

2010 CITY OF FREDERICK Urban Forestry Management Plan



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EXECUTIVE SUMMARY

BACKGROUND AND PURPOSE

Trees and forests play a vital role in the environmental, social, and economic well-being of a City. According to a report by the University of Vermont Spatial Analysis Laboratory on the City of Frederick's Existing and Possible Urban Tree Canopy (UTC), the City only has 14% canopy cover, the national average for cities is 25% and the national goal is 40% overall canopy cover within municipal limits.¹

The Urban Forestry Management Plan is intended to propose strategies, goals, policies, standards, and actions to protect, enhance, increase, and preserve the tree canopy of the City of Frederick. The recommendations found in the Plan intend to help coordinate and improve tree management in an equitable, economic, and sustainable manner. Moreover, the Plan will be a valuable strategic planning tool.

This Plan was written in concert with the City's 2010 Comprehensive Plan, the Land Management Code, and national specifications and standards.

MISSION

As a complement to the City's Comprehensive Plan, the Urban Forestry Management Plan establishes a set of tools to be used in the drafting of future regulations and ordinances aimed at promoting and increasing the health and vitality of the City's urban tree cover.

VISION STATEMENTS

- The City of Frederick will have a safe, healthy, and diverse tree canopy by promoting tree preservation and planting.

¹ Davey Resource Group, A Division of the Davey Tree Company, "Urban Forestry Management Plan", Town of Leesburg, VA, February 28, 2006.

- Through the guidance of professional urban forestry leadership and knowledgeable staff, the City's future urban forest will become an important community asset through proper maintenance and planting techniques, more efficient management of City resources, and public education and support.
- As a Tree City USA, the City of Frederick shall accomplish its goal to promote the City's urban tree canopy as a unique defining characteristic.

MAJOR GOALS

The Plan establishes guidelines for creating policies and regulations aimed at increasing the amount of tree canopy in the City as well as recommendations for strategies for improving the City's management of this valuable resource.

The goals of the Plan can be categorized into six (6) major areas as listed below:

Increase Forest Canopy Cover: The City's tree canopy has been estimated at only 14% and the City shall work towards the State and national goal of 40%.

Improve Forest Planting and Maintenance: Through site specific selection, the appropriate specie of tree shall be planted in order to maximize tree canopy to its greatest potential based on location. Proper and timely tree maintenance is required to maximize the benefits of plantings, assure new planting survivability, and increase service life.

Improve Tree Planting and Protection Legislation and Policies: Review existing forest conservation, landscaping, and enforcement regulations to identify opportunities for improvements which promote the increased canopy and survival of plantings.-

Improve and Direct Funding: The City shall explore new and innovative means for funding forest planting. The City shall increase its participation in State grant programs and promote State incentive programs for private citizens to plant trees. Consideration should also be given to creating City incentive programs.

Improve Organizational Structure: Creation of a tree management program through increased coordination among the various City departments which play a role in land planning and forest conservation processes including Planning, Engineering, Finance, and Parks and Recreation.

Provide Education and Public Relations: Educate private citizens about the importance of healthy trees and the impacts of canopy loss through the Neighborhood Advisory Councils (NACs) and public outreach meetings. Educate City inspectors on tree identification and health assessment. Educate and keep administrators and commission members apprised of regulatory changes in regards to forest and tree protection.

IMPLEMENTATION

The recommendations proposed in this Plan are intended for implementation over a three (3) year period. The ultimate goal of achieving an average of 40% canopy cover for the City may take 20 years or more to realize.

The benefits of planting trees and forested areas are not immediately recognizable; however, by planting trees today, we take steps towards assuring that these benefits will be enjoyed by generations of City residents to come. By establishing systematic planting and maintenance programs as well as securing adequate funding, staffing, regulations, and public education resources today, we are proactively addressing the health and sustainability of the future urban tree canopy.

There are several opportunities for increasing the urban tree canopy including plantings within City right-of-ways, parks, and other public properties. In addition, new and existing residential and commercial developments can be required and encouraged to plant more trees. The impact of these efforts can be measured through computer modeling programs that predict future levels of canopy cover.

An acre of newly planted oak trees will not yield a large canopy at the time of planting, however, in 20 years the growth can be dramatic. As demonstrated in Figure 10 of the UTC Assessment Report, the highest percentage of canopy lies within the City's older neighborhoods with the highest potential for planting in the newly developed areas at the periphery of the City. In these newer areas, although the trees have been planted, they have not reached maturity and as such yield little in the way of canopy.



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1.0 INTRODUCTION

The proper management and protection of the natural environment has reached a level of profound importance for municipal governments across the country. Traditionally focused on meeting the economic, public safety, and social service needs of a community, elected officials and municipal staff are now being challenged and even mandated by the State and Federal governments to take the lead in addressing environmental issues. Forested areas within the urban environment which may have once only been considered important for their aesthetic value are now becoming a major component in compliance with environmental regulations and maintaining a high quality of life.

As part of the Chesapeake Bay Program, the Chesapeake Executive Council- consisting of the Governors of Maryland, Virginia, and Pennsylvania, the Mayor of the District of Columbia, the Chesapeake Bay Commission, and the US Government- signed into effect the Expanded Riparian Forest Buffer Goals in 2003 (Chesapeake Bay Program Directive 03-01). Included in this Directive were goals pertaining specifically to the Urban Tree Canopy (UTC). The layer of leaves, branches, and stems of trees that cover the ground when viewed from above collectively known as the Urban Tree Canopy (UTC), produces stormwater control and water quality benefits which play an integral role in protecting the Bay, thereby expanding some of the functions of riparian forest buffers to urban settings. As part of Expanded Riparian Forest Buffer Goals the Council also committed to working with a minimum of five (5) jurisdictions in each state to increase the UTC and encouraging increases in the amount of urban and suburban canopy coverage through the establishment of local tree canopy goals.

In 2007, Mayor Holtzinger committed the City of Frederick to participate in the State Urban Tree Canopy (UTC) Initiative along with 36 other communities in the State of Maryland in an effort to work

towards increasing the City's coverage (see Appendix A) As part of UTC Initiative, the State in conjunction with the University of Vermont and the US Forest Service, conducted an assessment of the City's existing and potential urban tree canopy. According to the resulting report, based on 2002 land cover data, the City of Frederick had 12% canopy coverage, far less than the other jurisdictions evaluated. In response, the Planning Department contracted for a current canopy assessment in 2009 to be conducted based on the latest available 2007 mapping, imagery, and datasets. The table in Figure 12 of the 2009 report shows Annapolis, Baltimore, Brunswick, Rockville and Frederick with 41%, 25%, 38%, 44% and 14% canopy coverage, respectively (Appendix B). While the difference between the 2002 and 2007 results may be slightly attributable to actual increases in canopy, it is more likely that the increase from 12% to 14% is due to a higher resolution of imagery and more accurate mapping and quality control. At the 14% tree canopy, 69% of the land area was categorized as potential planting areas. Below are three (3) important conclusions from the assessment report specific to the City:

- 1) **“By ownership type, it is Frederick’s residents that control the largest percentage of the City’s tree canopy (Fort Detrick and the airport excluded)”.**

In the past, several residential communities, such as Dearbought, Walnut Ridge, and Waterford, have expressed interest in planting street trees and park areas. Planting in residential areas can be problematic however, because there is no requirements on private residential properties that trees be maintained and healthy trees are often removed for various reasons, e.g. for a garage, to eliminate leaf litter, are expensive to maintain, etc., without further consideration for the benefit to the overall environment.

- 2) **“Increases in UTC will be most easily achieved on government and institutional lands. These land uses have a relatively high percentage of Possible UTC and these are lands where the City can most readily implement policy”.**

An example of potential opportunities is the recently completed project for 24.64 acres of forest conservation on the Clustered Spires Golf Course which began in March 2002 and was completed in 2009. In response to the UTC Goal initiative, the Parks and Recreation Department has also identified other planting opportunities in public parks in 2009. Using the funds collected through the fee- in- lieu of forest option for forest conservation, the Mayor and Board subsequently approved a

City of Frederick Tree Fact

The Clustered Spires Golf Course (183 acres) has documented 157 specimen trees. Specimen tree for the City of Frederick is a tree with 25” diameter or greater and is greater than 75% of the State Champion tree size for that specie.

contract for a landscape vendor to provide and plant trees in public open spaces.

- 3) **“Of particular focus for UTC improvement should be parcels within the City that have large contiguous impervious surfaces, such as those in the various commercial and industrial land use categories that have disproportionately low amounts of tree canopy. These parcels contribute high amounts of runoff, degrading water quality. The establishment of tree canopy on these parcels will help to reduce runoff during periods of peak overland flow. Incentive or regulatory measures could be employed to encourage property owners to increase tree canopy on these parcels.”**

The City’s commercial and industrial lands allow for 70% and 90% impervious surface area, respectively. Often due to the high land values and development pressures in these districts, applicants for new construction often seek alternative means for complying with the forest conservation requirements, such as fee in lieu of, or often seek modifications to the landscaping standards. It may be necessary to reevaluate the landscaping standards, so as to acknowledging these pressures, yet also maximizes canopy coverage.

The City contains 14,365 acres, including those properties recently annexed in 2009. Historically, the majority of land annexed, as well as the 700 acres classified as growth areas of interest on the 2010 Comprehensive land use map, is farmland which may contain stand-alone specimen trees (25” or greater diameter at breast height (dbh) size) or smaller trees located along established fence lines or drive lanes, but very little forest. These existing trees are often removed when grading takes place prior to development.

Section 721 of the LMC, “Forest Conservation,” requires protection of specimen trees and directs reforestation and afforestation to critical floodplain and wetland areas during the development process. However, the high value of land in the City and the desire to maximize development potential is often a competing interest with forest conservation standards that require 15-20% of the land area be placed into forest conservation easements. To address this issue, the State and City regulations allow developers the option to pay a fee-in-lieu of planting forest. If forest conservation is not met on development sites, it is imperative that the City gain or purchase future receiving land areas as part of the Comprehensive Plan and/or City annexation process.

Collectively, the trees along streets, in parks and yards, by streams, and in other open spaces make up Frederick's urban forest system. Whether native, young saplings, newly planted landscape trees, or mature shade and woodland trees, the forest canopy as a whole contributes to making the City a sustainable and more beautiful place to live, work, and play.

THE VALUE OF URBAN FOREST

Below are elements of the Comprehensive Plan that individually and collectively help balance the ecosystems support and contribute to their success.

Tree Fact

Each average-sized tree provides an estimated \$7 savings in annual environmental benefits, including energy conservation and reduced pollution.

Source: Saveatree.com

1. Environment: The primary goal of the Environment Element is to protect and restore ecologically valuable lands that enhance water quality and protect wildlife habitat and forest canopy by minimizing the impacts of human activities. Throughout the 2010 Comprehensive Plan, references are made to improving the City's waterways through stream restoration, planting vegetative buffers, and retrofitting stormwater management facilities. Increased tree canopy coverage contributes to these goals through the following:

- Reducing erosion.
- Reducing the amount of sediment and pollutants that run off developed and developing lands.
- Removing air pollutants and improving air quality.
- Reducing the overall quantity of water runoff through increased absorption

2. Recreation: The primary goal of the Recreation Element is to develop a comprehensive park system that meets the needs of the community and addresses the balance between active parks and passive, forested parkland. According to the 2010 Comprehensive Plan, "*the City of Frederick has 61 public parks, totaling 440 acres, and as the City reaches its year 2030 projected population, approximately 500 additional acres of parkland will be needed.*" Increased tree canopy coverage contributes to these goals through the following:

- Making parks more desirable locations for recreation and leisure activities.
- Offering educational and interpretive opportunities for park programs.
- Protecting the critically sensitive land areas designated as City parkland, i.e. floodplain, wetlands and streams.
- Providing access to nature environments in an urban setting.
- Preserving natural landscapes and protecting sensitive wildlife habitats.

3. Heritage Resources: The Heritage Resources Element is intended to protect and restore historic resources that are significant in defining City's identity. Increased tree canopy coverage contributes to these goals through the following:

- By serving as landmarks and living witnesses of significant events and places; for example, Memorial Park contains several large specimen trees, such as the American Elm and Red Oak that are well over 50" in diameter.
- Complementing historic sites and preservation efforts.
- The private properties in the Historic District and downtown areas contain many individual specimen trees with the larger canopy, such as the most notable champion Ginkgo tree located at 11 West 2nd Street.
- Portions of the Historic District and downtown have in excess of 20% UTC which is significantly above the City's average.

4. Community Character and Design: The Community Character and Design Element is intended to assist the City in protecting and improving its neighborhoods through strengthening residential and commercial areas with compatible adjacent development and ensuring a balance of housing, shopping, and employment opportunities. Increased tree canopy coverage contributes to these goals through the following:

- By providing a key element in community design for roads, public buildings, and parks.
- By serving as amenities along City streets that create a "sense of place" for pedestrians.

City of Frederick Tree Fact

Below: A Maryland champion Pecan tree located at 500 Magnolia Avenue is 124 feet tall and 14 feet and 1 inch in circumference.



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- By offsetting environmental impacts associated with the built environment as promoted by LEED design and green building techniques

5. Land Use: The Land Use Element is intended to ensure the availability of a variety of land uses that are appropriately located, compatible with adjacent uses, and are sufficient for the City's present and future needs. Increased tree canopy coverage contributes to these goals through the following:

- By efficiently and effectively separate adjacent land uses.
- By absorbing a significant amount of water in outlying floodways.
- By mitigating negative impacts of development through site design, including buffers between different uses.

Tree Fact

Trees can help increase the value of commercial and residential property values, sometimes by 10% - 20%.

Sources: USDA pamphlet #FS-363

6. Housing: The Housing Element is intended to ensure a diverse, high-quality housing stock for future populations and workforce. Increased tree canopy coverage contributes to these goals through the following:

- Increasing property values.
- Homebuyer interest and homeowner satisfaction are increased when trees are preserved and major landscape elements are already established at the time of occupancy.
- Properly located trees reduce heating and cooling costs.

7. Economic Development: The Economic Development element is intended to promote a strong, diverse economy that supports the City character and high quality of life. Increased tree canopy coverage contributes to these goals through the following:

- Increase property values by 10% to 20% and attract more homebuyers and renters (source: University of Washington).
- Increase municipal revenue through property tax assessments (source: University of Washington).
- Create safer, more supportive neighborhoods working toward a common vision (source: University of Illinois).
- Improve streetscapes.

8. Transportation: The Transportation element is intended to promote a safe, convenient, and efficient motorized and non-motorized transportation system. Increased tree canopy coverage contributes to these goals through the following:

- Enhancing transportation routes—sidewalks, streets, and walking trails—both aesthetically and functionality by providing shade and shelter.
- Increasing the functional life of sidewalk surfaces by

-
- reducing maintenance repairs and preventing color degradation.
 - Absorbing, filtering, and moderating air pollution from vehicles.
 - Screening roads and walkways from other adjacent land uses, thereby creating visual and noise buffers.

9. Fiscal: The Fiscal element is intended to enhance the City’s fiscal health by identify needs in services and infrastructure for existing residents and businesses while simultaneously ensuring that new growth contributes equally to the costs of providing these services. Increased tree canopy coverage contributes to these goals through the following:

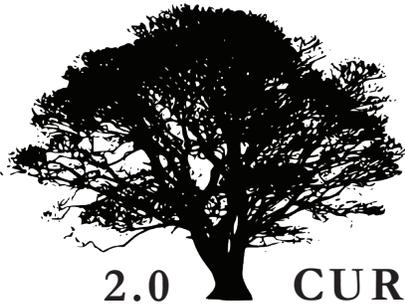
- By providing energy conservation, stormwater mitigation, and pollution moderation services. Avoid budgetary procedures that fund current expenditures at the expense of future needs.
- A comprehensive urban forestry program adhering to current industry standards and performing routine and preventive tree maintenance uses municipal funds more efficiently than a reactive management system. Evaluate the operational costs (staffing, maintenance).
- Proactive urban forestry management programs increase public safety and decrease municipal liability for tree risk situations.

10. Water Resource: The Water Resource Element is intended to protect and provide an adequate drinking water supply for the City and to provide adequate capacity of wastewater treatment. Increased tree canopy coverage contributes to these goals through the following:

- Protecting the supply from pollution and encroachment.
- Providing tools for wastewater treatment.
- Protecting the habitat and restoration value of the County’s rivers and streams.



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2.0 CURRENT ISSUES FACING THE CITY

2.1 EXISTING REGULATIONS

An important preliminary task in developing the Urban Forestry Management Plan was to review the existing regulations, policies, and standards that impact the management of the City's urban forest.

2.1.1 FOREST CONSERVATION ACT (FCA)

In 1991, the State of Maryland adopted the Forest Conservation Act (FCA) which required local governments to adopt regulations for the protection of existing forests and the establishment of new forests as a component of the development process. The FCA directive was, and remains, an unfunded mandate to the jurisdictions. In 1993, the City adopted the Frederick City Forest Conservation Ordinance, modeled off of the State legislation with minor adjustments made to reflect the City's individual needs. The Frederick City Forest Conservation Ordinance was later incorporated into the Land Management Code (LMC) when it was adopted in 2005 under Article 7 as Section 721, "Forest Conservation." The Planning Department serves as the primary agency responsible for the enforcement and implementation of Section 721 and also is the primary liaison between the City and the Department of Natural Resources (DNR) in regards to forest conservation issues.

As noted above, the City has been in compliance with the State Forest Conservation Act since 1993 and has reported all development related forest conservation annually to DNR. Amendments made in 2009 to the State FCA have also required that documentation regarding violations and penalties be incorporated into the reporting process. In order to improve this process, the annual and biennial reports must now incorporate GIS data so that it can be integrated into an overall State map.

Areas of Improvement: The City forest conservation program has evolved immensely since its inception with both staff and State officials learning what scenarios produce successful forest conservation and which factors have contributed to failures. The challenges for the City are based on the very nature of our urban environment and the ability to balance dense growth with the need to preserve and enhance our environmental resources. When “Greenfield” development is proposed within the City that contains open space and sensitive areas, often modifications and fee in lieu of payments are requested. One option for improvement is to create regulations which promote forest conservation in a manner which is more suitable for the urban environment yet complies with State laws and promotes increased tree canopy.

2.1.2 LAND MANAGEMENT CODE

The Land Management Code (LMC), adopted on July 21, 2005, regulates development activity in the City. The Planning Department is the administrative agency responsible for the implementation of the provisions contained therein. The Planning Commission and Zoning Board of Appeals are the appointed bodies responsible for overseeing the majority of development applications for compliance with the LMC and deliberating on modifications to those regulations when requested. With the recommendations from the Planning Commission, the Mayor and Board of Aldermen is the body ultimately responsible for the content of the LMC which is approved through the text amendment process.

The following provisions of the LMC relate either directly or indirectly to the UTC and should be evaluated in conjunction with the UTC Goals for opportunities for improvement:

- **Section 605, “Landscaping Standards”-** Establishes minimum requirements for street trees, interior parking lot landscaping, lot line and parking lot buffering, and overall site landscaping which is required as part of the development process.
- **Section 721, “Forest Conservation”-** Establishes the minimum standards for forest conservation and afforestation required as part of the development process.
- **Sections 410, “Planned Neighborhood Development (PND), 411, “Traditional Neighborhood Development, and 417, Mixed Use Districts”-** Establish design options which allow for more compact development that preserves large common, open spaces which can be used for plantings.
- **Section 608, “Parks and Open Space”-** Establishes the

- amount of parkland required for dedication through the development process and defines the types of parks, such as linear parks, natural areas, and playgrounds that will be accepted by the City.
- **Section 405, “Dimensional and Density Regulations”**- Establishes maximum lot coverage requirements through minimum building setbacks and an impervious surface ratio based on the zoning of a property.

Areas for Improvement: Accepted recommendations for canopy coverage are 15% for commercial areas, 25% for urban residential, 60% for suburban, and 40% on the average (*Prince William Conservation Alliance*). The City’s forest conservation standards require that on average, 15% of the land area, be dedicated to forest conservation per development site, unless the project is exempted or is below the minimum size which determines applicability. The remaining 25% necessary to meet the 40% overall UTC goal must then be acquired through the landscaping requirements or volunteer plantings. It is unknown if the existing landscape regulations are capable of accounting for the balance needed from each land use. The LMC landscaping requirements are enforced through the development review process, however are subject to modifications upon an applicant’s request which in turn, can lessen the acquired number of plantings.

In addition to increasing the number of plantings required through amendments to the regulations, improvements could be made which address site selection. Standardizing the review of landscaping plans by the City’s Arborist can assure that appropriate planting are proposed for the site and location. The landscape regulations may also be further amended to include specific guidelines for specie selection in different situations, such as street, open space, residential buffer, commercial buffer, etc. This will assure maximum survival rates and decrease the frequency with which healthy trees must be removed where they conflict with utilities and other structures.

As noted in the assessment report, a potential key source for increased canopy coverage lies on privately owned residential properties. As alluded to above, the landscaping requirements of Section 605 are at times compromised by modifications and may not apply retroactively to older communities.

While the LMC contains maximum thresholds for the amount of impervious surface permitted per zoning district, some of these maximums do not meet the more stringent requirements for forest conservation. For example, the LMC requires only 10% of a lot be covered by pervious surfaces in the M1 and M2 (industrial) zoning

Tree Fact

When 250 residents of Detroit were interviewed concerning their preference of trees in urban areas, eight out of ten respondents stated that trees would have an influence on the choice of a place to live. Ninety percent of the respondents believed that trees increase property values in excess of ten percent.

Sources: Getz, et. al., 1982

districts, while in these same districts, the forest conservation regulations require a minimum of 15% of the land area be planted.

Lastly, regulatory improvements can be made which address inspection and enforcement. Per Section 605(i) of the LMC, required landscaping is protected after completion of construction and is reinforced by Section 309(q) which requires that a Site Plan Enforcement Agreement be executed at the completion of a project. However, the City does not routinely inspect existing sites for compliance and many site owners will remove or fail to replace dying or damaged trees; in addition, there are occasions where owners have removed trees to intentionally change the landscaping. Changes in the enforcement and inspection processes may prove to be very labor intensive for the City with increased staffing needed to ensure compliance.

2.1.3 STANDARDIZED STREET DESIGN DETAILS

As part of the development review process, the City of Frederick requires that street trees be planted within the public rights-of-way. Street trees are a feature in the standard City detail as proposed by the Engineering Department and approved by the Mayor and Board and are applied to new developments and capital improvement projects alike. This is a great opportunity to increase canopy coverage by planting trees appropriately on the public streets in the City. In order to maximize the benefits of street trees, the focus should be placed on planting trees with medium and large crowns as often as possible while still allowing for adequate spacing with underground utilities and without obstructing vehicle sight distance at intersecting roadways.

Areas of Improvement: The City should reevaluate the existing street details and consider the use of trees and landscaping as a traffic-calming device. Studies across the country confirm that the presence of a tree-lined street and a canopy cover contributes to slower vehicle speeds. In addition to contributing to traffic management goals, the trees and landscaping enhance the character of the street and the neighborhood, which, in turn, improves the quality of life in the City.

The issue of appropriate tree placement in the public right-of-way should be addressed and any existing or potential conflicts resolved through inter-departmental cooperation. It may be appropriate to explore new street design details for street trees for alternative sidewalk locations and various tree panel widths or consider the placement of the trees on private lots within City easements to promote better tree placement and growth potential. An approach to potential utility conflicts is to simply review plantings on a case-by-case basis to customize and accommodate unique circumstances and conditions that

occur on different rights-of-way in the City. Public safety should be balanced with maximizing new tree plantings in Frederick.

2.2 TREE MANAGEMENT ORGANIZATIONAL STRUCTURE

The management of the urban forest within the City is the responsibility of many entities. Approximately 71% of the land in Frederick is privately owned and controlled, excluding the Municipal Airport and Ft. Detrick land areas. The Airport and Ft. Detrick have been excluded from consideration as planting areas during the canopy analysis due to the overriding fact that Federal regulations may prevent or restrict installing trees on the properties with the City having little control. Therefore, the greatest challenge, as well as the greatest opportunity for protecting and enhancing the City's forest, is in educating and working with citizens. However, the local government is also directly responsible for a significant portion of the current and future urban forest. Approximately 29% of the land in the City is publicly owned, including street rights-of-way, parks, and other municipal land holdings with exclusion of the airport.

Areas of Improvement: Currently, the City's tree management structure is decentralized; there is not one single agency or staff position which has direct and comprehensive responsibilities for trees on City owned property. Instead, all of the Departments within the Department of Public Works deal directly or indirectly with urban forest management issues, including: the Parks and Recreation Department, the Planning Department, the Engineering Department, the Operations Department of Public Works, the Airport, and the Mayor and Board of Aldermen. An example of this can be found by looking to the current practices related to street trees. The Planning and Engineering Departments process the development plans requiring specific trees as part of the road way improvements, the Parks and Recreation Department installs the streets in the case of City CIP projects; and then the Operations Department is responsible for maintaining and trimming them. These uncoordinated tasks can lead to inefficiency, duplication or overlapping efforts and/or the opposite, "under lapping," where areas of responsibility and needs go unmet.

2.2.1. PARKS AND RECREATION DEPARTMENT, DEPARTMENT OF PUBLIC WORKS

The Parks and Recreation Department has responsibility for the acquisition, development, and maintenance of between approximately 1,000 acres of open space, floodplain and planted right-of-ways in the City. The landscape trees and forests in City parks, community parks, and neighborhood parks are planted and maintained by Department staff and contractors. This Department also serves as the liaison and

advisor to the Parks and Recreation Commission appointed by the Mayor and Board.

The City Arborist is assigned to the Parks and Recreation Department and is responsible for street tree selection, planting and maintenance. In addition, the City Arborist also manages trees in the public parks. The City Arborist assists the Planning and Engineering Departments with plan reviews to assure appropriate management of street trees prior to the City assuming maintenance responsibility. The three departments recognize the valuable insights of the City Arborist as a review agency and seek to further formalize this relationship through implementation of this Plan.

2.2.2. PLANNING DEPARTMENT, DEPARTMENT OF PUBLIC WORKS

The Planning Department makes recommendations on development regulations; reviews development plans for compliance with applicable regulations; and enforces the adopted land use and zoning regulations. The Comprehensive Planning section of the Department is responsible for drafting the Comprehensive Plan for the City, which includes sections on Land Use, Parks, and the Environment. The policies and goals for each section identify trees as important assets affecting land use issues, parks, the economy and the environment. In contrast, the Development Review section is responsible for the next step in achieving the goals of the Comprehensive Plan through compliance with the development regulations including those for landscaping and forest conservation.

In addition, the Planning Department is the key agency responsible for the review and approval of forest conservation plans as part of the development review process. The Department also provides the City's annual and biennial forest conservation reports to the Maryland Department of Natural Resources and serves as the primary contact between the two agencies with regards to forest conservation.

2.2.3. ENGINEERING DEPARTMENT, DEPARTMENT OF PUBLIC WORKS

The Engineering Department is responsible for the review of public and private construction improvements including compliance with the standard City details for street design and the placement of trees in the right-of-ways. Construction or repair of utilities and other public infrastructure components and any subsequent damage to street trees and their root systems can be avoided through good design techniques. To accomplish urban forestry, street tree placement and maintenance

must be considered and weighed against other Engineering and Public Works priorities.

Through Section 721 of the LMC Forest Conservation, the Engineering Department also assumes responsibility for enforcing the forest conservation requirements in the event that an application for a grading or sediment control plan is filed for a property that exceeds 40,000 s.f. and is not already subject to a site plan or preliminary subdivision plat. This type of grading situation rarely occurs without a project plan being previously approved by the Planning Department or Planning Commission; however, a grading permit can be issued as an independent action for an individual land use without immediately proceeding with development.

2.2.4. OPERATIONS DEPARTMENT, DEPARTMENT OF PUBLIC WORKS

The Operations Department is responsible for providing citizens with high-quality water and sanitary sewer service. Trees and underground utilities have long been considered mutually exclusive based on the perception that all tree roots cause line breaks, which allow for root intrusion and blockages, making repairs and maintenance more difficult and costly. Although these facilities are typically located under the street and in a manner which avoids conflict with potential tree planting areas, the increasing prevalence of neo-traditional and smart growth design techniques present new challenges and opportunities for systems to be placed in vegetated easements. Although technology and design may allow for increased colocation of trees and utilities, the City Code prohibits trees from being planted within 10 feet from any utility lines. In addition to the location of infrastructure, the current maintenance practices in regards to mowing, snow and ice removal and street cleaning must also be evaluated for impacts on existing and proposed trees.

Management of tree and utilities should be coordinated between the City Arborist, the Engineering Department, and the Operations Department in order to minimize future conflicts and damage to existing trees near utilities. To preserve existing, mature trees on private and public property, a preventive maintenance program for inspections and clean out of roots should be implemented before the removal of an established tree is necessary.

The City is a member of Miss Utility, an underground utility protection service. This service is free and allows citizens, private contractors, and the City to have all underground utilities located and marked before any excavation project starts. This is an excellent program and should

Tree Fact

Asphalt and concrete streets and parking lots are known to increase urban temperatures 3-7 degrees. These temperature increases significantly impact energy costs to homeowners and consumers. A properly shaded neighborhood, mostly from urban street trees, can reduce energy bills for a household from 15-35%.

Source: Glattig Jackson and Walkable Communities, Inc. 2006

Tree Fact

Trees absorb the first 30% of most precipitation through their leaf system, allowing evaporation back into the atmosphere. This moisture never hits the ground. Another percentage (up to 30%) of precipitation is absorbed back into the ground and taken in and held onto by the root structure, then absorbed and then transpired back to the air. Some of this water also naturally percolates into the ground water and aquifer. Storm water runoff and flooding potential to urban properties is therefore reduced.

Source: Glattig Jackson and Walkable Communities, Inc. 2006

be used with all public and private tree planting projects and tree preservation efforts.

The Department of Public Works provides inspections on construction sites including those that contain forest conservation areas and are also responsible for managing the respective bond processing/release to ensure that development conforms to the City's forest conservation regulations. These responsibilities are generally more associated with private development and lands rather than publicly owned lands and, therefore, have the potential for long-term impact on the City's total canopy cover.

2.2.5. AIRPORT

The ownership and operations responsibilities related to the municipal airport lie with the Executive Assistant to the Mayor. The Airport occupies approximately 625 acres of publicly owned land within the City, which borders the Monocacy River, a critical and sensitive environmental feature. Plantings along the periphery of the river help to establish a valuable buffer for the protection of water quality; however, operational restrictions and safety concerns associated with the Airport have often resulted in trees being removed or topped to prevent height and wildlife interference. There are limited opportunities for urban forest enhancement activities on the airport property, limited primarily to low lying landscaping in parking areas and around buildings and reforestation of land not in the regulated flight path. Expansions of the airport should be thoroughly evaluated prior to creating environmental design conflicts with the Monocacy River.

2.2.6. MAYOR AND BOARD OF ALDERMEN

The elected officials are key to the growth and success of the City's urban forestry program. As the ultimate policy-making group and representatives of the citizens, the Mayor and Board can have direct influence over the current and future management of the urban forest. The Mayor and Board can approve new and improved tree ordinances, support increases in program funding, support additional staffing, and generally make urban forestry issues a priority for the City, as demonstrated by Mayor Holtzinger's previous commitment to the State Urban Tree Program.

2.3 MONITORING AND MAINTENANCE

The City currently uses Hanson, a data management software program, for collecting tree inventory data. Frederick's inventory should be updated on a regular basis to reflect new plantings, removals, and maintenance procedures performed. An accurate inventory is the best

way for the City to monitor the progress and cost-efficiency of its tree care operations. The primary benefit of an accurate tree inventory is that the City can budget, plan, and anticipate tree-related problems in the most cost-effective manner.

The Governor has raised the State forest and tree programs to a high level of priority. In 2009, the Governor initiated a tree planting program that challenges State agencies to plant 1 million new trees by 2011 and also provided monetary incentives to encourage private citizens to plant 50,000 trees by 2010. Currently, Frederick County has more than 8,000 trees registered with the State as new plantings. As part of the FCA and in order to increase the ability of the State to monitor and track progress, GIS data and digital files are now required with the annual reports to DNR. Starting with the 2010 FCA reporting period, the GIS Section of the Planning Department should digitize approved finalized forest areas and document violations made against the actual forest planted within the City.

2.4 FUNDING SOURCES

Currently, there is no line item or designated regular funding for new street tree planting, preventive tree maintenance, increased staff and support personnel, or equipment to support a forest initiative. Existing public funds are dispersed among various departments for various tasks and are usually spent on an emergency basis, upon individual citizen requests, or for individual capital projects with limited aspects of urban forest management.

In accordance with the FCA, Section 721 of the LMC establishes a fee-in-lieu fund for forest conservation whereby developers can remit a payment to the City, currently at the rate of \$0.30 per square foot, in lieu of conducting forest conservation on the subject property. With the fees collected, the City becomes responsible for identifying appropriate areas for planting and conducting the plantings. Although the fee in lieu of payments are ultimately dedicated to plantings which increase the overall canopy, this still only reflects the 15% of the original project area required for conservation, which falls short of the goal of 40% canopy coverage.

A potential opportunity for increasing the canopy coverage through plantings on public property is the use of the forest conservation funds collected through the fee-in-lieu of option for the planting of street trees. The budget for the Parks and Recreation Department currently only has an allotment for the purchase and installation of replacement streets trees and as such, the potential for growth in the number of plantings is limited. Through the use of these funds, the City can plant

more street trees in areas where they were not installed as part of a development project. Prior to being capable of using the fee in lieu of funds, however, the Department of Natural Resources requires that a municipality adopt a forest management plan.

PUBLIC EDUCATION AND PARTICIPATION

Currently, the involvement of the City in tree preservation and conservation programs is limited to implementation through the forest conservation regulations previously described and participation in the Tree City USA program through the Arbor Day Foundation. However, citizen participation in environmental issues is beginning to increase due to grass root organizations, such as the Friends of Frederick County, the Monocacy River Scenic Group, and local friends of park groups.

Citizens, businesses, the development community, and City staff and leaders can all benefit from continued education and marketing strategies targeted at increasing awareness as to the environmental benefits of trees. Making individuals aware of City resources and opportunities to become more involved in the urban forest management program can be a part of the solution.



City of Frederick Tree Fact

Left: A Maryland champion Gingko tree located at 11 W. 2nd Street is 62 inches (dbh) in diameter.



3.0 MANAGEMENT GOALS AND IMPLEMENTATION

Management goal areas are presented below with key recommendations for achieving progress over the next three (3) years and success in the next 20 years.

1. Improve Legislation and Policies for Tree Planting and Protection
2. Improve Organizational Structure
3. Improve Urban Forest and Tree Maintenance
4. Establish Sources for Funding
5. Expand Education and Public Relations

3.1 LEGISLATION AND POLICIES: TREE PLANTING AND PROTECTION

Statement: The City's regulations regarding tree planting and protection must reflect a commitment to urban forestry and environmental health.

Action:

- Expand the applicability of existing regulations pertaining to tree retention beyond the development review process. The City should consider the costs and benefits of developing a permitting process for the removal of trees on private properties. This permitting process should be independent of other development activity and applied only to trees beyond a specified threshold size. Enforcement, mitigation for removal, and the establishment of fines for noncompliance should all be evaluated.
- Review and revise the Land Management Code to ensure that landscaping regulations reflect the most current arboricultural and horticultural standards and best management practices to ensure maximum canopy coverage.
- Develop a proactive tree management program by

Tree Fact

The tallest tree in the country is a Coast Redwood growing in northern California's Redwood National Park. It is 369 feet tall and over 2000 years old.

Source: Saveatree.org

establishing incentive opportunities for tree preservation and planting and disincentives for tree removal and noncompliance as part of the development review process.

- New regulations should include the roles and responsibilities of the City’s Urban Forester/Arborist and the administration of the City’s public tree program.

City of Frederick Tree Fact

Below: A Maryland champion Elm tree located at Frederick Middle School is 95 feet tall and 20 feet and 3 inches in circumference.



3.2 ORGANIZATIONAL STRUCTURE

Statement: Efficient and effective management of the City’s tree population can be achieved by centralizing all related responsibilities and improving interdepartmental coordination and communication.

Action:

- Formalize and centralize urban forest management responsibilities, staff, equipment, funding, and resources. Proactive and efficient management requires task/issue identification and prioritization, expert guidance, internal review, external approval, and execution of the decision.
- Increase and/or reassign staffing and resources. A truly proactive and comprehensive urban forest management program requires trained and dedicated staff to oversee management and operational activities. Duties such as tree planting and maintenance, emergency response, plan review, site inspection, project management, contract administration, interagency assistance and coordination, and citizen education, among others, require a sufficient level of staffing, equipment, and other program resources.

3.3 URBAN FOREST MAINTENANCE

Statement: Proper and timely maintenance is required to

maximize the benefits of trees, increase service life, improve aesthetics, and ensure public safety. Maintenance programs are critical to the survival, vitality, and growth of existing trees and of newly planted trees.

Action:

- Implement four (4) tree maintenance programs—preventive maintenance on a 5-year cycle, routine maintenance on an as-needed or request basis, young or small tree maintenance, and an emergency response program.
- Conduct a complete public tree inventory every five (5) years, and use a tree management software program to update the data, document maintenance work and costs, and create annual work plans.
- Mandate the use of current and accepted best management practices and arboricultural work standards in all maintenance activities.
- Adequately train City employees performing maintenance, encourage City staff to become Certified Arborists as necessary, and hire contractors who perform work to the highest industry standards.
- Train inspectors on tree health and identification.

3.4 TREE MONITORING AND REPORTING

Statement: Through the use of technology such as specially designed modeling software, aerial photography, and remote sensing data, local jurisdictions can inventory existing and proposed canopy coverage in order to gain a better understanding of the ultimate environmental benefits associated with plantings. As of December 2009, the City of Frederick Parks and Recreation Department has inventoried 7,764 street trees and identified approximately 800 street tree locations available for future planting.

Action:

- Implement a process and data entry system for the recordation of field observations such as new plantings, work histories, changes in tree conditions, and maintenance recommendations. Consideration should be given to using volunteer resources for data collection and entry.
- Conduct a thorough inventory of the tree population every five (5) years or fewer if rapid changes in the urban forest occur, such as severe storms, serious insect and disease problems, or a dramatic increase in new tree planting.
- Generate Geographic Information System (GIS) data layers for existing forest and use the data to identify and rank potential planting areas.
- Acquire specialized modeling software designed to measure

Tree Fact

Computer simulations using standard building and tree configurations for cities across the U.S. indicate that shade from a single well-placed, mature tree (about 25-ft crown diameter) reduces annual air conditioning use 2 to 8 percent and peak cooling demand 2 to 10 percent.

Source: Simpson and McPherson, 1996

the size and location of the urban canopy in order to generate conclusions regarding public health and safety benefits such as reductions in air pollution, stormwater management and increased energy conservation. Example software models are:

- Urban Forest Effects Model (UFORE) - calculates the structure, environmental effects, and values of the entire urban forest. The model is designed to use standardized field data from randomly located plots or complete inventories. UFORE results are compatible with ArcView for display in GIS systems. The UFORE software is in the public domain and available at no cost to all interested individuals and organizations through i-Tree.
- Street Tree Resource Analysis Tool for Urban Forest Managers (STRATUM) - a street tree management and analysis tool that utilizes simple tree inventory data to quantify the value of annual environmental benefits, such as air quality, carbon dioxide reduction, stormwater control, etc. This model considers maintenance and planting costs for cost-benefit needs. STRATUM is also in the public domain and is available at no cost to communities.
- Provide an annual report to help assess progress towards meeting the City’s objectives and goals.

Tree Fact

Realtor based estimates of street tree versus non street tree comparable streets relate a \$15-25,000 increase in home or business value. This often adds to the tax base and operations budgets of a city allowing for added street maintenance. Future economic analysis may determine that this is a break-even for city maintenance budgets.

Source: Glattig Jackson and Walkable Communities, Inc. 2006

3.5 FUNDING SOURCES

Statement: Dedicated funding is vital to the success of a comprehensive and proactive urban forest management program. The City should seek new and reallocated funding sources to support a comprehensive urban forestry program. The 2006 national average sets the minimum annual budget at \$5 per capita (*per Davey Resource Group, Kent, OH, supplied to Leesburg, VA*), this equals approximately \$308,905 for the City of Frederick.

Action:

- Determine shortfall and need amount for allocation of funds;
- Create a Tree Account independent of the City’s general fund, not too dissimilar to that established for the collection of fee in lieu of payments associated with forest conservation, to deposit funds from various sources.
- Identify funding sources for the Tree Account such as:
 - **Damage Compensation:** Compensation for damages to public trees in an amount to cover, the value of the tree(s); the cost of repair or clean-up; and the cost of administrative time necessary to resolve the situation.
 - **Utility Company Fees:** Private utility companies

perform new construction, maintenance, and repair work on an annual basis in the City. Any compensation for documented damage to public trees during utility work – above or below ground- would be collected separately with the utility company responsible for the costs associated with remediation necessary (*e.g.*, pruning, fertilization, or temporary irrigation) above and beyond the fee for damage compensation.

- **Private Donations/Corporate Sponsorships:** Private businesses and corporations who wish to sponsor non-profit, environmental activities should be encouraged to make tax deductible donations.
- **Voluntary Utility Bill Donations:** Through municipal invoices for water/sewer services, the City could solicit voluntary contributions for the urban forestry program ranging from \$0.25 to \$1.00 which could be automatically added to each bill. Alternatively, residents could have the option of round the invoice amount up to a higher figure at their discretion.
- **Increase the General Fund Allocation to the Urban Forestry Program:** During future budgeting cycles, the City should consider increasing the financial resources available for urban forestry staff and functions and consider establishing a separate budget line-item for the urban forestry program.
- **Grants:** The City has previously received grants for urban forestry projects, however these opportunities could be greatly increased through additional investments in time and staffing dedicated to the grant application process. These opportunities can be found with the State and Federal governments, non-profit organizations, large corporate and private business foundations, and private charitable foundations. In the case of previously awarded grants the budget for the Parks and Recreation Department has provided matching funds; however, with the establishment of a Tree Account, these funds could supply the matching funds to leverage even more grant dollars.
- **Promote the Federal Tax Incentive to Citizens:** Because the City is a non-profit, citizens who pay directly for tree planting and maintenance on public property may receive a charitable deduction on their federal income tax return. Accordingly, as part of the City's outreach and education initiatives, residents should be encouraged to perform plantings as desired.

Tree Fact

A tree can be a natural air conditioner. The evaporation from a single large tree can produce the cooling effect of 10 room size air conditioners operating 20 hours a day.

Source: USDA pamphlet # 363

- Develop a fine system or a mitigating mechanism for removal of healthy trees on private property.

Tree Fact

If every American family planted just one tree, the amount of CO₂ in the atmosphere would be reduced by one billion pounds annually. That is almost five percent of the amount that human activity pumps into the atmosphere each year. 300 trees can counter balance the amount of air pollution one person produces in a lifetime.

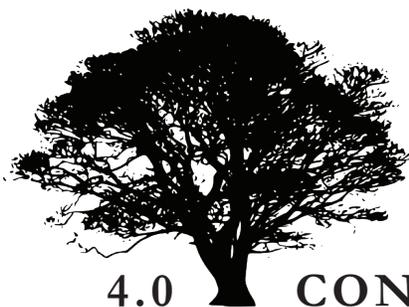
Source: coloradotrees.org

3.6 EDUCATION AND PUBLIC RELATIONS

Statement: The success of the City’s urban tree program relies on the participation of well informed citizens, businesses, developers, staff, and elective officials.

Action:

- Initiate public and citizen urban forestry outreach efforts through a wide variety of media outlets, special events, and publications to instill a sense of civic pride and gain more financial and political support for the urban forestry program.
- Create a standardized educational program for orienting newly elected public officials to the City’s urban forestry program, efforts, and goals.
- Promote internal educational opportunities by increasing professional interaction, coordination, and communication between departments and staff regarding tree planting and maintenance principles and practices. There is a need for available training of inspectors and additional arborist training within the different departments.
- Market the urban forestry program and its successes outside of the City to the County, region, and the country. A widespread and heightened awareness of the quality of the urban forest and of life in Frederick promotes economic development, which, in turn, enhances the visibility and political stature of the program.
- Explore incentive programs for the citizens to subsidize plantings personally and/or through their Homeowners’ Association.



4.0 CONCLUSION

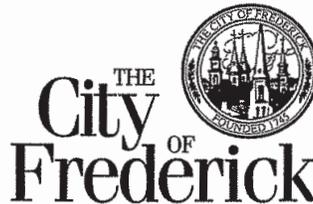
The Urban Forestry Management Plan should guide City staff and leaders in working towards short and long term goals for the City. Through the implementation of this Plan, the City will strengthen its role as a regional leader in environmental issues, will attract the business world, improve our residential quality of life, and improve the City's overall well-being.





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William J. Holtzinger
Mayor



Aldermen
Marcia A. Hall
President Pro Tem
David "Kip" Koontz
Alan E. Imhoff
C. Paul Smith
Donna Kuzemchak Ramsburg

April 30, 2007

Mr. Michael F. Galvin
Supervisor, Urban & Community Forestry
Maryland Department of Natural Resources
Tawes State Office Building
580 Taylor Avenue
Annapolis, MD 21401

RE: Chesapeake Bay Program's Riparian Forest Buffer Directive

Dear Mr. Galvin:

Thank you for the invitation to the City of Frederick to participate as one of the forerunners in such a worthy and State-wide program and as such implement an Urban Tree Canopy goal for the City.

The City of Frederick has been a Tree City USA for 27 years. However, during the past 15-years with the Forest Conservation Act in existence, the City of Frederick has experienced high growth numbers in population and development. Planning Staff have applied the Forest Conservation requirements and landscape regulations to development projects, but finds it a challenge to locate off-site planting areas to accommodate the use of the fee-in-lieu of monies collected. Our Planning Staff wants to create a comprehensive planting plan for the City, and within the City's boundaries, to identify open space available for reforestation and afforestation under the Forest Conservation Act and to use the forest fee-in-lieu of funds for tree planting. The State program would, indeed, assist us in this effort and also identify the Urban Tree Canopy goal for the City to ultimately reach.

On behalf of the City of Frederick, please consider this letter as the City's official acceptance and sign on for the Urban Tree Canopy program, to join other jurisdictions in the Chesapeake Bay watershed area. The Planning Department and any other needed City department shall welcome and work with the State on improving our tree canopy and watershed planning for the City.

Sincerely,

Mayor William J. Holtzinger

Cc: Chuck Boyd, Deputy Director for Planning
Catherine Parks, Manager, Current Planning
Neil Parrot, Deputy Director for Engineering
Tom Davis, Deputy Director for Public Works
Tom Rippeon, City Arborist, Parks & Rec Department

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A Report on the City of Frederick's Existing and Possible Urban Tree Canopy



Why is Tree Canopy Important?

Urban tree canopy (UTC) is the layer of leaves, branches, and stems of trees that cover the ground when viewed from above. Urban tree canopy provides many benefits to communities including improving water quality, saving energy, lowering city temperatures, reducing air pollution, enhancing property values, providing wildlife habitat, facilitating social and educational opportunities, and providing aesthetic benefits. Establishing a UTC goal is crucial for those communities seeking to improve their green infrastructure. A UTC assessment that provides the amount of tree canopy currently present (Existing UTC) along with the amount of tree canopy that could be established (Possible UTC) is the first step in the UTC goal setting process.

How Much Tree Canopy Does Frederick Have?

An analysis of Frederick's urban tree canopy based on land cover (Figure 1) derived from year 2007 high resolution aerial imagery found that more than 1,804 acres of the City were covered by tree canopy (termed Existing UTC) representing 14% of all land in the city. An additional 69% (9,307 acres) of the city could theoretically be improved (termed Possible UTC) to support tree canopy (Figure 2). Of land classified as Possible UTC, 20% (2,675 acres) of the is impervious and another 49% (6,633 acres) consisted of grass and shrub land. Establishing new tree canopy is likely to be easier on the areas identified as Possible UTC Vegetation, where as establishing tree canopy on Impervious Possible UTC will have a greater impact on water quality.

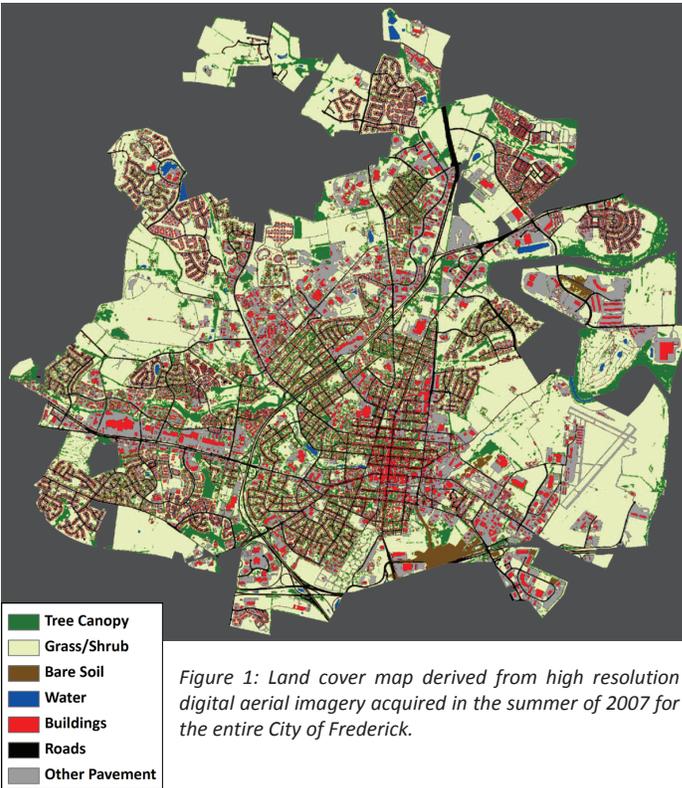


Figure 1: Land cover map derived from high resolution digital aerial imagery acquired in the summer of 2007 for the entire City of Frederick.

Project Background

The analysis of Frederick's urban tree canopy (UTC) was carried out in collaboration with the City of Frederick. The assessment was performed by the University of Vermont's Spatial Analysis Laboratory (SAL) in consultation with the USDA Forest Service's Northern Research Station. The goal of the project was to apply the USDA Forest Service's UTC assessment protocols to the City of Frederick using the best available data and methods.

Data for this project was provided by the Maryland Department of Natural Resources (MD DNR) and the City of Frederick. This analysis was conducted based on year 2007 data.

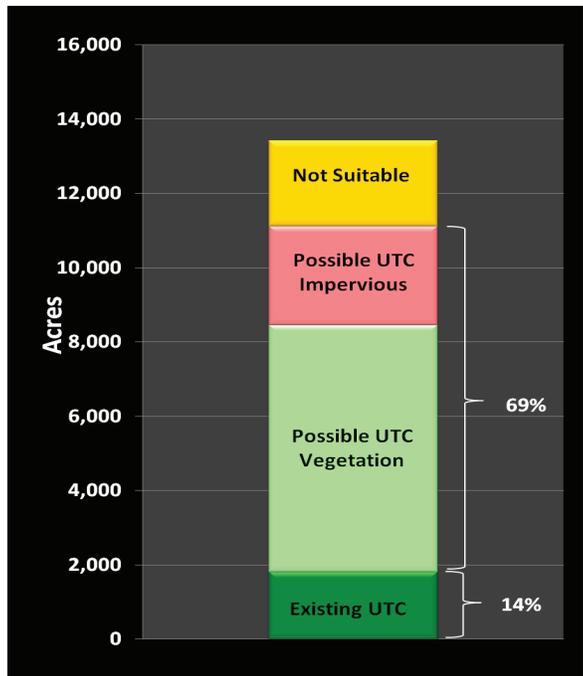


Figure 2: UTC metrics for Frederick based on % of land area covered by each UTC type.

Key Terms

- UTC:** Urban tree canopy (UTC) is the layer of leaves, branches, and stems of trees that cover the ground when viewed from above.
- Land Cover:** Physical features on the earth mapped from aerial or satellite imagery, such as trees, grass, water, and impervious surfaces.
- UTC Metrics:** UTC summaries (see below) based on various geographies such the community boundary, neighborhoods, and parcels.
- Existing UTC:** The amount of urban tree canopy present when viewed from above using aerial or satellite imagery.
- Impervious Possible UTC:** Asphalt or concrete surfaces, excluding roads and buildings, that are theoretically available for the establishment of tree canopy.
- Vegetated Possible UTC:** Grass or shrub area that is theoretically available for the establishment of tree canopy.

Mapping Frederick's Trees

The original UTC assessment for Frederick, based on MD DNR's 2002 Strategic Urban Forest Assessment (SUFA) land cover dataset (Figure 3a), estimated that 12% of the city was covered by tree canopy. This updated study of Frederick's tree canopy employed higher resolution imagery (Figure 3b), a more accurate methodology for mapping land cover, and robust quality assurance and quality control plan. This resulted in a more accurate accounting of tree canopy, particularly with respect to smaller forest patches and individual trees (Figure 3c), increasing the Existing UTC estimate to 14%.



Figure 3: Comparison of SUFA 2002 to 2007 high-resolution imagery and land cover. The 2007 land cover is more accurate and includes more classes

Parcel & Land Use Summary

UTC metrics were calculated for each property in the city's parcel database (Figure 4). For each parcel the absolute area of Existing and Possible UTC was computed along with the percent of Existing UTC and Possible UTC (UTC area / area of the parcel).

A City-wide land use layer was used to summarize UTC by land use category (Figure 5). For each land use category UTC metrics were computed as a percentage of all land in the city (% Land), as a percent of land area by land use category (% Category) and as a percent of the area for the respective UTC type (% UTC Type) (Table 1). For example, land designated as "Residential—Moderate Density" has the most Existing UTC of any land use category. 4% of all land in the city is covered by tree canopy in this land use type, and 27% of all of the tree canopy in the city is in "Residential—Moderate Density" properties. As a percentage of land within the land use category it is "Parks and Public Open Space" category that is the leader, with 28% tree canopy compared to 20% for "Residential—Moderate Density."

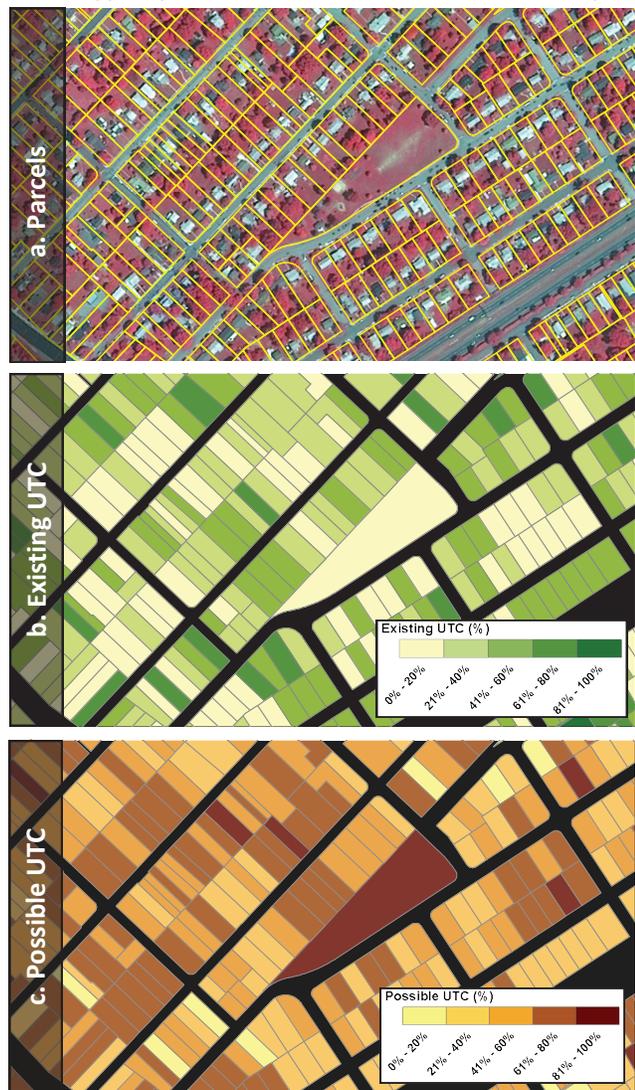


Figure 4: Parcel-based UTC metrics. UTC metrics are generated at the parcel level, allowing each property to be evaluated with respect to its Existing UTC and Possible UTC.

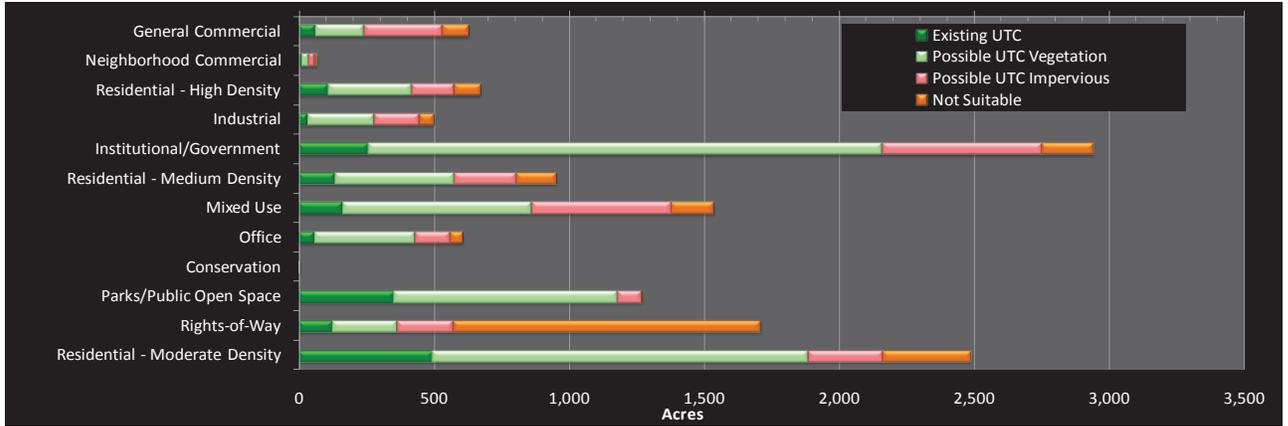


Figure 5: UTC metrics summarized by land use.

| Land Use | Existing UTC | | | Possible UTC Vegetation | | | Possible UTC Impervious | | |
|--------------------------------|--------------|------------|------------|-------------------------|------------|------------|-------------------------|------------|------------|
| | % Land | % Category | % UTC Type | % Land | % Category | % UTC Type | % Land | % Category | % UTC Type |
| General Commercial | 0% | 10% | 3% | 1% | 29% | 3% | 2% | 45% | 4% |
| Neighborhood Commercial | 0% | 17% | 1% | 0% | 38% | 0% | 0% | 33% | 0% |
| Residential - High Density | 1% | 16% | 6% | 2% | 46% | 5% | 1% | 23% | 2% |
| Industrial | 0% | 7% | 2% | 2% | 49% | 4% | 1% | 33% | 3% |
| Institutional/Government | 2% | 9% | 14% | 14% | 65% | 29% | 4% | 20% | 9% |
| Residential - Medium Density | 1% | 14% | 8% | 3% | 46% | 7% | 2% | 24% | 3% |
| Mixed Use | 1% | 11% | 9% | 5% | 45% | 11% | 4% | 34% | 8% |
| Office | 0% | 10% | 3% | 3% | 61% | 6% | 1% | 21% | 2% |
| Conservation | 0% | 18% | 0% | 0% | 72% | 0% | 0% | 9% | 0% |
| Parks/Public Open Space | 3% | 28% | 19% | 6% | 65% | 12% | 1% | 7% | 1% |
| Rights-of-Way | 1% | 7% | 7% | 2% | 14% | 4% | 2% | 12% | 3% |
| Residential - Moderate Density | 4% | 20% | 27% | 10% | 56% | 21% | 2% | 11% | 4% |

Table 1: UTC metrics by type, summarized by land use. For each land use category UTC metrics were computed as a percent of land in the city (% Land), as a percent of land area by land use category (% Category) and as a percent of the area for the UTC type (% UTC Type).

% Land = $\frac{\text{Area of UTC type for specified land use}}{\text{Area of all land}}$

The % Land Area value of **4%** indicates that 4% of Frederick's land area is tree canopy in areas where the land use is "Residential - Moderate Density."

% Category = $\frac{\text{Area of UTC type for specified land use}}{\text{Area of all land for specified land use}}$

The % Category value of **20%** indicates that 20% of "Residential - Moderate Density" land is covered by tree canopy.

% UTC Type = $\frac{\text{Area of UTC type for specified land use}}{\text{Area of all UTC type}}$

The % UTC Type value of **27%** indicates that 27% of all Existing UTC lies in areas of "Residential - Moderate Density" land use.



Figure 6: GIS-based analysis of the parcel-based UTC metrics for decision support. In this example GIS is used to select an individual parcel. The attributes for that parcel, including the parcel-based UTC metrics, are displayed in tabular form providing instant access to relevant information.

Decision Support

The parcel-based UTC metrics were integrated into the city's existing GIS database. Decision makers can use GIS to find out specific UTC metrics for a parcel or set of parcels (Figure 6). This information can be used to estimate the amount of tree loss in a planned development or set UTC improvement goals for an individual property.

| Attribute | Value |
|--|-------------------------|
| Address | 121 North Bentz Street |
| Land Use | Parks/Public Open Space |
| NAC | 9 |
| Existing UTC | 8% |
| Possible UTC | 25% |
| Possible UTC <input type="checkbox"/> Vegetation | 9% |
| Possible UTC <input type="checkbox"/> Impervious | 16% |

Fort Detrick and City Airport Exclusion Analysis

The potential for establishing tree canopy within Fort Detrick and the airport is limited by the activities inherent to those areas. The UTC metrics for the city, with Fort Detrick and the airport excluded, were recalculated in order to gain a more practical picture of the current tree canopy and planting opportunities. As the excluded areas have relatively few trees, Existing UTC for the city increased by one percentage point in the (Figure 8). With these open lands removed from consideration as available planting areas, the Possible UTC for the city as a whole decreased by two percentage points to 67%. The prominent role of the “industrial/government” land in the UTC metrics (Figure 5) is substantially decreased (Figure 9). This revised analysis emphasizes the significance of the city’s residents, particularly those in the “residential-moderate density” land use category, in controlling the city’s tree canopy (Figure 9).

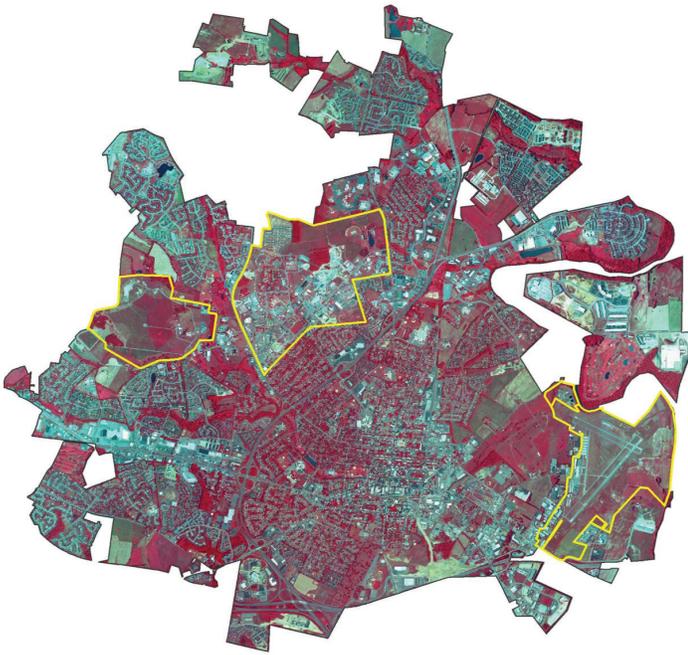


Figure 7: City of Frederick with Fort Detrick and the airport delineated.

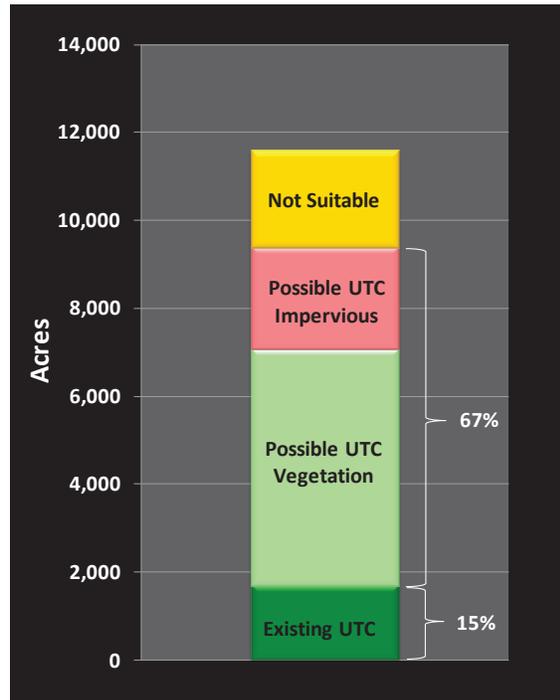


Figure 8: UTC metrics for Frederick with Fort Detrick and the City Airport excluded from analysis.

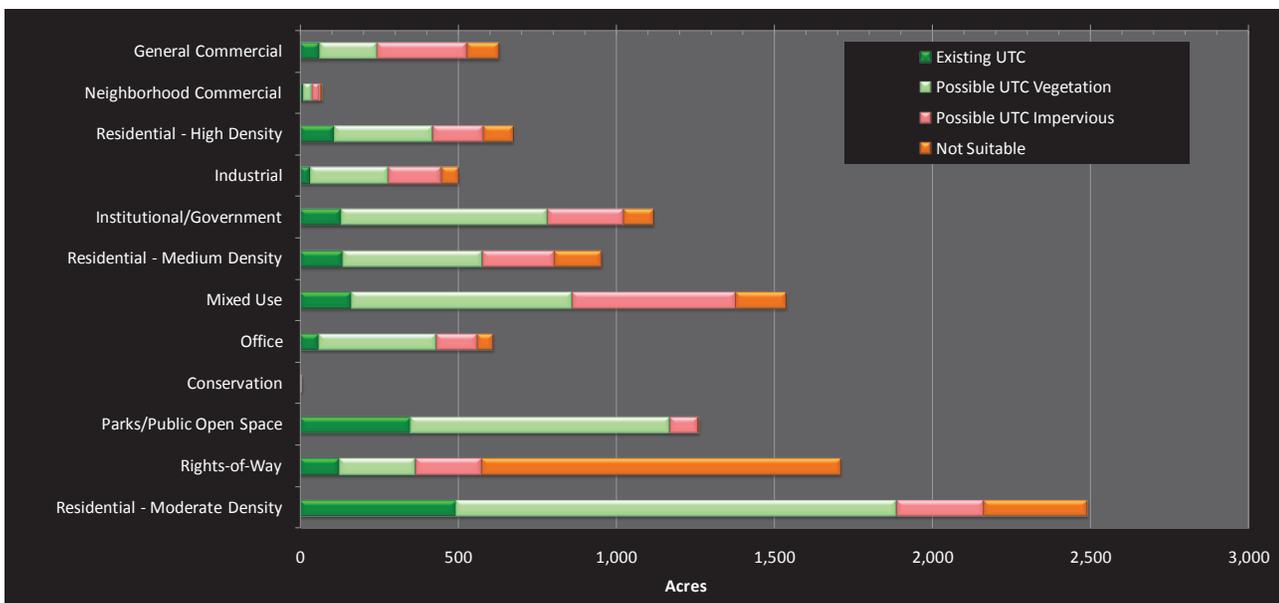


Figure 9: UTC metrics for city with Fort Detrick and City Airport excluded, summarized by land use.

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Neighborhood Advisory Councils

To better understand the distribution of tree canopy within the city, UTC metrics were generated for the twelve Neighborhood Advisory Councils (NAC). Land use and zoning clearly influence Existing UTC and Possible UTC metrics for the NACs. NACs 6 and 9, both heavily residential areas, have Existing UTC in excess of 20%, clearly above the city average. These two NACs also have the least room to plant trees in the city, with Possible UTC values under 60%. NACs 1, 2, and 3 have a high percentage of land managed by the government and institutions. As institutional and government land in Frederick contains below average tree canopy, these NACs have the lowest Existing UTC values in the city. NACs 1, 2, and 12 have the highest Possible UTC percentages, but as it will not be desirable or feasible to plant trees on playing fields and on grassy areas in and around the airfield, these values are not indicative of planting opportunities. NAC 10 has a relatively low percentage of Existing UTC, on par with NACs 1, 2, and 12, but due to the amount of land occupied by buildings and roads it does not have a corresponding high Possible UTC percentage.

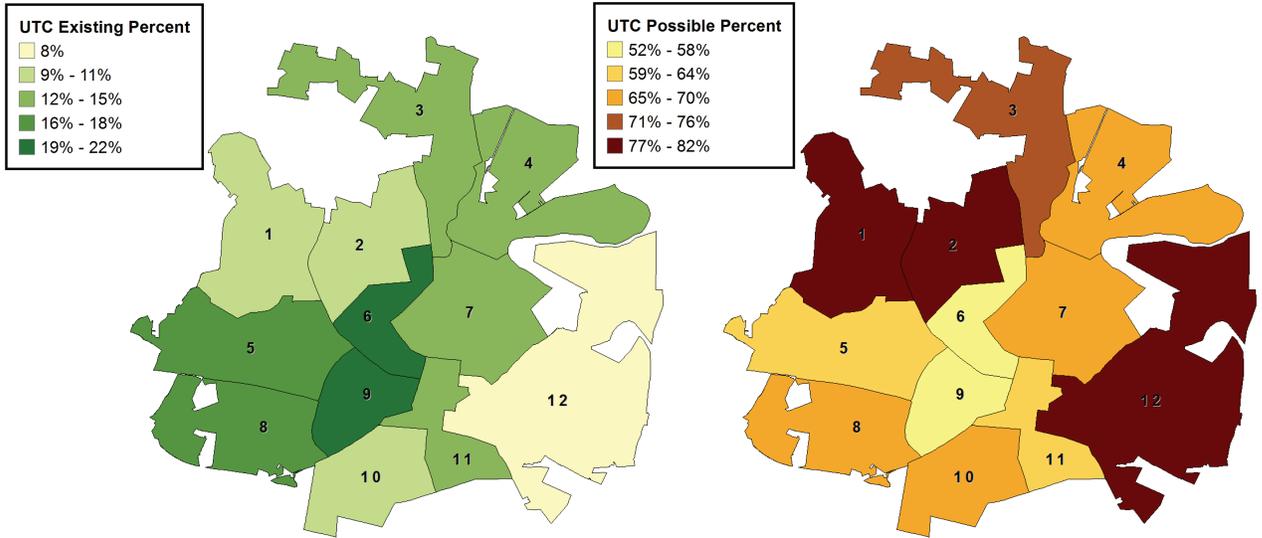


Figure 10: Existing UTC and Possible UTC for the nine NACs.

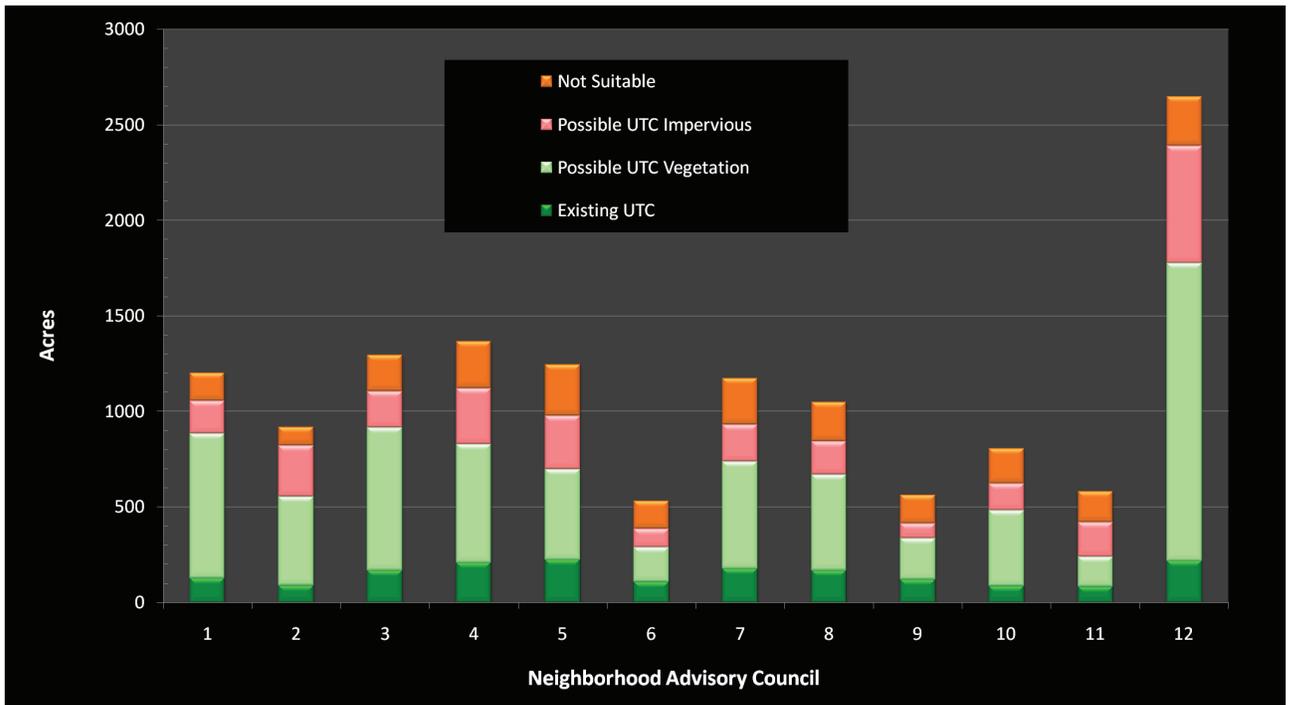


Figure 11: UTC metrics for the NACs.

10/25/2009

Conclusions

- Frederick's urban tree canopy is a vital city asset; reducing stormwater runoff, improving air quality, reducing the city's carbon footprint, enhancing quality of life, contributing to savings on energy bills, and serving as habitat for wildlife.
- This study represents the most accurate accounting of Frederick's tree canopy to date, and indicates that 14% of the city is covered by tree canopy as of 2007. Differences to the 12% estimate presented in the previous study, based on 2002 data, are most likely the result of differences in accuracy and should not be interpreted that tree canopy has increased 2%.
- Frederick should continue working toward its UTC goal. This goal should not be limited to increasing the city's overall tree canopy, it should focus on increasing tree canopy in those parcels or blocks that have the least Existing UTC and highest Possible UTC.
- With Existing UTC and Possible UTC summarized at the parcel level and integrated with the City's GIS database, individual parcels and subdivisions can be examined and targeted for UTC improvement.
- Of particular focus for UTC improvement should be parcels within the city that have large contiguous impervious surfaces, such as those in the various commercial and industrial land use categories that have disproportionately low amounts of tree canopy. These parcels contribute high amounts of runoff, degrading water quality. The establishment of tree canopy on these parcels will help to reduce runoff during periods of peak overland flow. Incentive or regulatory measures could be employed to encourage property owners to increase tree canopy on these parcels.
- By ownership type, it is Frederick's residents that control the largest percentage of the city's tree canopy (Fort Detrick and the airport excluded). Programs that educate residents on tree stewardship and incentives provided to residents that plant trees are crucial if Frederick is going to sustain its tree canopy in the long term.
- Increases in UTC will be most easily achieved on government and institutional lands. These land uses have a relatively high percentage of Possible UTC and these are lands where the City can most readily implement policy.
- Existing tree canopy is relatively low in transportation rights-of-way (1%). A "street trees" initiative could be employed to increase tree canopy in the ROW.
- Neighborhood- and zoning-level summaries could be used for targeting tree planting and preservation efforts within different regions of the City.

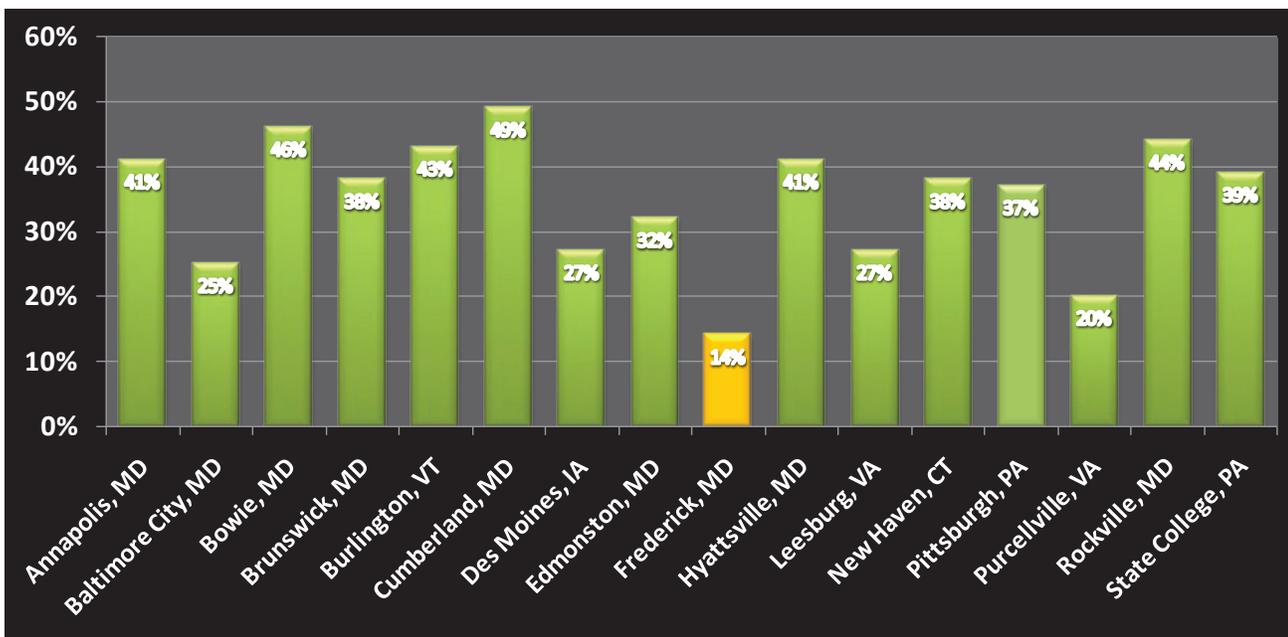


Figure 12: Comparison of Existing UTC with other selected cities that have completed UTC assessments.

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Additional Information

The study was conducted with funding from the City of Frederick and USDA Forest Service. More information on the UTC assessment project can be found at the following web site: <http://nrs.fs.fed.us/urban/utc/>



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