CITY OF VIRGINIA BEACH

URBAN FOREST MANAGEMENT PLAN

A COMPONENT OF THE COMPREHENSIVE PLAN

Virginia Beach Urban Forestry's vision is a strong urban forest that thrives through mutually beneficial partnerships and effective resource commitment which fosters sustainable development, clean air and water, economic vitality, strong neighborhoods, and the city's physical beauty.

Our mission is to enhance Virginia Beach's urban forest through education, community involvement, proactive management, and responsible stewardship.

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CONTRIBUTORS
CITY OF VIRGINIA BEACH

Parks & Recreation

Michael Kalvort, CPRE | Director

Barbara Duke | Senior Planner | Planning, Design & Development

Susan French | City Arborist | Landscape Management

Frank Fentress | Administrator | Landscape Management

Symsi Houser | Operations Coordinator | Landscape Management

Greg Newman | Planner | Planning, Design & Development

Brian Crouch | Landscape Inspector | Landscape Management

Chris Kennedy | Landscape Architect | Planning, Design & Development

Rob MacPherson | Landscape Architect | Planning, Design & Development

Chona O'Galvin | Media & Communications Coordinator | Marketing & Resource Development

Doug Cherry | Interim Administrator | Planning, Design & Development

Brian Solis | Administrator | Planning, Design & Development

Cody Matteson | Intern | Landscape Management

Paula LaRossa | Landscape Inspector | Landscape Management

Tommy Johnson | Chair | Parks & Recreation Commission

Public Works

Philip Davenport | Director | Public Works

Dempsey Bruton | Transportation Planning Engineer | Engineering - Design

Frank Hickman | Traffic Management Operations Division Administrator | Engineering

Dave Jarman | Transportation Project Management Supervisor | Engineering

Greg Johnson | Senior Project Manager | Engineering

Mark Johnson | Infrastructure Maintenance Administrtor | Operations

Mike Mundy | Water Research Program Management | Engineering

Phil Pullen | Transportation Division Manager | Engineering

Planning

Jack Whitney | Director | Planning & Community Development

Clay Bernick | Administrator | Environment & Sustainability Office

Carrie Bookholt | Landscape Architect | Development Services Center

Paul Scully | Landscape Architect | Environment & Sustainability Office

Nancy McIntyre | Coordinator | Development Services Center

Charles McKenna | Coastal Zone Inspector | Environment & Sustainability Office

Public Utilities

Thomas Leahy | Director | Public Utilities

Daren Williams | Engineer III | Operations

Virginia Beach City Public Schools

Tim Cole | Chief Sustainability Officer

Melissa Ingram | GIS Analyst

Housing and Neighborhood Preservation

Wells Freed | Administrator | Code Enforcement Division

Agriculture

Jenny McPherson | Agricultural Reserve Program Coordinator

City Attorney's Office

Adam Swann | Assistant City Attorney

Consultants

Carol Rizzio | Planner | Land Studio pc

Bill Spivey | Landscape Architect | Land Studio pc

Leah Wright | Business Manager | Land Studio pc

Technical Assistance

Barbara White | Urban & Community Forestry Partnership Coordinator | Virginia Department of Forestry

Eric Wiseman | Associate Professor | Virginia Tech Department of Forest Resources & Environmental Conservation

> People who will not sustain trees will soon live in a world which cannot sustain people.
>
> | Bryce Nelson

Executive Summary

The urban forest of Virginia Beach touches the lives of citizens everyday. It consists of every single tree in the city on both public and private property. Trees in Virginia Beach are cherished by residents for promoting strong neighborhoods and a good quality of life. The urban forest provides numerous benefits to the city and its residents, including cleaner air and water, cooler temperatures, and energy savings. With proper management, these benefits increase every year as trees continue to grow and thrive. Virginia Beach's urban forest is a vital component of the city's infrastructure, as important as efficient transportation and clean water.

The purpose of this plan is to provide the goals and objectives that will help preserve and shape Virginia Beach's urban forest in the years to come. The Urban Forest Management Plan is structured around a sustainable urban forestry model that includes understanding the vegetative resource, proactively managing it, and partnering with residents, business owners, developers and non-profit organizations to protect and enhance the city's urban forest. Each of these aspects are addressed in this Urban Forest Management Plan.

Over the last several years, the City of Virginia Beach as an organization has taken important steps to understand this vital resource. In 2008, the city's first urban tree canopy (UTC) data was obtained. Assessment of that data forms the foundation of this plan and its recommendations. The City Arborist along with other staff members from the Parks & Recreation Department led the development of this plan with input from numerous internal and external stakeholders.

The current UTC of Virginia Beach is 36%. American Forests, the oldest national nonprofit conservation organization in the country, recommends a minimum canopy cover of 40% for cities in the mid-Atlantic region of the United States. Envision 2040, a community-developed plan endorsed by City Council, includes a vision of 50% UTC for the city by 2040. Based on those recommendations and careful analysis of the city's UTC data, this Plan sets an aggressive, but achievable, intermediate goal of 45% UTC within 20 years.

In order to reach this goal, the City will need a multifaceted approach that includes recognition of trees as vital infrastructure components to help address numerous environmental, social and economic challenges of the future. Planting and preserving trees is recognized as an effective low-cost strategy to meet new and more stringent state and federal stormwater management requirements in the Chesapeake Bay Watershed and other watersheds across the city. Publicly-owned lands, on which the City of Virginia Beach has complete control, only make up a small portion of the city's land area. Much of Virginia Beach's urban tree canopy is on private property, with residential property owners holding the largest percentage of the city's UTC (42%). Educating residents about the services the urban forest provides is an important part of ensuring a sustainable forest. The City will also need to engage business owners and commercial land owners. Older commercial areas in the city present a tremendous opportunity. As these areas re-develop,

there will be opportunities to increase the urban tree canopy with careful planning. Trees should be an important component of all newly developed and redeveloped areas. It is also equally important to give special consideration to preserving existing trees and incorporating space for them.

Current funding for the urban forest primarily includes staff salaries and hazardous tree abatement. Minimal funding is available for proactive maintenance, tree replacements or new tree plantings. This lack of early maintenance and new tree plantings is not sustainable and leads to expensive pruning costs and removal of unhealthy mature trees without replacements. This Plan offers the framework needed for a comprehensive proactive urban forest management program that will require a committed effort on the part of City Council, city departments, developers and city residents. While managing the urban forest does not come without costs, the benefits far outweigh the expense. Virginia Beach's urban forest provides ecological services valued at $256 million dollars annually.

The Urban Forest Management Plan should be seen as a living and working document. It should be reviewed and updated at least every five years. Strategic annual workplans and regular updates that are based on the goals of this Plan and that respond to the changes in our urban forest will play an important role in Virginia Beach remaining "A Community for a Lifetime."

Purpose of the Urban Forest Management Plan

The purpose of the Urban Forest Management Plan is to guide a broad range of actions that will sustain a healthy and vibrant urban forest in Virginia Beach. This plan looks over a 20-year horizon and recommends specific steps the city should take to protect and enhance the cherished environment that trees help create.

The Urban Forest Management Plan provides the analysis, evaluation, and strategies to introduce and communicate to the public the numerous benefits the urban forest provides in meeting the many environmental and social challenges communities face. The Plan is structured around a sustainable urban forestry model that includes understanding the vegetative resource, pro-actively managing it, and partnering with residents, business owners, developers and non-profit organizations to protect and enhance the city's urban forest. Each of these aspects are addressed in this Urban Forest Management Plan.

> To exist as a nation, to prosper as a state, and to live as a people, we must have trees.
>
> | Theodore Roosevelt

Introduction

Urban forestry is the management of trees in urban community ecosystems for the environmental, economic, social, health, and aesthetic benefits trees provide society. Many citizens see trees as an important measure of the quality of their communities. Researchers are quantifying the services provided by trees and confirming their value as vital green infrastructure. Internationally, there is a growing body of research that supports the importance of maintaining healthy, sustainable urban forests. Unlike conventional or "grey" infrastructure, which begins to deteriorate and depreciate the moment it is installed, the value of a properly planted and maintained tree actually increases over its functional lifespan.

Virginia Beach has many unique qualities, and residents value the livability of the community. The community draws a wide range of livability attributes, such as clean water and air and beautiful neighborhoods and parks, from trees. A healthy urban forest is as crucial a component of Virginia Beach's infrastructure as is efficient transportation. Proper tree care and sound forest management programs are essential to the health, longevity, and sustainability of our urban forests. Urban forest management is a wise investment in our future.

Background

Both internal and external stakeholders have been involved in the development of the Urban Forest Management Plan. Early in the process, representatives from each City department that affects the urban forest met monthly for six months. During those meetings the state of the city's urban forest, the benefits it provides, interdepartmental coordination, and goals/objectives for this Plan were all discussed. Those discussions form the basis of this Plan.

External stakeholders were involved through two public meetings, one focusing on the city's northern watersheds and the other concentrating on southern watersheds. Information related to the city's urban forest and how it is managed was presented to our valued citizens. Feedback was obtained through questionnaires provided at the meeting and posted on Virtual Town Hall, the city's online forum for civic engagement. A summary of the results of public input can be found in Appendix C.

Benefits of Trees

Traditional economic analysis sets the value of nature's benefits, including tree cover, at zero. Due to recent strides in technology and research, the monetary worth of the benefits related to trees can now be quantified and added to economic and land use analysis to allow for more comprehensive decisions. Individuals must understand that all trees in the urban environment, whether in a parking lot, backyard or a neighborhood park, perform numerous important ecological services. Healthy trees provide a multitude of benefits in addition to having a positive impact on our quality of life. Healthy trees should be valued as important infrastructure investments that can help Virginia Beach meet the environmental, social and economic challenges of the future in many ways. Some of the many benefits of trees are described in the following pages.

Clean Drinking Water

Advancements in science and technology have allowed effective treatment of most known contaminants in drinking water sources. This has allowed many communities to neglect policies that protect source water and instead rely on water treatment systems for clean drinking water. Costly upgrades of these systems are often required to handle new standards and threats. A movement reverting back to protecting the source water is a cost effective and sustainable practice, and trees play an important role in that effort.

- The Trust for Public Land and the American Water Works Association conducted a study in 2002 of 27 water suppliers which showed that treatment costs for drinking water increases when the amount of forestland and wetlands declines. Approximately 50% of the variation in operating treatment costs could be explained by the percentage of forest cover in the drinking water source area alone.

- Cities such as New York and Boston provide quality water with minimal treatment through assertive forest protection programs.

- The more water sources are affected by impervious surfaces, production agriculture and other intensive land uses, the harder and costlier it is to filter or treat drinking water.

Energy Conservation and Lower Energy Bills

Trees cool air temperature and help offset the "heat island" effect of hardscapes by providing shade and by transpiration (the release of water vapor into the air). Water from roots is drawn up to the leaves where it evaporates. A single large tree can transpire over 100 gallons of water into the atmosphere each day. The conversion from water to gas absorbs huge amounts of heat, cooling hot city air.

Large deciduous trees planted on the east, west, and southwest side of buildings reduce summer air conditioning costs and evergreen trees on the north side of buildings block cold winter winds.

- Cities are 5 to 9 degrees warmer than rural areas and 3% to 8% of summer electric use goes to compensate for this urban "heat island" effect.

- Average households can save $250 each year in energy bills with strategically planted trees.

Improve Air Quality

Air pollution in cities harms human cardiovascular and respiratory systems with broad consequences for healthcare costs and productivity. Air quality measurements, initiatives and policies in Hampton Roads are typically considered at the regional level. Virginia Beach most frequently rates as "Good-Moderate" on the Air Quality Index (AQI). In 2008, the City of Virginia Beach and Virginia Beach Schools took the bold initiative to adopt a "no-idle" policy for most owned or leased motor vehicle and equipment. This action is intended to reduce carbon monoxide emissions, a major air pollutant.

Swimmable and Fishable Lakes and Rivers

Trees play a vital role in sustaining good water quality that allows us to continue swimming and fishing in our waterways. Tree crowns intercept rainfall, thereby reducing the amount of runoff. Tree roots make the ground more porous. As a result, water runoff from storms can be more readily absorbed by soils and nutrient loads reduced from lakes and rivers.

Despite years of efforts to reduce nutrient loads in the Chesapeake Bay, the watershed is still challenged with detrimental pollutants and more stringent regulations are imminent. Stormwater management through green infrastructure, such as the planting of trees, is an economical part of the solution.

- Healthy, vegetated stream buffers reduce total suspended solids, phosphorus, nitrogen and heavy metal transfer between urban areas and streams by 55% to 99%.

- Trees help prevent soil erosion and sedimentation on stream banks by slowing runoff and holding soil in place.

- Leafy tree canopies catch precipitation before it reaches the ground, allowing some of it to gently drip and the rest to evaporate. This lessens the force of storms and reduces runoff and erosion.

- Research indicates that 100 mature tree crowns intercept about 100,000 gallons of rainfall per year, reducing runoff and providing cleaner water.

A healthy urban forest can further mitigate air pollutants. Trees produce oxygen, absorb odors and polluting gases (nitrogen oxides, ammonia, sulfur dioxide and ozone) and filter particulates out of the air, enhancing a community's respiratory health.

Improve Emotional and Physical Health

Neighborhoods and homes that are barren of trees have been shown to have a greater incidence of violence both inside and outside of the home than their greener counterparts. Trees and landscaping help to reduce the level of fear, stress, fatigue, and aggression in humans, and and help to increase social ties.

Additionally, several studies have shown that patients with views of trees from their windows heal faster and with less complications. A widely reported 1984 medical paper written by Roger Ulrich concluded that viewing a natural setting through a window during surgery recovery contributed to shorter hospital stays and reduced use of pain medicine compared to patients with a view of a blank wall.

Sustain and Stimulate Vibrant Commercial Areas

Communities and business districts with healthy tree cover attract new residents, industry, and commercial activity. They stimulate retail and commercial business districts by attracting shoppers. Tree-lined streets slow traffic and promote pedestrian activity, encouraging patronage of more than one store. The establishment of more trees in commercial areas would help to enhance resident and visitor experiences.

- Trees enhance economic stability by attracting businesses; people linger and shop longer when trees are present in retail centers.

- Where a canopy of trees exists, apartments and offices rent more quickly and have a higher occupancy rate; businesses report more employee productivity and less absenteeism.

Increase Property Values

According to Arbor National Mortgage & American Forests, 83% of realtors believe that mature trees have a 'strong or moderate impact' on the salability of homes listed for $150,000; this perception increases to 98% on homes over $250,000.

- Homes landscaped with trees sell more quickly and are worth 5% to 15% more than homes without trees. Homes may be worth 25% more where the entire street is tree-lined.

- In 2011, the Trust for Public Land prepared a report entitled "The Economic Benefits of the Park and Recreation System of Virginia Beach, Virginia." The report established that the value of residential properties within 500 feet of a park, especially a natural resource park with trees, is increased by 3.26%, averaging an additional $9,246 in sales price per home.

Provide Food and Shelter for Wildlife

Trees provide important food and shelter habitats for numerous bird, insect and animal species. Native trees are best adapted to the environment and provide the most benefits to wildlife. The North Landing River corridor has been identified as having the greatest ecological diversity in Virginia east of the Blue Ridge Mountains. It provides habitat to many rare plant and animal species. Preserving individual trees as well as contiguous forested areas that serve as wildlife corridors (such as those along the North Landing River) are important in maintaining a healthy and diverse wildlife population.

Proper Shade Tree Placement

Trees properly placed around buildings can reduce air conditioning needs by 30 percent and can save 20% to 50% in energy used for heating.

| U.S. Forest Service

Shade east and west windows, but prune lower branches to prevent blocking the view

Plant shade trees over patios, driveways, and air conditioning units

N

Plant on the west and southwest to provide mid-to-late afternoon shade in most locations
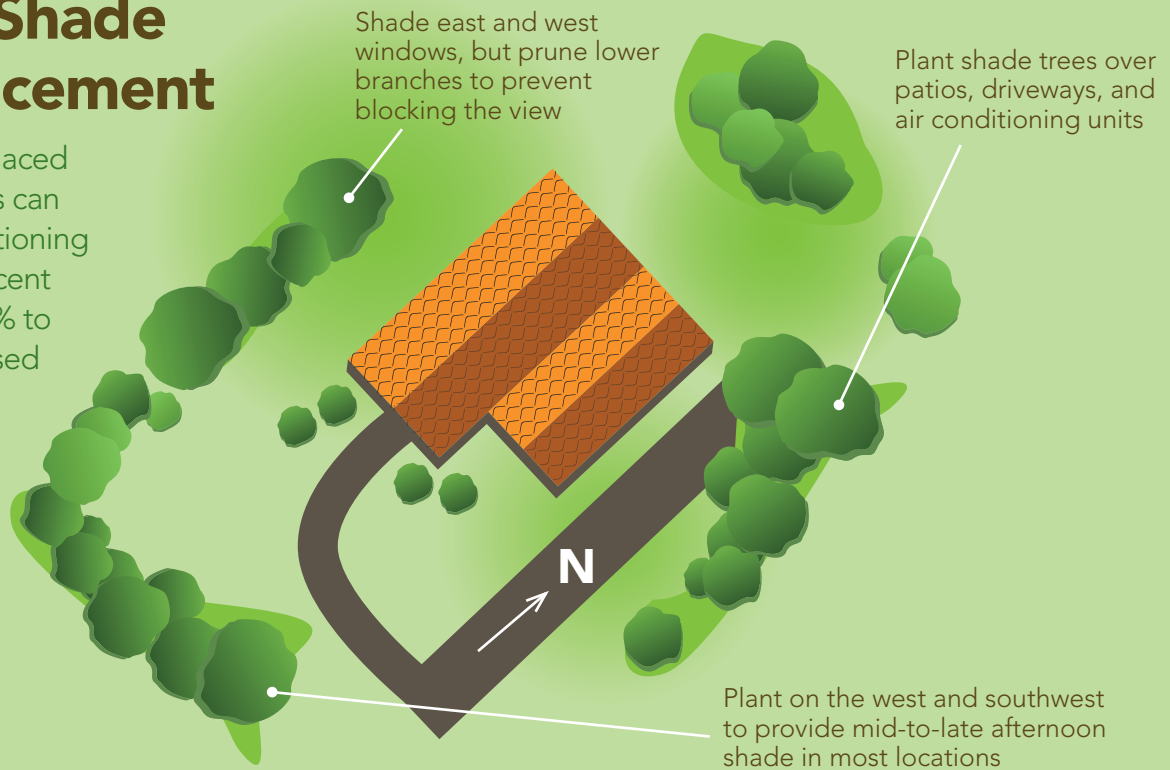
Mitigate Climate Change

There is a growing concern about increasing levels of carbon dioxide and other greenhouse gases contributing to climate change. By the year 2100, the average surface temperature is expected to rise between 1° and 4.5°F, and sea level is projected to rise between 1.5' and 5.5'. Forests are a critical component to mitigating climate change because they store carbon. Carbon dioxide (CO_2) is a major greenhouse gas. Trees absorb CO_2 and release oxygen back into the air.

- In one year, an acre of mature trees absorbs the amount of CO_2 produced when you drive your car 26,000 miles and can provide enough oxygen for 18 people.

Reduce Noise Pollution

Trees reduce noise pollution as much as 40% by absorbing sounds. A grove of trees 98 feet wide and 49 feet tall can reduce highway noise by six to 10 decibels.

The net cooling effect of a young, healthy tree is equivalent to 10 room-size air conditioners operating 20 hours a day.

| U.S. Department of Agriculture

> Urban trees and forests are considered integral to the sustainability of cities as a whole. Yet, sustainable urban forests are not born, they are made. They do not arise at random, but result from a community-wide commitment to their creation and management.
>
> | Clark et al.: Urban Forest Sustainability

Scope of the Plan

This Plan is modeled after the nationally recognized *Model for Urban Forest Management Planning* by Clark, J.R., Matheny, N.P, Cross, G., and V. Wake. Their definition for a sustainable urban forest is, "the naturally occurring and planted trees in cities which are managed to provide the inhabitants with a continuing level of economic, social, environmental and ecological benefits today and into the future." This definition requires acceptance of the following three ideas:

- **City trees provide a wide range of net benefits.**

- **The regeneration of urban forests requires intervention and management by humans.**

- **Sustainable urban forests are possible within defined urban areas and are composed of all trees in the community, regardless of ownership.**

From those principles, a model of urban forest sustainability is developed. The model requires addressing the following three components simultaneously:

1. **Stable Vegetative Resource**: the trees themselves, as individuals or in forest stands.

2. **Appropriate Management of the Tree Resource:** the policy, planning and resources including staff, funding and tools.

3. **Strong Community Framework:** the way residents and other stakeholders are engaged in planning and caring for trees. Because most trees in the urban forest are on private property,

a successful program requires that citizens plant and maintain trees on their property.

These three components are threaded throughout this Plan as we discuss the status of the urban forest today and our goals and recommendations for the future. This Plan should be considered a working document in which the recommended strategies should be annually reviewed, and work programs should then be developed for the following year. The entire Plan should be reviewed and updated every five years to address changes in urban forest conditions and management.

The recommendations in this Plan are made using the best information currently available. They also highlight the need for additional and continuous city-wide assessments of the tree resource to provide context for strategic management direction. Urban forests are complex living resources that interact with the surrounding environment. Community leaders, forest managers and residents must have a sound understanding of the urban forest resource and how it changes over time in order to fully realize all the benefits trees have to offer.

Purpose

The purpose of the Urban Forest Management Plan is to guide a broad range of actions that will achieve a sustainable urban forest in Virginia Beach well into the future. A sustainable urban forest includes an abundance of trees with an expansive, integrated and connected

tree canopy. This Plan provides an overview of the state of the urban forest as it is currently understood, establishes a clear set of priorities and objectives based on the data collected to date, and identifies the highest priority implementation items.

The creation of this Plan not only lays the framework for sustainable urban forest management in Virginia Beach, it indicates a high level of commitment to protecting trees and sharing knowledge about the important environmental, economic and social roles trees play in building healthy sustainable communities. The benefits of trees can be maximized when both professional management resources and an educated public coexist.

Relationship to Other Planning Documents

It is common practice for local governments to work to improve the quality of life for community residents by improving housing, transportation, and business opportunities. Urban forests are also an integral indicator of a community's well-being. To experience all the benefits of a healthy urban forest, urban forestry principles must be integrated into other planning initiatives and documents. The results of an effectively managed urban forest naturally support many other common community objectives.

There are several long range city planning documents that will directly affect the future of the city's urban forest. It is important to align the objectives and strategies in this Plan with these documents. This will ensure that the city's urban forest and the benefits it provides become an important consideration at all levels of community planning. All plans should consider public and private trees as part of the urban forest and its ecosystem.

Community Planning Document Purpose of the Plan	Relationship to the Urban Forest
Comprehensive Plan Comprehensive guide for Virginia Beach to reach its vision of "A Community for a Lifetime"	A sustainable urban forest will help the city reach its vision. The Urban Forest Management Plan is an integral component of the city's Comprehensive Plan.
Envision Virginia Beach 2040 Community vision for the city to achieve by 2040	The Envision 2040 report recommends that tree canopy be increased to 50% of the city's landmass. The city's current urban tree canopy is 36%.
Sustainability Plan To provide the road map for the City to a sustainable future	A healthy tree canopy is an important infrastructure element in achieving a sustainable city. The Sustainability Plan recommends expanding the urban forest to improve air quality.
City Stormwater Management Regulations To comply with the federal Clean Water Act, localities in the Chesapeake Bay watershed must develop and implement a "pollution diet" for the Bay and its tidal waters known as a Total Maximum Daily Load (TMDL)	Tree planting and preservation is an efficient, cost effective way to reduce water pollution.
Strategic Growth Area Plans Strategic Growth Areas (SGAs) have been identified to guide future growth	Trees will increase real estate values and enhance livability as SGAs develop into dense urban areas. Planning for sufficient tree cover in SGAs should be proactive.
Outdoors Plan To guide the city's open space acquisition program and outdoor recreational improvements	The urban forest is an important consideration both in the management of existing park facilities and in the development of new facilities.

> Trees are the best monuments that a man can erect to his own memory. They speak his praises without flattery, and they are blessings to children yet unborn.
>
> | Lord Orrery, 1749

Assessment

A comprehensive urban forest management plan must begin with a thorough understanding of the urban forest itself. This is accomplished through research, inventory and analysis. Through this process, the current extent and condition of the urban forest is better understood, and both challenges and opportunities for future resource management are identified. The following three key elements of the sustainability model provide the framework for this assessment.

• Assessment - understanding of the vegetative resource
• Management - how the urban forest is sustained over time
• Collaboration - how all members of the community are engaged in protecting and enhancing the urban forest

This chapter presents our current understanding of the city's urban forest. It starts with a contextual understanding of the environment within which the forest has evolved. The last section of the chapter presents an analysis of the urban forest as a whole and also analyzes individual planning areas and land use categories.

Context

The historical pattern of development, along with community and environmental characteristics, have and will continue to shape Virginia Beach's urban forest. These elements as they relate to the urban forest are discussed on the following pages.

Community

Virginia Beach is located where the Chesapeake Bay meets the Atlantic Ocean. Native Americans occupied this area for at least 1,500 years. By 1635, early settlements occurred along the Elizabeth, Lynnhaven and North Landing Rivers. Princess Anne County was established in 1691. Through the early 1900s, the area was dominated by rural farmlands and tree-lined waterways and wetlands. At the end of World War II, Princess Anne County's rural past was being replaced with a sprawling suburban city. In 1963, Princess Anne County became the City of Virginia Beach, taking on the better known name of its oceanfront town. By 1975, urban and suburban development dominated the northern portion of the city. Tree-lined waterway and wetland corridors were minimized. Roadways, parking lots and buildings replaced agricultural fields in the northern section of the city.

In 1979, the City of Virginia Beach established a Green Line, an urban-growth boundary, to concentrate development to the north part of the city and to protect its agricultural land to the south. The Transition Area, just south of the Green Line, will ultimately be developed with low density residential and non-residential uses.

Today, the City of Virginia Beach is a large, maturing and highly diverse municipality that includes the entire range of urban, suburban and rural areas. The city has approximately 447,000 residents and 307 square miles of land and water that lie within three primary watersheds (Chesapeake Bay, Southern Rivers and Atlantic Ocean). Inland waterways cover roughly 59 square miles of the city and are comprised of water, marshes and wetlands that stretch along hundreds of miles of shoreline. Much of the urban forest is located within its diverse residential neighborhoods, two national wildlife refuges, state parks, 265 city parks, along inland waterways and in rural areas. Surprisingly, despite the diversity of the northern, southern and transition areas, their overall urban tree canopy coverages are very similar.

Growth Projections

There is estimated to be a 20% increase in Virginia Beach population by the year 2040. As the city remains committed to preserving its rural southern areas, much of this growth will need to occur in the northern portion of the city. The city has established several Strategic Growth Areas (SGAs) to capture that growth. Urban forest management needs to address the varying challenges such diverse land uses present.

Environment

Sea Level Rise

Historically, healthy green infrastructure corridors along Virginia Beach's many waterways have been significantly reduced in width due to shoreline development. The Hampton Roads Planning District Commission completed a study in 2012 that estimates a range of 1.5 feet to 5.5 feet of sea level rise over the next 90 years (*Climate Change in Hampton Roads, Phase III Sea Level Rise in Hampton Roads, VA*). Because of our relatively flat topography, a large portion of the remaining tree cover along the city's waterways is in jeopardy. Rising sea levels will lead to the inundation of wetlands, drowning wetland vegetation. In order to prevent permanent loss of wetlands, upland areas must remain open for wetlands to migrate and change. The beneficial tree cover provided by forested swamps will be lost if trees are unable to migrate inland. As the trees die, the area will become tidal grass-dominated wetlands. Below are discussions related to specific strategies that can be utilized to reduce the impact of sea level rise in two Virginia Beach watersheds.

North Landing River Watershed - Shifting Habitats

The southern watersheds of Virginia Beach are considered to have the highest concentration of rare species east of the Blue Ridge Mountains. Many bird species use the area as a temporary stopping point as they migrate along the Atlantic Flyway. Adaptation is an appropriate strategy to use to cope with the effects of sea level rise on the urban forest within the North Landing River watershed. When identifying conservation

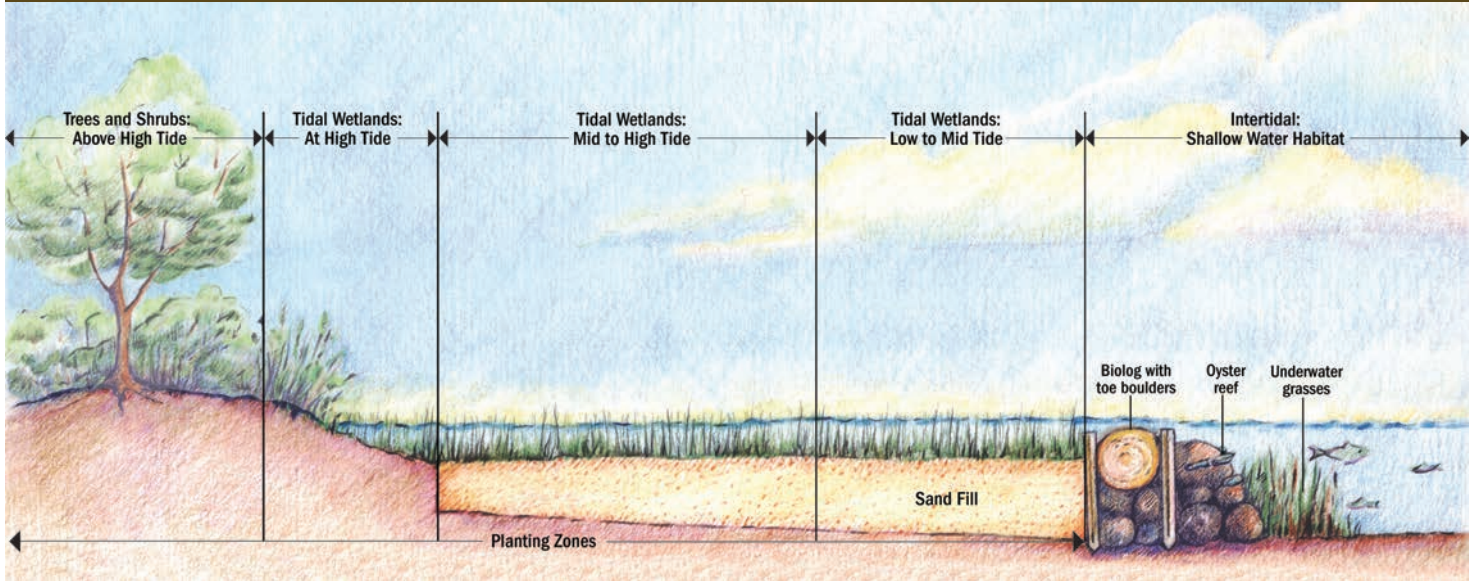## Chesapeake Bay Foundation Living Shoreline Model

Illustration credit: Terry Coker Petersen

lands, forest restoration or tree planting sites, it is important to consider areas that will not be impacted by sea level rise so that habitats can be reestablished and ensure that the rare and diverse species found in Virginia Beach can continue to flourish.

Lynnhaven River Watershed - Living Shorelines

Encouraging more widespread use of Living Shorelines as an alternative to hardening the shoreline when developing or redeveloping waterfront property will help to protect and increase urban forest assets throughout the Lynnhaven River watershed. Planting trees as part of a Living Shoreline helps to protect shorelines from erosion, filters pollutants and provides critical habitat for wildlife. Blue-Green corridors can be formed by linking Living Shorelines to each other. Living Shorelines are better able to accommodate inland-migrating wetlands than other hard stabilization methods.

Forest Fragmentation

Forest fragmentation occurs when forests are cut down in a manner that leaves only small isolated patches of forest standing. The intervening matrix that separates the remaining woodland patches can be natural open areas, farmland or developed areas. Remnant woodlands act like islands of forest in a sea of pastures, fields, subdivisions, shopping malls, etc. resulting in loss of habitat value. There can also be a loss of efficient flood storage when wooded areas within large flat floodplains are fragmented. The ordinances adopted by the City to protect the Chesapeake Bay buffer areas as well as the Southern Watershed buffer areas have helped to keep forests that are valuable for habitat and floodplain storage intact. Expansion of the remaining intact forests is desired.

Extreme Weather

According to the National Weather Center Weather Prediction Service, a tropical storm, or its remnants, can be expected to impact the area almost every year. On average, hurricanes impact the area once every 2.3 years. The best defense to extreme weather is healthy trees. While this does not eliminate downed trees and branch failures, it can make it less common. Research is being conducted in some states to determine why certain trees fall and others do not to better understand the factors that lead to tree failure. That research will provide valuable information related to planting and maintaining urban trees in cities like Virginia Beach.

History

State assessments and aerial photography indicate that the overall amount of undisturbed tree cover has diminished significantly statewide, occurring at varying rates for individual localities. Undoubtably, Virginia Beach has experienced that same decline. The city's first comprehensive tree canopy cover assessment was completed in 2008. The next assessment is planned for 2014. Comparison of those two data sets will provide insight as to where current losses and gains in canopy cover are occurring.

Since canopy cover data is not available for the city prior to 2008, historical aerials from 1937 were compared to 2007 aerials to assess canopy cover changes over the last 75 years. The areas highlighted in the following images exemplify the primary trends that can be identified.

Area 1 - Hilltop - Laskin Road
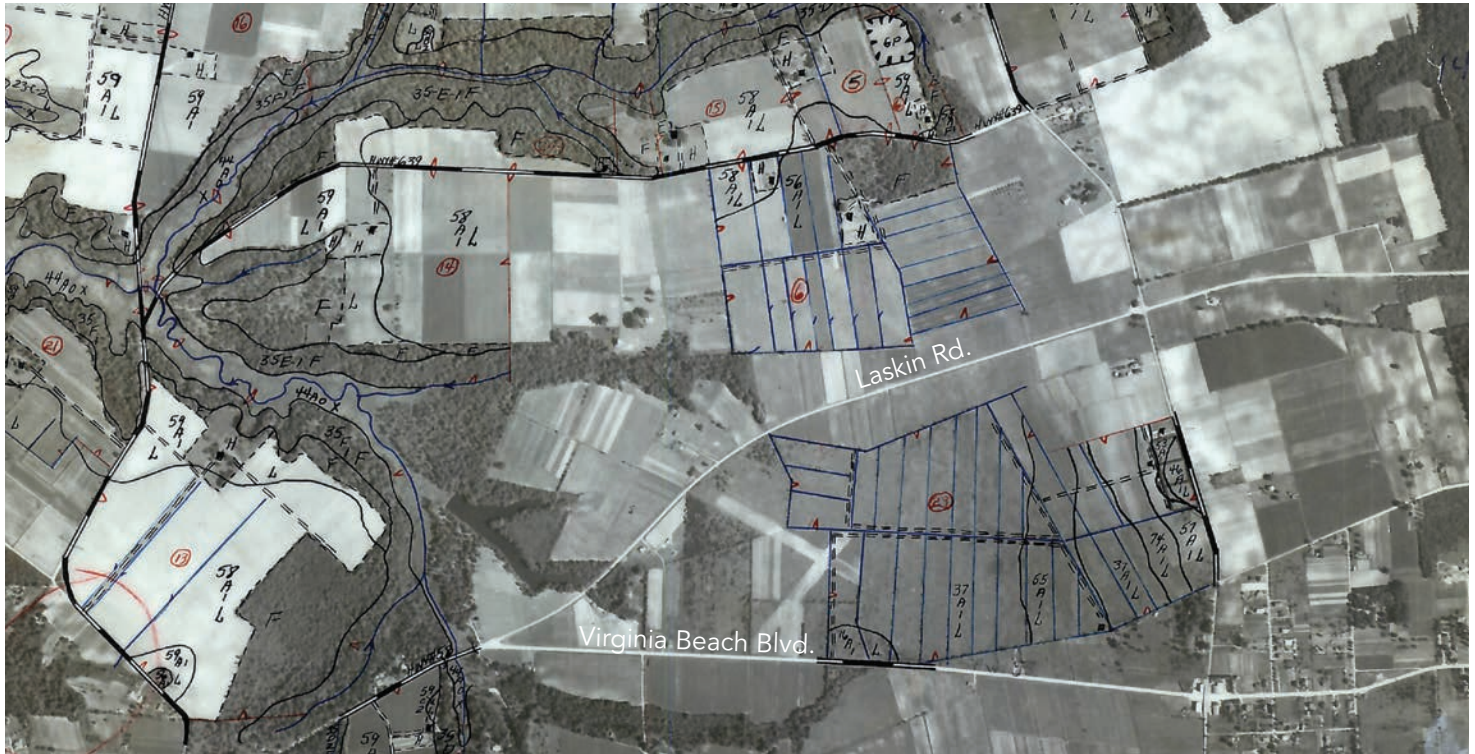
1937 - Area is dominated by agriculture areas and forested lands.
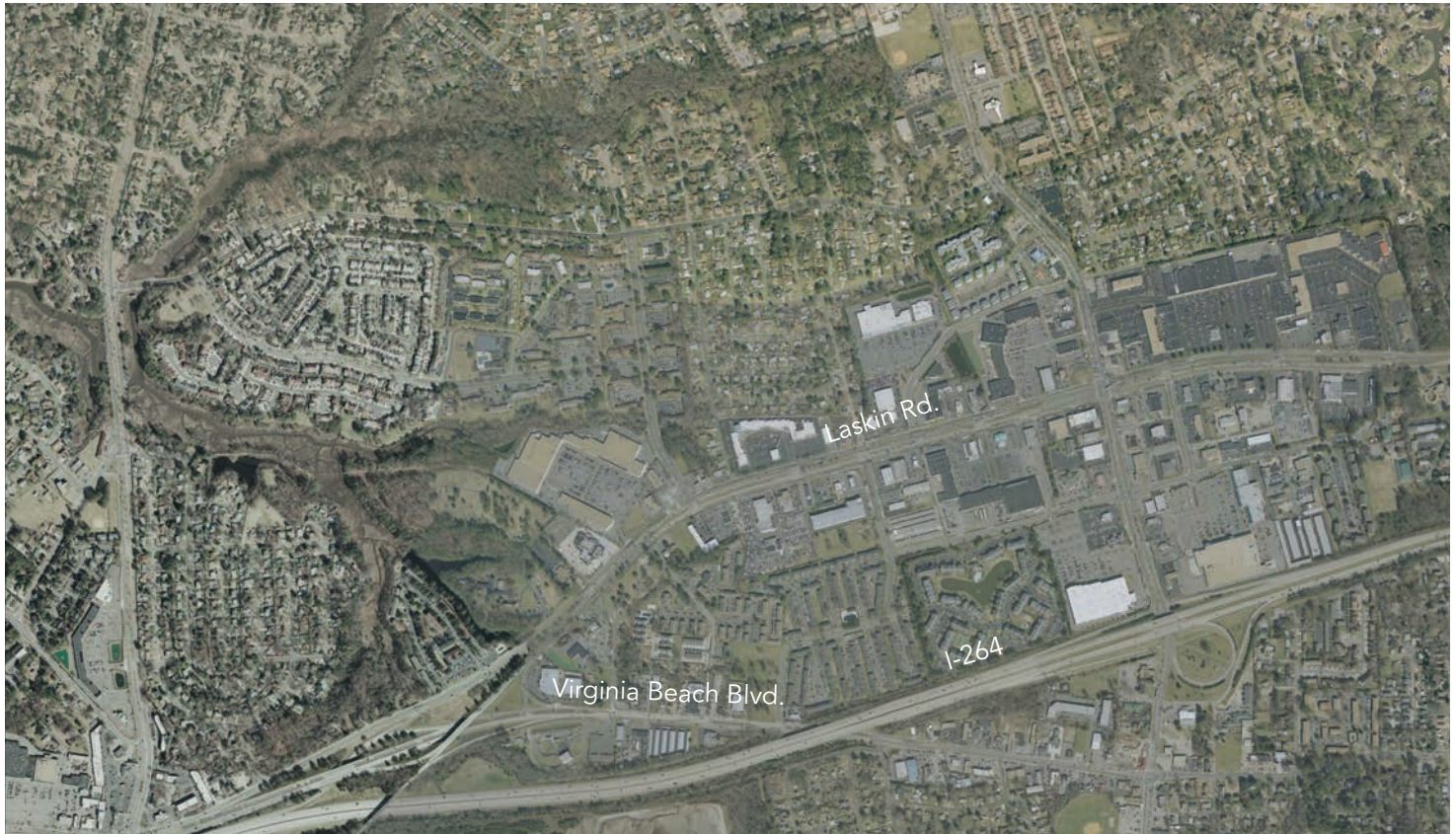
2007 - Continuing urban development/redevelopment removed remaining forested areas and shrinks vegetated buffers along waterways even more.

Area 2 - Oceanfront - Bay Colony

1937 - Area is dominated by open fields, forested areas, and coastal habitats along the oceanfront - light residential development is along the coast.

2007 - Residential development expands and while the forested areas lost tree cover, the open fields and areas along the coast increased in tree cover.

Area 3 - South of the Green Line - Municipal Center Area

1937 - Area is dominated by agricultural and forested areas - a small township is located at a crossroads.

2007 - Residential and commercial development occurs along road corridors first and then expands into forested and agricultural areas.

3.0M TREES IN VIRGINIA BEACH
PROVIDE **$256.9M** IN SAVINGS & BENEFITS EACH YEAR

AIR QUALITY IMPROVEMENT **$21.0M** IN BENEFITS PER YEAR

ENERGY **$33.8M** IN SAVINGS PER YEAR

STORMWATER RUNOFF REDUCTION **$83.9M** IN BENEFITS PER YEAR

PROPERTY VALUE **$109.5M** INCREASE PER YEAR

CO_2 REDUCTION **$8.7M** IN BENEFITS PER YEAR

Total Annual Economic Benefits
Virginia Beach Urban Tree Canopy

With approximately 3 million trees estimated to exist in Virginia Beach, the encompassing urban tree canopy inherently contributes to economic savings and environmental benefits for residents.

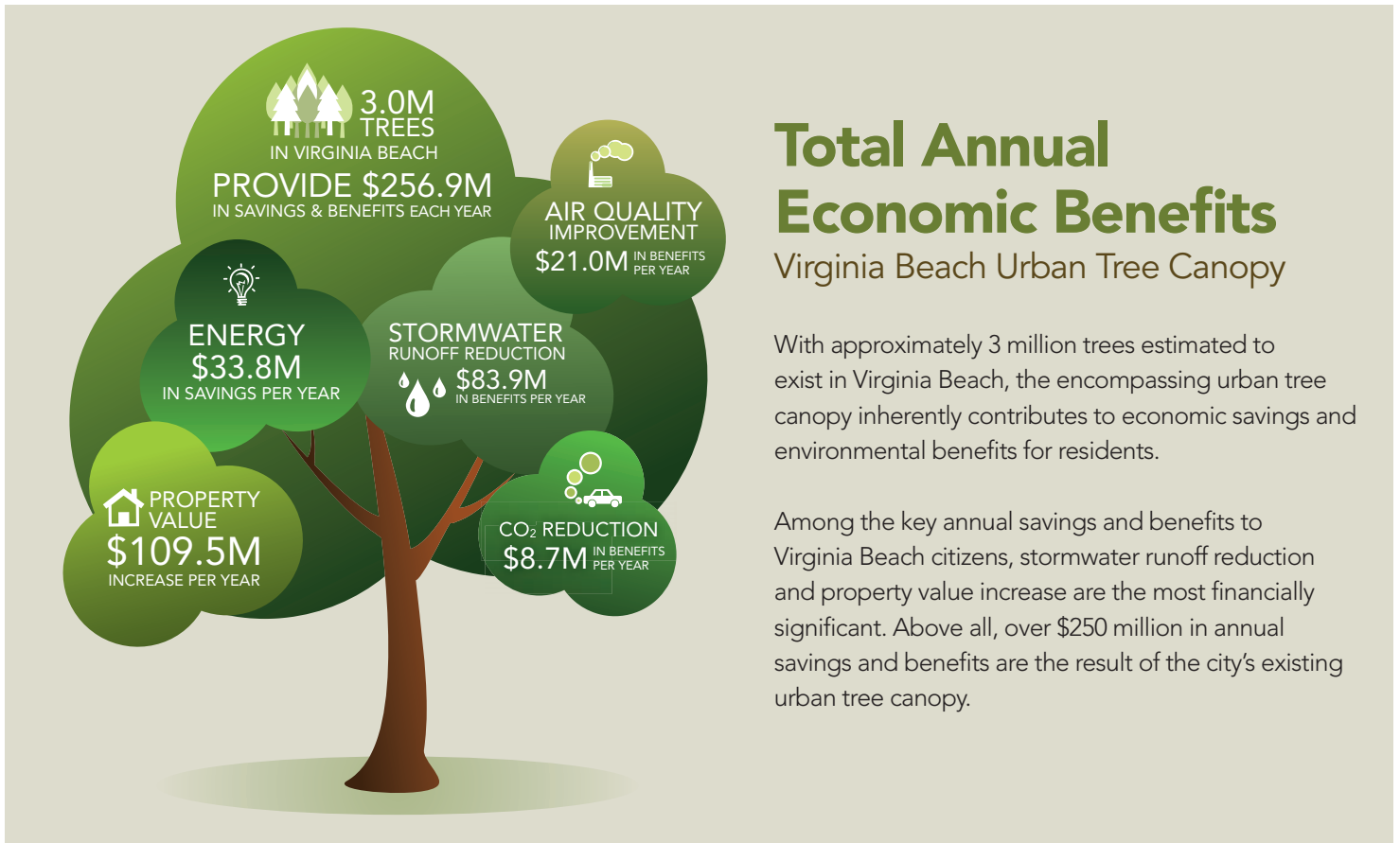Among the key annual savings and benefits to Virginia Beach citizens, stormwater runoff reduction and property value increase are the most financially significant. Above all, over $250 million in annual savings and benefits are the result of the city's existing urban tree canopy.

The primary tree canopy trends that can be identified include:

Tree Canopy Losses Primarily Due to:
- Residential and commercial development activities - as development grows forested areas and riparian buffers shrink.

Tree Canopy Gains Primarily Due to:
- The conversion of farm fields to residential lots with tree plantings.
- The conversion of a beach front sand dune environment along the oceanfront to residential neighborhoods.

This analysis suggests an overall decrease in canopy cover over the past 75 years due to extensive residential and urban development, despite gains due to changes in land uses in certain areas.

Assessment and Analysis

Assessment and analysis of the urban forest resource present in Virginia Beach is a vital first step in being able to outline steps for its management. There are several elements related to the forest resource that can and should be quantified, such as ecosystem services, canopy cover, species diversity, age, health and planting/removal rates. When reviewed and analyzed comprehensively, each of these assessments will help to establish the framework for immediate priorities and future goals related to sustaining and enhancing the urban forest.

Assessment of Ecosystem Benefits

A healthy urban forest will help Virginia Beach meet the many environmental challenges urban communities face, such as sustaining clean water, air quality and combating increasing energy costs related to the heat island effect. For the purposes of this Plan, ecosystem services are products that we receive from the urban forest, such as cleaner air, fewer pollutants in our waterways, carbon sequestering and reduced energy costs. The economic values of the ecosystem services are based on the cost of obtaining these same services without the benefit of having trees. Without trees, additional grey infrastructure such as stormwater management facilities would need to be built or other costly mitigation measures would have to be implemented to meet environmental standards.

In order to calculate the value of the ecosystem services provided by all trees in the city, the first Virginia Beach Urban Tree Canopy (UTC) assessment based on 2008 data was used to estimate an average tree canopy size of 828 square feet. UTC is the layer of leaves, branches and stems of trees that cover the ground when viewed from above. From that average tree canopy size, the approximate number of trees within the city's commercial, residential and natural areas can be estimated.

CITY WIDE ANALYSIS

Land Area Type	Land Area Type (Acres)	Tree Canopy (Acres)	Tree Canopy Percentage	Possible UTC Vegetation/ Impervious	Factors Affecting UTC Percentages
State & Federal Property	29,005	13,219	46%	26% / 6%	
Entire City with State & Federal Property	155,314	58,291	38%	41% / 11%	State and federal property consisting of parks and military facilities add 2% to the city's overall UTC.
Without State & Federal Property	126,309	45,072	36%	41% / 11%	Residential tree cover and buffers along the city's waterways make up the majority of the city's UTC.

Note: Land area acreage identified does not include water or state and federal property.

The city's urban forest contains an estimated 3 million trees. Using the National Tree Benefit Calculator, which was developed based on the i-Tree street tree assessment tool, those trees provide over $83 million in annual stormwater benefits to the city. As new software tools and more detailed tree inventory information becomes available, these numbers will be adjusted accordingly. The i-Tree software was developed from empirical models, based on observations in the field, and peer-reviewed studies over the last decade. Technical documents and information about the research behind the i-Tree application and utilities can be found at **www.itreetools.org/resources/archives.php**
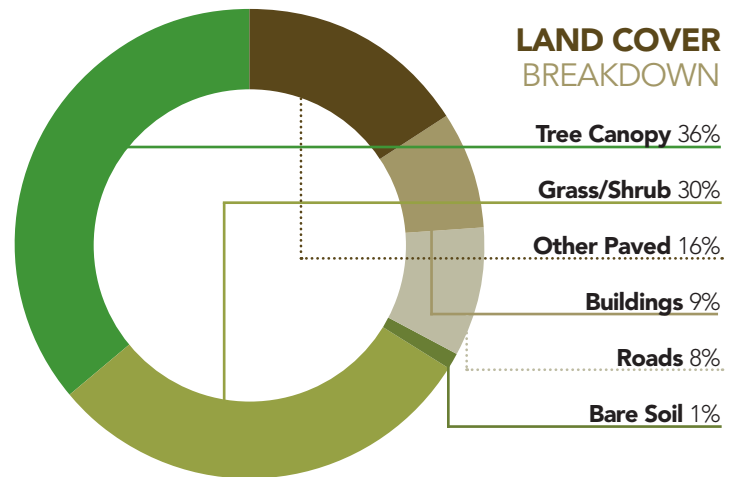
Assessment of Urban Tree Canopy (UTC)

In 2008, the City received a Water Quality Improvement grant from the Virginia Department of Forestry and the Virginia Department of Conservation and Recreation to develop its first Urban Tree Canopy assessment. In 2013, the City received a Technical Assistance Grant from the Virginia Department of Forestry to develop a UTC Implementation Plan based on the 2008 UTC data assessment. The information provided on the following pages establishes the baseline for analysis of UTC percentages city-wide, as well as in many individual planning and land use categories. Tree canopy goals that are included in this Plan are also detailed. Another UTC data assessment is planned for 2014, and the changes in the city's UTC will be evaluated to determine trends in tree canopy expansion or loss. In addition, software is currently being developed as part of the Technical Assistance Grant which will assist the City in prioritizing tree preservation and planting sites.

Overall Characteristics

Based on the 2008 data, the city's overall tree canopy is 36%, not including state and federal properties. When state and federal property are included, the city's overall tree canopy is 38%. However, this assessment only includes areas within which the city has some level of planning control. Beyond the tree canopy, 31% of Virginia Beach's land area consists of pervious cover (grass/shrub and soil), and the remaining 33% is comprised of impervious cover including buildings, roads and other hard surfaces.

American Forests recommends a minimum of 40% UTC for cities in the mid-Atlantic region of the U.S. To meet this minimum, the city

LAND COVER
BREAKDOWN

Tree Canopy 36%

Grass/Shrub 30%

Other Paved 16%

Buildings 9%

Roads 8%

Bare Soil 1%

would have to increase its overall UTC by 4%. As a point of reference, an estimated number of additional trees needed to increase the city's UTC by 1% is 80,000. This 1% increase would happen after a 15-20 year growth period and does not take into account tree removals or growth of existing trees. This example highlights the fact that although tree planting is an important element of increasing canopy cover, there are many other equally important elements that are essential to increasing UTC over time. Increasing the city's UTC is a multifaceted process that involves a wide variety of strategies such as:

- Actively maintaining the trees we have on public property to ensure that they increase in size
- Continuing to educate and encourage the planting of trees on private property
- Replacing dead or diseased trees on public property
- Working cooperatively with developers to preserve existing trees during development
- Educating the public to plant trees that contribute to species diversity, minimizing the chance of species 'meltdowns'
- Identifying and preserving publicly-owned open space that can be allowed to regenerate to forest
- Managing pests and diseases effectively

Using these and other new strategies outlined in this Plan, the city will be able to successfully increase its UTC. A citywide goal of reaching 45% canopy coverage over the next 20 years is achievable and will encourage other cities to adopt similar beneficial goals.

Forest Cover Distribution

A map of the City's tree canopy shows the location and distribution of forest cover. At this scale, areas of concentrated forest are seen along waterways, in preserved conservation and park properties and in older established neighborhoods in the northern portion of the city.

Tree Canopy
Grass/Shrub
Bare Soil
Water
Building
Impervious
Road
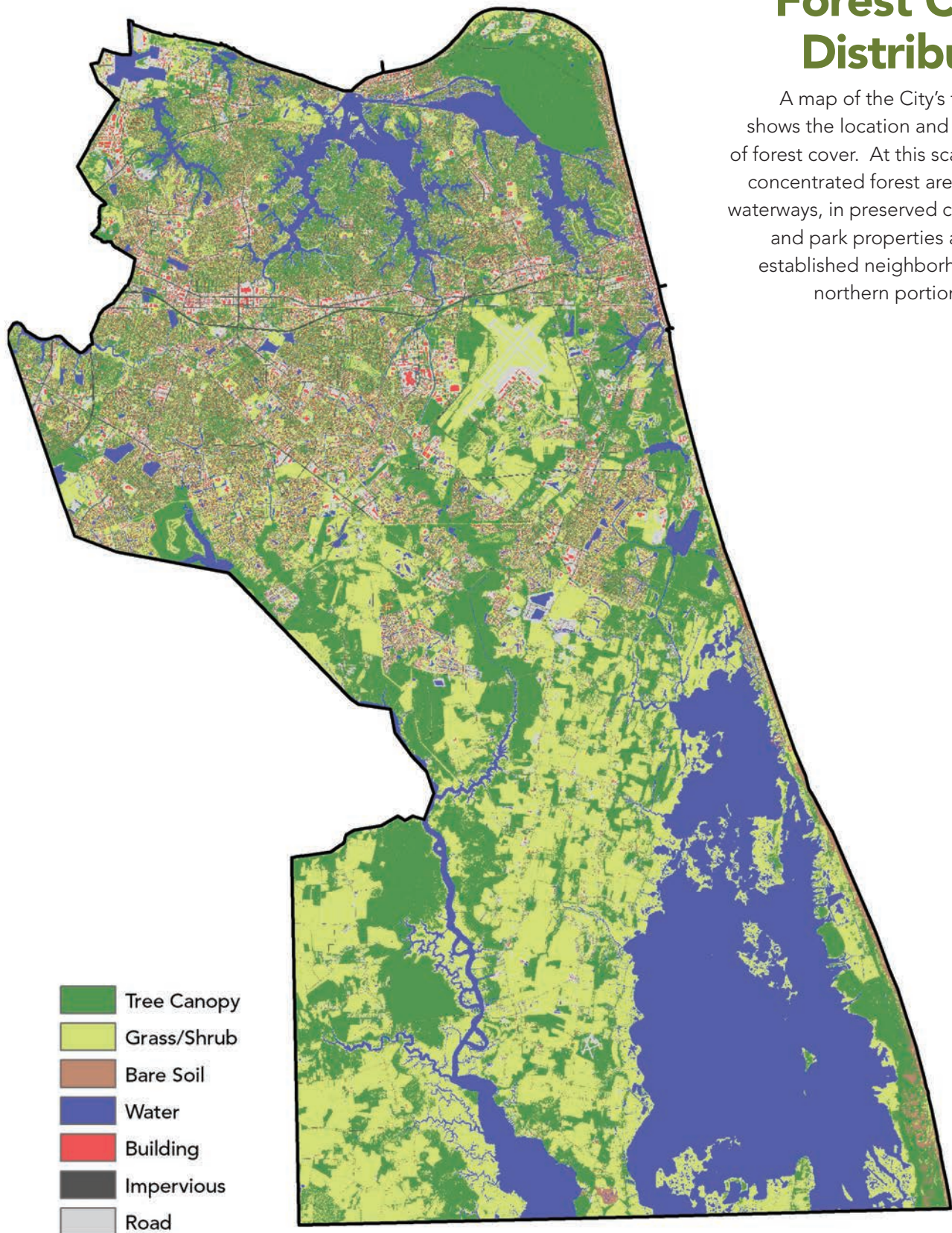
PLANNING DENSITY AREA ANALYSIS

Land Area Type	Land Area Type (Acres)	Tree Canopy (Acres)	Tree Canopy Percentage	Factors Affecting UTC Percentages
Planning Zone				
Urban Area	74,343	26,556	36%	While UTC percentages are low in developed commercial areas, the urban area includes a lot of older residential areas with mature trees.
Transition Area	6,316	2,316	37%	The Transition Area includes characteristics of both the urban and rural areas, open agricultural lands, forested waterway corridors, and newer commercial/residential developments with young trees.
Rural Area	45,649	16,200	35%	The Rural Area is dominated by agricultural fields and rural residential development. It's forest resources are primarily made up of heavily forested waterway corridors and other isolated forested tracts.

Note: Land area acreage identified does not include water or state and federal property.

Possible Urban Tree Canopy

Possible tree cover is an important element in the 2008 UTC data assessment. Possible tree cover is tree cover that theoretically could be established, and it includes two categories:

- **Possible UTC Vegetation:** Describes existing vegetated areas that could potentially be converted to tree canopy areas by planting new trees
- **Possible UTC Impervious:** Describes existing impervious surfaces, excluding roads and buildings, that have the potential to be converted to tree cover areas by removing the impervious surface and planting new trees.

Possible UTC areas are expressed as a percentage of land and provide just a starting point for further evaluation at a site specific level. The site specific level analysis will reveal areas captured as Possible UTC that are not realistic for 100% tree cover such as ball fields, large parking areas serving active uses, and agricultural fields. Possible tree cover was analyzed as part of each specific area analysis (except Planning Density Areas) described on the following pages.

Specific Area Analysis of UTC

The urban tree canopy data was evaluated to identify characteristics related to various community attributes such as planning areas, watersheds, and land uses. The following pages present some of those findings. Please note, these findings do not constitute all the conclusions that are possible through the use of this data. As city forest managers become more familiar with the data, its capabilities, and the interrelationship it has with other community planning activities, more findings will be apparent. Estimates of possible UTC within many of these areas is used as a beginning point to understand the opportunities and constraints each area has related to improving the city's overall UTC.

Planning Density Areas

For planning purposes, the city has been divided into three major density areas; urban, rural and transition area. The Urban Area contains much of the city's historic residential and commercial growth. The Rural Area is primarily agricultural mixed with rural residential and has been for centuries. The Transition Area is the area between urban and rural. This area contains newer residential and commercial developments along with remaining rural single family and agricultural land uses. It is notable that all three have similar UTC percentages even though they contain drastically different land uses.

Watershed Analysis

The UTC for the city's seven major watersheds covers a range of percentages. Given the many stormwater and water quality benefits UTC provides, the city is interested in evaluating the characteristics of the UTC in each watershed and establishing specific UTC goals and strategies based on those characteristics. For the purposes of this Plan, two watersheds - the Lynnhaven River and North Landing - were evaluated and will start to lay the groundwork for specific canopy cover goals and strategies for use in these and other watersheds.

WATERSHED ANALYSIS

| Land Area Type	Land Area Type (Acres)	Tree Canopy (Acres)	Tree Canopy Percentage	Possible UTC Vegetation/ Impervious	Factors Affecting UTC Percentages
Lynnhaven River Watershed	30,833	11,712	38%	25% / 17%	Presence of older established residential areas with large, mature trees contrasted with older commercially developed areas with very limited UTC.
North Landing Watershed	55,153	21,200	38%	47% / 8%	Large forested areas along many natural drainage ways contrasted with a large concentration of non-forested agriculture land.

Note: Land area acreage identified does not include water or state and federal property.

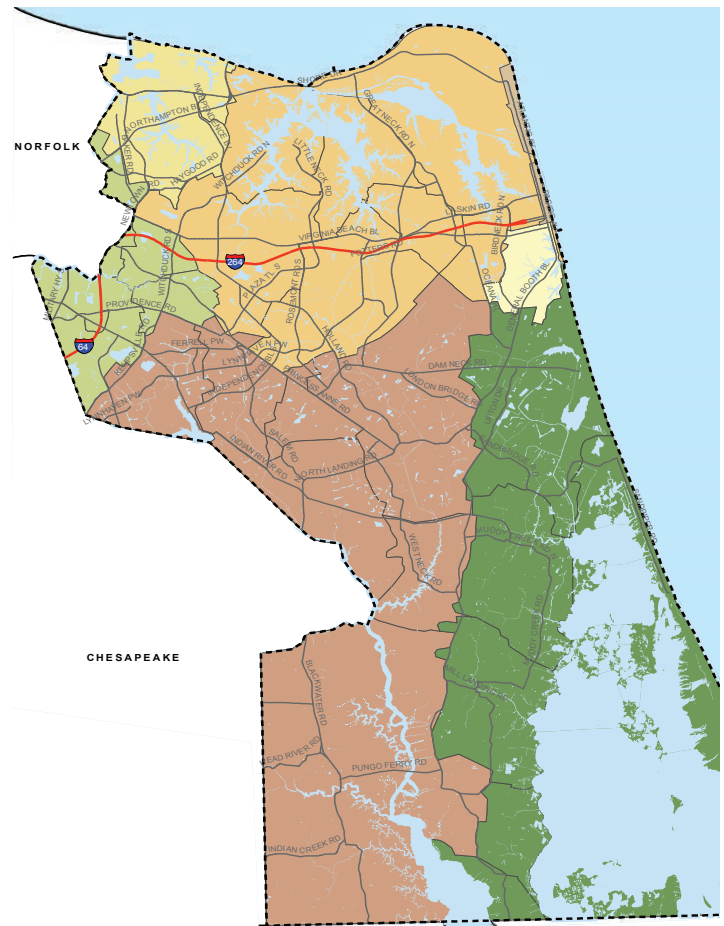### Lynnhaven River Watershed

The Lynnhaven River watershed is comprised of many of the oldest residential and commercial developments in the city. As such, the residential areas contain very good canopy cover from numerous large mature trees on average. Much of the watershed's overall UTC is due to these established residential areas. In contrast, the commercial areas in this watershed suffer from scarce canopy cover, primarily due to the lack of tree planting/preservation requirements when these commercial areas were developed. SGAs bearing these commerical areas were identified in 2003 to absorb urban growth and to preserve residential neighborhoods and the city's rural heritage. Improving UTC in the city's commercial areas is needed and can be accomplished through appropriate and thoughtful redevelopment. See page 27 for more information related to the city's identified Strategic Growth Areas.

North Landing River Watershed
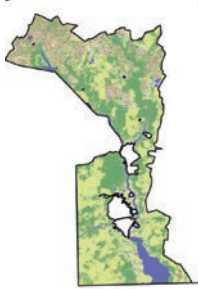
The North Landing River watershed is comprised of newer residential and commercial developments in its northern section and older rural residential and agricultural land uses in its southern section. Much of this watershed's overall UTC is due to large tracts of remaining forested lands surrounding natural drainage ways, such as the North Landing River. These forested areas should be preserved to the greatest extent possible. This watershed also contains much of the land within the city's Agriculture Reserve Program (ARP). The ARP was established in 1995 to preserve and protect the city's agricultural industry and rich southern rural heritage. Lands enrolled in ARP represent many facets of agriculture: grain, fruits and vegetables, horses, livestock, pasture and timber. While many of these naturally preclude tree cover and minimize the watershed's overall UTC percentage, the program is a great model for what can be done to encourage private property owners to preserve important forested areas.

Urban Tree Canopy by Watershed

- Back Bay Watershed
- Elizabeth River Watershed
- Little Creek Watershed
- Lynnhaven Watershed
- North Landing Watershed
- Rudee Inlet Watershed
- Oceanfront Watershed

WATERWAY BUFFER AREA ANALYSIS

Land Area Type	Land Area Type (Acres)	Tree Canopy (Acres)	Tree Canopy Percentage	Possible UTC Vegetation/ Impervious	Factors Affecting UTC Percentages
Chesapeake Bay Resource Protection Area (RPA) Buffer	7,745	4,224	55%	25% / 10%	Grassed tidal wetland areas are identified as grass/shrub on the UTC analysis, these areas should be counted as water to show a more accurate UTC percentage.
Southern Watershed Buffer	16,602	9,475	57%	40% / 1%	Grassed tidal wetland areas are identified as grass/shrub on the UTC analysis, these areas should be counted as water to show a more accurate UTC percentage.

Note: Land area acreage identified does not include water or state and federal property.

Waterway Buffer Areas Analysis

The above table identifies the current tree canopy coverages within the Chesapeake Bay Resource Protection Area (RPA) buffer and the Southern Watershed buffer. These required buffer areas have done a great deal to preserve existing trees. While the existing UTC percentages in the buffer areas are fairly good, improvements can be made. One important aspect of the UTC analysis to understand is that the UTC assessment categorized many wetland areas along waterways as grass that may be better categorized as water, since tree canopy in them is not possible. This is not believed to have a significant impact of the city's overall UTC percentages, but is an important point of clarification as future analysis is performed.

Sea level rise will impact the city's urban forest and will also be an important factor in the long term sustainability of these buffers. Further analysis should be done to determine the effects of sea level rise on these vulnerable buffer areas. Strategies should then be put in place to obtain additional canopy cover within the buffer and properties adjacent to them to mitigate potential future impacts.

Exciting new research and resources are being developed that will allow localities to quantify and utilize the expansion and preservation of tree canopy as a Best Management Practice (BMP) to improve water quality and meet the pollutant reduction mandated for the Chesapeake Bay. For this strategy to receive full credit, the resource must be monitored and maintained, and an urban forestry program must be in place. Areas within the city that can be planted and/or preserved to meet this water quality strategy should be identified in conjunction with the implementation of this Plan.
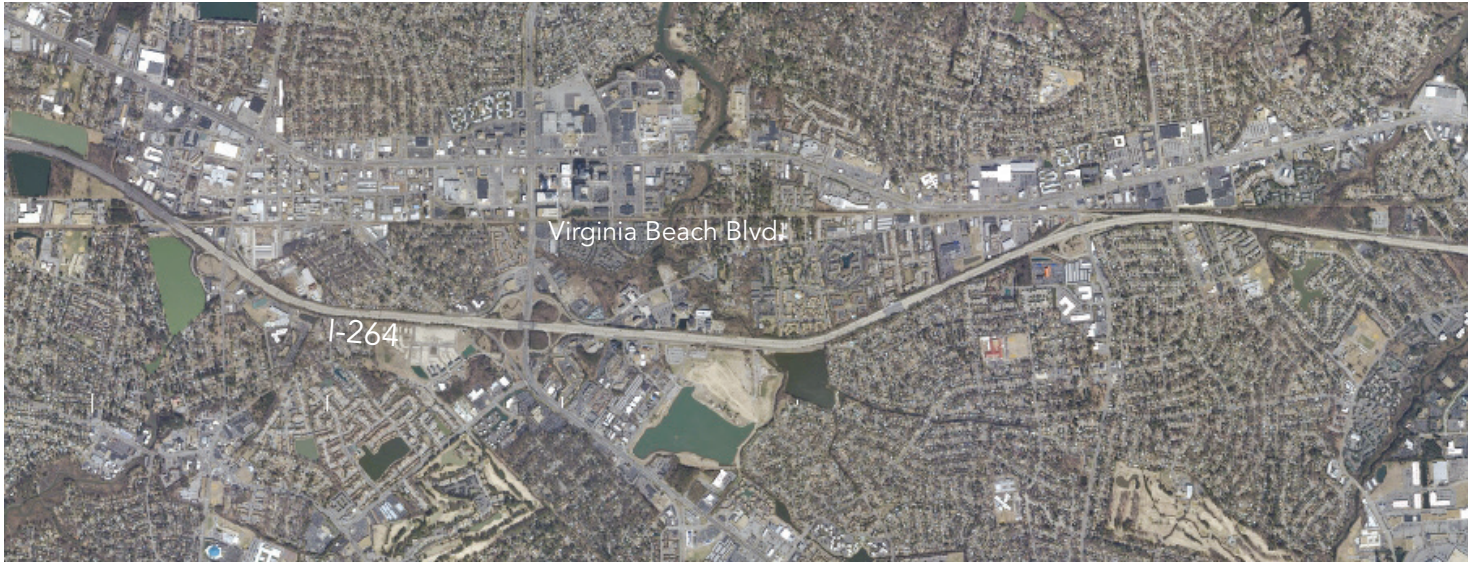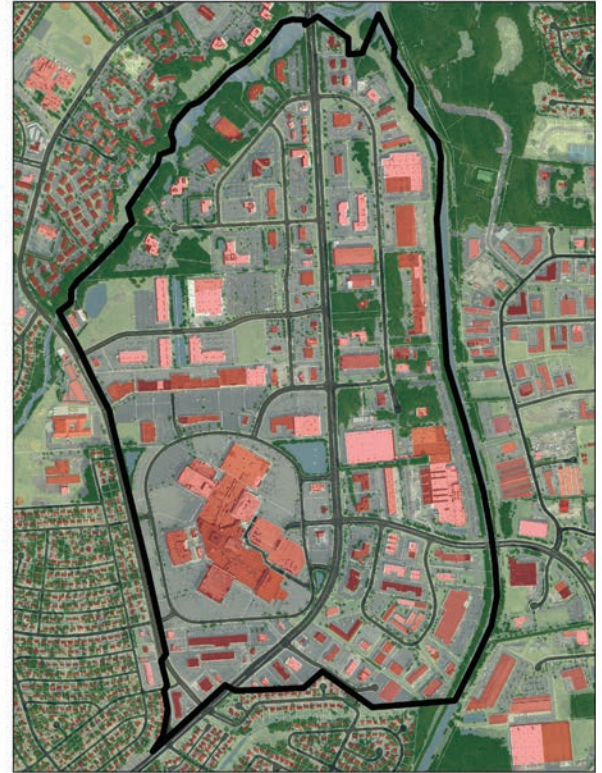
Commercial Area Analysis

American Forests recommends a minimum 15% UTC for central business districts. An analysis of the city's commercially zoned properties depicts a 22% overall UTC. This is primarily due to the presence of trees on undeveloped commercial parcels. Developers of commercial properties with existing healthy trees should be encouraged to preserve and adequately protect them during construction. The city's Integrated Site Design Guide (currently in development) outlines a number of alternative strategies available to developers to meet the City's development requirements in a sustainable and low-impact manner. Strategies such as the use of structural soils in the city's commercial areas should also be encouraged to ensure trees that are planted will survive and flourish.

Many of the older developed commercial areas in the city have an average UTC of 3 to 5%. This is predominantly apparent along the Virginia Beach Boulevard corridor as pictured above. Established in 1937, Virginia Beach Boulevard was the primary route to the Oceanfront Resort Area until the development of Interstate 264. As such, it contains some of the oldest commercial developments in the city. These areas were developed before planting requirements were instituted and/or planted trees have either perished or not reached full growth due to poor urban conditions. There is significant room for improvement in these areas of the city. Along with the strategies mentioned above, current planting requirements could significantly increase UTC coverages in commercial areas of the city as these areas redevelop. Planting trees in urban areas can reduce temperatures and lessen the urban heat island effect associated with urban centers.
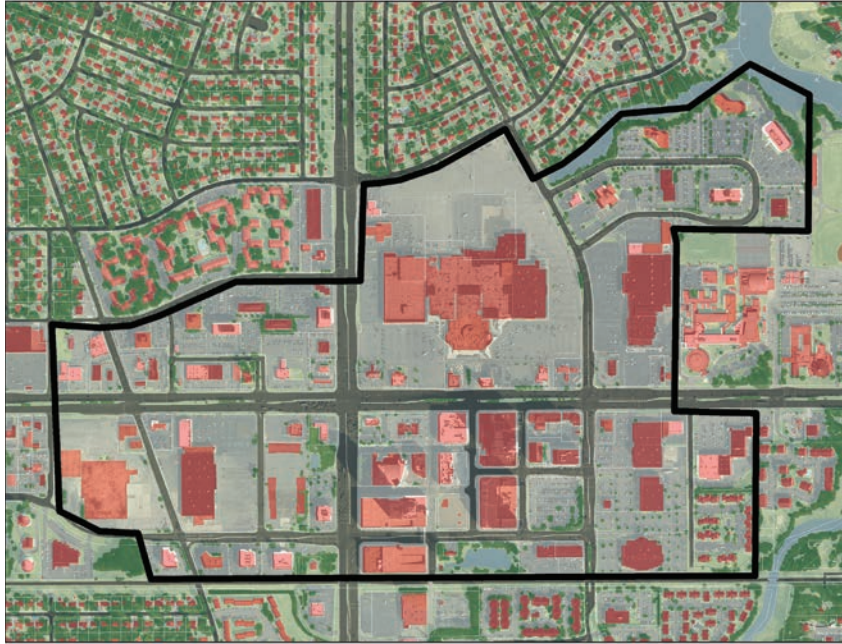
Commercial Area Examples: Pembroke/Town Center (above); Lynnhaven Mall (right)

COMMERCIAL AREA ANALYSIS

Land Area Type	Land Area Type (Acres)	Tree Canopy (Acres)	Tree Canopy Percentage	Possible UTC Vegetation/ Impervious	Factors Affecting UTC Percentages
City-Wide Commercially Zoned Areas (includes land zoned business, hotel, office and resort tourist)	10,579	2,349	22%	20% / 44%	These areas show a higher UTC percentage primarily due to the fact that not all the properties zoned commercial have been developed. As these areas develop, property owners should be encouraged to preserve existing tree canopy.
Older Developed Commercial Area Examples					
Hilltop Area	236	9	4%	8% / 58%	This area was developed prior to planting requirements. Large expanses of paved areas with minimal planting areas dominate this area.
Pembroke Mall /Town Center Area	269	15	6%	6.5% / 53%	Much of the Pembroke area was developed prior to the time when planting requirements for commercial developments were established. Large expanses of paved areas with minimal tree canopy dominate this area. The Town Center portion of Pembroke was developed in early 2000 under an urban framework. The initial master plan for town center included large public open spaces and tree lined streets. Much of the area originally planned for open space has been lost to development.
Lynnhaven Mall Area	584	91.5	16%	14% / 42%	This area meets American Forest's minimum recommended UTC for central business districts of 15%. This is primarily due to the preservation of tree canopy along the portion of properties adjacent to a tributary of the Lynnhaven River and several properties that preserved significant tree cover during their development.

Note: Land area acreage identified does not include water.
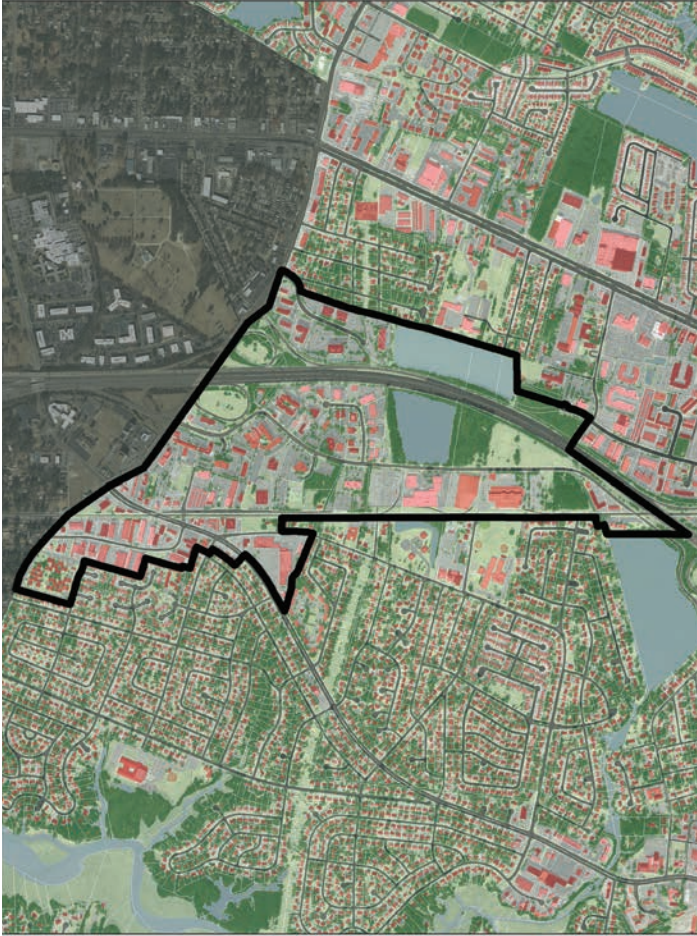
STRATEGIC GROWTH AREAS ANALYSIS

Land Area Type - Example SGA	Land Area Type (Acres)	Tree Canopy (Acres)	Existing Tree Canopy Percentage	Possible UTC Vegetation/ Impervious	Factors Affecting UTC Percentages
Newtown SGA	348	73	21%	20% / 33%	Existing UTC includes several large forested areas. These areas are slated for new developments. If these areas are not preserved at least in part, or tree planting is not an important part of redevelopment, tree canopy will be significantly reduced in this SGA.

Note: Land area acreage identified does not include water.

Strategic Growth Areas (SGA) Analysis

The city has identified eight SGAs to absorb urban growth and preserve residential neighborhoods as well as the city's rural heritage. Eventual development within SGAs will increase density and create a negative impact on the city's overall tree canopy, expressly regarding the correlation of more densely developed areas affecting existing trees in greater capacity. This impact can be relatively offset with specific attention given to preserving existing trees and incorporating as many trees as possible into new developments. The Strategic Growth Area Office is tasked with implementing the plans for these areas, and coordination with the Parks & Recreation Department related to the urban forest resources should continue to be a priority. Several areas have been identified as opportunity areas for new tree planting within SGAs.

- Existing and proposed rights of way
- Future park spaces
- Surface parking lots
- Waterway buffer areas
- Interstate buffers

For these opportunity areas to be realized, the following strategies must be utilized:

1. When revisions to development ordinances (zoning, site plan, stormwater, etc.) are necessary to accommodate the urban form desired within Strategic Growth Areas, provisions to

Virginia Beach Single Family Residential - 33% UTC

Virginia Beach Apartment Complex - 24% UTC

RESIDENTIAL LAND USE ANALYSIS

Land Area Type	Land Area Type (Acres)	Existing Tree Canopy (Acres)	Existing Tree Canopy Percentage	Possible UTC Vegetation/ Impervious	Factors Affecting UTC Percentages
Single Family Residential	36,831	15,924	43%	31% / 13%	UTC percentages across single family residential lots vary widely. Those with lower than desired UTC cover are made up of newer developments in which the trees have not reached full growth potential and some older smaller lot subdivisions in which limited tree planting occurred.
Multi-Family Residential (Apartment)	4,856	1,301	27%	27% / 26%	UTC percentages for multi-family residential areas are good. The city's open space requirements for multi-family developments have encouraged the preservation and planting of trees.

Note: Land area acreage identified does not include water.

encourage tree planting and tree preservation on redevelopment properties should be included to meet American Forest minimum standards.

2. When large impervious areas are converted to a grid street network, adequate space for street tree plantings must be provided along the new streets.

3. Existing wooded lots within the SGAs should be considered a high priority for conversion to public open space/park space.

4. Open spaces provided within private developments should include tree plantings to create a canopy of at least 25%.

5. Emphasize tree planting and canopy cover as a desirable element in projects requesting an optional form of development.

6. Include tree plantings as a desirable element of all outdoor amenity spaces.

7. Utilize structural soil when tree plantings are desired within hardscape areas with limited green space.

8. Target urban tree planting and tree canopy expansion efforts to maximize stormwater benefits.

Residential Land Use Analysis

Private residential property owners are important stakeholders in maintaining a healthy urban forest. The single family residential class has the second largest amount of land area in the city (agriculture is the first) and the largest percentage of the overall city UTC (42%).

American Forests recommends 25% minimum UTC in urban residential areas and 50% minimum UTC in suburban residential areas. From a general review of the UTC analysis, much of this stakeholder group is maintaining adequate urban forest canopy. Coverages vary widely in residential areas, from as low as 15% to as high as 66%. A good way to establish realistic UTC targets for residential areas is to use the 75th percentile rule. Using this rule for specific residential areas would mean that the overall UTC goals for the area would be based on the tree canopy that is present on 75% of the residential lots.

Through additional analysis of the UTC data, established residential areas where appropriate levels of UTC are not met can be identified. Once identified, these areas could be targeted with innovative programs to encourage additional tree plantings. The potential to convert areas from possible UTC to tree cover in single family residential areas is high due to the ability for tree canopies to span over homes, roads and driveways.

Publicly Owned Lands Analysis

The city's publicly owned lands make up approximately 15% of the city's land area. Different types of publicly owned lands were analyzed based on the canopy cover assessment and detailed tree inventories to determine their UTC opportunities and constraints. While public lands do provide substantial opportunities to increase the city's overall UTC,

PUBLICLY OWNED LANDS ANALYSIS

Land Area Type	Land Area Type (Acres)	Tree Canopy (Acres)	Tree Canopy Percentage	Possible UTC Vegetation/Impervious	Factors Affecting UTC Percentages	Canopy Cover Target
Road Right of Way (ROW)	12,492	2,210	18%	15% / 19%	Along many Virginia Beach roadways, trees compete with private/public utilities and other infrastructure elements such as water and sewer for limited space. Primary roads have the most opportunity for improving UTC percentages, due to wider r-o-w widths and planting areas.	30%
Public Facilities & Parks	10,859	5,123	47%	35% / 16%	There are many opportunities for tree plantings and preservation at public facilities and parks, but also some constraints.	60%
Park Example: Mt. Trashmore Park	94	10	10%	70% / 15%	The previous use of this site as a community land fill limits the space available for tree plantings as trees cannot be planted on the landfill. Additionally, from its previous use the site probably suffers from compacted soils and trees are not able to reach full maturity.	
Schools	1,774	210	12%	41% / 33%	While there is room for improvement in tree canopy cover at schools, they often contain large open active recreational areas such as sports fields that limit tree planting opportunities. Additionally many have installed security cameras and the placement of trees must be carefully coordinated with those elements.	25%

Note: Land area acreage identified does not include water.

they also contain many constraints, such as road infrastructure elements and parks with existing or future ball fields. Each site must be looked at individually to identify opportunities and constraints.

Road Right of Way Analysis

Along with parks, schools, and other local government-owned parcels, city-owned street rights of way are one of the few areas where the local government can directly control the condition of the urban forest. Unfortunately, trees in public rights of way have numerous infrastructure and safety elements to compete with. Roadside recovery zones needed for vehicular safety limit available planting space. Often, especially when limited space exists, trees are the last addition to the corridor. This can lead to a limited number of trees planted and poor growth rates for those that are planted, as well as early removal due to mortality, impacts to adjacent infrastructure, and/or disease and insect problems related to environmental stress.

From the UTC analysis images, primary roads appear to have less canopy coverage than secondary and local roads and more opportunities to improve canopy cover. Utilizing the estimated average tree canopy size for the city, approximately 116,265 street trees exist within public rights of way. This number is just an estimate based on the data available at this time.

Along with sample detailed tree inventories and potential planting locations, further analysis of right of way canopy coverages is being performed in several neighborhoods to identify opportunities and constraints related to increasing the city's overall UTC through street tree plantings. The neighborhood street tree inventory to date shows an overuse of certain species. Crapemyrtles (19%), Red Maples (10%), and Sweetgums (10%) make up the majority of the roadside planting species. At 19%, Crapemyrtles make up an excessive percentage of the neighborhood street trees, and the Landscape Management Division discourages their use. With over 90% under 20 inches in caliper indicating young tree age, the overall health of neighborhood street trees is positive. This aligns with the fact that until the adoption of the Street Tree Ordinance in 1990, street trees were not required.

Public Facilities and Parks Analysis

With numerous public facilities and an expansive park system of 265 active and passive recreational areas, Virginia Beach carries great opportunities to preserve and enhance its UTC. Various existing sites can be enhanced with new tree plantings, and ensuring future site development incorporates preservation and planting of as many trees as possible is achievable.

Detailed tree inventories have been implemented at the Virginia Beach Municipal Center and Mount Trashmore Park. These inventories provide an overall picture of tree status including tree species, health, aesthetic value, visual obstruction, utility conflicts and potential planting locations. Along with analysis of the UTC data, they also help to develop appropriate and sustainable UTC strategies to be utilize at each site over time.

At Mount Trashmore Park there appears to be good species diversity, with the exception of Red Cedars that make up approximately 16% of the tree species. Ideally, no species would make up more than 10%. Most of the trees (96%) are under 20 inches in caliper. This falls in line with the understanding that the site was previously a landfill and more than likely compacted soils exist in most areas, limiting the tree's potential to reach full growth. Recently, many new trees have been planted. The success of those trees over the next several years will provide valuable information for future plantings.

School Analysis

There are over 90 public school sites throughout the city. School sites can play an important role in sustaining the city's urban forest as well as educating children through activities involving tree preservation and plantings at the schools. Additional tree plantings at schools should be chosen carefully to ensure sustainability and should actively involve the student body to inspire future tree stewards.

The city has compared tree inventory information from eight schools in different watersheds. Preliminary analysis indicates overall tree health is good to fair and there is reasonably good species diversity, with most trees apparently in early middle age.

UTC Analysis Conclusions

Through specific area analysis and comparison of the UTC coverage maps with historical and planned growth patterns in the city, at risk, improvement, and preservation areas have been identified as listed below. Effective management, innovative programs that target these areas, and the addition of trees in identified improvement areas will significantly and positively impact the city's UTC percentages.

At Risk Areas

- Redevelopment areas that clear cut wooded lots
- Forested areas within SGA districts
- Future road corridors

Important Areas to Improve

- Developed commercial areas
- Local government-owned parcels (schools, parks, right-of-ways)
- Industrial areas
- Established residential areas with low UTC
- Areas adjacent to and within Chesapeake Bay and Southern Watershed buffer areas with low UTC

Important Areas to Preserve/Enhance

- Southern Watershed buffer
- Chesapeake Bay buffer
- Remaining green infrastructure corridors/wildlife corridors
- Significant tree stands along farm field ditches (can serve as future green infrastructure corridors)
- Areas surrounding public water reservoirs
- Mature residential areas
- Critical or sensitive forested areas

Quantification of Individual Tree Resources

Detailed tree inventories are an important element of the urban forestry plan. This type of inventory is essential for tree risk management, emergency preparedness, forecasting budget allocations for maintenance, and predicting overall benefits to the city. It requires qualified individuals going to sites to physically identify the trees and their characteristics related to size, age, species, health, etc.

Benefits and constraints exist when completing detailed tree inventories. They provide comprehensive understanding of tree characteristics such as species, exact location, current condition and potential future hazards or maintenance concerns. Downsides to detailed tree inventories include factors that they are very time-consuming, and individuals must be well trained in order to identify species, diseases and insects, etc. For these reasons, complete inventories of individual

trees for large cities like Virginia Beach are difficult, if not impossible to obtain. However, there are a number of techniques that result in fairly accurate results based on a sampling (5-10%) of the total urban forest or of a specific zone or area. The software i-Tree has developed a process for the sampling.

The city's tree inventories to date have been accomplished through the use of qualified interns. The city has used i-Tree software to complete inventories. Once specific trees are inventoried, they can be placed on the city's GIS mapping system with other infrastructure elements. Additional detailed tree inventories are needed in city rights of way and other areas as identified on a case by case basis. Additional inventories will gather detailed information related to the large number of street trees that have been planted over the past 10 - 20 years. It is a priority to identify potential conflicts, safety concerns, and additional planting sites. In most other areas, due to the size of the city, a statistically generated sampling, such as what is recommend with i-Tree, is more appropriate.

Planting and Removal Rates

There are numerous instances in which both city and private tree removal and planting activities occur. Planting and removal records for the Department of Parks and Recreation have been compiled annually for the last 10 years as part of the Tree City USA program. Documentation of municipal tree activity shows that the number of city trees planted exceeds the number removed. However, when estimates of private property tree removals are included with city removals, the total exceeds current overall planting rates.

Capturing comprehensive planting and removal rates for such a large city is difficult, but can improve with better tracking software and procedures. It is critical for the city to create a plan for how to best monitor trees planted and removed each year on both city and private projects to predict changes in the UTC. Public tree removal and planting rates could be obtained by individual departments tracking them with each capital project. In order to better gain a comprehensive understanding of private tree removal and planting rates, measures can be put into place to capture private planting/removal rates that coincide with current processes. For example, new developments going through site plan review could provide information to quantify the number of trees removed and planted with each development. Private tree companies could be asked to report to the city the number of trees they removed within city limits on a quarterly basis. While this information would not be perfect, it would provide a more complete picture of planting and removal rates and their impact on the city's overall UTC.

Future Assessment and Analysis Needs

The information gathered to date provides a good starting point for the city to establish broad UTC goals. Additional analysis of the 2008 data is needed to be able to effectively establish UTC targets for more specific land planning and land use areas. Further analysis is also needed to quantify the impacts of sea level rise and future development (specifically within the SGAs) on the city's UTC so that effective strategies can be put info place to minimize impacts.

Beginning in 2014, ongoing analysis will be performed to identify if the city is losing or gaining UTC as a whole, as well as on smaller scales, such as watershed, land uses, etc. The comparison of the 2008 UTC analysis with the 2014 UTC analysis will be the first concrete information available to track trends. Along with annual accounts of public and private planting and removal rates, it will allow the city to predict future changes and develop plans of action to address them as needed.

In addition to the canopy cover assessments, the city should continue to perform detailed tree inventories and use those to extrapolate information for the entire city related to tree health, age, and species diversity. This information will be important to establish future work programs and maintenance schedules for publicly owned trees.

The software currently under development by the Virginia Department of Forestry will be an important tool to help the city identify priority planting and preservation sites to meet the identified UTC goals for public facilities and parks, schools, and right of ways that are set in this Plan. That software will allow the city to layer and weight multiple criteria to identify sites that provide multiple benefits.

> It is time to make some changes in the design and construction of our cities (...) Just planting more trees is not the answer. Trees have long been fit into spaces leftover after everything else is written into the design. This approach will not work if we want our trees to be a major element in a city's structure.
>
> | James Urban, with Ralph C. Sievert, Jr., and James Patterson, *A Blueprint for Tomorrow: Getting Trees into Urban Design*

Management

The City of Virginia Beach has a long history of understanding the important quality of life and aesthetic benefits trees provide. In 2014, the City of Virginia Beach will mark its 34th year as a Tree City USA. To become and maintain Tree City USA certification, certain tree resource management requirements must be met, such as a tree board or department, a community tree ordinance, a community forestry program with an annual budget of at least $2 per capita, and an annual Arbor Day observance event. The city meets or exceeds each of these requirements. These requirements provide the starting point for more comprehensive urban forestry management. Other important management aspects include qualified staffing, adequate resources, proactive maintenance, planting, innovative programs and interdepartmental coordination.

Historically, due to limited funding and staffing, the urban forest management approach in Virginia Beach has been primarily reactive in response to tree removal, emergencies and tree pruning as opposed to a proactive adaptive management approach. However, since 2008, when the first UTC cover analysis was completed, the City has been moving to a much more proactive management approach that involves gaining a detailed understanding of the urban forest, interdepartmental coordination, and the development of this Plan. This has been accomplished through utilizing available funding and staff resources along with the development of several innovative programs and interdepartmental coordination. This section describes the current City of Virginia Beach framework for managing the urban forest resource related to existing ordinances and policies, maintenance and planting programs, use of volunteers, resources and funding.

During the development of this Plan, stakeholders utilized the criteria for sustainability identified by Clark et al. in *A Model of Urban Forest Sustainability* to evaluate the City's current practices. The three components of the sustainability model, Vegetative Resource, Community Framework, and Resource Management were evaluated based on current City practices and characteristics. This "Treeport Card" should be reassessed every five years to determine where progress is being made and where additional efforts should be focussed. For additional details, see Appendix A.

Existing Ordinances, Policies and Standards

The city has a number of policies, programs, regulations, and documents that establish a framework for tree preservation, planting, and care. Through a comprehensive review of existing city ordinances, policies, and standards, there are several instances where the preservation of existing natural features is encouraged and/or regulated. Other ordinances require the identification of existing vegetation and any impact to that vegetation to be noted on the site plan.

The strategic use of current regulations along with the inclusion and encouragement of more sustainable development practices are goals of the Plan. The city is currently transforming the current Landscaping Guide into a more comprehensive and flexible guidance document that will be known as the Integrated Site Design Guide. A table listing

all the current regulations, ordinances, and standards that affect the city's tree resources can be found in Appendix E.

Maintenance and Planting Programs

Currently, the city's maintenance programs consist of the removal or pruning of hazardous trees and limited new tree plantings throughout the city. Limited funding and staff resources are available for proactive tree maintenance and street tree replacement. In fiscal year 2011, 69% of operational funding and staff resources went toward hazard tree removal, while 29% was spent on preventative maintenance and only 2% on new tree planting and tree replacement. This unbalanced situation amplifies future maintenance costs, increases removal rates, and can adversely affect the city's UTC percentages.

Hazardous Tree Abatement

The identification of hazardous trees is accomplished a variety of ways. Parks and Recreation staff work closely with site managers of facilities throughout the city to identify and address potential high risk trees. Service requests also come from property owners adjacent to city facilities. The requests are prioritized by the hazard level and the work orders grouped and contracted out for completion. Issues that need immediate attention are addressed as they arise. The in-house Urban Forest Unit is responsible for tree work on city-owned property. The majorty of work involving hazardous tree removals plus all of the removals/pruning of trees under or near power lines is contracted out for safety reasons.

Pruning

An important benchmark for an effective urban forestry program is the establishment of regular pruning cycles. To date, funding has not been allocated for cyclical pruning of young street trees. This lack of early maintenance can lead to expensive pruning costs and removal of a higher number of mature trees.

Since the adoption of the Tree Planting Ordinance in 1990, the Landscape Management Division has inspected the installation of over 31,000 neighborhood street trees required in residential developments. In addition, many other developments included hundreds of trees along the roadways and in medians that were not required by ordinance. Huge numbers of these trees are in dire need of "elevating" for vehicular, pedestrian and bicycle safety, maintenance pruning for street light and sign conflicts, and preventive pruning to sustain healthy growth habits. Funding for proactive contractual maintenance of street trees on a five to six year cycle is ideal. Young tree pruning will extend the life span of trees in the public right-of-way and lead to greater retention of UTC with more predictable expenditures. If left unaddressed, many of these trees will become hazard trees and require much more expensive pruning or removal activities.

To help with neighborhood street tree needs, a volunteer Neighborhood Tree Pruning Program was established in reponse to numerous and constant requests from civic leagues for tree pruning of their street trees. Volunteers have been trained by International Society of Arboriculture-certified municipal arborists for small projects that do not involve power tools or climbing equipment. After mastering pruning skills, the volunteers are granted permission to work within city rights-of way to prune young trees in their neighborhoods. This program should be considered a supplement to a funded cyclical street tree pruning program. To make this program successful city-wide, additional staff time would be required to organize volunteers.

Tree Planting, Removal and Replacement

Most of the new tree plantings that occur are funded by donations or transpire in conjunction with City capital projects and planting requirements related to private developments. The Parks & Recreation and Planning Departments have limited funding for new tree plantings at public facilities.

Tree Removal & Replacement on Public Property

Despite efforts to minimize tree loss, numerous trees are removed each year as a result of disease, insect infestation, weather extremes, structural defects, clearance for utility/flood control and development activities. The number of trees in need of replacement continues to rise, and there is a significant need for increased funding to address the existing backlog and allow for future replacements. When tree canopy is removed without replacement somewhere else in the watershed, additional stormwater management facilities will need to be built, or other potentially costly mitigation measures put into place to meet environmental standards for clean water and air.

There is interest in establishing rational city-wide replacement standards for use on all City projects. This would help to ensure minimal detrimental effects on the city's urban forest from City projects. Through interdepartmental coordination with the Public Works and Public Utilities operations divisions, a replacement factor of 1:1 or 3:1 has been agreed to on some projects. These agreements are an important milestone in establishing a coordinated effort to minimize impact to the city's urban forest. When replacements are not possible at the site, funds donated to a tree planting account could be used for plantings elsewhere in the watershed.

Tree Removal & Replacement on Private Property

Currently there is not, nor is it desired, to have a requirement for the replacement of trees removed on privately-owned property. The only exception involves trees located in designated Chesapeake Bay Resource Protection Areas. When trees are removed in these areas illegally, the City takes actions against the property owners and uses each opportunity to educate citizens about the important roles trees play in a healthy Chesapeake Bay. For all areas outside of the Chesapeake Bay Resource Protection Areas, the City's hopes to encourage sustainable development practices and actively educate its citizens about the benefits of trees to encourage tree preservation and plantings on private properties.

Integrated Pest Management

The Landscape Management Division has taken low cost, proactive steps to minimize future pests, diseases and other issues that impact health, maintenance and replacement costs. Funding has been requested for an Integrated Pest Management (IPM) program to combat insects and diseases that lead to tree decline and death, but because of competing priorities, it has not been approved. The department is not currently set up to be able to respond comprehensively to major disease or insect infestation. To date, yearly review and revision of "acceptable species" lists has helped to reduce the planting of problematic trees that are susceptible to insect infestation, disease, drought intolerance/heat, and exhibit characteristic structural weakness.

Recycling Green Waste

Forestry operations generate considerable amounts of by-products, from large logs to leafy compostable materials. In 2008, the City started recycling the by-products of tree removal and pruning activities by chipping up logs. All city sites utilize recycled mulch and the city has not had to purchase mulch since the start of this program. Other by-products currently end up in the landfill as the city does not have a comprehensive green waste program. Certain products have greater value than others and could provide some monetary payback. To that end, research of best management practices related to dealing with city generated green waste, such as composting, landfill cover amendment, direct land application in agriculture areas,, etc., and the implementation of other activities similar to producing mulch internally, should be explored.

Tracking Management Activities

Tree management has been enhanced with the implementation of the Hansen 8 software system that can track maintenance requirements, customer requests, tree locations and costs related to tree management. Parks & Recreation has recently redesigned the parameters of Hansen 8 to calculate urban forest management costs more effectively and provide more accurate documentation for Tree City USA designation. The expanded use of the Hansen 8 software by other departments would provide a more comprehensive look at tree-related activities. Combined with the i-Tree suite, Hansen 8 will allow effective program and budget decisions, adaptation to changing conditions over time, and effective communication with senior management and the public about the benefits of trees and the costs required to effectively manage this important resource.

Use of Volunteers

The recruitment and use of volunteers to help manage the urban forest is done in many localities with the support of a dedicated staff member to that effort. Current staff workloads do not allow for full-scale volunteer recruitment efforts. The department does reach out to citizens and other organizations such as the Virginia Beach Master Gardener Tree Stewards, the Virginia Beach Clean Community Commission and the Beautification Commission for volunteer support when opportunities

arise. Volunteers can support an urban forestry program by assisting with tree inventories, planting and maintaining trees, raising awareness and educating others. Staff also understands the importance of educated citizens and takes every opportunity to volunteer their time to speak at civic league meetings and organizational events, educating and training citizens in urban forestry practices and basic tree maintenance.

Resources and Funding

Developing and maintaining the urban forest does not come without costs, although the benefits of a mature urban forest far outweigh the expense. Current budget needs related to managing the urban forest exceed budget allocations. Currently funded operational management components include:

- staff salaries/support
- equipment
- materials
- contractual hazardous tree abatement

The amount of funding required for hazardous tree removal and pruning regularly exceeds the amount budgeted. In the interest of public safety, the Landscape Management Division internally reallocates funds to cover the costs of hazardous tree removals. This trend appears to be diminishing due to the division's aggressive approach of addressing identified issues to limit the City's liability and the increased use of internal landscape crews for tree work. In 2011, the department purchased a state-of-the-art forestry bucket truck and conducted extensive staff training to increase the City's ability to address hazardous tree concerns in-house. Requested, but not funded, management components include:

- tree maintenance
- tree replacements
- new plantings
- integrated pest management

The lack of funding for tree plantings or preventative maintenance can result in a reduction in canopy cover, poor tree performance, more expensive maintenance activities in the future, and early removals due to mortality or poor growth patterns. Funds are needed to establish a sustainable tree care program through cyclical maintenance of neighborhood street trees and tree replacements for the numerous trees that, despite efforts to minimize loss, are removed each year as a result of disease, insect infestation, weather extremes, and inherent structural defects. As the makeup of the urban forest is better understood (species makeup, age classes, and condition of trees), financial resources can be strategically allocated to priority items and innovative programs developed as part of a comprehensive urban forest program.

Management costs can be offset through the use of volunteer and innovative programs that actively involve the community in helping to maintain the urban forest. Innovative programs that have been developed to help address budget shortfalls include the Neighborhood Tree Pruning Program and two financial donation programs: the Beautification Program and Tree Buddies. Expansion of these programs as well as the creation of additional similar programs would be beneficial.

- There have been a total of 864 Beautification Program projects since 1973, mostly involving the planting of trees and shrubs. Since 2006, 669 tree have been planted with this program.

- Tree Buddies was developed by the Virginia Beach Parks & Recreation Foundation in 2006 to support the need for tree planting/replacement on public property. Through donations, individual citizens, businesses and organizations may purchase trees in the name of their business or organization, to commemorate special events or to honor loved ones. As of July 1, 2012, 74 trees have been planted throughout the park system with this program since its inception.

Other Funding Possibilities

The establishment of an Urban Reforestation Fund could provide an opportunity for citizens and community organizations to contribute money addressing the need for trees in our community. Donations could be used to replace trees that have been lost throughout the city due to disease, storms or urban development. Similar programs in other communities are funded with private donations, fines from tree related violations, site plan review fees, construction permit fees and/or the locality's general fund. The program could also provide trees to residential property owners to plant and maintain on their properties or for groups to plant on public property and maintain for a minimum of two years.

Staff Resources

Parks & Recreation Landscape Management Division is responsible for all landscaping and grounds maintenance of city building sites, school sites, park sites, roadways and the resort area, including:
- 512 building sites
- 86 school sites
- 5,500 acres of parks
- 816 miles of roadway
- 1,700 individual locations and land parcels dispersed throughout the city

The Division has three full-time and two part-time employees devoted to managing the city's urban forest. Together they address all tree-related management and maintenance city-wide, often assisting other departments with tree-related issues.

Current staff workloads provide little time for actively managing the urban forest, as much of staff's time is spent reacting to current tree-related emergency issues and concerns. Staff members have utilized other resources, such as the use of qualified interns, additional staff training/certifications, volunteers and coordination with staff in other divisions to begin to lay the foundation for the development of a more proactive management approach.

Future Management Needs

The City has taken many steps over the past several years to become more proactive in managing the city's urban forest. The continuation of that shift is needed. Proactive management involves pulling the individuals and resources together to ensure that tree planting and preservation are effective tools in helping the city meet its environmental challenges, such as reducing pollutant loads in the Chesapeake Bay. Formal establishment of an Urban Forest Management Committee made up of department representatives, external stakeholders, and citizens could provide a working group that is able to address a variety of issues comprehensively. Additional interdepartmental coordination related to protecting and enhancing the city's urban forest is needed, as well as standard tree care practices, tree replacement standards, and the expanded use of Hansen software to track tree removals, replacements, etc.

Additional funding is needed in order to effectively manage the city's urban forest. The city should continue to utilize and develop innovative programs such as the Neighborhood Tree Pruning Program. However, those efforts will not replace the need for additional, on-going funding for items such as cyclical maintenance and tree replacements/new plantings.

> It is the long history of humankind (and animal kind, too) those who learned to collaborate and improvise most effectively have prevailed.
>
> | Charles Darwin

Collaboration

Collaboration with Citizens

A sustainable urban forest is a community-wide asset. Without the active support and engagement of the community, urban forestry programs cannot succeed. Community appreciation of the benefits and engagement in planning, planting and caring for trees establishes long-term sustainability. This section describes the ways the community is currently educated about stewardship of the urban forest and how to participate.

Collaboration with Citizens

The foundation of an effective community outreach program is education. The City has an important role in fostering residents' understanding of the environmental, economic and community benefits of trees, as well as proper tree selection, planting and care. During the development of this Plan, citizens expressed a strong desire to learn more about how to properly take care of, plant, and protect trees. They also identified social media and a comprehensive City website as the best ways to communicate with citizens related to the urban forest.

Information related to the city's urban forest is provided through the City's website, brochures and other publications, and during special events, such as Arbor Day. As the urban forestry program grows, there may be a need for an urban forest educator, similar to the Fire Department's Life Safety Educators and the Department of Public Utility's Water Conservation Educator. Information on tree care is also provided through the Hampton Roads Agricultural Research and Extension Center and Landscape Management.

Many citizens express their concerns about trees and the way the City is managing them with e-mails, service requests and phone calls. Citizens are often misdirected to various City departments before they can find the right division to help with their tree-related issues. For example, Housing & Neighborhood Preservation serves customers with hazardous trees on private property, and Parks & Recreation serves customers with trees on City property. It can be confusing to the customer regarding the responsible department within the municipality, which can impact the quality of customer service.

Expanded use of the City's website is an effective tool to educate and inform citizens about all aspects related to management of the urban forest. The Environment & Sustainability Office has launched a website called Virginia Beach Green (**www.VBgov.com/vbgreen**), and it is intended to provide information that facilitates internal communication within the City and external dialog with citizens of all ages related to environmental sustainability, including urban forestry. Currently, the urban forestry section contains limited information. This section should be expanded to include this Plan along with all activities, ordinances, policies and other information related to Virginia Beach's urban forest organized for citizens, businesses and other departments. The expanded site may be best housed on the Parks & Recreation section of VBgov.com with a link directed from the Virginia Beach Green website.

Project Learning Tree (PLT)

Educating the community's youth about urban forestry and the importance of trees can be done in partnership with the Virginia Beach school system and after school care programs conducted by the Parks & Recreation Department.

Project Learning Tree (PLT) is an award-winning environmental education program designed for teachers and parents working with youth from preschool through Grade 12. The *Focus on Forests* module is designed to foster student understanding of and appreciation for forested lands. The module's activities provide an opportunity for hands-on study of forest resources while addressing concepts in biology, civics, ecology, economics, forest management and other subject areas. PLT teamed up along with the U.S. Forest Service, Universal Studios and the Ad Council to design six PLT activities to help students understand the inherent value of forests and the importance of sustainable forest management. For more information about PLT visit their website: **www.plt.org**.

Collaboration With Other Agencies

As important as it is for good communication to occur between City departments on urban forestry matters, it is equally important that similar communication exists between the City and other public, private and non-profit agencies. These organizations are often engaged in activities that impact Virginia Beach's urban forest, so establishing collaborative working relationships related to urban forest management with a variety of external stakeholders from small, local non-profits to large corporations is essential.

Regional Utilities and Infrastructure

- Dominion Virginia Power
- Hampton Roads Sanitation District (HRSD)
- Virginia Department of Transportation (VDOT)
- Verizon
- Virginia Natural Gas

Non-Profits

- Lynnhaven River NOW
- Virginia Beach Beautification Commission
- Council of Garden Clubs of Virginia Beach
- Friends of Live Oaks
- Master Gardeners
- Civic Leagues/Home Owners' Associations
- Scout Troops
- Chesapeake Bay Foundation
- Land Conservancy Organizations
- Elizabeth River Project
- Back Bay Restoration Foundation
- Rudee Inlet Foundation
- Military Bases

Corporations/Businesses/Colleges & Universities

- STIHL Corporation manufactures and sells chain saws, trimmers, and blowers. Locally every year, corporate representatives work with the Parks & Recreation Department to choose a public site for their annual "PLANET Day of Service" event. These events have been hosted at Marshview Park, Stumpy Lake Natural Area, Lake Lawson/Lake Smith Natural Area, Beach Garden Park and others. The corporation provides the needed equipment and recruits volunteers to perform needed activities, such as tree trimming, kudzu removal, etc.
- Virginia Wesleyan College developed a Master Landscape Plan to support their *Go Green* campaign, a campus-wide greening initiative to improve environmental sustainability.
- Virginia Tech/Hampton Roads Agricultural Research and Extension Center is a valuable resource in which extension staff offer training opportunities and research-based information to the city.
- Tidewater Community College
- U.S. Navy
- Commercial nurseries
- Commercial arborists

Regional Cooperation

The formation of the Urban Forestry Roundtable of Hampton Roads has enhanced external communication with other localities of the greater Hampton Roads community related to management of the areas urban forest. The group meets several times a year, and its presence along with its certified arborist training programs helps to focus attention on urban forestry triumphs and challenges in Southeast Virginia. Additionally, the City has collaborated with The Nature Conservancy and the Trust for Public Land as opportunities arise to raise awareness and preserve natural areas.

Future Collaboration Needs

The development of a comprehensive urban forestry website that includes information for residents, externals stakeholders and City departments will allow the City organization to easily disseminate information related to the urban forest to a wide variety of individuals. To promote the continued stewardship of the city's urban forest, the city's youth should be actively educated about the ecosystem services and benefits it provides.

The City should also continue their involvement in the Urban Forestry Roundtable of Hampton Roads and actively share assessment data and management strategies with external and regional stakeholders to forge future partnership opportunities.

Trees are the sole infrastructure component of the city that increases in value with age.

Goals & Objectives

This section identifies the goals and specific actions needed to enhance and preserve Virginia Beach's urban forest. The establishment of goals for overall canopy cover and individual management areas is a necessary first step and will help guide the identification and prioritization of actions to reach those goals.

Guiding Principles

The City understands the importance of community and stakeholder involvement in sustainable urban forest management. To encourage an active and engaged stakeholder group, the City has established the following guiding principles that apply to all recommendations made in this plan.

- Educate all members of the community about the environmental, economic and social benefits of the urban forest.

- Work interdepartmentally to better manage the city's urban forest on public properties through enhanced collaboration and education of the important benefits the urban forest provides.

- Develop new guidelines and policies that allow flexibility and encourage the protection and enhancement of the urban forest for the benefit of all.

- Demonstrate the understanding that the urban forest is a vital city infrastructure element through City programs, policies and actions.

Canopy Cover Goals

Establishing canopy cover goals helps communities identify specific implementation steps for those areas that consider planting opportunities, planting limitations and other priorities. Canopy cover goals also help to rally the community around a clear set of common targets and allow the measurement of progress along the way. Once established, areas with the greatest potential for new trees or the greatest lack of trees can be identified and prioritized to maximize benefits for the city as a whole.

American Forests, a leading urban forest management, conservation and research group, measured tree cover in 440 communities and established recommended minimum canopy cover percentages. For the region in which Virginia Beach is located, communities should strive to maintain at least 40% UTC. This percentage is the minimum recommended to help to sustain a healthy community.

Recognizing the multiple social, ecological and economic benefits of urban forests and links to other policy initiatives including water and air quality, energy savings and public health, Virginia Beach has established the UTC goals identified on the following page. At this time only goals for the city as a whole and areas under the complete control of the City have been established. After further evaluation of the city's UTC and involvement of additional stakeholders, other goals will be established for various planning areas, such as watersheds and land use categories, such as residential and commercial.

CANOPY COVER GOALS BY MANAGEMENT AREA

Management Area	Land Area Type (Acres)	Tree Canopy (Acres)	Existing Tree Canopy (%)	Possible UTC Vegetation/ Impervious	Proposed Tree Canopy (%) 20yr goal	Explanation of Goal
City Wide						
City-Wide	126,309	45,072	36%	41% / 11%	45%	To achieve this goal in 20 years, the City will need to have a comprehensive, proactive urban forestry management program.
Land Use Type						
Transportation Corridors	12,492	2,210	18%	16% / 19%	30%	Transportation corridors serve as the gateways into and through the community. Possible tree plantings along major roadways will be identified and prioritized. Tree plantings along minor roadways will be enhanced and maintained to ensure they are healthy and reach full maturity.
Public Facilities and Parks	10,859	5,123	47%	35% / 16%	60%	The city has a responsibility to model good stewardship related to urban forest resources at all city sites. Potential planting sites will be identified and prioritized for all existing public facilities and parks. As new facilities are planned and constructed, existing tree resources will be preserved to the greatest extent possible.
Schools	1,774	210	12%	41% / 33%	25%	The Virginia Beach school system has implemented green building technologies into all new buildings. The expansion of that practice out into the landscape provides a unique opportunity to enhance the city's urban forest and educate the city's youth about the importance of trees.

Note: Land area acreage identified does not include water.

Assessment, Management and Collaboration Goals

In order to reach established canopy cover goals and continue developing achievable canopy coverage goals for individual watersheds and land uses, the city must allocate resources toward the three sustainable management principals of assessment, management, and collaboration. The goals and objectives identified under each of these categories form the foundation for the policies and activities the city will use to implement the recommendations in this Plan. Directly related to the needs identified during the community evaluation, analysis, and stakeholder input, the highest priority strategies at this time are included in the implementation plan.

Assessment

Goal: Understand the trends and characteristics of Virginia Beach's urban forest.

Objective: Perform periodic canopy cover assessments and tree inventories, especially in priority areas, to understand the extent and composition of the city's urban forest.

Implementation Strategies:
* Perform comprehensive city-wide GIS-based canopy cover assessments every five years and compare data to track changes.
* Supplement the city-wide UTC data with additional tree inventories in prioritized areas.

Objective: Utilize the technological resources available to obtain data related to the functions and benefits the urban forest provides as well as to assist in its analysis and management.

Implementation Strategies:
* Utilize software to quantify the species composition, number of trees, tree sizes, tree health and tree locations
* Utilize available research to better understand the ecosystem benefits that Virginia Beach's urban forest provides.

Objective: Monitor changes in urban forest ecosystems related to climate, growth, and land use changes.

Strategies:
* Utilize the periodic canopy cover assessments to track changes in canopy cover for each watershed and understand the trends between water quality and UTC.
* Quantify the future effects of sea level rise on the city's urban forest cover.
* Quantify the effects fully-developed SGAs will have on the city's UTC.
* Develop a plan for how to best monitor trees planted and removed each year on both City and private projects to predict changes in the UTC.
* Identify important forested tracts for preservation that will help limit forest fragmentation.

Management

Goal: Establish a proactive urban forest management program.

Objective: Obtain needed resources for the management of the urban forest through dedicated funding for an Urban Forest Management Program.

Strategies:
* Seek additional funding for new tree planting and preventative cyclical tree maintenance.
* Establish an Urban Reforestation fund that is dedicated to planting trees on public property and educating citizens about the value and stewardship of trees.
* Identify potential interdepartmental activities that could reduce duplicate services related to management of the urban forest.
* Develop a coordinated approach to seek grant funding from local and regional foundations, industries, and corporations.

Objective: Ensure that urban forest planting and maintenance practices continue to improve the quality of tree canopy so that potential benefits are maximized.

Strategies:
* Use detailed street tree inventories along right of ways to determine conflicts with the built environment and develop better ways to ensure tree health.
* Create and update GIS tree inventories with tree maintenance and removal data.
* Using available tree inventories, develop realistic plan for a five year pruning cycle for neighborhood street trees.
* Develop a comprehensive maintenance plan for all city owned trees.
* Implement city-wide standards for tree care.
* Utilize specialized strategies, such as structural soils, in dense urban areas to improve the health and growth of planted trees.

Objective: Integrate urban forest management planning with other city planning efforts.

Strategies:
* Work with the SGA Office to develop plans for the incorporation of tree resources into new development and redevelopment in the SGAs.

Goal: Achieve a long-term support for the urban forest from City Council, City departments, developers and Virginia Beach residents.

Objective: Ensure that benefits provided by the city's urban forest are understood and considered an integral part of maintaining the quality of life in Virginia Beach.

Strategies:
* Develop attractive and concise annual state of the urban forest reports that highlight successes achieved and challenges faced.
* Update the Urban Forest Management Plan every five years.

Objective: Develop comprehensive policies that encourage the protection and enhancement of the urban forest and acknowledge the numerous benefits provided by trees.

Strategies
- Finalize the Integrated Site Design Guide.
- Recognize and integrate tree plantings/preservation as important elements in meeting environmental challenges, such as reducing pollutants in the Chesapeake Bay.
- With all new developments and redevelopments, consider impacts to existing trees and the incorporation of new tree plantings.

Objective: Improve interdepartmental and inter-jurisdictional collaboration regarding tree regulations, policies, planting and preservation standards.

Strategies:
- Establish a permanent Urban Forestry Committee that meets quarterly with representatives from each department that has an effect on the city's urban forest, citizens and external stakeholders.
- Continue to coordinate with other departments related to capital projects and operations that involve removal, planting, planning and maintenance.
- Educate staff members about tree protection guidelines, policies and best practices on a routine basis.
- Proactively share our data, standards, regulation and policies with other stewards of the urban forest.

Goal: Maximize canopy cover and optimize age and species diversity.

Objective: Achieve an appropriate level of tree canopy cover throughout Virginia Beach based on watershed and land use type.

Strategies
- Utilize the software provided with the Virginia Department of Forestry grant to identify and prioritize planting and preservation areas.

- Identify established residential and commercial areas with very low percentages of UTC to target with innovative programs to encourage tree plantings.
- Encourage property owners and developers to preserve and install additional plantings.

Objective: Achieve adequate tree species and age diversity throughout the urban forest.

Strategies
- Continue to update the approved tree species lists for both public and private developments.
- Add a species diversity requirement to the Landscape Ordinance.
- Continuously add new plantings to public properties to ensure adequate age diversity throughout the city's UTC.

Goal: Preserve and protect existing trees, and encourage new tree planting throughout the city.

Objective: Ensure a balanced approach to enhancing the urban forest through maintaining what exists, along with strategically adding new plantings.

Strategies:
- Allocate sufficient resources toward both needed maintenance activities and tree planting/replacements on public property.
- Encourage the preservation and planting of trees on private property.
- Work with large property owners, residential property owners and civic associations/home owners associations in established areas with low UTC to educate them about the benefits of trees and encourage tree planting.
- Educate developers, builders and private property owners about the value of trees.
- Develop innovative programs for property owners to preserve trees and to plant additional trees in prioritized areas.
- Engage community stakeholders to identify opportunities and barriers for tree planting and preservation on private property.

Goal: Model good stewardship in City practices.

Objective: Ensure that tree planting and preservation are important elements of all City projects.

Strategies:
- Establish a City directive for urban tree canopy goals on all city projects.
- Work with representatives from all impacted departments to develop clear, concise procedures when dealing with urban forest resources.

Objective: Approach tree removal on public property from a comprehensive understanding of both the benefits the trees provides and the constraints they place on other community goals.

Strategies:
- Consider existing tree resources when identifying locations for new facilities.
- Conduct site assessments to quantify the number of trees to be removed and to identify possible alternatives that limit impacts to the urban forest resource.
- Discuss conflicting management goals interdepartmentally.
- Develop standard, practical guidelines that address the replacement of removed trees for use on all city projects to ensure a sustainable forest canopy.

Objective: Preserve existing wooded parks and natural areas, and plant trees in parks, natural areas and other public open spaces to improve the overall tree canopy.

Strategies:
- Manage forested areas on public lands so that there is adequate species diversity and size class distribution to maintain a sustainable urban forest.
- Control and manage invasive plant species and tree pests and diseases in an environmentally responsible manner.
- Manage and enhance areas adjacent to existing streams as riparian forest buffers wherever possible and appropriate.
- Perform reforestation projects on sites as appropriate.

Goal: Develop and implement effective resource management tools.

Objective: Ensure the use of effective and efficient tree resource and benefits database programs.

Strategies:
- Expand the use of the Hansen software to track urban forestry expenditures, tree removals, and planting opportunities.
- Obtain and train staff in the use of the i-Tree software.

Objective: Develop adaptive management practices to accomplish urban forest objectives in light of the constantly changing ecological, social and regulatory environment.

Strategies:
- Continuously monitor urban forest best management practices and adapt local management practices and programs appropriately.
- Review urban tree canopy coverage data to identify new trends and strategies that need to be addressed.

Collaboration

Goal: Enhance public awareness of the urban forest as a community resource.

Objective: Inform all interested partners about the state of the city's urban forest and what they can do to help.

Strategies
- Develop a user friendly website that serves as a single source for all information, targeted to city residents, developers, and city staff members. Include social media links for a more interactive experience.
- Educate private land holders and residents on the important role that they play in healthy urban forest management, and engage them as key stakeholders through outreach programs and services.
- Educate local teachers and students about the importance and benefits of the urban forest through the development and/or use of a relevant urban forest educational program.

Goal: Actively engage all members of the community in achieving a sustainable forest.

Objective: Promote citizen/government/business partnerships related to preserving, maintaining and enhancing the urban forest.

Strategies:
- Continue to promote the Tree Buddies program that provides citizens an opportunity to plant trees on public property to commemorate someone or something.
- Expand involvement in the Neighborhood Tree Pruning Program.
- Partner with nurseries and the landscape industry to make quality information and plant materials available, and discourage the sale and planting of known non-native invasive plant species.
- Develop a program to acknowledge and publicize contributions to urban forestry by citizens, businesses, institutions and neighborhood organizations.
- Facilitate opportunities to collaborate with universities and the private sector on urban forestry practices.
- Continue to refine partnerships with providers of utility and public infrastructure such as Dominion Virginia Power, HRSD, VDOT, Verizon, etc.

Priority Implementation, Tracking and Evaluation

The completion of this document is not the end of the planning process. In fact, it is just the beginning of a long-term planning, coordination, and implementation process.
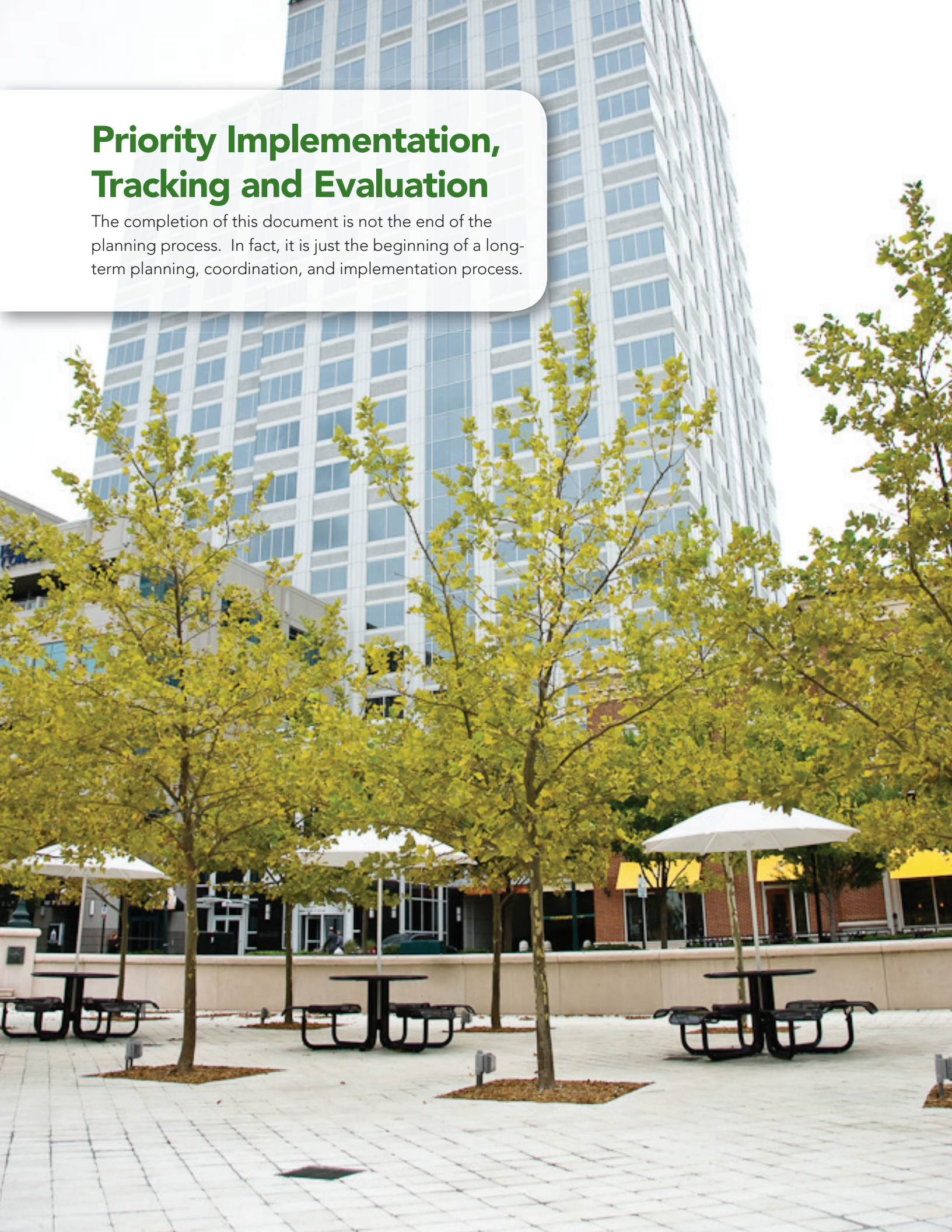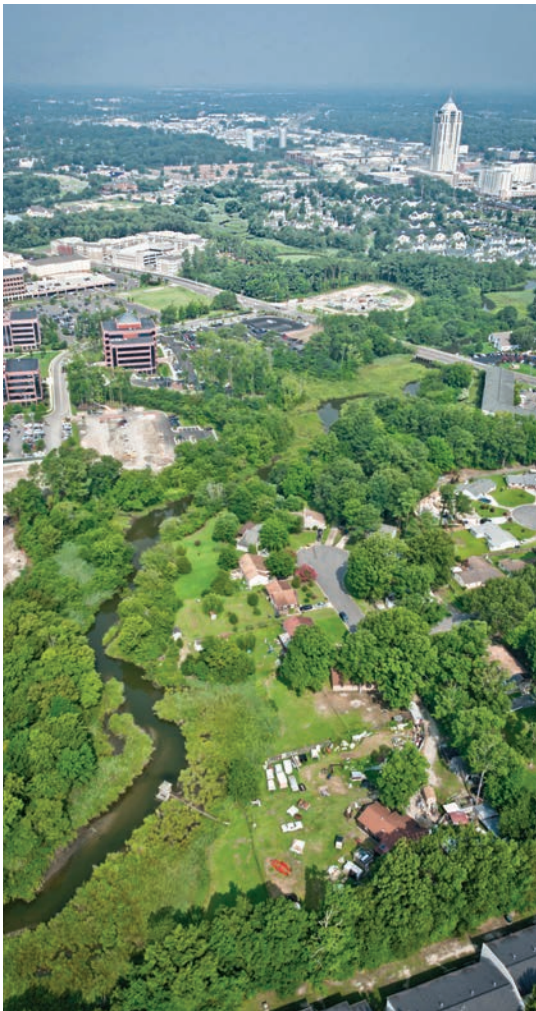
What we are doing to the forests of the world is but a mirror reflection of what we are doing to ourselves and to one another.

| Mahatma Gandhi

The previous chapters have presented a comprehensive picture of the state of the city's urban forest and goals for the future. The real work for putting the Plan into action and bringing the goals for the city's urban forest into reality begins with this chapter - Implementation, Tracking and Evaluation. It will take a committed effort from the city's staff, officials, business owners, external agencies, and citizens.

Significant internal and external stakeholder input has identified a multitude of actions that can be taken to preserve and enhance the city's urban forest. Work has begun on several of the actions identified. During the development of any plan, a sense of direction, purpose, and future prosperity are gained by those involved in the process. It is important to maintain those feelings through ongoing accomplishments of the work that has been planned and begun. This chapter provides a process by which those actions can be implemented.

The following pages outline the various actions that have been identified as top priorities to accomplish over the next one to five years. These will help Virginia Beach reach its canopy cover goals and realize all the ecological benefits that come along with them. They are categorized based on the three sustainability components: Assessment, Management and Collaboration.

Implementation Action Plan (1-5 years)
Assessment

Goal and Related Action Item(s)	Detail/Tracking and Evaluation	Lead Agency(s) & Stakeholders	Priority
Understand the trends & characteristics of Virginia Beach's urban forest			
Perform comprehensive GIS-based canopy cover assessment	**Detail**: In 2008 the city obtained its first urban tree canopy (UTC) cover assessment. Analysis of the 2014 UTC data will provide valuable info as to changes in the city's UTC. **Tracking and Evaluation**: Review and analysis of 2014 UTC data.	**Parks & Recreation Planning, Design & Development**	Ongoing
Continue to perform detailed tree surveys in prioritized areas	**Detail**: Detailed tree inventories have been performed on several municipal sites, schools, parks, Town Center, and along select neighborhood streets. Continuing to perform detailed tree inventories will provide a better picture of the city's tree resource and identify conflicts, maintenance needs, and new planting opportunities. **Tracking and Evaluation**: Yearly review of tree survey data. A progression of data and use should be evident.	**Parks & Recreation Landscape Mgmt**	Ongoing
Develop a plan to better track public and private planting and removal rates	**Detail**: Public and private tree removal and planting rates are important components in understanding long term impacts to the urban forest. Public planting and removal rates are captured but are not comprehensive. Private tree removal and planting rates are not tracked at all. Both can be captured through coordination with stakeholders and simple documentation steps added to existing procedures. Public planting/removal rates can be captured by each department engaged in those activities. Private planting/removal be tracked through coordination with the site plan review process and local tree removal companies. **Tracking and Evaluation**: Year 1 - plan developed to track public and private data. Year 2 - plan implemented to track public data and private data through the site plan review process. Year 3 - plan implemented to track private data not involved in the site plan review process.	**Parks & Recreation Landscape Mgmt,** Planning, Public Works, Public Utilities, and Housing	3-5 year priority
Identify important forested tracts to preserve that limit forest fragmentation	**Detail**: Local, state, and federal land holdings in the southern and central portions of the city have preserved significant forested areas along waterway corridors. The preservation of additional forested tracks adjacent to these areas will expand important green infrastructure corridors. **Tracking and Evaluation**: Year 1 & 2 - identify important tracks to preserve during the 2014 Outdoors Plan update. Year 3 - work with property owners to identify innovative tools and incentives to permanently preserve tracks.	**Parks & Recreation Landscape Mgmt,** P&R Planning, Design & Development, and Planning Department	3-5 year priority

Implementation Action Plan (1-5 years)
Management

Goal and Related Action Item(s)	Detail/Tracking & Evaluation	Lead Agency(s) & Stakeholders	Priority
Establish a proactive urban forest management program			
Seek additional operational funding to more proactively manage the urban forest	**Detail**: Additional funding is needed for street tree maintenance and tree replacements/new plantings. **Tracking & Evaluation**: Additional funding is allocated for street tree maintenance and planting. These activities make up an increasing percentage of dollars spent managing the city's urban forest.	**Parks & Recreation, Landscape Mgmt**	1-2 year priority
Identify interdepartmental activities that could reduce duplicate services related to impacts to and management of the urban forest	**Detail**: Many departments impact the urban forest through tree removals and plantings. Better interdepartmental coordination related to these activities will lead to a more comprehensive approach to management of the urban forest. **Tracking & Evaluation**: Parks and Recreation regularly meets with other departments related to management of the city's urban forest resources.	**Parks & Recreation, Landscape Mgmt** and other City Departments	3-5 year priority
Achieve long-term support for the urban forest from City Council, City departments, developers and Virginia Beach residents			
Finalize the Integrated Site Design Guide	**Detail**: The Integrated Site Design Guide encourages developers to use more sustainable, low impact development approaches to meet current city regulations, including the preservation of existing trees - an important component of maintaining the city's UTC. **Tracking & Evaluation**: The Integrated Site Design Guide will be adopted by City Council and developers will be using the guide.	**Planning Department** and Parks & Recreation	1-2 year priority
Establish a permanent Urban Forestry Committee	**Detail**: The Urban Forestry Committee is comprised of representatives from each department that has any effect on the city's urban forest. **Tracking & Evaluation**: An established Urban Forest Committee that meets regularly to address a variety of urban forest related issues.	**Parks & Recreation Landscape Mgmt**	1-2 year priority
Work with the SGA office to ensure tree resources are addressed	**Detail**: Provisions for the preservation of existing trees and new plantings in the SGA's is important for these areas to become vibrant, attractive and sustainable urban areas. **Tracking & Evaluation**: Adopted regulations and guidelines for the SGAs encourage the preservation of trees and new tree plantings.	**Parks & Recreation Landscape Mgmt,** P&R Planning Design & Development, and SGA Office	1-2 year priority
Utilize tree plantings to meet environmental challenges, such as reducing pollutants in the Chesapeake Bay.	**Detail**: New Chesapeake Bay regulations promote the use of trees as an effective strategy to reduce pollutants in the Bay. **Tracking & Evaluation**: Each year, Public Works and Parks & Recreation work together to identify priority locations for new tree plantings. Funding is allocated the following year. All plantings related to this process are tracked in a database.	**Parks & Recreation Landscape Mgmt,** and Public Works	Ongoing
Maximize canopy cover and optimize age and species diversity.			
Establish a replacement factor for tree removals on public land	**Detail**: A standard replacement factor is needed that takes into account the numerous benefits trees provide. **Tracking & Evaluation**: A city-wide standard practice has been established (1-2 years).	**Parks & Recreation Landscape Mgmt,** Public Works, Public Utilities, and Planning	3-5 year priority
Continuously add new plantings to public properties	**Detail**: To ensure adequate age diversity throughout the city's UTC, new plantings are needed. **Tracking & Evaluation**: Data (species and location) related to new plantings by all city departments are kept and reviewed annually.	**Parks & Recreation Landscape Mmgt**	Ongoing

Implementation Action Plan (1-5 years)
Collaboration

Goal and Related Action Item(s)	Detail/Tracking and Evaluation	Lead Agency(s) & Stakeholders	Priority
Enhance public awareness of the urban forest as a community resource.			
Develop a comprehensive Urban Forestry website	**Detail**: The urban forestry website should serve as a single source for all information targeted to city residents, developers, and city staff members. **Tracking and Evaluation**: A comprehensive urban forest web page has been developed (1-2 years). Annual review of site statistics show an increasing number of hits and website updates are tailored to identified interest points.	**Parks & Recreation Marketing & Resource Development**	Ongoing
Actively engage all members of the community in achieving a sustainable forest.			
Promote volunteer programs such as "Tree Buddies" and Neighborhood Pruning Program	**Detail**: Due to limited funding for tree plantings and limited staffing for tree pruning, the "Tree Buddies" and Neighborhood Pruning Programs are great examples of involving citizens in the stewardship and management of the urban forest. **Tracking and Evaluation**: Annual review of programs shows a steady or increasing trend in funding and/or volunteers.	**Parks & Recreation Landscape Mmgt**	Ongoing
Acknowledge and publicize contributions to urban forestry	**Detail**: Develop a program to acknowledge and publicize contributions to urban forestry by citizens, businesses, institutions, and neighborhood organizations. The Beautification Committee currently does this for beautification projects. **Tracking and Evaluation**: Each year at least one individual or organization is publicly acknowledged for their contributions to the urban forest.	**Parks & Recreation Landscape Mgmt**	Ongoing
Facilitate regional collaboration	**Detail**: Facilitate opportunities to collaborate with universities and the private sector on urban forestry practices. This can be done in association with the Urban Forest Roundtable of Hampton Roads. The city should actively share the city's assessment information and implementation strategies with regional partners. **Tracking and Evaluation**: The city's arborist and others as available continue to actively participate in the Urban Forest Round Table of Hampton Roads.	**Parks & Recreation Landscape Mgmt**, Local universities, arborists, nurseries, etc.	Ongoing
Refine partnerships with providers of public infrastructure	**Detail**: Continue to refine partnerships with providers of public infrastructure such as Dominion Virginia Power, HRSD, VDOT, etc. These agencies regularly impact the city's urban forest. Open lines of communication with these agencies related to the benefits of the city's urban forest will ensure impacts to tree resources are minimized. **Tracking and Evaluation**: All interactions with external agencies are documented and reviewed annually to celebrate successes and identify instances where additional effort/outreach is needed.	**Parks & Recreation Landscape Mgmt**, Private and Public Utility Companies	Ongoing

Urban Forest Sustainability
Treeport Card

During the development of this plan, the city's internal stakeholders utilized the criteria for sustainability identified by Clark et.al. in *A Model of Urban Forest Sustainability* to evaluate the City's current practices. Scores in each criteria area were reached by consensus. This "Treeport Card" should be reassessed every five years to determine where progress is being made and where additional efforts should be focussed.

Vegetative Resource	Grade	Notes
Canopy Cover	C+	Our existing canopy cover equals 25-50% of potential
Condition of Publicly Owned Trees	C-	Sample inventories indicating tree condition and risk level are in place
Species Diversity	C-	There are some species that represent more than 20% of sites inventoried
Overall Grade	**C-**	

Community Framework	Grade	Notes
Public Agency Cooperation	B	Informal teams among departments are implementing common goals on specific projects
Neighborhood Action	C	There are isolated or limited numbers of active people
General Awareness of trees as a community resource	C	Trees are seen as important to the community
Overall Grade	**C**	

Resource Management	Grade	Notes
Canopy Cover Inventory	A	A sampling of tree cover using aerial photography is included in city GIS
Municipality funding	C-	Funding is currently limited to reactive management
Tree Protection Policy and Enforcement	C	There are policies in place to protect public trees, but only limited policies in place to protect private trees
Maintenance of public trees	C	Public trees are maintained on a request/reactive basis; no systematic pruning
Overall Grade	**C**	

Appendix B
Coordinating with
Stakeholders

Coordination with Internal and External Stakeholders

Interdepartmental Coordination

Effective interdepartmental coordination is essential for consistent delivery of urban forestry programs. *A Model of Urban Forest Sustainability* (Clark et al. 1997) describes this ability as the "...degree to which all city departments operate with common goals and objectives." All City departments have the same over-arching goal related to improving the physical and environmental quality of the city and reaching City Council's vision of "A Community for a Lifetime." There is a common understanding among City departments of the role the urban forest plays in helping the City achieve the vision it is developing. A core group of City staff members from Parks & Recreation, Public Works, Public Utilities, Housing & Neighborhood Preservation, Virginia Beach City Public Schools and Planning members frequently meet to consider tree issues. This same core group provided valuable input into the goals that are part of this plan.

While there has been marked progress, there are still issues that spur debate. The establishment of a clear, consistent policy related to management of the urban forest and procedures to follow when conflicting objectives arise is needed. The following established interdepartmental partnerships and collaborative working relationships will form the foundation for those discussions.

- Inclusion of key stakeholders in the Urban Forest Management Plan development process
- Increased oversight and plan review with Schools, Public Utilities and Public Works facilitating better tree protection where needed, mediation when trees are to be removed as part of a project, and more sustainable tree species and placement of trees.
- Interdepartmental field meetings to discuss site plan modifications when needed. Often these field meetings result in a better understanding between departments of urban forestry management issues. For example, Landscape Management requests tree protection and may initially receive resistance from another department. Staff meets in the field to discuss options and how roots are impacted by equipment compacting surrounding soil. In many cases, a new understanding of the importance of tree protection is established fostering positive relationships.
- Parks & Recreation, Police and Risk Management utilize interoffice mail as well as Risk Master, a limited access management tracking system for addressing property damages to trees in the public right-of-way.

- Planning Development Services Center (DSC) staff meets weekly to evaluate tree issues on environmentally sensitive properties within the Chesapeake Bay watershed.
- Shared training opportunities are offered to city arborists by the DSC.
- An interdepartmental training program involving hazardous tree identification has been implemented to include all Parks & Recreation Landscape Management members as well as Housing & Neighborhood Preservation members.
- The City Arborist serves as an instructor for Agriculture volunteer training programs.
- Planning Department and Parks & Recreation share folders on the city intranet server related to existing tree policies.
- Housing & Neighborhood Preservation and Parks & Recreation communicate regularly through on the management of hazardous trees on both public and private property.

The tables on the following pages identify the departments along with their activities which impact the city's urban forest.

DEPARTMENTS AFFECTING THE URBAN FOREST

Department /Department Activities	Role Related to Urban Forest Management
Parks & Recreation/Landscape Management	Public Land Management
Certified arborists and landscape architecture staff	Houses needed technical staff to effectively manage the city's urban forest; works independently and with other departments to address tree-related maintenance, management and planting throughout the city.
Manages and maintains existing park facilities	Responsible for the protection of existing tree resources on sites and the potential for additional tree plantings
Capital Improvement Program (CIP) projects for all new parks and recreational facilities	Responsible for locating sites for new City facilities and the management of their development which includes the removal and planting of trees
Parks & Recreation Foundation	Exists to support P & R by raising funds, accepting gifts and providing other resources to enhance existing programs, services, facilities and technology; manages Tree Buddies program
Public Works	Public Infrastructure Management
Manages CIPs for all new city infrastructure (roads, buildings, etc.)	Responsible for locating sites for new City facilities and the management of their development which includes the removal and planting of trees
Stormwater Ditch Maintenance	Remove trees annually as part of their infrastructure maintenance responsibilities
Chesapeake Bay TMDLs strategy program management.	New tree plantings are an identified strategy to help the city meet more stringent TMDL requirements
Public Utilities	Public Infrastructure Management
Clears/maintains utility easements	Removes trees annually as part of their infrastructure maintenance responsibilities
Manages CIPs for all new City infrastructure (utilities)	Responsible for locating sites for new City facilities and the management of their development
Planning & Community Development	Private Development Management
Manages the Chesapeake Bay Preservation and Southern Watershed Area Management programs	Ensure the protection of the required buffers within the Chesapeake Bay and Southern waters
Development Services Center - Development Review	Responsible for review and approval of development plans which includes ensuring the placement of required trees per the landscape ordinance as well as inspections during the construction process.
Environment & Sustainability Office	Development of a VB Green website, finalization of the Integrated Site Design Guide, address sea level rise related issues, and have a small fund for tree planting. Manages the activities of several volunteer groups including the Friends of the Live Oaks
Agriculture	Private Land Management
Manages numerous volunteer groups such as Master Gardeners, Master Gardeners Tree Stewards and 4H	Established lines of communication and outreach with desired urban forestry stakeholders
Manages the Agriculture Reserve Program (ARP)	Through work with the ARP, can talk with property owners to plant more trees in Southern Watershed buffer areas
Strategic Growth Area Office	Private Development Management
Design and implementation of SGA plans	Can help to guide the protection of existing tree resources and the additional tree plantings in developing SGAs

DEPARTMENTS AFFECTING THE URBAN FOREST (CONT'D)

Department /Department Activities	Role Related to Urban Forest Management
Schools/Libraries/Museums	Public Land Management
Education of citizens	Established lines of communications and outreach with external urban forestry stakeholders/partners
Land and facility management	Manage public lands where additional tree planting locations may be available
Housing & Neighborhood Preservation	Private Land Management
Manages disputes between neighbors related to trees and addresses public safety concerns on private property	Works with the P&R department on hazard tree issues, i.e. during 2009, over 300 cases requiring tree pruning or removal were mitigated through enforcement of City Code
Buys and renovates homes	Responsible for the protection of existing tree resources on sites, removal of hazard trees, and the potential for additional tree plantings
Staff includes 35 inspectors	Through potential cross-training, inspectors could provide an additional set of eyes on urban forest resources throughout the city
Development of the VB pattern book	Potential expansion of the pattern book to include landscape concepts and the benefits of tree on private property
City Attorney	Violations and Liabilities
Assists when individuals illegally cut trees	Recently started working with the P&R department to investigate legal issues; prior to this, very little action was taken when trees on City property were illegally cut down
Communications & Information Technology	Database Management
Center for GIS	Manages the City's GIS database (utility easements, land parcel information, etc) including the integration of the UTC coverage data
Fire Department	Emergency Management
Coordination of Emergency Operations	Serves as the lead department during emergency situations, such as storms and coordinates the activities of other departments

Appendix C
Public Involvement

Urban Forest Management Plan
Public Involvement

P ublic information meetings were held in May 2013 inviting citizens to provide input towards the City of Virginia Beach's Urban Forest Management Plan. Citizens were able to learn what is in the works to improve the environmental, economic and social benefits of the city through the proper planting, maintenance and preservation of trees. Two public meetings were hosted - the first one involved discussions of the City's northern watersheds (Lynnhaven River, Elizabeth River, Rudee, Oceanfront, and Little Creek), and the second one focused on the southern watersheds (North Landing River, Back Bay, Northwest River, and Sandbridge).

Online surveys were also conducted to garner public input on the Urban Forest Management Plan through City of Virginia Beach Virtual Town Hall, an online forum for civic engagement. The four-question survey reflected discussion topics from the public meetings to identify citizens' top priorities within the urban forest which resulted with 237 unique visitors to the topic and 82 individuals who participated in answering the questions, equivalent to 4.1 hours of public comment.

Below are results to both forums of public involvement:

Survey Summary from May 15, 2013 Public Meeting

Question	Most Common Response
I know how to properly take care of and plan trees.	Strongly Agree
I would like to know more about how to properly take care of and plant trees.	Strongly Agree
I don't have enough knowledge or time to care for trees.	Strongly Disagree
it is financially difficult to maintain healthy trees or buy and plant new trees.	Somewhat Disagree
I am interested in tree preservation and growth strategies.	Strongly Agree
I would like to know more about how to properly save trees during land development.	Somewhat Agree

Survey Summary from May 22, 2013 Public Meeting

Question	Most Common Response
I know how to properly plan trees.	Somewhat agree
I would like to know more about how to properly plant trees.	Somewhat disagree
I would like to know how to properly take care of trees.	Somewhat agree
I would like to know more about how to properly take care of trees.	Somewhat disagree
I don't have enough time to care for trees.	Strongly Disagree
It is financially difficult to buy and plant trees.	Somewhat agree
It is financially difficult to maintain healthy trees.	Somewhat disagree
I am interested in tree preservation.	Strongly Agree
I am interested in tree growth strategies.	Strongly Agree
I would like to know more about how to properly save trees druing land development.	Strongly Agree

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Virtual Town Hall

Welcome to Virtual Town Hall

This is **your** city government. We want to hear from you.

Our goal is to provide outstanding services and to maintain the high quality of life we all enjoy in Virginia Beach – excellent schools, parks, libraries, roads, water and sewer services, and much more.

The City Council and staff want to hear from you.

Virtual Town Hall is an online forum for civic engagement. We want to know your priorities and needs. From time to time, we'll ask your opinion on important issues. Please visit often. Take the time to learn about new issues and express your views. Read what others are saying. City leaders will read the statements and incorporate them into the decision process.

When you post your first statement, you will be asked for your **name and home address**. This confidential information is used only to identify statements from residents in and near Virginia Beach.

Virtual Town Hall is run by Peak Democracy, a non-partisan company whose mission is to broaden civic engagement and build public trust in government. Peak Democracy will keep your information confidential per its strict privacy agreement.

As issues arise, city leaders will consider input from this forum and from public hearings, letters, calls and emails from citizens.

Thank you for helping us build a better Virginia Beach.

Urban Forest Management Plan

By completing this brief survey, you will provide valuable input on what your top priorities are for our urban forest, as well as how we should move forward to enhance the existing urban forest and meet the needs of future generations.

As of November 18, 2013, 10:38 AM, this forum had:

Attendees: 237
Participants: 82
Hours of Public Comment: 4.1

Introduction

An urban forest consists of the trees where we live, work and play and provides many environmental, economic and social benefits to our community. Broadly comprised of urban parks, street trees, landscaped boulevards, public gardens, greenways, wetlands and natural areas, urban forests are dynamic ecosystems that play an important role in our environment: they filter air, water and sunlight, provide shelter to animals and recreational areas for people. They moderate local climate, slowing wind and stormwater, and shading homes and businesses to conserve energy. Urban forests are fundamental to the city of Virginia Beach's physical beauty, healthy neighborhoods, sustainable development, clean air and water, energy conservation, and economic vitality.

In fiscal year 2010/2011, Virginia Beach released its first State of the Urban Forest report, which provided a strategic framework for the future and showcased quantifiable Urban Tree Canopy (UTC), tree-related community and interdepartmental city communications, and sustainable management practices. The Fiscal Year 2012 State of the Urban Forest report examines current quantification processes, improvements in community and interdepartmental communication, as well as recently implemented management practices.

Technology continues to enable us to efficiently quantify, as well as monitor, our ever-changing urban forest and is a valuable and necessary tool in establishing citywide tree management parameters. Though our watersheds possess similar characteristics, data from our UTC study has enabled us to evaluate the city as a whole and make comparisons between many different geographic areas. The recommended UTC for cities in the Mid-Atlantic Region is 40%, and the UTC in Virginia Beach is 36%. Strategies need to be defined to minimize decline in our current canopy to ensure that it continues to develop into a healthy and viable resources for the future.

The mission of the Virginia Beach Urban Forest Management Plan is to protect and enhance the urban forest through community involvement, proactive maintenance, education, and responsible stewardship of financial resources. The urban forest is an indicator for environmental health, economic prosperity and community cohesion. A sustainable Urban Forest Management Plan is crucial in order for the city to move forward proactively in enhancing the existing urban forest, and to meet the needs of an expanding population. Developing that plan will not only benefit the forest, but also improve the quality of life for generations to come.

Urban Forest Management Plan
By completing this brief survey, you will provide valuable input on what your top priorities are for our urban forest, as well as how we should move forward to enhance the existing urban forest and meet the needs of future generations.

Responses

Which of the following considerations related to public tree planting are MOST important to you? Please check all that apply.

		%	Count
Caring for trees after they are planted		73.2%	60
Species of trees planted		47.6%	39
Number of trees planted		46.3%	38
Funding for tree planting		41.5%	34
Developing partnerships for tree planting		43.9%	36
Public education and outreach about tree planting		37.8%	31
Focusing on areas with bigger tree planting needs first		48.8%	40
Other		0.0%	0

Where would you like to see more trees planted? Please check all that apply.

		%	Count
Residential Areas		46.3%	38
Industrial/Commercial Areas		52.4%	43
Waterway Buffers		62.2%	51
Roadways		59.8%	49
Schools		46.3%	38
Parks		45.1%	37

> ## Urban Forest Management Plan
> By completing this brief survey, you will provide valuable input on what your top priorities are for our urban forest, as well as how we should move forward to enhance the existing urban forest and meet the needs of future generations.

Which of the following tree_related issues should the city provide more education about? Please check all that apply.

		%	Count
Appropriate tree planting techniques		52.4%	43
Appropriate species to plant		75.6%	62
Tree maintenance (watering, pruning, etc.)		76.8%	63
Benefits of trees		64.6%	53
Characteristics of the city's urban forest		37.8%	31
Other		1.2%	1

What would be the best avenues to educate/inform citizens about the city's urban forest? Please check all that apply.

		%	Count
Flyers/Brochures		26.8%	22
Newspaper		61.0%	50
Website		67.1%	55
Social Media		78.0%	64
Public Meetings		23.2%	19
Other		7.3%	6

Appendix D

Staff Resources

EXISTING URBAN FOREST STAFF RESOURCES

Parks & Recreation Staff	Primary Tasks Related to Management of the Urban Forest	% of time spent related to UF Mmgt
City Arborist	Responsible for management of trees on City property including tree inspections, community outreach, coordination with other departments, external organizations and private citizens on tree-related issues	100%
Landscape Inspector	Tree inspections and management of contracted tree-related work on City property	100%
Operations Coordinator	Coordination of customer service requests with the city arborist, inspectors and life cycle superintendant	25%
Contractual Field Assistant (Part Time)	Assists with inspection of tree-related service requests; originally hired to address large volume of Fire Department requests to prune trees for vehicular obstructions caused by low hanging branches	100%
Account Clerk	Administrative support to urban forestry staff	25%
Planners (2)	Long range planning assistance related to the urban forest and GIS support	15%
Landscape Architects (2)	Develop planting plans and manage planting contracts	25%
Tree Unit (4-5 individuals)	Responsible for landscaping and grounds maintenance of City-owned property; tree-related work only includes a small portion of their responsibilities	15%
Inspectors (5 individuals)	Review of landscape plans and management of contracted grounds maintenance activities throughout the city; tree-related work only includes a small portion of their responsibilities	10%

CURRENT REGULATIONS, ORDINANCES AND STANDARDS
that affect the City's Tree Resources

City Administrative Directive	
Tree Removal from City Property (3.18)	To ensure the preservation of the urban forest to the maximum extent possible and provide guidelines and a procedure to determine under what conditions tree removal on City property is unavoidable
Ordinances	
Subdivision Ordinance	Section 4.6 of the ordinance discusses the preservation of noteworthy features including existing vegetation
Site Plan Ordinance	Section 5A discusses parking lot and foundation landscape requirements and the purpose for those requirements related to the numerous benefits tree provide; also refers to the "Landscape Guide" (see below); section 9 discusses penalties (a fine on not more than $100 per day for violations)
Virginia Beach Landscaping Guide	The Landscape Guide is the most comprehensive listing of all required plantings for sites, such as parking lot, foundation, landscaping, screening and buffering. It also includes approved planting lists, details and specifications, tree protection guides and copies of pertinent ordinances; the Landscape Guide has overall been effective in helping the City achieve its current 36% UTC; the one element missing that many other communities address is species diversity
Stormwater Management Ordinance	Section 6 requires the inclusion of existing site vegetation and impacts to that vegetation to be identified in the Stormwater Management Plan for the site
Tree Planting, Preservation and Replacement	Section 1.1 describes the ecosystem benefits of trees; Section 1.4 establishes requirements for residential developments including lot requirements and street tree planting; existing trees can be used to meet requirements provided they are of an acceptable species and tree protection is utilized during construction
Chesapeake Bay Preservation Area Ordinance	Requires minimal disturbance and preservation of existing vegetation in the buffer area.
Southern Watershed Ordinance	Section 8 Design Criteria limits impacts to existing water courses including removal of vegetation; Section 9 states that the required watershed management plan shall include the location of existing vegetation and impacts to that vegetation
Department of Housing and Neighborhood Preservation - Removal of Certain Trees 23-50.1	Regulates the removal of trees which present a danger to property or to the health and safety of persons
Standards and Specifications	
Public Works Standards	Identifies a variety of elements to consider when located plant materials such as the distance tree plantings must be from a road, the placement of vegetation in easements/site triangles, etc.
State and Federal Regulations	
Occupational Health and Safety Office (OSHA)	Regulations for use of tree cutting equipment and safety practices for staff and contractual tree workers
Federal and State Agriculture Departments	Information about EPA regulations, regulation of pesticide and fertilizer use, monitoring and control of noxious and invasive plants

Appendix F

Administrative Directive:
Tree Removal from City Property

Administrative Directive

Title: Tree Removal from City Property	Index Number: AD 3.18
Date of Adoption: 02/01/01 Date of Revision: 12/28/09	Page 1 of 3

1.0   Purpose and Need

To ensure preservation of the urban forest to the maximum extent possible and provide guidelines and a procedure to determine under what conditions tree removal on specified City property is unavoidable and requires review and approval.

2.0   Administrative Directive

City Property:

No person(s) nor entities, and no City departments nor City contract entities shall remove any living tree from City of Virginia Beach property without specific written authorization from the Department of Parks and Recreation, Landscape Management Division, and in accordance with the Code of the City of Virginia Beach Section 33-59 "Issuance for Cutting, Trimming or Spraying Trees or Shrubs" and Section 23.39.1 "Cutting, etc. of Trees, Shrubs or Other Vegetation upon City Property." Notwithstanding the above, the City's Traffic Engineer, as stated in Section 33-59, shall have the authority to require removal of a tree(s) "which obscures, hinders, or creates visibility obstructions for vehicles entering a street from another street or from a driveway."

This administrative directive shall not apply to the following:

- Emergency removal(s) necessitated by storm events.
- Maintenance of rights-of-way, utilities, and easements where tree removal is necessary to achieve the primary purpose of the right-of-way, utility or easement.
- City-owned golf courses, as long as the tree removal is approved by the Golf Course Administrator.
- Tree removal approved in site and subdivision construction plans.

This Administrative Directive does not apply to removal of trees on private property.

All reasonable efforts should be made to avoid tree removal; however, when removal is unavoidable and/or required, project plans must be coordinated with Landscape Management Division staff.

3.0   Procedure to Accomplish Administrative Directive

A request for authorization for tree removal shall be directed to the Department of Parks and Recreation, Landscape Management Division, in writing, facsimile, electronic mail, or by telephone, for evaluation. The request shall include the specific location of the tree(s) and the justification for removal and will be reviewed by the City Arborist.

a. The specific tree(s) shall be inspected by the Landscape Management Services Administrator, City Arborist, or Landscape Management Division's certified arborists. A determination shall be made if the tree(s) requires removal or if an alternative is more appropriate.

b. Approval for tree removal shall only be granted by the Landscape Management Administrator or the City Arborist and must satisfy one or more of the following criteria:

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3.0 **Procedure to Accomplish Administrative Directive** (continued)

The tree:

1. Is a bona fide hazard and poses a threat to the health, safety, and welfare of the public;
2. Is diseased and has no prospect of recovery;
3. Has been damaged by a storm event or damaged mechanically resulting in instability and posing a danger to people and/or property;
4. Is damaging adjacent infrastructure, and root or crown reduction will not eliminate the intrusion;
5. Is obstructing motorists' view which creates an unsafe condition, and pruning will not eliminate the obstruction;
6. Needs to be removed due to construction activity, new landscape installations, or landscape renovations and the tree cannot be incorporated into the project;
7. Has declined substantially, will not recover, and detracts from the landscape;
8. Has outgrown its location or is planted too close to a building.

c. Shade, leaves, fruit, limited building and sign visibility, view visibility, etc., shall not constitute justification for tree removal. Selective thinning shall be performed instead of removal whenever possible; however, selective thinning of trees and removal of underbrush will only be approved if one or more of the following conditions will result from the removal:

1. Improved vehicular operator or pedestrian visibility.
2. An aesthetic improvement which will serve the best interest of the City.

The requesting party shall be contacted by the Landscape Management Administrator or the City Arborist and advised of whether removal will be authorized.

d. Upon approval, tree removal may proceed in accordance with accepted arboricultural practices. All debris must be removed and the site thoroughly cleaned, top soiled, graded, and seeded if the tree stump is removed. The City will not assume responsibility for stump removal or removal of trees or portions of trees that were cut by utility companies at a homeowner's request. The City will assume responsibility for tree removal from drainage easements of any dead, declining, or hazardous trees whose condition can be reasonably attributed, in the City's opinion, to ditch excavation for drainage maintenance purposes.

4.0 **Responsibility and Authority**

The Landscape Management Administrator or designee will be responsible for administration of this directive. All Department Directors will make every effort to minimize tree removal regarding their respective Capital Improvement Projects (CIP). Departments are required to submit construction plans for each CIP for review by the Landscape Management Division to ensure tree removal is minimized. To the maximum extent practical, all CIPs will include a plan for replanting or replacing removed trees.

5.0 **Definitions**

Tree: A woody perennial plant usually having a single main axis or stem (trunk) and normally exceeding ten feet in height at maturity.

Tree removal: Physical removal of a tree or trees by cutting or other physical means from City of Virginia Beach property.

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Approved as to Content:

_____   12/28/09
Director, Department of Parks and Recreation   Date

Approved as to Legal Sufficiency:

_____   3/35/10
City Attorney's Office   Date

Approved:

_____   3/31/10
Deputy City Manager   Date

Approved:

_____   3/31/10
City Manager   Date