormwater management goals.	Medium	DPR, CPHD, DES, APS	VDOT, NPS, NOVA Parks, DOD, DOS, private property owners, BIDs	$$	Operating budget, capital budget

Key: Short-term: 1-3 years; Mid-term: 5-10 years; Long-term: 10-20 years; Ongoing: Long-term collaberations, operational changes, aspirational changes. $: Less than $250,000; $$: $250-1,500,000; $$$: $1,500,000+

1.2.6	Review and update Chapter 10, Article II of the Arlington County Code to allow and encourage naturalized areas using native plantings on private and public property.	Short	CPHD, DPR	NVRC, County commissions	$	Operating budget
1.2.7	Provide technical assistance to owners – including HOAs and institutions – who wish to add natural landscape and biophilic features to their property.	Short	CPHD, DES, DPR	Private property owners, EcoAction Arlington, nonprofits, Virginia Cooperative Extension	$	Operating budget, private funding
1.2.8	Deliver programs and projects in a manner that supports equitable access to natural infrastructure.	Short	DPR, DES	EcoAction Arlington, NOVA Parks, NPS, DOD	$$	Operating budget, capital budget
1.2.9	Review and refine tree retention and replacement rules to address ecosystem services provided by trees.	Medium	DPR, CPHD, DES	Private property owners, BIDs, County commissions	$	Operating budget, capital budget, private funding
1.2.10	Address County environmental priorities through additional site development requirements and compliance options.	Long	CPHD, DPR, DES	County commissions, private property owners	$	Operating budget, private funding
1.2.11	Review and strengthen tree-planting and establish guidelines and standards of care where appropriate.	Medium	DPR, CPHD	County commissions, private property owners	$	Operating budget, private funding
1.2.12	Evaluate roads and rights-of-way to identify opportunities for reducing impervious surfaces and expanding plantable space.	Medium	DES, DPR	VDOT, Federal Highways	$$	Operating budget, capital budget, federal funding, state funding
1.2.13	Conduct a systematic inventory of land encroachments that threaten to degrade public lands.	Long	DPR, DES, CPHD	Private property owners	$$	Operating budget
1.2.14	Test and deploy a site certification system, such as Sustainable Sites Initiative (SITES) or LEED Neighborhood Development (LEED-ND), for public and private projects (including APS).	Medium	CPHD, DPR, DES	Private property owners, BIDs, APS, Developers	$	Operating budget, capital budget

Key: Short-term: 1-3 years; Mid-term: 5-10 years; Long-term: 10-20 years; Ongoing: Long-term collaberations, operational changes, aspirational changes. $: Less than $250,000; $$: $250-1,500,000; $$$: $1,500,000+

1.2.15	Offer training to contractors and tree-care companies to ensure compliance with best practices for planting and maintenance of trees.	Medium	DPR, CPHD, DES	Contractors, nonprofits	$$	Operating budget, private funding
1.3 Assess and account for all the benefits of trees and natural areas						
1.3.1	Incorporate ecosystem valuation methods that capture known ecosystem values of existing trees and natural areas into County planning.	Long	DPR, DES	County commissions, ISA	$$	Operating budget
1.3.2	Determine how the "community value" of trees can be incorporated into site plan reviews and approvals.	Medium	CPHD, DPR, DES	ISA	$	Operating budget
1.3.3	Strengthen developer requirements to provide multi-year maintenance of trees and natural resources on site plan projects.	Short	CPHD, DPR	County commissions, private property owners, development community	$	Operating budget
1.3.4	Ensure that successive owners of property are aware of key landscape features and maintenance requirements.	Long	CPHD, DPR	Property owners, developers	$	Operating budget
1.4 Foster and strengthen Arlingtonians' commitment to conservation of trees and natural resources						
1.4.1	Expand and enhance the guidance the County provides to residents on appropriate tree care and natural resource management practices, including invasive species, the value of native planting, conserving and expanding stream buffers, night sky protection and wildlife benefits.	Long	DPR, DES	Nonprofits, Virginia Cooperative Extension	$	Operating budget, private funding
1.4.2	Review and select existing national and local programs that support County environmental education and volunteer stewardship goals.	Medium	DPR, DES	County commissions, nonprofits	$	Operating budget, private funding

Key: Short-term: 1-3 years; Mid-term: 5-10 years; Long-term: 10-20 years; Ongoing: Long-term collaborations, operational changes, aspirational changes. $: Less than $250,000; $$: $250-1,500,000; $$$: $1,500,000+

1.4.3	Recruit and train community, cultural and faith-community leaders in addition to existing partner groups to serve as nature ambassadors and proponents of grassroots conservation.	Medium	DPR	Nonprofits, civic assocations, faith community	$	Operating budget, private funding
1.4.4	Work with APS to identify and, where needed, assist in planning and landscaping areas suitable for outdoor learning on existing and new school sites.	Medium	APS, DPR	PTAs, nonprofits	$$	Operating budget, capital budget
1.4.5	Increase environmental education opportunities by expanding partnerships with APS and nonprofit organizations.	Long	APS, DPR	PTAs, nonprofits	$	Operating budget, private funding
1.4.6	Explore ways to expand the green jobs workforce and career development programs, supported by a multi-sector coalition.	Long	AED, APS, DPR	Nonprofits, local buisinesses, educational institutions	$	Operating budget, federal funding, state funding, private funding
2. Climate Mitigation, Adaptation and Resilience						
2.1 Allocate resources to climate-vulnerable hot spots						
2.1.1	Identify Tree Equity Areas and work with these communities to direct resources to neighborhoods currently underserved by existing tree canopy or access to natural areas.	Short, Ongoing	DPR, CPHD, DES	Civic associations, private property owners, developers	$$-$$$	Operating budget, capital budget, federal funding, state funding, private funding
2.1.2	Explore a County initiative that positions tree and natural area conservation as a high-priority public health issue, implemented by a consortium of local nonprofits, including local hospitals.	Long	DPR, CPHD	Nonprofits, health care providers, civic assocations	$$	Operating budget, state funding, private funding
2.2 Maximize use of trees and other green infrastructure to support climate resilience						
2.2.1	Consider revisions to development policies that maximize energy conservation and cooling.	Medium	CPHD, DPR, DES	County commissions, private property owners, development community	$	Operating budget
2.2.2	Examine ways that Business Improvement Districts (BIDs) might initiate or accelerate the greening of their neighborhoods.	Short	AED, DPR, DES	BIDs, private property owners, development community	$	Operating budget, private funding

Key: Short-term: 1-3 years; Mid-term: 5-10 years; Long-term: 10-20 years; Ongoing: Long-term collaberations, operational changes, aspirational changes. $: Less than $250,000; $$: $250-1,500,000; $$$: $1,500,000+

3. Biodiversity						
3.1 Support healthy ecological communities of native plants and wildlife						
3.1.1	Expand natural lands in the County.	Long	DPR, DES, CPHD	NVCT, NVRC, nonprofits, VDOT, NPS, NOVA Parks, DOD, DOS, private property owners, County commissions, BIDs, development community	$$$	Operating budget, capital budget, federal funding, state funding
3.1.2	Update, maintain and report on the inventories of natural resources and wildlife on County-owned lands.	Short	DPR	NVCT, NVRC, nonprofits, volunteer organizations	$$	Operating budget
3.1.3	Identify additional management categories for natural public lands to enable the application of appropriate conservation measures and maintenance strategies.	Medium	DPR	NVRC, NVCT, NPS, DOD, NOVA Parks	$	Operating budget
3.1.4	Protect and support sensitive populations of plants and wildlife.	Ongoing	DPR, DES	NVCT, NVRC, nonprofits, VDOT, NPS, NOVA Parks, DOD, DOS, private property owners, County commissions, BIDs, development community	$$	Operating budget, capital budget, federal funding, state funding, private funding
3.1.5	Develop a meadow management plan.	Short	DPR	County comissions, non-profits, other jurisidictions	$$	Operating budget
3.1.6	Adopt a native plant requirement for public and private sites to expand use and retention of local and regionally native plants.	Short	CPHD, DPR, DES, APS	Development community, nonprofits, other jurisdictions	$$	Operating budget, capital budget
3.2 Manage threats to ecological health and integrity from invasive and native species						
3.2.1	Update Arlington's invasive species management strategy.	Medium	DPR	County commissions, nonprofits, private property owners	$	Operating budget
3.2.2	Participate in partnerships for invasive management.	Ongoing	DPR	National Capital PRISM, NPS, NOVA Parks VDOT, DOD, DOS, NPS	$	Operating budget, state funding, private funding
3.2.3	Sustain momentum already made in invasive management.	Ongoing	DPR	Nonprofits, volunteer organizations	$ - $$	Operating budget, capital budget
3.2.4	Enhance and expand invasive plant detection and removal programs.	Short	DPR	National Capital PRISM	$$	Operating budget, capital budget, private funding
3.2.5	Support policies restricting the sale and use of invasive plants.	Long	DPR, CPHD, DES	Development community, private property owners, BIDs	$	Operating budget

Key: Short-term: 1-3 years; Mid-term: 5-10 years; Long-term: 10-20 years; Ongoing: Long-term collaberations, operational changes, aspirational changes. $: Less than $250,000; $$: $250-1,500,000; $$$: $1,500,000+

3.2.6	Monitor and manage native species with the potential to harm ecological health and integrity.	Ongoing	DPR, DES	National Capital Prism, nonprofits, volunteer organizations	$$	Operating budget, capital budget, federal funding, state funding, private funding
3.3 Establish a County-wide natural infrastructure and conservation connectivity network						
3.3.1	Document existing habitat on private and public lands and identify connective corridors.	Ongoing	DPR, CPHD, DES	Private property owners, NVCT, other jurisdictions	$$	Operating budget
3.3.2	Identify a suite of incentives and actions to support natural infrastructure and connectivity on private land.	Ongoing	DPR, DES, CPHD	Private property owners, NVCT, other jurisdictions	$-$$$	Operating budget, federal funding, state funding, private funding
3.3.3	Identify biodiversity, natural infrastructure and connectivity management opportunities on all underutilized or unplanned public lands, regardless of ownership.	Medium	DPR, DES	NPS, NOVA Parks VDOT, DOD, DOS, NPS	$$	Operating budget, capital budget, federal funding, state funding
3.4 Restore and manage water resources with a holistic, ecological approach						
3.4.1	Prioritize stream restoration opportunities that address multiple goals.	Ongoing	DES, DPR	County comissions, nonprofits, civic associations	$-$$	Operating budget, capital budget, federal funding, state funding
3.4.2	Develop a Pond, Seep, Spring and Wetlands Management Plan.	Short	DPR, DES	County commissions, private property owners, NOVA Parks, NPS	$$	Operating budget, capital budget, federal funding, state funding
3.5 Foster biodiversity in the build environment						
3.5.1	Reduce light pollution.	Short, Ongoing	CPHD, DPR	Development community, Biophilic Cities Network, County commissions, development community, BIDs, private property owners	$$	Operating budget, capital budget, federal funding, state funding, private funding
3.5.2	Strengthen the guidance of the bird-friendly material outlined in the Green Building Incentive Policy.	Medium	CPHD, DPR	Development community, Biophilic Cities Network, County commissions, development community, BIDs, private property owners	$$	Operating budget, capital budget, federal funding, state funding, private funding
3.5.3	Implement best practices for sustainable natural surface trails.	Short	DPR	Nonprofits, NVRC, NVCT, NPS, Nova Parks	$$	Operating budget, capital budget, federal funding, state funding, private funding

Key: Short-term: 1-3 years; Mid-term: 5-10 years; Long-term: 10-20 years; Ongoing: Long-term collaberations, operational changes, aspirational changes. $: Less than $250,000; $$: $250-1,500,000; $$$: $1,500,000+

4. Operations						
4.1 Set explicit outcome-oriented performance measures for maintenance activities and schedules for regular assessment						
4.1.1	Monitor changes in tree canopy every 3–5 years, or more frequently if technology improves and costs decline.	Ongoing	DPR, DES	USFS, Chesapeake Bay Network	$$	Operating budget
4.1.2	Establish long-term cooperative relationships for data gathering.	Long	DPR, CPHD	Nonprofits, other jurisdictions	$$	Operating budget
4.1.3	Publish a web-based map of the County's current tree canopy as assessments are performed and report regularly on canopy changes.	Ongoing	DPR, DES		$	Operating budget
4.1.4	Report annually on tree removals and plantings.	Ongoing	DPR	County commissions, nonprofits	$	Operating budget
4.1.5	Update qualitative data about the County's urban forest through continued plot-based surveys.	Ongoing	DPR	Nonprofits, volunteer organizations	$$	Operating budget
4.1.6	Conduct staggered (non-tree) flora and fauna inventories on 5–10-year cycles.	Ongoing	DPR	Nonprofits, volunteer organizations	$$	Operating budget
4.1.7	Enlist and train residents to participate in monitoring flora and fauna.	Ongoing	DPR	Nonprofits, volunteer organizations, civic associations	$	Operating budget, private funding
4.1.8	Conduct surveys on high-impact organisms and existing/emerging pests, as needed.	Ongoing	DPR	Nonprofits, volunteer organizations	$-$$	Operating budget, capital budget
4.2 Develop and review partnerships with independent entities outside the County's jurisdiction						
4.2.1	Continue to develop and enhance partnerships with organizations that already operate in the County.	Ongoing	DPR, CPHD, DES	Nonprofits, volunteer organizations	$	Operating budget, private funding
4.2.2	Continue to develop and review regional partnerships.	Ongoing	DPR, CPHD, DES	Nonprofits, volunteer organizations, NPS, DOD, VDOT, other jurisdictions	$	Operating budget
4.2.3	Formalize partnerships with MOUs.	Ongoing	DPR, DES, CAO	NPS, VDOT, DOD, NOVA Parks	$	Operating budget
4.3 Provide a single platform to coordinate recruitment, training and mobilization of volunteers						
4.3.1	Strengthen coordination with organizations that volunteer in the County to share information, plan jointly and maximize the impact of volunteer efforts for natural resources.	Ongoing	DPR	Nonprofits, volunteer organizations	$	Operating budget, private funding

Key: Short-term: 1-3 years; Mid-term: 5-10 years; Long-term: 10-20 years; Ongoing: Long-term collaborations, operational changes, aspirational changes. $: Less than $250,000; $$: $250-1,500,000; $$$: $1,500,000+

4.3.2	Improve tracking of volunteer efforts and expand recognition programs.	Short, Ongoing	DPR	Nonprofits, volunteer organizations	$$	Operating budget, private funding
4.3.3	Formalize volunteer roles for maintenance, restoration, education and leadership.	Short	DPR, DES	Nonprofits, volunteer organizations	$	Operating budget, private funding
4.3.4	Continue to recognize and reward exceptional performance by organizations and individuals at the neighborhood and County levels.	Ongoing	DPR	Nonprofits, volunteer organizations	$	Operating budget
4.4. Adopt regular, cyclical maintenance schedules for street trees and natural resources						
4.4.1	Move from "reactive" to "proactive" maintenance of publicly owned natural assets, outside of extreme storm events and other emergencies.	Ongoing	DPR	USFS, VDOF	$	Operating budget
4.4.2	Establish a regular cyclical maintenance schedule.	Ongoing	DPR	USFS, VDOF	$$	Operating budget
4.4.3	Inform and educate constituents about the nature and extent of maintenance activities. Publish basic maintenance schedules so they are visible to employees and constituents.	Ongoing	DPR, DES		$	Operating budget
4.5 Seek long-term sustainable funding to support forestry and natural resource management activities						
4.5.1	Pursue funding support for urban forestry and natural resource management activities through the Capital Improvement Plan (CIP).	Ongoing	DPR, DES		$$$	Capital budget
4.5.2	Identify activities that would benefit from longer-term consistent funding.	Ongoing	DPR, DES		$$	Operating budget, capital budget
4.5.3	Consider tools to calculate the value of Arlington's green assets that can then be used for County budgeting.	Ongoing	DPR, DES	ISA, other jurisdictions	$	Operating budget

Key: Short-term: 1-3 years; Mid-term: 5-10 years; Long-term: 10-20 years; Ongoing: Long-term collaberations, operational changes, aspirational changes. $: Less than $250,000; $$: $250-1,500,000; $$$: $1,500,000+

4.5.4	Explore multiple sources of funding – federal, state and private – to cover higher costs for tree planting, maintenance and natural area conservation on public land and rights-of-way in underserved neighborhoods.	Ongoing	DPR, DES	USFS, VDOF, VDOT	$	Operating budget, capital budget, federal funding, state funding, private funding
4.6 Practice and promote environmental responsibility in maintenance operations						
4.6.1	Create, review and refine existing standard operating practices (SOPs) and consider consolidating them into a single guide.	Medium	DPR, DES	Virginia Cooperative Extension, other jurisdictions	$$	Operating budget
4.6.2	Reduce negative impacts to constituents, natural areas and wildlife.	Ongoing	DPR, DES, CPHD		$-$$$	Operating budget, capital budget
4.6.3	Develop and regularly refine best management practices (BMPs) that promote environmental responsibility.	Ongoing	DPR		$$	Operating budget

Key: Short-term: 1-3 years; Mid-term: 5-10 years; Long-term: 10-20 years; Ongoing: Long-term collaborations, operational changes, aspirational changes. $: Less than $250,000; $$: $250-1,500,000; $$$: $1,500,000+

Photo Credit: Max Julius

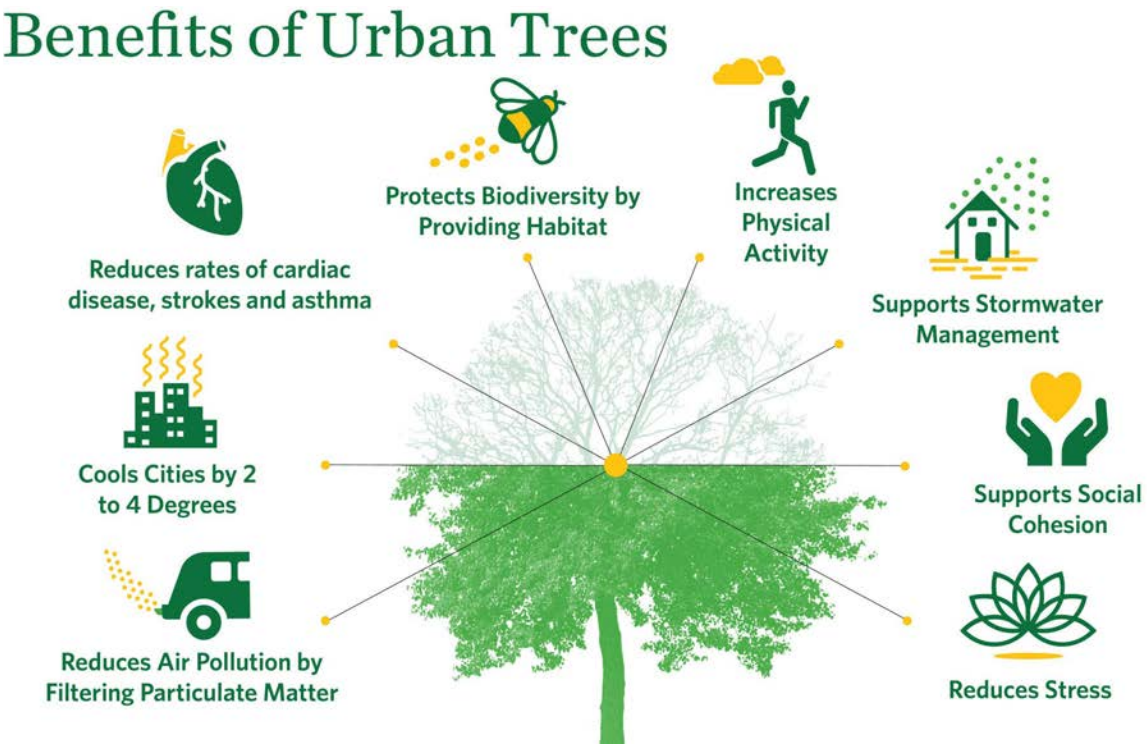
APPENDICES

APPENDIX A: ADDITIONAL RESOURCES

NATURE MATTERS

The FNRP recognizes the multiple values of Arlington's natural resources and considers them holistically. This approach is based on the concept of natural capital — the stock of resources from water, rocks and soil to all the living organisms that inhabit our County.

Natural capital is like any other; we must invest in and thoughtfully manage it to earn the real and tangible ecosystem benefits it provides to people — from protection against excessive heat to wildlife diversity. Conserving, protecting and enhancing nature in Arlington must be a community-wide effort, engaging not just the County government, but our residents, employers and visitors alike.



Urban trees confer a variety of benefits to our communities. Credit: The Nature Conservancy

NATURE IMPROVES OUR HEALTH

General Health. Philosophers and naturalists throughout time recognized the positive effects of "being" in nature. In the last decades, contemporary scientists and physicians have proven them right. In fact, public health practitioners now confirm that understanding environmental and socio-demographic conditions in a person's neighborhood can help predict their future health.

By 2019, doctors and scientists had analyzed more than 9,000 studies that measure health impacts. Their conclusion: people live longer and healthier lives in greener environments.[2] And policies to increase vegetation may provide opportunities for physical activity, reduce harmful exposures, increase social engagement and improve mental health."[3]

Heat-Related Illness. People who live in neighborhoods where pavement has replaced trees, grass and other vegetation are vulnerable to the effects of excessive heat. Neighborhood "heat islands" in Arlington can experience temperatures as much as 9° F higher than other places in the County. The impacts can be deadly. Researchers estimate that between 5,000 and 12,000 people die annually in the United States due to heat-related causes.

Mental Well-Being. Nearby nature supports mental health. Extensive research affirms that not only might people live longer, they will also enjoy better health, reduced stress, higher productivity and more cohesive neighborhoods if they have access to urban trees and natural areas.[5]

Classroom views of green landscapes cause significantly better performance on tests of attention and increase students' recovery from stressful experiences.[6] Access to green recreational areas during recess improves high school student performance.[7]

Between 1972 and 1981, Dr. Roger Ulrich studied post-surgical outcomes to determine whether assignment to a room with a window view of a natural setting might speed recovery. Twenty-three surgical patients assigned to rooms with windows looking out on a natural scene had shorter postoperative hospital stays, received fewer negative evaluative comments in nurses' notes, and took fewer potent analgesics than 23 matched patients in similar rooms with windows facing a brick building wall.[1]

For centuries, Japanese people have "walked in the woods" to recover from the stresses of everyday life. They call it "forest bathing." Arlington parks and natural areas provide the same opportunities for respite.

Hospital emergency room visits can total as many as

60,000

annually during intensely hot summer months.[4]

NATURE MAKES US MORE RESILIENT

Trees absorb and store carbon dioxide as part of a virtuous cycle, creating the oxygen needed to sustain life. But since the mid-20th century[8], greenhouse gases have reached dangerous levels in the atmosphere, leading to global warming. While trees are only part of the solution, they help keep harmful levels of carbon dioxide out of the atmosphere by acting as nature's air filter, thus helping reduce the impact of climate change.

Each year, the trees in Arlington remove approximately

9,630 tons

of carbon, storing it in their branches, roots and trunks — only a fraction of the County's greenhouse gas emissions. Moreover, urban trees, by lowering tempearutes and curbing the heat island effect, reduce energy use in buildings and transportation.[9]

Localized flooding from intense rainfall events challenge parts of Arlington's existing stormwater system due to its capacity and the limited availability of overland relief. Summer storms, in particular, can drop multiple inches of rainfall very quickly on parts of the County. As climate change causes even more severe and frequent storms, the capacity of Arlington's stormwater management system will be increasingly challenged.

While single trees or small groves cannot prevent flooding, they can intercept rainfall from less intense storms. Investing in trees and green infrastructure rather than concrete and pavement can help mitigate existing flood risk and other stormwater impacts.

NATURE MAKES US MORE PROSPEROUS

Conserving mature trees, particularly those near buildings and pavement, retains shade that lowers temperature on the ground. These trees make communities more comfortable for pedestrians, bus riders and bicyclists, and neighborhoods more attractive to the public, thus increasing community cohesion. Shaded streets support sustainable transportation modes like walking and biking.

Studies have shown that consumers prefer to visit retail districts that are green and well-landscaped. Shoppers claim they'll travel further and spend 9-12 percent more for goods and services in central business districts with a high-quality tree canopy[10], indicating that tree canopy and other green elements contribute positively to economic prosperity.

NATURE NEEDS BIODIVERSITY

Trees and natural areas provide a multitude of services that can be quantified and directly benefit humans, such as wetlands and flood storage. Natural areas provide terrestrial and aquatic habitats for urban wildlife. Removal of invasive species and deliberate restoration of different habitat types can re-establish regionally native plant communities and support the ability of wildlife critical to our ecosystem to thrive in the County.

Biodiversity thrives where there is continuous habitat available for species to move and populations to exchange genes. Unless connected by "green corridors," animal populations remain confined in small patches. Repetitive interbreeding is a major cause of genetic vulnerability

Recognizing the intrinsic value of nature is also an important component of conservation and restoration work. Natural places attract people who themselves seek solitude and the restorative impact of simply "being in nature." And research suggests that people prefer "green space" with higher levels of biodiversity,[12] and views of "blue space" — streams, rivers and ponds — especially when accompanied by the sounds of flowing water.[13]

OTHER BENEFITS OF NATURE

- Through a process called phytoremediation, some common plants can remove pollutants — especially heavy metals — that cause serious health impacts when introduced into the food chain.[14]
- Multiple studies have documented the positive effects of urban trees on incidences of asthma and other respiratory ailments among non-allergenic children and senior citizens, as trees remove pollutants from the air.[15]

TREE PLANTING AND PROPERTY VALUES

Recent research suggests that an abundance of trees raises home values. Although increases in median sales prices may be modest, higher taxes and fees can pressure lower-income residents to relocate. But a Portland, Ore., study concluded where the existing tree canopy is spread evenly across both low- and high-income areas, the impact on home values of planting additional trees dissipates.[11]

- In the past 20 years, heat-related mortality among those older than 65 years has increased by more than 50 percent. Higher temperatures have brought increased dehydration and renal function loss, skin malignancies, tropical infections, adverse mental health outcomes, pregnancy complications, allergies, and cardiovascular and pulmonary morbidity and mortality.[16]
- Researchers at Harvard University examined data from a 40+-year-long study of thousands of nurses — resurveying periodically to determine where and how they lived, as well as the status of their health. Findings indicated exposure to "higher levels of green vegetation were associated with decreased mortality."
- Yoshifumi Miyazaki, director of the Centre for Environment Health and Field Sciences at Chiba University in Japan, has taken more than 600 research subjects into the woods for monitored forest bathing trips. He and his colleagues have found that forest walks, compared with urban walks, yield a 12.4-percent decrease in the stress hormone cortisol, a 7-percent decrease in sympathetic nerve activity, a 1.4-percent decrease in blood pressure, and a 5.8-percent decrease in heart rate (Lee and others 2009, 2011). On subjective tests, study participants also report better moods and lower anxiety. The lower concentrations of cortisol are a direct indicator of less stress.[17]
- Estimated property values increase for houses and neighborhoods with substantial tree canopy — as much as 9 percent, according to a study in Portland, Ore.
- Studies by the Urban Land Institute affirm that some — but by no means all — developers believe that building with green infrastructure not only reduces construction and operating costs, but also increases the attractiveness and value of their property.

ARLINGTON: A CATALYST FOR REGIONAL PROGRESS

Arlington County occupies only a small part of our region. We are surrounded by larger entities, such as Fairfax County, and share control of our land with federal, regional and state authorities. Achieving FNRP goals demands that the County take a leadership role in establishing strong cooperative relationships — not just with County residents and businesses, but with our neighbors and other public entities which influence land use in the County.

APPENDIX B: RACE AND HOUSING IN ARLINGTON COUNTY

A complete timeline of Arlington's history of segregation can be found at https://sway.office.com/LDWSWfLwS49GT0Af?ref=Link

LOOKING BACK

The roots of Arlington's Black neighborhoods reach back to the early 19th century — decades before the start of the Civil War. Albeit rarely, Black residents received land grants from former masters; some free citizens purchased homes of their own. Arlington's Green Valley neighborhood, for example, rests on a site purchased in 1844 by Levi Jones and his wife Sara. Jones was the son of slaves on George Washington's Mt. Vernon plantation.

During the Civil War, the federal government created Freedmen's Village on the confiscated property of Robert E. Lee — the first publicly sponsored housing program designed to accommodate newly freed slaves. Over the years after the Civil War, Freedmen's Village became one of 12 Arlington neighborhoods with majority Black residents. By 1900, African-Americans represented nearly one-third of the County's population.

CONSEQUENCES OF GROWTH

As Reconstruction failed and the federal government expanded, white residents flowed into the County. Demand for land to develop exploded. Black residents paid the price, as communities that had flourished before and after the Civil War were pushed off the map. Freedman's Village was closed to accommodate the grounds for Arlington National Cemetery, sparking the movement of African-American residents to other largely Black neighborhoods. Pressure continued, and Blacks continued to move to the few places not subject to racist zoning, planning, restrictive covenants, redevelopment and loan policies.[18]

By 1950, three predominantly Black neighborhoods remained in Arlington: Green Valley, Johnson's Hill and Hall's Hill. And Black residents constituted only 9 percent of the County's total population.

THE MECHANICS OF SEGREGATION

Federal housing authorities — first established during the Depression — provided loan guarantees in neighborhoods they considered to be low-risk investments. Called "redlining" after the color of the ink used to designate areas that were **not** deemed investment-worthy.

The Home-Owners Loan Corporation (HOLC) was founded in 1933 as part of a New Deal effort to help owners buy and retain private homes. Much like federal housing agencies today, HOLC provided loan guarantees issuing bonds. Rates and terms for these loans were more favorable than those available in the private marketplace.

To "manage risk," the HOLC developed maps that delineated neighborhoods where loans were least risky (graded "A"), as well as areas where loans were so risky (graded "D") that they were not eligible for HOLC programs. These "D-graded" neighborhoods were mostly populated by racial and ethnic minorities. The impact on Black property owners was dramatic and long-lasting. Blocked from low-interest loans and prevented from moving to other neighborhoods by widespread restrictive covenants, residents remained in neighborhoods plagued by under- and non-investment.

White homeowners each built a cinder-block and brick fence to separate Hall's Hill and High View Park from their adjacent fully segregated neighborhoods. Courtesy Frank da Cruz; Blog, Arlington, Virginia, 1956-61: Hall's Hill. Accessed July 2, 2021; http://www.columbia.edu/~fdc/family/hallshill.html

APPENDIX C: PROGRESS SINCE APPROVAL OF PRIOR FORESTRY AND NATURAL RESOURCE PLANS

Not Pursuing Implemented Ongoing

Urban Forest Master Plan

#	Recommendation	Status	Notes
	Improve Arlington's urban forest canopy coverage.		
1	Conduct tree canopy monitoring.	Implemented	200,820,112,016
2	Establish tree cover goals in accordance with American Forests' criteria.	Not pursuing	Guidelines rescinded by American Forests.
3	Implement street tree planting plan.	Implemented	Limited spaces left to plant at this point.
	Encourage the conservation and planting of trees on private property.		
4	Establish a tree fund.	Implemented	Working as intended.
5	Work with Civic Associations and volunteers to plant trees on private property.	Implemented	Many civic associations participate.
6	Consider a funded County program to plant trees on private properties that abut street right-of-way (ROW).	Implemented	Tree distribution, Tree Canopy Fund address this.
7	Offer incentives to conserve canopy and encourage planting on private property.	Ongoing	Developer incentives increased in 2014. Still exploring.
8	Explore reviewing the Tree Replacement Guidelines to ensure that the tree replacement formula better reflects an equitable calculation for the value of trees lost. This should take into consideration the weight of alternative valuation methods such as the landscape appraised value of the tree and the monetary value of the benefits the tree provides.	Implemented	Tree replacement donation amount increased to $2,400 in 2010.
	Ensure through education and outreach that all stakeholders appreciate the value of Arlington's trees and what is necessary for their stewardship.		
9	Seek training and certification opportunities for staff including risk assessment and tree conservation appraisal.	Implemented	Additional staff members have International Society of Arboriculture and Tree Risk Assessment Qualification certifications.
10	Develop a "one-stop shopping" comprehensive website for trees.	Implemented	https://environment.arlingtonva.us/trees/
11	Maintain a presence at public events.	Ongoing	Present at multiple events pre-COVID-19.
12	Include Urban Forestry Commission, Arlington ReLeaf, Tree Stewards, Extension in education outreach.	Ongoing	Arlington ReLeaf defunct.

13	Expand content and increase the availability of our urban forestry related literature.	Ongoing	Moved online, hard copy at public events. New topics.
	Improve coordination and communication regarding County tree regulations, policies and planting and conservation standards and guidelines.		
14	Engage networks, including Metro Washington Council of Governments (MWCOG), to share goals and plan jointly.	Ongoing	Through MWCOG, developed regional canopy strategy.
15	Strengthen partnerships with Dominion Energy, NOVA Parks, VDOT and expand to other entities.	Ongoing	Dominion Energy now includes full notification of work, follows American National Standards Institute (ANSI) standards. NOVA Parks partnership could be expanded. VDOT more likely to collaborate.
16	Share our data, standards, regulations and policies proactively with other stewards of our urban forest.	Ongoing	All current data sets are publicly available.
17	Engage landowners in Arlington and neighboring urban forest managers in cooperative stewardship.	Ongoing	Roundtables, bill stuffers, public service announcements (PSAs) help. More action needed.
18	Coordinate with other County Departments to optimize impact of urban forest stewardship.	Ongoing	Cooperation with the Department of Environmental Services (DES) and Community Planning, Housing and Development has increased significantly.
19	Review development plans early to ensure trees may be preserved and considered equitably.	Implemented	Review of DES, other projects at scoping or early in design.
	Ensure that tree planting and conservation are important elements of our streetscapes.		
20	Establish liaisons for departments and/or divisions that affect our stewardship of the urban forest.	Ongoing	No “official” liaisons assigned. Other department staff provide “unofficial” but valued guidance and input. Required plan review process helps.
21	Create more opportunities for tree planting in the public ROW, such as tree nubs; street narrowing; larger planting strips; curb, gutter and sidewalk design; and material innovations.	Ongoing	DES and Neighborhood Conservation Program (renamed Arlington Neighborhood Program in 2021) continue to look for opportunities to reduce impervious surfaces and work with DPR to provide planting space, where appropriate. Several projects were implemented since adoption.
22	Optimize communication so that redeveloped ROW is planted as soon as possible.	Implemented	All appropriate planting spaces get trees planted through the project or through DPR planting.
23	Work with streetscape designers and planners to ensure tree species diversity.	Implemented	DPR review is thorough for DES projects, and diversity of species is enforced.
24	Implement street tree-planting plan.	Implemented	Almost all open planting sites on County ROWs have been filled, when appropriate.
	Conserve existing wooded parks and natural areas, and plant trees in parks, natural areas and other public open spaces to improve Arlington’s overall tree canopy.		
25	Continue to monitor tree health, forest structure and the occurrence of invasive species in parks and naturally forested areas throughout the County.	Implemented	i-Tree Eco survey created better understanding of forest health and structure and gathered data on invasive presence. Invasive species are being treated in NRCAs and mapped throughout the County.

26	Begin to inventory trees in parks, natural areas and other public facilities.	Ongoing	All new plantings are being inventoried.
27	Wherever possible manage forested areas on public lands so that there is adequate species diversity and size class distribution to maintain a sustainable urban forest.	Ongoing	Diversity is a big component of our planting plans. Active removal for diversity reasons not yet explored.
28	Control and manage invasive plant species and tree pests and diseases in an environmentally responsible manner.	Implemented	Funding was made available for invasive species treatment on NRCAs.
29	Manage and enhance areas adjacent to existing streams as riparian forest buffers wherever possible and appropriate.	Ongoing	RPA requirements require permitting for tree removal and increase of impervious areas. Publicly owned buffers have been planted with native vegetation throughout the County since adoption.
30	Continue the partnership between DPR and DES, as well as local environmental groups, to ensure that the BMPs are used to maximize the habitat benefits the urban forest provides.	Ongoing	Several policies have been put in place to reduce impact to trees on public land, including parks. Additionally, Urban forestry is advocating for trees as a stormwater BMP. More to come. The partnership between DPR and DES does exist to improve these habitats, but more plant-focused planning is needed.

Ensure that urban forest maintenance practices continue to improve the quality of tree canopy in Arlington so that potential benefits are maximized for the community.

31	Ensure that BMPs are used when providing tree maintenance in critical areas such as riparian stream buffers.	Implemented	Great care is taken when working in RPAs and stream corridors to reduce erosion and other riparian habitat impact. Additionally, where maintenance is required on utilities in these corridors, guidelines were created by DES to reduce impact.
32	Use the street tree inventory to determine conflicts with the built environment (sidewalks and tree grates) and prioritize their mitigation.	Ongoing	Tree inventory improvement is underway, but funding for regular maintenance of these conflicts does not exist in DPR. DES does work with DPR where significant sidewalk conflicts exist.
33	Update the GIS street tree inventory with tree maintenance and removal data.	Ongoing	Tree inventory improvement is underway, as we perform tasks in a new work order system.
34	Continue to systematically review potential tree hazards using the tree inventory. Consider the development of a Tree Risk Management Plan.	Ongoing	Tree inventory improvement is underway, as we perform tasks in a new work order system. Current funding is available only on an as-requested basis for tree risk assessment and cannot address the whole inventory's concerns.
35	Using the tree inventory, develop a realistic plan for a five-year pruning cycle of the trees in the street ROW.	Ongoing	Current funding does not allow for a five-year pruning cycle.
36	Create a GIS mapping program for invasive species to track progress and assist with management.	Implemented	Mapping of invasive plants on park land is ongoing and will improve with new work order system.

Planting Plan

#	Recommendation	Status	Notes
1	Use the GIS street tree inventory to target available planting spaces in the County streets ROW. Planting levels for the ROW are based on a goal of having a full stocking level for public street trees in three years.	Implemented	Almost all open planting sites on County ROWs have been filled, when appropriate.
2	Plant parks and other County facilities at the optimal level. Passive open space will be forested wherever appropriate.	Implemented	Where appropriate, reforestation and landscape planting are occurring.
3	Use GIS to evaluate the overall urban forest canopy to determine where planting opportunities exist on public property.	Implemented	Currently using tree canopy data to explore gaps. Vincent Verweij also performed a Master's thesis, using canopy data to find spaces in riparian habitats to improve.
4	Continue to work with schools to plant and maintain trees on their grounds.	Ongoing	Coordination with schools improved. There continue to be projects which take out many trees, but earlier involvement in review has been consistent. Planting and maintenance of trees remains with APS, and the APS maintenance section is underfunded for the amount of land.
5	Establish a tree fund (funds from special exception projects that cannot plant required replacements on-site) that will be dedicated to planting on public and private properties.	Implemented	Tree canopy fund, although only on private land. Stormwater fund pays for trees planted.
6	Develop opportunities and partnerships with environmental organizations, such as Arlington ReLeaf, American Forests and the Potomac Conservancy, to plant more trees with volunteers.	Implemented	Several organizations, groups and companies have provided volunteers and plants to planting events throughout the years.

Natural Resources Management Plan (2010)

#	Recommendation	Status	Notes
1	Adopt a general policy goal of "Zero-Loss" of County-owned natural lands.	Implemented	Implementation completed upon adoption of the NRMP on November 13, 2010, by the County Board and reaffirmed by Board statements in 2014 and 2015.
2	Establish a new administrative category of County-owned open space, known as NRCAs.	Implemented	Adopted by County Board. Delineation by GIS completed, 10 NRCAs established in seven parks.
3	Develop a new GIS-based environmental review process to protect significant individual natural resources on Arlington County-owned open space from ongoing maintenance activities, redevelopment or new construction on County-owned properties or private properties within 100 feet of a designated natural resource feature. Revise current Administrative Regulation 4.4 (Environmental Assessment Process) to incorporate the use of this GIS layer into the review process for all County-initiated land-disturbing activities. Explore expansion of current County review processes to help ensure that land-disturbing activities on private property would not adversely impact documented natural resources on property owned and/or managed by Arlington County Government, Northern Virginia Regional Park Authority, APS, or Northern Virginia Conservation Trust or any other land trust.	Implemented	A.R. adopted by County Manager, roll out to all units concerned underway.
4	Manage Arlington's natural resources effectively by establishing a single management unit with specialized skills in natural lands conservation and natural resources management.	Implemented	Natural Resources Unit established, with Alonso Abugattas as the Natural Resources Manager. $5,000 annual budget established. Invasive Plant unit with both a full-time Natural Resources Specialist and Natural Resources Technician now part of unit, along with $100,000 Invasive Management budget and additional $15,000 supply budget.
5	Develop an individual natural resources management plan for each County-owned park designated as a NRCA or containing NRCAs.	Implemented	All seven draft individual NRCA management plans completed and signed by DPR's division chief.

6	Actively pursue opportunities to identify and conserve additional open space through conservation easements, voluntary dedications, partnerships and fee simple acquisition. Potential acquisitions with natural lands or significant natural resources present should be the highest priority. Parcels offering additional protection to surface streams or serving as green corridors between natural areas should also be considered for their environmental benefit. Citizens should be educated about opportunities for voluntary participation in these programs.	Ongoing	Re: easements - target parcels shared with NVCT. Discussions with Arlington Public Schools about conservation easements and management of significant natural resources on their properties. Renaturalization of certain areas under discussion for conversion and restoration into natural lands.
7	Update and submit to the County Board for approval a revised edition of the RPA map and GIS layer.	Implemented	Updated RPA map adopted by County Board in July 2017.
8	Develop a strategy for the protection and conservation of seeps, springs and first-order streams found on Arlington County-owned parkland or open space.	Ongoing	DPR completed GIS mapping and data sheets. DES work underway.
9	Develop a clear objective-based methodology and process for the management of streams, artificial wetlands and ponds located on Arlington County-owned open space.	Ongoing	Process development underway. Work on pond and wetland natural resources management plans being drafted by Natural Resources Unit as part of the updated integrated Forestry and Natural Resource Management Plan in 2019, update to start. A Stormwater Specialist now part of PNR staff. Several vernal pool creation pilot projects initiated.
10	Amend Chapter VI of the Urban Forest Master Plan to reflect policy changes in forest management practices for natural lands.	Ongoing	Discussions and preliminary suggestions made to DPR by the Natural Resources Joint Advisory Group (NRJAG). In contact with the Urban Forestry Commission (UFC) and the Urban Foresters for commencement of the initial draft. The updates of the Integrated Urban Forest Master Plan and Natural Resources Master Plans are scheduled to begin upon completion of the update to the Public Spaces Master Plan (2019).
11	Promote the use of native plant species in County-sponsored plantings and enhance the ability to procure local ecotype plant stock.	Ongoing	DPR Planting Policies and Guidelines are established and part of operating process. Native Plant Nursery in operation. Seed stock being collected regularly. Regular volunteer workdays. Appeals for volunteers also underway for long-term projects and operations. Eight tables allotted for Natural Resource Unit use in the County greenhouse. Numerous restoration plantings conducted.
12	Restrict, to the maximum extent practicable, all vegetation plantings within NRCAs to those included in objective-based restoration plans reviewed or developed by the Natural Resources Management Unit.	Implemented	Completed with adoption of DPR Planting Policies and Guidelines.

13	Develop a new long-term, objective-based invasive plant removal strategy combining volunteers, County staff and contractual services in order to maximize efforts and environmental benefit to Arlington's natural resources. Seek Capital Improvement Project (CIP) funding to support large-scale invasive plant removal and natural land restoration and conservation efforts.	Implemented	Rolling 10-year Invasive Plant Management Strategy created. Permanent $100K funding obtained in baseline budget. Full-time technician added. Robust volunteer program through RiP ongoing. Regular contract work being added by Park Managers and agencies under oversight of Natural Resources Specialist. On steering committee for the National Capital Area Partnership for Regional Invasive Species Management (NCR-PRISM) and continuing an Early Detection, Rapid Response (EDRR) pilot project under Department of Interior auspices
14	Clarify the roles and responsibilities of County Departments in relation to invasive plant control efforts to identify leadership and foster cooperation.	Implemented	DPR will continue with leadership and planning while supporting other Departments. Invasive Plant Management Strategy completed.
15	Include an invasive plant monitoring and maintenance component in the design of all future stream restoration projects, new trail side "no-mow and grow" zones and riparian buffer restoration and plantings.	Implemented	Completed with adoption of DPR Planting Policies and Guidelines. Strategies for managing open field and meadow areas along with wetlands will be part of the updated integrated FNRP.
16	Inventory and prepare an analysis of existing riparian zones on County-managed open space in order to assess the feasibility of reestablishing natural vegetation along stream corridors in the future.	Ongoing	Considered a long-range planning tool. Extensive GIS review, field work, staff availability and analysis will be required. Already making recommendations for some projects and their plantings.
17	Initiate the formation of a local inter-jurisdictional Natural Resources Working Group for the purpose of strengthening existing partnerships and developing new cooperative working relationships.	Implemented	Meetings of the Regional Natural Resources Management Group in April 2012 and continue to date.
18	Establish a NRJAG to enable Board-appointed advisory commissions to advise more effectively on natural resource issues.	Implemented	NRJAG formed in February 2011, with representation from the Park & Recreation Commission, UFC (now Forestry and Natural Resources Commission), and Environment & Energy Conservation Commission (now Climate Change, Energy and Environment Commission).
19	Arlington County staff should seek and embrace opportunities to educate residents and landowners of the importance of environmental sustainability, natural resource protection and habitat enhancement on private properties.	Ongoing	Long-term and continuing process with nature centers, volunteer and other environmental organizations. Staff are engaged with Master Naturalists, Master Gardeners, Tree Stewards, Plant NOVA Natives, and Audubon Society of Northern Virginia, among others, on backyard habitat education and implementation programs.

APPENDIX D: ARLINGTON COUNTY DRAFT NATIVE PLANT AND MAINTENANCE STANDARD

The benefits of utilizing native species of plants rather than exotic species are well-documented. These benefits range from waterway health, wildlife diversity and abundance, adaptation to local conditions of soils and climate, and beyond. These benefits are not limited to natural areas and can also be realized across the spectrum of natural to urban landscapes. However, urban planting areas can offer challenging soil, heat or wind conditions for which the appropriate native plants may not be commercially available. Non-invasive, non-native plants may be appropriate there. This native plant standard sets requirements for percentages of native plants. The most straightforward approach to complying with these standards is to start with an all-native plant, community-based palette, substituting non-native plants only when needed. The intent of this regulation is to retain local native plants, maximize wildlife habitat and native plant survival.

The targets set out in this policy will be reviewed every five years.

INTENT

Foster habitat for native wildlife that is necessary for plant reproduction by conserving or installing plants that are native to the site's ecoregion (from SITES, page 121).

OUTREACH AND EDUCATION

The County may partner with nurseries, educators and designers to help meet the goals in this standard through education of private and County project designers, BIDs and their property managers, and public and private maintenance staff.

DEFINITIONS

1. Per the USDA Natural Resources Conservation Service, a native plant is: "A plant that is a part of the balance of nature that has developed over hundreds or thousands of years in a particular region or ecosystem. Only plants found in this country before European settlement are considered to be native to the United States."

2. For additional clarification, a native plant is: A plant that lives or grows naturally in a particular region without direct or indirect human relocation from outside the designated area.

3. Urban agriculture, or urban and peri-urban agriculture, is defined as practices that yield food and other outputs through agricultural production and related processes (transformation, distribution, marketing, recycling…), taking place on land and other spaces within cities and surrounding regions. It involves urban and peri-urban actors, communities, methods, places, policies, institutions,

systems, ecologies and economies, largely using and regenerating local resources to meet changing needs of local populations while serving multiple goals and functions. (Courtesy of the Food and Agriculture Organization of the United Nations)

4. Percent plants required: Percentages apply to the total area of each plant type specified or properly conserved on landscape and civil engineering plans.

5. For the purposes of specifying plants within Arlington County, the following definitions/categories of native plants shall be utilized:

    a. Regionally native: Plants that are native (using the primary definition above) to the Piedmont and/or Coastal plain of the Mid-Atlantic states of Virginia, West Virginia, Maryland, Delaware, North Carolina, Washington, D.C., New Jersey and Pennsylvania. Regionally native is the sum of regionally native and locally native vegetation specified on the plans for each plant type.

    b. Locally native: Plants that are native to the Piedmont and/or Coastal Plain area of Northern Virginia and the immediate Capital area, generally circumscribed by the area within Arlington County; Washington, D.C.; the City of Alexandria; the following Virginia counties: Fairfax, Prince William and Loudoun; and the Maryland counties of Montgomery and Prince George's. Plants must have genetic provenance in the jurisdictions noted for regionally native plants.

    c. Local ecotype native: Plants that fit the locally native description and have been grown from seed collected or derived in other ways (such as clonal reproduction) in the areas defined in the locally native description.

PLANT REQUIREMENTS

1. No plants from the most current Non-Native Invasive Plant list, published by Arlington County, shall be used.

2. All plans shall provide a palette of plant material with significant biodiversity to create a variety of ecosystem services and wildlife habitat.

3. Areas used for urban agriculture and extensive green roofs may use non-native, non-invasive plants. Native plants used in these can be counted towards the total.

4. Public land must follow the requirements in Table X, with a preference for maximizing the use of locally native plants whenever practicable, with exceptions in:

    a. Areas with documented culturally relevant non-native plants (such as historic landscapes), may use those plants, if non-invasive.

    b. Natural lands, as defined in the FNRP must use only locally native plants.

c. Natural Resources Conservation Areas, as defined in the FNRP, must use only local ecotype native plants. This is the only area where cultivars of plants are not acceptable.

4. Development outside of public land must follow the requirements in Table X.
5. Areas must be designed to support the long-term survival of the plants proposed or designed to transition naturally into an ecosystem native to the area.
6. A landscape maintenance plan must be submitted with any plan that is privately maintained for the plants and associated landscape proposed.
7. Credit may exist for LEED and/or SITES certification for the use of native plants.

PLANT TYPES

All plants must follow the current edition of ANSI Z60.1 for Nursery Stock.

1. Urban trees: Where the majority of the surface within the projected 20-year canopy area of the tree is impervious. Examples may include street trees, rooftop planters and plaza plantings.
2. Trees (non-urban): Standard trees are trees which do not qualify as urban trees per the above definition.
3. Evergreen shrubs: Woody plants, which, at their mature height, stay generally below 15 feet tall, and retain green and functional leaves over the winter.
4. Deciduous shrubs: Woody plants, which, at their mature height, stay generally below 15 feet tall.
5. Groundcovers: Groundcovers are distinguished from perennials in that groundcovers are low-growing (under 18 inches in height), clonally reproducing plants (via rhizomes, runners, etc.) whose use is intended to form a continuous bed or mat of plant materials.
6. Vines: Woody plants that are not self-supporting.
7. Ornamental grasses: Grasses and grass-like plants, such as rushes and sedges (forbs and graminoids), grown for ornamental purpose plants.
8. Other plants: All other non-woody plants, such as perennials and ferns.

Plant Type	Native Type	Percent Plants Required
Urban trees	Locally native Regionally native	70 90
Trees (non-urban)	Locally native Regionally native	89 95
Vines	Regionally native	100
All other plants	Regionally native	60
Extensive green roof	Exempt	Exempt
Urban agriculture areas	Exempt	Exempt

Sample table:

Plant Type	Percentage Provided	Percentage Required
Local ecotype native	50	0
Locally native	80	70
Regionally native	100	90

APPENDIX E: DEFINITIONS AND ACRONYMS

DEFINITIONS

Biodiversity: The measure of the number of species within a certain area. Biodiversity constitutes the intricate web that all species, including humans, require to survive and thrive. Evolution ensures that biodiversity isn't static; rather, it is always changing. The "web of life" encompasses environmental, ecological, social and economic services on which all living species.

Biophilia: The innate connection of humans to the natural world. (Adapted from E.O. Wilson) (Public Spaces Master Plan)

Biophilic Cities Network: A growing global community of partner cities, organizations and individuals committed to planning and designing cities with abundant nature, where citizens have rich contact with the flourishing natural world as an element of daily life. Arlington joined the network in 2019. Data gathering for reports to the Biophilic Cities Network might serve as the basis for aggregating multi-departmental data sets.

Biophilic community: A place that cherishes natural features that already exist and works to restore and repair what has been lost or degraded. A place that emulates nature by incorporating natural forms into its cityscape and buildings and plans and designs in conjunction with nature. A place that facilitates connecting humans with nature. (Adapted from Tim Beatley, Biophilic Cities, Public Spaces Master Plan)

Bird-friendly buildings: Buildings which reduce bird mortality from collisions with glass.

Blue space: Healthy bodies of water.

Connective corridors: Using natural infrastructure principles, they could include natural areas and semi-natural elements where it is not possible to dedicate land exclusively to this purpose.

Dillon Rule: All Virginia localities are subject to the Dillon Rule. Arlington's powers are limited to those expressly granted to it by the General Assembly, those necessarily or fairly implied or incident to those powers, as well as essential or crucial to the existence of local government. Unless it is clear that a locality has been granted a power by the General Assembly, it cannot exercise that power.

Early Detection Rapid Response (EDRR): A coordinated set of actions to find and eradicate potential or emerging invasive species in a specific location before they spread and cause harm.

Flooding: Stormwater runoff from heavy rainfall that is not contained within stream networks and/or storm drain systems and causes damage to businesses, homes and properties, and, often, threatens public health and safety.

Geographical information system (GIS): A computer system that analyzes and displays geographically referenced information. It uses data that is attached to a unique location. (U.S. Geological Survey)

Green bank: A reservoir of biodiversity that will continue to enrich nature.

Green infrastructure: Trees and the soil they grow in, as well as green spaces. Also includes a subset of "green stormwater infrastructure." The value of green infrastructure is often calculated by measuring avoided costs (e.g., reduction in costs and water treatment), or the monetary benefits from carbon capture (such as energy conservation) and pollution reduction (e.g., reduced illness and fewer emergency room visits). These values generally increase as plantings grow and mature. Also, significant and measurable, but harder to express in fiscal terms, are improvements in student performance, healthier habitat for pollinators and overall biodiversity.

Green roofs: A layer of vegetation planted over a waterproofing system that is often installed on top of a flat or slightly sloped roof.

Green space: A publicly accessible area with a focus on natural vegetation, such as grass, plants or trees, which may include built environment features, such as urban parks, as well as less managed areas, including woodland and nature reserves. (Public Spaces Master Plan)

Green Streets: Tree-lined streets designed to serve as an extension of the public space system. Offers pedestrians, cyclists and drivers a more attractive travel experience, provides shade in the heat, blocks wind in the cold, and may integrate stormwater management features. (Public Spaces Master Plan)

Green Streets Program: Aims to reduce the water quality impacts associated with the streetscape and areas that drain to it through impervious surface (hardscape) reduction, the increase of trees and native plantings in landscape strips, and incorporation of runoff mitigation through the use of such practices as rain gardens in the median and along curbs.

Green Stormwater Infrastructure: A subset of green infrastructure that includes engineered systems to manage stormwater runoff while providing other co-benefits. Includes, but is not limited to, rain gardens, vegetated roofs, blue roofs, rainwater capture and permeable paving.

i-Tree Eco: Plot-based data provide details on the type, condition and size of trees in the County. Data collected can be processed online to calculate the environmental benefits provided by the urban forest, such as carbon sequestration, stormwater management and air pollution mitigation.

Invasive species: An invasive species is a species that is not native to a specific region and that tends to spread to a degree believed to cause damage to the environment, human economy or human health. The term as most often used applies to introduced species that adversely affect the habitats and bioregions they invade economically, environmentally or ecologically. Invasive species may be plants, animals, fungi and microbes; some also include native species that have invaded human habitats such as farms and landscapes.

LDA 2.0 Initiative: Alternative Compliance Option for LDA/SWM 2.0 Permit. Arlington County Department of Environmental Services. July 2021.

Leadership in Energy and Environmental Design (LEED) Certification: A green building certification program developed by U.S. Green Building Council and used worldwide. It includes a set of rating systems for the design, construction, operation and maintenance of green buildings, homes and neighborhoods, which aims to help building owners and operators be environmentally responsible and use resources efficiently. (Wikipedia)

Light pollution: Unwanted, inappropriate or excessive artificial illumination of the night sky, often limiting the visibility of faint stars or other celestial objects.

Local ecotype native: Plants that fit the locally native description and have been grown from seed collected or derived in other ways (such as clonal reproduction) in the areas defined in the locally native description.

Locally native: Plants that are native to the Piedmont and/or Coastal Plain area of Northern Virginia and the immediate Capital area, generally circumscribed by the area within Arlington County; Washington, D.C.; the City of Alexandria; the following Virginia counties: Fairfax, Prince William and Loudoun; and the Maryland counties of Montgomery and Prince George's. Plants must have genetic provenance in the jurisdictions noted for regionally native plants.

Managed Natural Landscapes: A planned, intentional and maintained planting of native grasses, wildflowers, forbs, ferns, shrubs or trees, including but not limited to rain gardens, meadow vegetation and ornamental plantings.

Metacommunity: Incorporates space and the movement of organisms into the community and evolutionary ecology, challenging the classic view of the community as a localized and isolated entity. As such, it recognizes two broad categories of effects: (1) Local, incorporating species sorting due to environmental constraints or through interactions between species; and (2) Regional, reflecting the flux of organisms from the regional species pool.[19]

Native plant: A plant that lives or grows naturally in a particular region without direct or indirect human relocation from outside the designated area.

Natural capital: The natural environment, and the biodiversity contained within it, and is generally considered to comprise three principal categories: natural resource assets, land and ecosystems. All are considered essential to sustainability for their provision of beneficial functions. Valuing natural capital enables governments to account for nature's role in the economy, environment and human well-being.

Natural infrastructure: Refers to the network of natural and semi-natural elements that support or restore ecological benefits such as supporting wildlife, storing water or purifying the air. Elements can range from urban forests to community gardens, green roofs and other stormwater features, and riparian corridors.

Natural lands: Natural lands refer to areas of land that have experienced only minimal human alteration, are in the process of being restored by human intervention, or have recovered from anthropogenic disturbance under mostly natural regimes of species interaction and disturbance. "Natural lands" is a management category employed by the Department of Parks and Recreation to steward natural resources in undeveloped areas of the park system. There is no common management strategy for all natural ands; each parcel faces unique challenges and is managed for a variety of conservation and recreation goals. In some instances, natural lands overlap with casual use and green spaces.

The County's Natural Resource Conservation Areas (NRCAs) are a sub-category within natural lands with the highest level of resource protection. Additional categories with specific management objectives may be developed to address the goals of the Forestry and Natural Resources Plan (FNRP).

Natural resources: Living organisms and non-living materials that humans and other life forms depend on, and that are derived from or are a part of the environment, including water, soils, minerals, air, vegetation, fauna and fungi, among others. (Public Spaces Master Plan)

Natural Resource Conservation Areas (NRCAs): A sub-category of County-owned natural lands, managed for the conservation of the most sensitive natural resources. Criteria for inclusion are an analysis of intact, significant natural resources, features or attributes that represent the most ecologically sensitive natural lands remaining on County property. These delineated areas provide ecosystem-level protection to high-value contiguous forests or plant communities. The primary management objective within an NRCA is the conservation of existing natural resources, and each NRCA has a site-specific management plan.

Natural Resources Inventory: A database that includes riparian buffers, seeps, springs, rare plants, native plant communities, wetlands and unique geologic resources.

Over-browsing: Forest edges are vulnerable to invasive species and encroachment. In most urbanized areas, seedlings of ecologically valuable tree species, such as oak and hickory, struggle to compete against common pioneer and invasive trees in small patches of forest under intense foraging pressure from deer.

Park/Parkland: Land or other outdoor areas, such as a waterway or rooftop, that are primarily used for recreation, leisure or conservation of natural resources, including ancillary uses that support these primary uses (e.g., recreation facilities, storage and parking). (Public Spaces Master Plan)

Percent plants required: Percentages apply to the total area of each plant type specified or properly conserved on landscape and civil engineering plans.

Privately owned public spaces: A privately developed space that remains under private ownership but has an easement or license that guarantees it is open and accessible to the public. (Public Spaces Master Plan)

Redlined neighborhoods: Called “redlining” after the color of the ink used to designate areas that were not deemed investment worthy.

Regionally native: Plants that are native (using the primary definition above) to the Piedmont and/or Coastal plain of the Mid-Atlantic states of Virginia, West Virginia, Maryland, Delaware, North Carolina, Washington, D.C., New Jersey and Pennsylvania. Regionally native is the sum of regionally native and locally native vegetation specified on the plans for each plant type.

Riparian corridors: A unique plant community consisting of the vegetation growing near a river, stream, lake, lagoon or other natural body of water.

Stormwater: Precipitation that is discharged across the land surface or through conveyances to one or more waterways; may include stormwater runoff, snow melt runoff, and surface runoff and drainage.

Sustainable Sites Initiative (SITES): A rating system designed to distinguish sustainable landscapes, measure their performance and elevate their value. SITES certification can be used for development projects with or without buildings and is intended to align land development and management with innovative sustainable design.

Tree canopy: The layer of tree leaves, branches and stems that provide tree coverage of the ground when viewed from above.

Tree Equity Score National Explorer: A Tree Equity Score is a metric that helps cities assess how well they are delivering equitable tree canopy cover to all residents. The score combines measures of tree canopy cover need and priority for trees in urban neighborhoods (defined as Census Block Groups). It is derived from tree canopy cover, climate, demographic and socioeconomic data.

Tree Equity Score Analyzer: A tool designed by American Forests for cities and states that want to dive deep into decision-making around Tree Equity Scores. The platform allows users to discover how targeted tree plantings can improve health and well-being in neighborhoods and communities.

Urban agriculture, or urban and peri-urban agriculture: Practices that yield food and other outputs through agricultural production and related processes (transformation, distribution, marketing, recycling…), taking place on land and other spaces within cities and surrounding regions. It involves urban and peri-urban actors, communities, methods, places, policies, institutions, systems, ecologies and economies, largely using and regenerating local resources to meet changing needs of local populations while serving multiple goals and functions.

Urban forest: A mosaic of varying types of communities where trees are the dominant natural feature in an urban community. Examples of categories include: natural lands, managed parklands, commercial landscape, streetscapes and trees on residential and municipal properties. Growing conditions, management requirements, soil quality and land use will differ within the categories, but the common thread is the existence of trees as a prominent natural feature.

ACRONYMS

AI	Artificial intelligence
APS	Arlington Public Schools
BID	Business Improvement District
BMPs	Best management practices
CIP	Capital Improvement Plan
CTLA	Council of Tree and Landscape Appraisers
DES	Department of Environmental Services
DPR	Department of Parks and Recreation
EDRR	Early Detection Rapid Response
FIA	Forestry Inventory and Analysis
FNRP	Forestry and Natural Resources Plan
GIS	Geographical information system
GSP	Green Seattle Partnership
GHG	Greenhouse gases
HOLC	Home Owners Loan Corporation
LEED	Leadership in Energy and Environmental Design
LiDAR	Light Detection and Ranging
MOU	Memorandum of understanding
MWCOG	Metropolitan Washington Council of Governments
NAIP	National Agricultural Imagery Data
NCR-PRISM	National Capital Area Partnership for Regional Invasive Species Management
NRCA	Natural resources conservation area
NRMP	Natural Resources Management Plan
NOVA	Northern Virginia
NOVA PRISM	Northern Virginia Partnership for Regional Invasive Species Management
NPS	National Park Service
PRISM	Partnership for Regional Invasive Species Management
PSMP	Public Spaces Master Plan
RiP	Remove Invasive Plants
ROW	Right-of-way
RPA	Resources protection area
SITES	Sustainable Sites Initiative
SOPs	Standard operating practices
TQP	Tree quality points
UFMP	Urban Forests Master Plan
USDA	United States Department of Agriculture
VDOT	Virginia Department of Transportation

APPENDIX F: HOW THE FNRP RELATES TO OTHER PLANS AND INITIATIVES

Plan Name	Summary	FNRP Intersections
Stormwater Master Plan	Evaluates the current state of stormwater and flood management and mitigation, and the condition of storm sewers, streams and watersheds in the County. Provides a framework for resilient stormwater, streams and watersheds.	Improve or develop and apply stringent, consistent and equitable standards for canopy density and natural area standards to all forms of development. Restore and manage surface water resources with a holistic, ecological approach.
Master Transportation Plan	Recognize that most County-owned property is dedicated to public ROWs (streets and sidewalks), parks, trails and public buildings. The County has committed to environmental sustainability and "complete streets" in its current plan. The FNRP envisions "green streets" that maximize environmental and economic benefits.	Promote expansion and protection of natural lands and natural areas. Establish "low mow" areas and conservation lawns within the ROW. Reconstitute pervious spaces through modifications to transportation plan, parking spaces, roadways and ROWs. Expand and enhance tree-planting standards to assure survival in urban settings.
Community Energy Plan	Arlington has implemented a best-in-class climate change and energy conservation plan. The plan includes a policy advocating for the use of biophilic design principles (Policy 2.4) and incorporates goals for buildings, resilience, renewable energy, transportation, County government actions, education and human behavior.	Explore how ecosystem service considerations might be incorporated into the County's site plan review principles and practices through modification of canopy-cover requirements, tree replacement calculations and planted space regulations. Revise landscape guidelines for commercial and multi-family buildings and parking lots to maximize and implement state-of-the-art cooling and energy conservation strategies.
Chesapeake Bay Preservation Plan and Ordinance	Since 1988, Arlington County has implemented the General Assembly's requirement that jurisdictions in the Chesapeake watershed enact ordinances that establish criteria to minimize or reduce pollution during development and redevelopment. The initial 1992 ordinance has been revised in 2003, 2011 and in 2014 in tandem with a new stormwater ordinance.	Restore and manage water resources with a holistic, ecological approach. Explore how ecosystem service considerations might be incorporated into the County's site plan review principles and practices through modification of canopy-cover requirements, tree replacement calculations and planted space regulations. Reconstitute pervious spaces through modifications to transportation plan, parking spaces, roadways and ROWs.

Resolution on Climate Action	Reaffirms the County's commitment to climate action, the principles of the Paris Agreement, and continued implementation of the Community Energy Plan.	Identify climate-vulnerable hot spots, prioritizing programs to mitigate impact of climate change. Consider site plan and building requirements that maximize climate protection capacity of trees and green space. Support the biodiversity that can coexist with humans in the built environment.
Biophilic Cities Resolution	As a Biophilic City Network Partner, the County strives to apply biophilic principles to current and future policies and practices.	Establish and implement programs and policies that promote expansion and protection of tree canopy and natural areas. Improve or develop and apply stringent, consistent and equitable standards for canopy density and natural area standards to all forms of development. Support the biodiversity that can coexist with humans in the built environment. Engage, educate and empower residents to become active participants in planning, promoting, protecting and fostering the presence of trees and natural areas. Identify climate-vulnerable hot spots, prioritizing programs to mitigate impact of climate change. Designate additional public land-use categories for conservation and connectivity. Establish a County-wide natural infrastructure and conservation connectivity network.
Equity Resolution	The 2019 Equity Resolution sets racial equity as a priority in policies and programs. This means closing race-based outcome gaps, so race does not predict one's success while improving outcomes for everyone; moving beyond services to focus on policies, institutions and structures.	Apply an equity lens to the delivery of natural infrastructure on private properties. Develop Arlington-specific benchmarks, data sets and analytic tools that can help direct both public and private resources to areas not well served by existing tree canopy or access to natural areas.

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