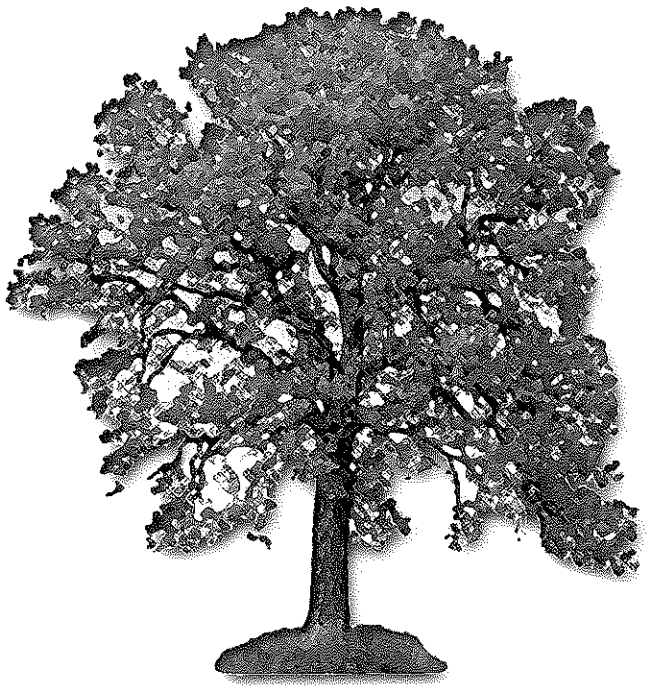
Sitka Urban Forestry Management Plan



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Prepared for
the City and Borough of Sitka
by Community Forestry
Consultants, Inc.

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EXECUTIVE SUMMARY

Urban areas constitute a man-made ecosystem that has a profound effect on the natural landscape surrounding it. The term urban forest or "city trees" includes trees subjected to tough urban conditions including street and park trees and those planted along boulevards, in medians, in parking lots, in tree pits, and other urban open spaces. A new definition of the urban forest is proposed that recognizes the need for an ecosystem approach to urban forest management and the integral role that humans play in that ecosystem. To facilitate this approach the implementation of urban forest management plans in small communities can maintain their character and provide environmental, social, and economic benefits.

City/Borough of Sitka (CBS), for the first time, is attempting to provide a complete account of its urban forest. This document was initiated by a grant from the Alaska Department of Natural Resource Division of Forestry Community Forestry Program (ADNR) with funding from the USDA Forest Service and the CBS Parks and Recreation department to facilitate the city's ongoing commitment to maintain, enhance, and preserve CBS's tree canopy. It is a guide for CBS staff, landowners, utility companies, developers, planners, and residents to follow when making decisions about community trees.

Purpose of the UFMP

Management, maintenance, and preservation of trees in the urban environment can only be achieved effectively through the development and implementation of a Strategic Urban Forest Management Plan that standardizes the policies and practices surrounding all activities related to trees. This report lays out the framework for and components of such a strategic plan, one that encompasses a long-term vision with short-term goals for the management of trees in CBS. The goal is to provide specific guidance on managing, maintaining, and preserving trees within the urban and suburban infrastructure.

An Urban Forest Management Plan (UFMP) is intended to provide a framework for ensuring that the public trees and forests of CBS are appropriately cared for according to community goals over the next five years. The CBS UFMP provides a strategic framework to initiate and expand the CBS's Urban Forestry program to meet a range of policy, education, and management goals. The plan is intended as a tool to explore community concerns and management conflicts, while offering a series of prioritized implementation actions based on inventory data, current urban forestry and arboriculture practices, and community outreach. The plan evaluates staffing needs; addresses program sustainability, funding, and community support.

The plan provides an evaluation of the urban forest resources and their capacity to supply benefits to the community. The interconnection between fisheries, air and water quality, erosion and sediment control, local climate, cultural benefits, and habitat functions can be followed into the heart of the urban and rural forest. The fish give to the forest, but they also require the nutrients and stability of a healthy forest to survive as young fish and the entire ecosystem, people included, depend on clean water. Water quality is linked directly to healthy urban forests.

The capacity of the urban forest to provide benefits depends on how the resources are developed and managed. The UFMP will serve as a road map to improve the CBS's

urban tree management and stewardship in a coordinated, cooperative approach with city/borough departments, program partners, and private land owners.

The plan was prepared through a systematic and comprehensive review of existing city regulations, standards and other adopted plans, discussions with key staff members, an assessment of urban forestry financial resources, and an analysis of tree inventory data.

As a strategic and forward-looking document, this plan should be incorporated into the existing policies and requirements of the CBS Municipal Code, the Comprehensive Plan, the Parks and Recreation Plan, CBS Visitor Industry Plan, and agreements with other government agencies. The UFMP does suggest modifications and expansions to city codes to improve long-term tree stewardship. Any proposed code revisions will be reviewed and considered through future public processes.

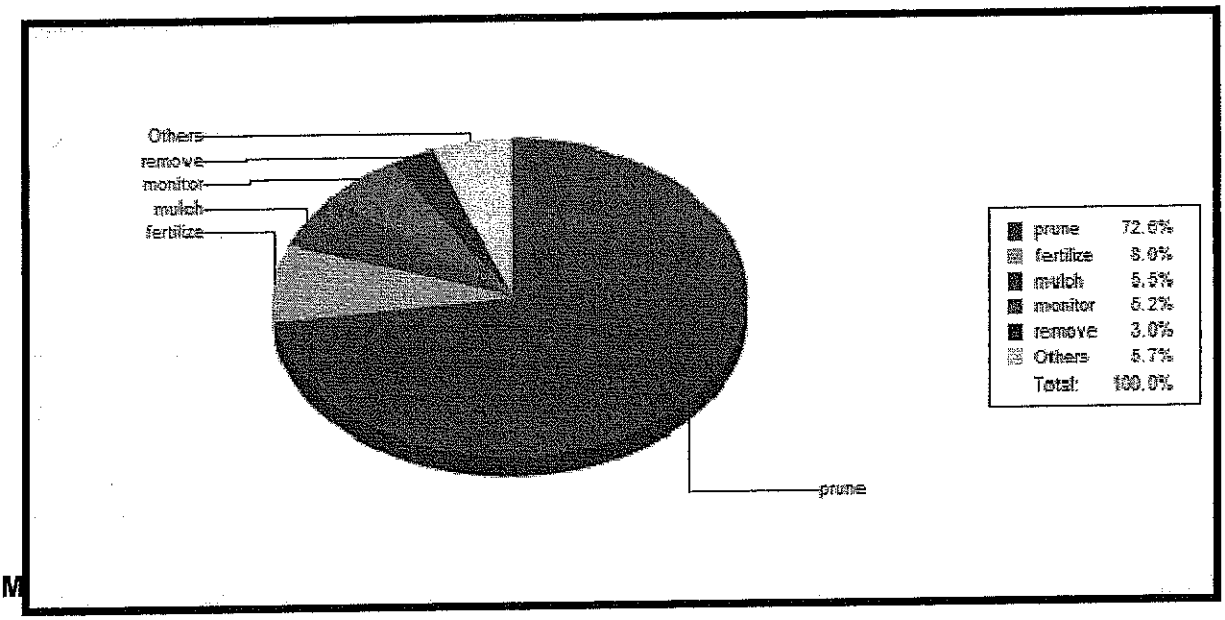
CBS Tree Inventory Summary

The city staff, ADNR staff, and consultants inventoried trees in city parks, harbor facilities, public buildings, and facility grounds at 21 sites. Many other public sites were not inventoried in this project.

***Data results**

- Trees inventoried: 636
- Appraised value of trees inventoried: $1,014,000.00
- Appraised value of trees inventoried if in better condition: $1,250,000.00
- Trees requiring pruning maintenance: 462
- Trees requiring removal: 19
- *Pruning maintenance cost: $92,400.00 (Average tree maintenance cost: $200.00/tree).
- *Removal cost: $8,550.00 (Average removal cost: $450.00/tree).

***Costs are based on historical contract costs and/or CBS staff costs. Future cost estimates should be based using International Society of Arboriculture certified arborists and ANSI approved industry work practices.**



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These recommendations are based on program management goals and are preliminary steps to enhancing the urban forestry management program for CBS. The following table contains a summary of the management goals contained in the UFMP.

TYPE	RECOMMENDATION	DESCRIPTION	PAGE
Program Management	Tree inventory	Inventory public trees to enhance short and long-term management of public trees.	18
	Management Plan	Use management plan to establish a clear set of priorities and objectives for maintaining a productive and beneficial community forest.	19
	Effective administration	Responsibility for administration of community tree program	21
	Five-year management plans	Create five year plans that are first level of operational planning	21
	Annual operating plans	Create annual work plans to direct day-to-day operations	22
Public Outreach	Education, outreach, and stewardship	Create a strategy to capture key stakeholders and broader community input to the vision and goals for the future management plan development	24
	Sitka Tree and Landscape committee	Engage tree committee in program development, annual operating plans, and community outreach.	26
Tree Resource Protection	Tree preservation during development and construction	Require developers and contractors to preserve trees and use best arboriculture practices to protect trees in construction areas.	26
Risk Management	Risk tree management	Managing tree risk and reducing city liability	27
	Risk tree abatement	High risk trees should be inspected as soon as possible and removed to reduce risk to residents, visitors, and facilities.	30
	Tree inspections	Establish an inspection routine to inspect trees regularly for risk and maintenance treatments.	30
Maintenance	Tree maintenance	Establish tree maintenance program	32
	Mature tree care	Establish a two to five year cyclic pruning program for mature trees	34
	Young tree pruning	Implement a pruning program for new	36

TYPE	RECOMMENDATION	DESCRIPTION	PAGE
	program	trees to establish structure and branch architecture	
Tree Resource Expansion	Tree planting	Establish annual planting program	38
	Tree planting practices	Install new trees with root collar at grade level; treat circling and girdling roots at the time of installation.	41
	Mulching	Apply mulch in 10 foot diameter circles to all new tree installations and recently planted trees to avoid mower and weed eater damage.	42
	Diversification	Install many varieties of trees. No single genera should account for more than 10% of the population.	42
	Diameter distribution	Create a program that strives to increase the population of large stature trees.	43
Tree Protection	Vandalism	Use public outreach and education to reduce vandalism and accidental tree injury.	45
	Young tree protection	Fence trees; install tree guards to prevent animal damage, vandalism and injury.	45
CBS Municipal Code Review	Tree ordinance development	Write a tree ordinance with community input to reflect current arboriculture practices, address program goals, and meet community needs.	46
Operational Review	Develop and enhance program functions and funding	Improve program budget; develop multi-year maintenance budget.	49
	Budget	Budget requirements and development.	49
Downtown Corridor	Design, planning, and planting	Revise designs to develop sites conducive to tree growth.	54
Program Actions	Short-term actions	Recommendations for short-term management actions	57
	Long-term actions	Recommendations for long-term management actions	59

The UFMP initiates an effort by the CBS to systematically manage the public tree population. The primary actions and objectives of the plan are listed below and described in detail in the body of the management plan.

- Effective administration
- Inventory and proactive management of public trees
- Annual analysis and removal of risk trees
- Proper tree selection and purchase
- Proper tree planting
- Proper tree maintenance
- ***Annual urban forestry maintenance allocation – $10,450.00**
- Community education, participation, and collaboration

*** Costs are based on historical contract costs and/or CBS staff costs. The annual maintenance allocation represents funding and supplies to perform removals, pruning, and planting by CBS staff, contractors, or combination of both. All work will be accomplished by ISA certified arborists. All work shall meet or exceed current industry and best management practices. The figure considers the current needs of the program. It represents a program goal to provide a level of service to the community to maintain, sustain, and ensure the urban tree canopy thrives.**

- *Pruning maintenance cost: $1,800.00 (Average tree maintenance cost: 90 trees annually @ $20.00/tree).
- *Removal cost: $2,500.00 (Average removal cost: 5 trees annually @ $500.00/tree).
- *Planting cost: $2,250.00 (Average cost to plant 2 to 3 inch caliper shade tree: $450.00).
- Supplies: $3,900.00 (Includes fertilizers, amendments, arborist tools).

The recommendations and actions will expand and conserve CBS's tree resource and sustain the tree canopy for future generations. Although this commitment will come with costs, the long-term benefits are significantly greater and will result in a sustainable asset for the citizens of CBS today and tomorrow.

INTRODUCTION

In 2012 the Alaska Department of Natural Resources Community Forestry Program provided grant funding to assist the CBS to begin a public tree inventory and develop a management plan to guide the management of the community trees. The CBS provided staff for inventory data collection and funds to match the grant and support the project.

The CBS, formerly New Archangel under Russian rule, is a unified city-borough located on Baranof Island and the southern half of Chichagof Island in the Alexander Archipelago of the Pacific Ocean. CBS is the fourth-largest city by population (9,000) in Alaska.

According to the United States Census Bureau, the borough is the second largest incorporated city by area in the U.S., with a total area of 4,811.5 square miles, with 2,874.0 square miles being land and 1,937.6 square miles of it, or 40.27%, being water. CBS displaced Juneau, Alaska as the largest incorporated city in the United States upon the 2000 incorporation with 2,874 square miles of incorporated area.

CBS has a maritime climate with moderate, but generally cool, temperatures and abundant precipitation. CBS is the only town in Southeast Alaska that faces the Gulf of Alaska head-on. Weather patterns and trends are influenced greatly by the Gulf. CBS's weather and location on the outer coast of the archipelago make transportation and access more challenging and expensive. Average annual precipitation is 86.1 inches; average seasonal snowfall is 30.9 inches falling on 233 and 19 days respectively. The mean annual temperature is 45.0 °F, with monthly means ranging from 34.9 °F in January to 57.2 °F in August. Approximately 5 days per year see highs at or above 70 °F; conversely, there are only 13 days with the high not exceeding freezing.

CBS's location was originally settled by the Tlingit people over 10,000 years ago with later settlement by the Russians in 1799. The settlement was once known as the "Paris of the Pacific;" for the first half of the nineteenth century; it was the most important port on the West Coast. While gold mining and fish canning paved the way for the town's initial growth, it wasn't until World War II, when the Navy constructed an air base on Japonski Island (bringing 30,000 service personnel to the area), that CBS finally came into its own.

In 2010, two of CBS two larger employers were the Southeast Alaska Regional Health Consortium (SEARHC), employing 482 people, and the CBS School District, employing 250 people. However, there are more people employed in the seafood industry than in any other sector. An estimated 18% of CBS's population earns at least a portion of their income from fishing and seafood harvesting and processing. CBS is the 6th largest port by value of seafood harvest in the United States. Many CBS residents hunt and gather subsistence foods such as fish, deer, berries, seaweeds and mushrooms for personal use.

CBS's unique position of being straddled between the Pacific Ocean and the most mountainous island in the Alexander Archipelago creates an abundant variety of outdoor opportunities. In 2008 and again in 2012, the League of American Bicyclists awarded CBS the bronze level in bicycle friendliness making CBS the first bicycle-friendly community in Alaska.

Aerial photo of CBS areas inventoried. The dots represent over 600 trees in public areas.

Program History, Organizational and Functional Overview

The trees, landscapes, and open spaces now enjoyed were preserved or planted by early settlers, individuals, CBS staff, garden clubs, Tree and Landscape committee, water front development projects, and youth groups. These people worked to enhance the livability of CBS through tree planting and maintenance. The pattern of growth has been confined and shaped by natural and man-made features. The gulf waters, mountains, wetlands, riparian habitat, and natural terrain have concentrated development along the ocean front of CBS while major roads have defined a linear pattern of commercial development stretching out from the waterfront into unincorporated areas.

Tree maintenance has always been the responsibility of the Parks and Recreation Division, which historically responded to tree-related issues on an as needed basis. Tree maintenance is funded from the general fund as part of the Parks and Recreation budget. The Parks and Recreation supervisor, an International Society of Arboriculture (ISA) certified arborist, oversees tree maintenance. There is no dedicated budget for urban forestry and limited arboriculture equipment. The CBS does not have a position designated specifically as "city arborist".

There are eight cities in Alaska that have the 'TREE CITY USA' designation. TREE CITY status demonstrates a community commitment to managing urban tree resources and creates opportunities for grants. CBS acquired TREE CITY USA status in 2003.

As the CBS tree program is currently structured and staffed, the range and complexity of arboriculture responsibilities exceeds the capacity of resources and staff. Currently, the

scope of responsibilities of the Parks and Recreation Division far exceeds the number of employees required to complete the work. The Division is critically understaffed with only three positions to manage 54 developed sites and 109 acres of developed parks, grounds and ball fields. Often Community Forestry activities must take lower priority in context of all the maintenance demands; **this reality illustrates a major limitation to the city's overall efficacy in protecting and expanding urban tree resources.**

Vision Statement

The vision statement describes how the community wants its landscapes to look and function in the future. This brief paragraph describes the desired outcomes of the plan. It includes views about the importance of a community's trees and natural resources in terms of attractiveness, sustainability, public health and safety, economic prosperity, and provisions for future generations.

City – Borough of Sitka Urban Forestry Vision Statement

The City - Borough of Sitka is dedicated to provide proactive management, maintenance, and preservation of public trees within the city by informing the community, protecting and expanding the public tree resource, utilizing proper arboriculture practices, and increasing community forestry partners to ensure the long term safety, health, viability, and aesthetic quality of the public tree resource.

Tree Benefits

Few elements of the grey infrastructure of urban places can be said to boost property values, sustain fisheries, support retail activity, enhance tourism experiences, improve municipal health, protect water quality, reduce storm water runoff, counter climate change, and ensure roadway safety all at once. Communities looking for these benefits may be surprised to find a solution right in their own backyards, along their streets, and in their parks. The green infrastructure of trees, along with parks and open space, provide a wealth of benefits to CBS (Figure 1).

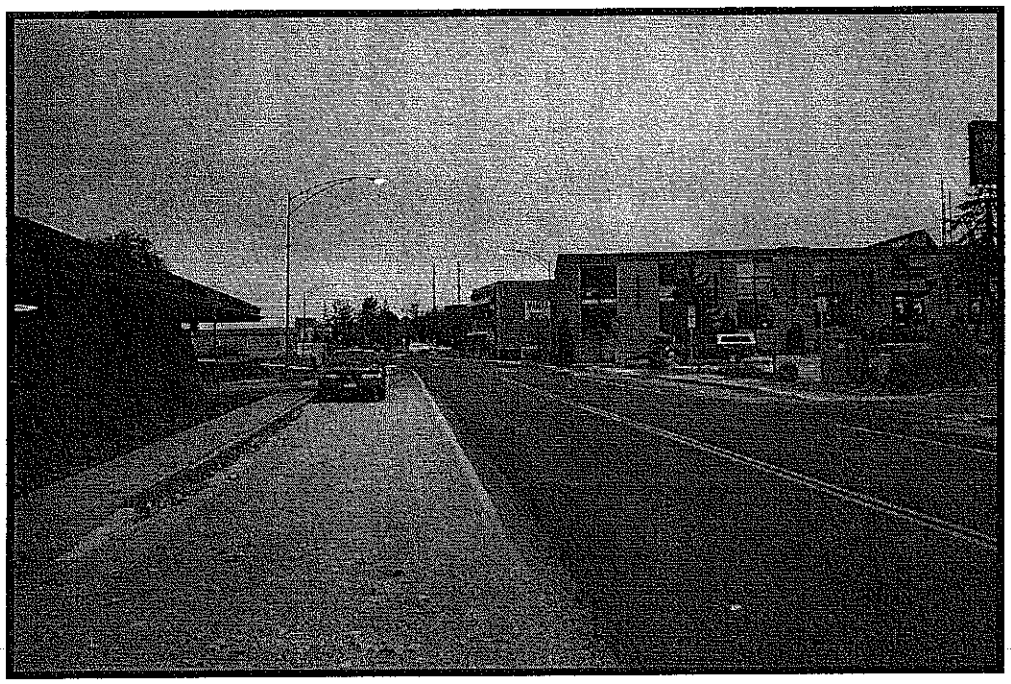


Figure 1 – Many of CBS's arterial, main, downtown, and residential streets lack trees.

Trees hold a prominent role in discussions regarding environmental change. A growing number of scientific studies in recent years are specifically directed toward the role of trees in urban environments. Trees and urban forests provide environmental, ecological, economic, and social benefits to people living in urban and suburban areas. Urban trees and natural forestlands play a huge role in the quality of life in CBS and throughout all of Alaska. Urban trees and forestlands are essential to the health and sustainability of the community, protecting vital water resources and salmon spawning grounds, improving air quality, increasing property values, reducing storm water runoff, and providing critical habitat for wildlife. A summary of key values and benefits, and some supporting sources, is provided below.

Water Quality, Storm Water Retention, Landslide Prevention. The Blue Lake and Indian River watersheds are critical to CBS. CBS has implemented a variety of measures to improve water quality and reduce storm water runoff and wastewater infiltration into the watersheds. Landslides and avalanches are issues affecting water quality and debris content. Urban trees are an effective tool available every day to improve water quality, storm water retention, and prevent landslides and avalanches.

Urban forests absorb rainfall, control surface water runoff, filter ground water and assist in ground water recharge. According to one study, 37,500 tons of sediment per square mile per year comes off of developing and developed landscapes, and urban trees could reduce this amount by 95% (Coder 1996). The Blue Lake and Indian River watersheds contain millions of acres including the river, wetlands, riparian habitat, and tributaries.

Urban tree canopy reduces storm water runoff by intercepting and storing rainfall and increasing infiltration into the soil through improved soil structure. The US Environmental Protection Agency issued a report, *Using Smart Growth Techniques as Storm Water Best Management Practices*, which identified urban tree canopy as an

innovative and sustainable means to dramatically reduce storm water runoff and the costs associated with storm water management. Trees contribute to water quality and quantity improvement through storm water control, attenuation of peak flows, maintenance of base flow, erosion control and rainfall interception (Bernatzky 1983; Xiao et al 1998; Floyd 2002; American Forests 2007).

A tree canopy and continuous vegetation, which is adapted to the local environment, has a positive effect on slope stability (Reubens et al. 2007). Tree root systems enhance the shearing strength of the soil, enabling it to resist landslides and erosion (O'loughlin 1974). Through interception, evapotranspiration and enhancing soil permeability, forests also improve the hydrological characteristics of the soil (Ziemer 1981). Trees on slopes can prevent, protect, and minimize the damage in the event of landslides or avalanches.

Salmon Forest. The economy of CBS is driven by salmon. Salmon need the urban forest and trees adjoining the CBS watersheds and oceanfront. The interconnection between ecosystems can be seen in the watersheds. There, salmon follow rivers into the heart of the forest, past white, Sitka, and Lutz spruce, salmonberry, and other plants that grow on the banks.

- Upon spawning, the salmon die.
- Their bodies are hauled up on land by scavengers such as bears and eagles.
- The scavengers feed on the salmon and leave some of the carcass behind.
- The carcass eventually breaks down, leaving nutrients in the soil.
- Those nutrients become available to trees, shrubs, and other vegetation by absorption their roots.

Salmon need the forest. The exchange of nutrients works both ways. The fish give to the forest, but they also require the nutrients, clean water, and stability of a healthy forest to survive as young fish. A healthy forest supports a healthy ecosystem. The salmon rely on the animals in this ecosystem for food. Inshore, where salmon feed, depends on a healthy forest. The creatures that live along the shore are fed by nutrients from the forest, which are washed from the interior by rain and streams.

Reimchen (2002) found that as much as 60 percent, and an average of 40 percent, of the carbon in tissue from young fish that had never seen the ocean was built of ocean-derived elements. But it does not stop with fish. A sample of salmonberries, a bush that grows at streamside, showed that 18 percent of their nitrogen came from the ocean, giving a new significance to the plant's name. They are literally built of dead salmon.

At certain times of the year, as many as twenty vertebrate species, feed directly on salmon carcasses, cycling those nutrients further into the landscape. The natural community has an economy built on its members, all meshing together like a series of gears. Remove one gear, and the machine stops turning. It loses its power. All who rely on this productive power, including humans, become impoverished in the process.

Life flows both ways. The forest raises the salmon, but the salmon also raise the forest. This mutual dependence is the very definition of community, and in the end, the heart of the matter.

Air Quality Improvements. According to the Alaska State Department of Environmental Conservation Division of Air Quality, particulate matter still poses a dangerous threat to human health and the environment. Regional haze can impair visibility in all directions over a large area. Air toxins such as carbon monoxide contribute to respiratory problems.

Trees absorb gaseous pollutants such as ozone, nitrogen oxides and sulfur dioxide; and they filter particulate matter such as dust, ash, pollen and smoke. Reductions in these pollutants results in improved public health and reduces the severity of ozone-induced asthmatic responses and other respiratory illnesses. Urban trees absorb carbon dioxide, a major greenhouse gas, at an approximate rate of 230-lbs per year per tree. According to the U.S. Department of Agriculture, "one acre of forest absorbs six tons of carbon dioxide and puts out four tons of oxygen. This is enough to meet the annual needs of 18 people."

Trees improve air quality by producing oxygen, absorbing pollutants and sequestering carbon (Rowntree and Nowak 1991; Nowak 1992; McPherson et al 1999; American Forests 2007). A regional ecosystem analysis specific to CBS using tree inventory data can estimate the monetary value of pollution removal services provided by the urban forest.

The Economics of Aesthetics. CBS is a center for trade and services, and for local government and health care for the Baranof Island region. It is important to the community and fiscal revenues to remain competitive and attractive to businesses and customers, and tourists. Recent development in neighboring communities continues to increase competition for businesses and customers.

Improving aesthetics of CBS has tangible economic benefits. Networks of natural areas and trails give a community a reputation for being a good place to live and visit. Increased recreational and community activity attracts new businesses, fosters expressions of creativity, and stimulates tourism. Due to the changing nature of business needs and the move toward tourism based economy, businesses locate or re-locate based on a community's quality of life, including an abundance of open space, nearby recreation and pedestrian friendly neighborhoods. Nationwide, easy access to parks and open space has become a new measure of community wealth – an important way to attract businesses and residents by guaranteeing both quality of life and economic health.

Aside from the potential price effect on residential property sales, trees in retail settings increase shoppers' willingness to pay for goods and services by 12%. Shoppers also indicate that they are willing to drive farther and stay longer if a retail district is well-landscaped with trees. Also, respondents consistently reported greater willingness to pay values for goods and services in the landscaped mall at an overall rate of 8.8%. Urban forests create an appealing consumer environment in business districts (e.g., Wolf 2003, 2005). Trees provide a critical solution that allows CBS to maintain its role as a regional retail center, tourism destination, generate higher sales tax revenues, and keep property taxes at a fairly low rate.

Increases in land values or sale prices as a result of quality landscaping and the presence or retention of trees offers a secondary benefit to the local jurisdiction. The

adjustments directly relate to additional revenue from sources such as real estate transfer taxes and property tax assessments (Behe et. al. 2005; Wolf, 2007).

Health & Well-Being. The emergence of the health care industry as one of the primary industries in CBS area provides significant opportunities for the future. Trees provide a benefit to the health care industry and improve the mental and physical states of the community residents and visitors. Trees foster safer, more sociable neighborhood environments and have been shown to reduce levels of crime, including domestic violence. Views of nature reduce the stress response of both body and mind when stressors of urban conditions are present. Hospital patients with window views of trees recover significantly faster and with fewer complications than comparable patients without access to such views.

Public spaces with trees receive more visitors, increasing the frequency of casual social interactions and strengthening the sense of community. Trees along transportation corridors narrow a driver's field of vision, reducing traffic speeds and increasing pedestrian safety by providing a natural, physical barrier. Studies have found that urban highways lined with trees decrease driver stress, resulting in fewer incidents of road rage.

Parks, campgrounds, green space, harbors, and trails are important assets for CBS residents and visitors. Use of these resources by the community promotes the health and well-being of the individuals as well as the sense of community.

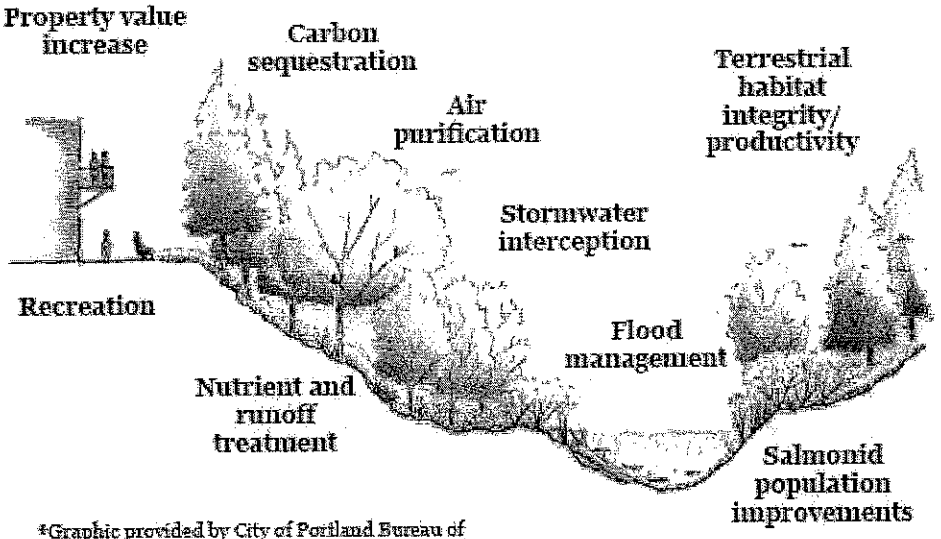
Overall, the service value of individual urban trees can be quantified as shown in the table below.

Average annual net benefits values per tree by size

Small	Medium	Large
$1 - $8	$19 - $25	$48 - $53

Source: *Society of American Foresters: Western Forester, January 2007*

The graphic below illustrates the various benefits of and the integrated functions provided by the urban forest.



*Graphic provided by City of Portland Bureau of Environmental Services (Endangered Species Program)

While real costs must be borne by CBS and its residents because of the urban forest (e.g., storm damage, removals, planting, care, leaf removal, infrastructure impacts, etc), the protection and expansion of the CBS urban forest will yield increased environmental, economic and social benefits. This plan specifies a number of actions the CBS can take to maximize these benefits and engender community involvement and activism.

Appraised Value. Trees in urban areas are valued differently than the timber value of their forestry counterparts or trees in undeveloped areas of the community. Appraised value of urban trees is based on the species of tree, the trunk diameter, the condition of the tree, and the location of the tree. The public trees represent a considerable economic, social, recreational, and environmental asset to the community. **The 636 trees inventoried in CBS have a total appraised value over $1,014,000.00 (Table 1).**

There are additional trees in the urban/rural interface of CBS and undeveloped areas of CBS that will raise the appraised value higher as these areas develop and become urban landscape trees.

The graph shows the number of trees in a range of dollar values. The majority of trees inventoried are in the small diameter class size and species that are rated lower by industry standards. The average appraised value for CBS's trees is $500.00. Consequently, most of CBS's trees fall into the $1 to $2000 range on the graph.

Appraised Value

Total Number of Trees in Report: **636**

Total Appraised Value: **$1,014,000.00**

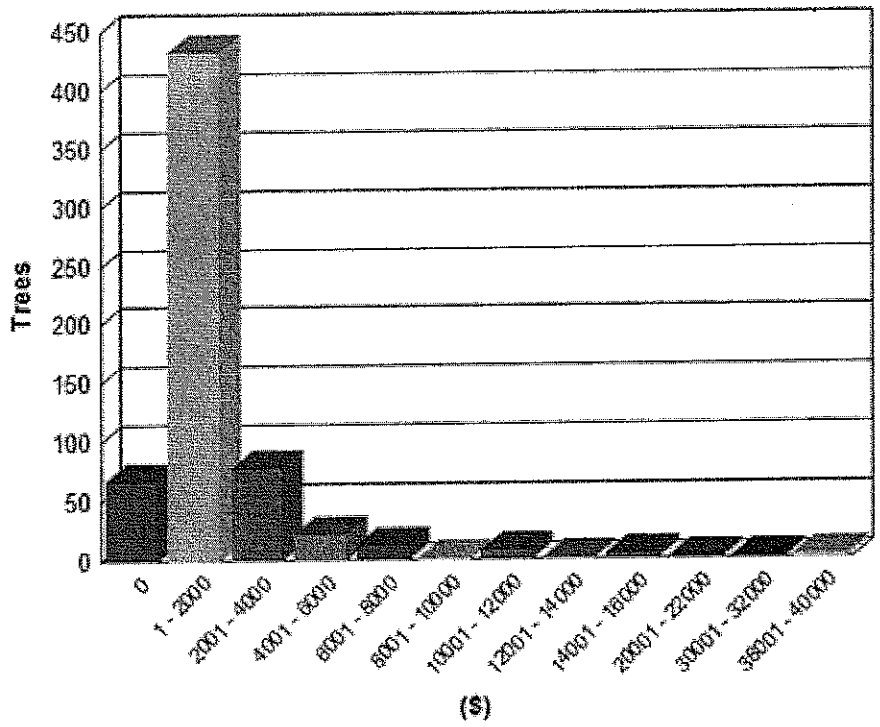


Table 1 – The appraised value of inventoried trees was determined from the Council of Tree & Landscape Appraisers Guide for Plant Appraisal, 9th Edition.

There may exist an additional 500 street and park trees in CBS potentially raising the value of this city asset to 1.25 million dollars. Trees are the only asset owned by CBS that increases in value as they age, but only if they receive proper maintenance.

Relationship to Other Planning Documents

To supplement the processes conducted in the development of this plan, the following community-based documents were reviewed for policy direction and goals as they pertain to the protection and management of the urban forest. Trees and urban forests offer solutions for every objective defined in these plans.

The CBS Comprehensive Plan Update: adopted in 2007: The Comprehensive Plan directs land use planning and development policies for the CBS. It also establishes specific policies related to economic growth, housing, transportation, water quality, public facilities and services, maintenance of subsistence lifestyles, access to natural resources, park amenities, and encourages landscaping for public facilities. The comprehensive plan specifically mentions support of the Tree and Landscape Committee and educating the community about the benefits of trees.
The UFMP and the establishment of an urban forestry program have a direct bearing on the CBS Comprehensive Plan. The UFMP should be mentioned, if not incorporated as a component of the Comprehensive Plan for the community. Trees impact all components discussed in the CBS Comprehensive Plan and are an important component to the successful implementation of the CBS Comprehensive Plan.

The UFMP specifically is a comprehensive management plan for public trees. The UFMP will act as a stand-alone management tool for CBS within the Urban Forestry Program. Upon review and adoption by the CBS Assembly, this plan will guide the protection, expansion, and management of the street trees in CBS, while also complementing the guidelines of the other CBS plans and policies. The UFMP provides enabling solutions for every component of the CBS Comprehensive Plan through sustainable urban forestry management and is consistent with the plan initiatives.

Sitka Visitor Industry Plan: adopted 2007: Sitka appeals to a range of travelers, in state, out of state, business and vacation/pleasure. It offers a diverse set of visitor attractions. Tourism creates benefits, including jobs, business opportunities, and tax revenues. The plan objectives are to improve public spaces by adding flowers and landscaping in the downtown, harbor areas, and parks to enhance visitor experiences. Trees are connected to city habitat, downtown amenities, and street and park design. Adoption and implementation of the UFMP will complement objectives, goals, and recommendations described in the Sitka Visitor Industry Plan.

Sitka Health Summit: Annual Meeting: The summit is an action group formed to study successful revitalization projects and then craft a project that will bring similar benefits to CBS. The group generally brainstorms ideas and whittles them down to several dozen and finally to a manageable level. The November 2012 summit meeting proposed many ideas. The 2012 Health Summitt goal of Downtown Revitalization includes support for trees, tree issues, and trees in the downtown corridor as an important component of accomplishing this community goal.

URBAN FOREST MANAGEMENT PLANNING

The pressures created by urban sprawl are leading to a reduction in forested land in North America. Poorly controlled land-use planning contributes to the haphazard urbanization of many small communities. Urban forests are largely ignored as an asset and the potential benefits they can offer to communities are often not acknowledged in the planning process. Relatively few communities across the United States have any form of urban forest management.

In natural forests trees in all stages of growth and decay are important to functioning of the ecosystem, and even when left alone a forest will convey many benefits to humans. The same cannot be said of city and park trees. The term "city trees" includes trees subjected to tough urban conditions including street and park trees and those planted along boulevards, in medians, in parking lots, in tree pits, and other urban open spaces. Their health and vitality are compromised primarily through limited soil volume, compacted soils, restricted root space, and conflicts with other CBS infrastructure.

Other urban activities such as mowing, leaf collection, vehicle and pedestrian traffic, vandalism, and pollutants submit community trees to additional stresses. Intense citizen use necessitates pruning and prompt removal of high-risk trees to maintain high safety standards. A sustainable urban forest requires careful management in order to maximize the benefits of green infrastructure while addressing the direct and indirect human influences on the trees.

Community trees play an important role in the livability of CBS. The urban forest has been recognized as a visual amenity and for its environmental benefits for several decades, but has only recently begun to be considered as a vital component of a community's infrastructure, and given the specific label of "green infrastructure" or "natural capital" (e.g., Benedict and McMahon 2002; Wilkie and Roach 2004; Ewing and Kostyack 2005). As a result, in CBS, as in many municipalities, resource allocation for management of urban trees has been relatively limited, and staff has largely been occupied with responding to emergency situations and minimal maintenance rather than having the opportunity to pursue more proactive management practices.

As with any type of infrastructure, the urban forest requires regular maintenance and monitoring to ensure that it continues to function properly and provide benefits to its maximum capacity. Infrastructure such as roads and sewers that are neglected for many years can only be repaired at a great cost to the CBS and the people who live there. For the urban forest, this neglect typically comes in the form of failure to plant young trees to replace maturing populations, to adequately diversify tree species to protect against species-specific diseases, to prune trees early on to limit the risks posed by trees as they mature, and failing to maintain mature trees properly.

Fortunately in CBS there are many opportunities to improve the urban forest through well-planned active management over time. This is one key area in which green infrastructure differs from built infrastructure; trees in cities, like other infrastructure, require maintenance to remain safe and viable but their value to the community generally increases over time as they mature so that they become less and not more of a liability.

As shown in the annual Sitka Health Summit, the citizens of CBS value their trees but the community has not, until recently, recognized that it should have a proactive, practical plan to ensure that the urban forest is managed to provide maximum benefits to the residents now and in the decades to come.

Management, maintenance, and preservation of trees in the urban environment can only be achieved effectively through the development and implementation of a Strategic Urban Forest Management Plan that standardizes the policies and practices surrounding all activities related to trees. This report lays out the framework for and components of such a strategic plan, one that encompasses a long-term vision with short-term goals for the management of trees in CBS. The recommended short and long term goals are for the CBS Parks and Recreation Division to follow. It is up to CBS to provide the short and long-term support required to implement it. The goal is to provide specific guidance on managing, maintaining, and preserving trees within the urban and suburban infrastructure.

Employing the best management practices of the arboriculture and urban forestry industries, Community Forestry Consultants, Inc. recommends the following management and maintenance recommendations to improve the health, quality, size, and diversity of the working forest of CBS. This section outlines the primary objectives of this urban forest management plan.

PROGRAM OBJECTIVES

The overall goal of strategic planning and management of the urban forest is to ensure a healthy, aesthetic, safe, and diversified tree cover that can provide a sustained supply of environmental, economic and social benefit to society. Research shows the average city tree lives only 32 years (Moll and Ebenreck 1989) and the closer to the city's center, the shorter the life of the average tree. To help address issues like these, a long range plan is essential for management of a resource that is by its very nature a long-term matter.

Strategic plans define long-term and short-term goals for the agency's urban forestry program. Management plans define how individual goals are achieved through action plans and timelines. Each goal must have an achievable and discernible outcome. Both types of plans can define the overall program management goals of the agency.

The objective of this report is to provide a framework for a Strategic Management Plan that will set the parameters for a standardized approach to urban forest management designed to promote the growth of healthy, functioning trees. The aim is to fulfill this vision over a five-year timeline.

Tree Inventory

Many communities have public street and park trees, a shade tree commission, and plant trees, but how many actually know what the resource looks like, the condition it is in, the benefits it is providing, and how effective their program has been? Whether you are managing a retail store or natural resources, an inventory is critical. Without an inventory of the resource, you don't know what you have, its condition, and what kind of work is needed to maintain or manage it for the future. An inventory also helps you better document the many benefits that trees are providing the community. Tree

inventories are the foundation of an effective tree management program. Tree managers can identify current and potential problems and plan for budgets, removals, pruning, planting and other maintenance requirements with a tree inventory. A tree inventory is a means by which a tree manager can acquire and retain pertinent information about the condition and value of CBS's tree resources (Figure 2). The inventory data supplies objective and quantitative information that can be used to document estimates for funding, personnel and equipment. Using and regularly updating the tree inventory moves the urban forestry program into proactive management.

Figure 2 - Inventory data collection

Street and park tree inventories provide information for the planning, design, planting, maintenance, and removal of trees. It provides useful information to justify starting and managing a tree program and funding an existing program. An inventory of a community's public trees and planting spaces is a prerequisite for making sound decisions. A community that operates a tree program without an inventory may question the need for an inventory. Previous decisions may have been based on tradition rather than an accurate assessment.

A tree inventory can quantify the answers to many important questions. For example, an inventory can provide the location of risk trees, the number of trees located within the public right-of-way, the value of street and park trees, and the number of available planting sites. In addition, an inventory can help identify insect or disease problems, pruning needs, and work and budget priorities.

With this information, the Tree and Landscape committee and staff can better plan and prioritize tree removals, maintenance work, and plantings. They can also determine the value of public trees, which can help emphasize the program's importance. An inventory can be used to monitor tree conditions to quickly and accurately answer management questions, such as where and how many trees should be planted in a year. Over the years, changes can be seen in the number, age, condition, and species of trees. A well-maintained inventory can be used in cases of liability to demonstrate that there was no negligence in the inspection or care of these trees. An inventory will also improve the chances of receiving grants and other assistance by providing documentation of the extent and worth of street and park trees.

The following objective will enhance management of the urban forestry program.

- Maintain the assessment of the tree population to obtain accurate, functional data necessary to manage the urban forestry program.

- Maintain and update the tree inventory regularly as part of the urban forestry management program

Maintaining the tree inventory and using TreeWorks™ to prioritize maintenance establishes a systematic tree maintenance program which actually reduces costs. This is primarily because systematic maintenance in general leads to healthier trees that require less expensive maintenance over the long run than unhealthy, high-risk trees. A computerized tree inventory aids in reducing the subjectivity of tree management decisions and stimulates proactive responses.

Management Plan

Land is used for many purposes. It is also the focus of conflict between a wide range of land uses including agriculture, mining, forestry and nature protection, leisure, parks, harbors, shoreline, and urban and industrial development. Competition between users grows more under increasing population pressure and in communities with a mixed economy. Decision making on land use options is therefore a current problem of modern societies.

Traditional forestry is the management of trees or stands of trees for timber production and other values including wildlife, water quality, and ecological health. Urban forestry is the management of trees and other forest resources in urban ecosystems for the environmental, economic, social, health, and aesthetic benefits trees provide society.

Municipal tree plans provide policy and standards for implementing and managing community tree programs. The principal purpose of a community tree plan is to guide the management and maintenance of a community tree program, including tree removal, pruning, planting, funding, volunteer opportunities, and other important work. Tree plans should be consistent with other municipal planning strategies and usually include a vision statement, goals, objectives, and strategies.

In any given city nationwide, buildings and roads receive careful planning and scheduled maintenance. It is widely recognized that neglect of infrastructure planning and maintenance can result in deterioration leading to numerous potential expenses and risks. Why should trees receive any less planning, attention and care? Tree management plans help cities proactively manage their tree resources to avoid risk, reduce liability, cut maintenance costs, and increase the value of trees. A comprehensive plan helps promote the future health and sustainability of the community's street and park trees, while providing a framework to make difficult decisions about tree removal, preservation, pruning, and planting. A proactive approach to tree issues reduces costs for maintenance, removal, and liability associated with tree failures.

The CBS, in partnership with the State of Alaska Community Forestry program has taken the proactive step of creating a comprehensive UFMP. The UFMP was systematically developed by a review of existing city documents, specifications and standards, tree inventory data; through interviews with key staff and interested citizens, field observations, and by applying national arboriculture standards and best management practices. Field observations of trees along streets, in parks, city facilities, and in the downtown corridor were conducted. This is a customized UFMP for the city based on local conditions, resources, and priorities.

The UFMP is intended to provide strategies, goals, policies, standards, and actions to protect, enhance, expand, and preserve the urban forest for the benefit of the community. The UFMP provides program coordination and improves CBS's tree management in an equitable, economic, and sustainable manner. Moreover, the UFMP will be a valuable strategic planning tool, serve as a road map to enhance the urban forestry program, and become a part of the CBS's comprehensive plan.

The UFMP plan will help the members of the tree and landscape committee, CBS staff, CBS administrators, and other concerned citizens understand the current condition of the community forest and shape its future. Good tree management involves setting goals and objectives and developing specific management strategies to meet them. Implementations of the UFMP objectives are the foundation of an effective tree management program.

The objective is to adopt a proactive, systematic, and strategic focus on an urban forest system as a whole. While limited municipal funds for urban forestry programs often constrain proactive tree care, management planning efforts can increase the efficacy and reach of scarce resources, and have significant impact on the landscape. Sharing the UFMP could further educational efforts by showing staff, elected officials, and citizens how science informs tree management as well as promoting CBS pride. Knowledge gained from this UFMP should also be integrated into other city plans that impact trees. Issues discussed in the UFMP can be used to educate the citizens about the value of trees to the community.

The UFMP will help raise citizen awareness of the benefits of a healthy, diverse and well-managed urban forest. A strong management plan will serve as a tool to be used for garnering public support, cooperation, funds, and help the community sustain its trees for future generations.

The objectives of the municipal tree plan include:

- Effective administration
- Annual analysis and removal of risk trees
- Proper tree selection and purchase
- Proper tree planting
- Proper tree maintenance
- Adequate funding and staffing
- Community and staff education, participation, and collaboration

Effective Administration

Like the gray infrastructure of streets and utilities, trees are an essential part of a community's green infrastructure and should be administered effectively. The responsibility for administering a community tree program must be clearly defined and carried out on a regular basis. These responsibilities often are divided among elected officials, a tree committee, and municipal employees in various departments.

The size and complexity of a municipality will determine how to organize the tree program. CBS's tree population and maintenance requirements require a portion of a staff person's time is funded and allotted to manage the tree program and to coordinate work with the tree and landscape committee, municipal departments, and the public. The responsibility of primary program management belongs to a city arborist. To ensure

good program administration, responsibilities need to be directly assigned and procedures defined clearly.

Community tree plans provide overall guidance to the long-term administration of public trees, and must then be translated into effective actions. Annual work plans for tree removal, tree maintenance, tree planting, periodic inspections, task scheduling, securing funding, and public education and involvement should be used to schedule the work required to meet the plan's objectives and goals. By using an annual work plan and a budget based on this plan to prioritize and schedule tasks for the upcoming year, a tree program can become more efficient and avoid crisis management.

Framework for the 5-year Strategic Management Plan (2013 – 2018)

The plan is intended primarily to provide guidance to the Parks and Recreation Division using a tree information database and a management cycle approach to monitor short to long term trends.

This plan is also intended to provide guidance for the ongoing education of and coordination with the various stakeholders with whom urban forestry staff must work for effective protection of the urban forest. This is intended to be an adaptive and "living" plan, creating a clear critical path for planning and activity, while still accommodating changes in priorities related to economic and/or environmental conditions.

Annual Operating Plans

Annual operating plans (AOP) will direct the day-to-day operations and can be used to project budget requirements for all aspects of urban forest maintenance. The annual plan will include plans for planting, pruning, removals, inspections, plant health care and maintenance of the inventory. Initially, the annual plan will need to address priorities derived from the inventory, but eventually will be focused on proactive management objectives. The preparation of AOPs is the responsibility of CBS urban forestry staff. An example is provided in Table 2.

PROGRAM ACTIVITY	J	F	M	A	M	J	J	A	S	O	N	D
PLANNING												
Work priorities												
Organize activities												
Modification												
TREE REMOVALS												
Review inventories												
Field inspections/survey trees												
Announce/hold public hearings												
Schedule tree crews - Conduct removals												
Stump grinding/reseeding												
Permit inspections												
TREE PRUNING												
Review inventories												
Field inspections/survey trees												
Schedule crew - Conduct tree pruning												
Permit inspections												
TREE PLANTING												
Review inventories/survey potential planting sites												
Survey neighborhoods; notify adjacent property owners												
Purchase trees												
Install trees												
Water trees												
Permit inspections												
COMMUNITY EDUCATION AND OUTREACH												
Education programs												
Report to CBS Assembly												
Arbor Day Recognition												
Tree and Landscape Committee												
STAFF TRAINING												
Professional development												
Safety training												

Table 2 – Example of an Annual Work Plan

PUBLIC OUTREACH

A promising approach for participatory urban forest management planning is the combination of multiple-criteria decision-making and group decision making. A crucial part of the participatory multiple-criteria decision-making process is the aggregation of individual stakeholder preferences into a collective preference.

There are many justifications for citizen participation in decision-making processes. The commonly cited justifications for direct citizen involvement include democratic, substantive, and pragmatic rationales (Korfmacher 2001). The democratic rationale emphasizes that citizens are the "quasi-owners" of the resource; hence, they have the right to participate in the decision-making process. The substantive rationale holds the view that citizens have unique knowledge about the resource in question, and therefore their contributions should inform the decision-making process. The pragmatic justification points out the strengthened commitment to decisions by direct citizen involvement, which increases the chances of smooth policy implementation.

Considering the frequency and magnitude of urban forest conflicts, perhaps pragmatic justification offers the most compelling reason for direct citizen involvement. The inherent characteristics of environmental issues such as complexity, uncertainty, and large temporal and spatial scales and irreversibility offer further justifications for direct public participation in decision making (van den Hove 2000).

A shift from government to governance in the approaches to urban forest policy formulation and related decision-making procedures is taking place at all levels. Policy-makers and other participants traditionally involved in forestry-related decision-making have to tackle and apply new concepts and tools, like public participation, networking, and governance mechanisms.

Education, Outreach and Stewardship

Effective implementation of this UFMP will require the "buy-in" and support from as broad a base as possible. This will include, but is not limited to: CBS staff (particularly those departments who work with, or around, trees), Tree and Landscape Committee, CBS assembly, Sitka Health Summit, Alaska DNR Community Forestry, local arborists, planners, landscape architects, developers, interested individuals, and groups involved in the protection and restoration of CBS's trees, private landowners, local green industries, and local institutions with trees on their properties or properties where trees could be planted.

Education, public outreach, and stewardship are some of the best tools available to keep staff, citizens, and elected officials of CBS informed of the benefits of trees and the proper care of trees. Education and personal involvement of as many community members as possible is critical to the success of a sustainable community forest. Education about proper tree care and participation in the community tree program can translate into more tree benefits for CBS and a willingness to support the tree program in the future.

There are many opportunities to involve the community in the management of CBS's trees. Through a range of projects from increasing the potential for passive awareness (signs), to active recruitment for tree care through stewardship programs, the city can

continue to focus on bringing street and park trees, the benefits they provide and the maintenance needed to the attention of residents and patrons.

Objectives of education initiatives:

- Provide education about the benefits of native plants, the negative effects of invasive species and promote the concept of "Right Plant, Right Place" (e.g., site appropriate planting).
- Design, maintain, and update promotional and technical information, in multiple media, about urban forestry using staff contributions or program partner materials.
- Coordinate with schools and other organizations to develop and/or promote youth education and outreach materials related to urban forestry.
- Coordinate with Alaska DNR urban forestry program, local schools, community colleges, and universities in support of the development of urban forestry training programs for mentorship, internship and research opportunities for students.

Objectives of outreach initiatives:

- Host events and festivals to promote the benefits of trees, such as Arbor Day and Earth Day celebrations, and recognize forestry community advocates and volunteers. Work collaboratively with groups and organizations whose mission and goals are related to, impact, or further urban forestry issues.
- Elevate the prominence of and expand content of the CBS's web page regarding urban forestry; develop internet address mailing lists to enhance communication and marketing efforts with the public.
- Increase communication with CBS decision-makers, including CBS Assembly, planning commissions, public works, and other officials about the benefits of trees and the urban forestry program's objectives and performance.

Objectives of stewardship initiatives:

- Promote proper tree care to increase tree health and longevity, reduce risk potential, and minimize storm damage.
- Expand community-based volunteer and stewardship opportunities, such as volunteer planting or pruning programs, as a way to inform and engage residents about urban forestry issues, such as tree planting, tree care and management and expanding the CBS's tree inventory database.
- Promote professional development opportunities to strengthen the core skills and engender greater retention of and commitment from volunteers, tree committee members, and staff.

The purpose of these objectives will be to capture key stakeholders and broader community input to the vision and goals for the UFMP, and provide an opportunity to create or re-establish relationships with individuals and groups interested in being involved with ongoing implementation and review of the community tree program.

Sitka Tree and Landscape Committee

The Sitka Tree and Landscape Committee (STLC) consist of seven members. A tree committee fulfills one of the criteria to become Tree City USA. A tree committee can be a very useful resource for busy city staff working to develop and implement a management plan since it provides additional opinions from individuals who are interested in, and typically knowledgeable about, the subject at hand, and also helps maintain relationships with groups and individuals that may be able to assist with implementation.

The primary role of the STLC advisory committee for the CBS's UFMP, and the related *5-year Management Plans* would be to periodically (e.g., once a year) review the plans, to track the status of the various recommendations, and evaluate the progress towards management goals. This primary function should supersede other duties of the STLC described in section 2.54.060 of the CBS code.

Objectives for a tree and landscape committee can gain support for a tree program by involving the public in various important endeavors:

- Developing a community tree plan.
- Developing an annual work plan and budget for tree care.
- Designing tree plantings.
- Soliciting funds, including grants and donations.
- Developing or reviewing a street tree ordinance.
- Organizing and coordinating Arbor Day celebrations, other events, and education programs.

The STLC committee should report to and be overseen by the staff member responsible for directing and managing the implementation of the UFMP.

Tree Resource Protection

The primary goal of tree protection is the long-term survival and stability of a tree or group of trees. It is not about trying to save every tree during development and construction because some trees are not salvageable due to structural problems or poor quality species. It is about preserving and protecting trees that add value to the property or because the community demands trees be preserved and protected.

Arboriculture practices cannot repair construction damage or vandalism to a tree or reverse degradation of its growing environment. A limited ability to cure these injuries or accumulated stresses to trees exists. The focus to reach the goal of tree protection is to prevent injury to trees.

Implementing the following objectives can prevent canopy loss and sustain the tree population in CBS.

- Develop and promote a nomination-based, voluntary Memorial/Heritage Tree program to recognize and protect unique, landmark or notable trees.
- Promote tree-friendly development and land use practices by reviewing and reinforcing policies to preserve mature, significant trees and planning for appropriate replanting.
- Promote stewardship of native plant communities on private and public property.
- Prevent unnecessary tree removal on single-family residential lots through property owner education.
- Ensure CBS municipal code section related to urban forestry is enforced consistently and reviewed as community needs change.

TREE RISK MANAGEMENT

Tree Risk Management

Tree risk management is the application of policies, procedures, and practices used to identify, evaluate, mitigate, monitor, and communicate risk. It is impossible to maintain trees free of risk; some level of risk must be accepted to experience the benefits that trees provide. These statements provide a foundation for balancing tree risk and the benefits that trees provide:

- Trees provide a wide variety of benefits to society
- Trees are living organisms and naturally lose branches or fail
- The risk to human safety is extremely low
- Tree owners have a legal duty of care
- Tree owners should take a balanced and proportionate approach to tree safety management

Fortunately tree failure is an infrequent occurrence. Serious damage, injury, or death from tree failure is rare. Tree failures during normal weather conditions are often predictable and preventable. However, any tree, whether it has visible weaknesses or not, will fail if the forces applied exceed the strength of the tree or its parts.

The trees inventoried in CBS are small stature (92% of the population inventoried) or have not reached their mature size yet and pose little liability concerns currently. It is important to manage risk trees despite the small number of potential tree failures in CBS. There are 19 trees inventoried that are removals. Ultimately a municipality has the responsibility for maintaining a safe public right-of-way once it has created one.

These responsibilities include high risk trees or limbs that could damage property and cause injuries or even death, trees that block required traffic sight lines and signs, or tree roots that raise sidewalks, invade segmented pipes, or disruption of activities. The human and financial impact of these problems can far outweigh the costs that a municipality would have incurred in providing proper, proactive care.

Major Defects and Conditions that Increase Potential for Tree Failure

- Dead parts
- Broken and/or hanging branches
- Cracks
- Weakly attached branches and codominant stems (Figure 3)
- Missing or decayed wood
- Unusual tree architecture – lean, balance, branch distribution, and lack of taper
- Loss of or inadequate root support

Tree owners, or people acting on their behalf, have a duty of care to ensure than the trees in their care do not create an unreasonable risk. The liability associated with trees can best be avoided by clearly assigning the responsibilities for tree inspection and care and then documenting that this responsibility is regularly met. Cities and other property owners are expected to conduct annual work, including yearly tree inspections, removal, pruning, and other maintenance. The goal of tree risk management is to provide a systematic and defensible approach by which those risks can be assessed and managed to a reasonable level.

Objectives for the tree plan or tree risk management plan that create proactive tree management and reduce exposure to liability:

- A tree inventory will be completed and maintained. Dates of inspection, condition of inventoried trees, and pruning and other maintenance needs will be recorded.
- Annual inspections of community trees should be completed and accurate inspection records should be kept.
- Hazardous tree branches should be removed as they become known.
- Only trained, ISA certified, and insured tree care professionals who follow arboriculture industry practices should be hired for any tree maintenance work on public trees.
- CBS personnel will be trained in risk assessment, risk management, safe arboriculture procedures, first aid, and safe equipment use.
- Visual clearance for intersections, traffic signs, and signals shall be maintained.
- Requests by CBS departments, property owners, and others should be responded to promptly.
- Implement a risk tree removal action plan based on levels of risk.
- Implement a cyclic pruning program.

Tree risk assessment can also be used as an educational tool to demonstrate the necessity for urban forest planning. Proper planting and aftercare combined with regular pruning and periodic inspections, reduces the likelihood that weaknesses or defects will become hazardous. Proper management will lead to permanent reductions in liability.

Public safety is the major concern for urban forest managers. The CBS has a legal duty to exercise reasonable care to protect the public from foreseeable risks. CBS managers, administrators, staff, and elected officials must demonstrate reasonable care to minimize the risk associated with trees in public areas. It is imperative for all CBS departments to follow established risk management policies.

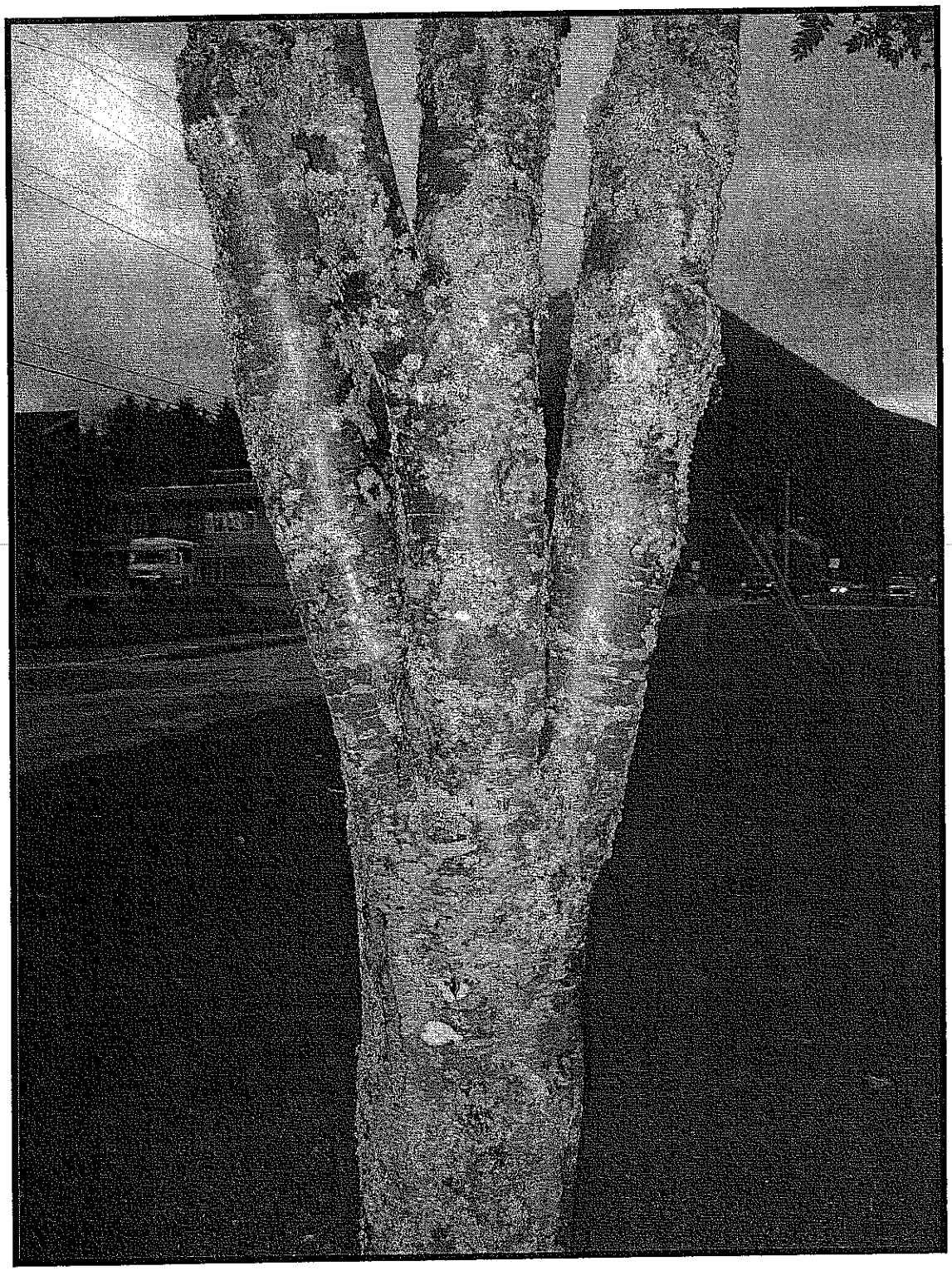


Figure 3 – Mountain ash tree in Crescent Park with codominant stems and included bark. This defect is easily fixed when the tree is young. The CBS has a legal duty to exercise reasonable care to protect the public from foreseeable risks associated with urban trees.

Risk Tree Abatement

Acceptable risk is the degree of risk that is within the CBS's or controlling authority's tolerance or that which is below a defined threshold. Municipalities, utilities, and property managers may have laws, ordinances, or risk management plans that define the level of acceptable risk. Safety is the priority but may not be the only basis used by the risk manager to establish acceptable levels of risk; budget, a tree's historical or environmental significance, public perception, and other factors may come into the decision making process.

Once the inventory is completed, there will also be a need for the continued assessment of risk trees. Assuming that all trees with some risk factor will not be immediately removed, trees that are retained should be inspected on a scheduled basis. The determination of which trees should be inspected and how often should be part of the development of a tree risk program once the tree inventory is completed. Dedicated and qualified staff or consulting arborists will be required for tree inspections. Tree risk inspections should be performed by a certified tree risk assessor.

With the initiation of a cyclic pruning program, at a minimum, each tree will be re-inspected once every cycle. Pruning crews will systematically work through the community and when they are assessing pruning needs they can also evaluate risks. Any new risks can be added to the database and then further inspections can be requested if required. Simple risk abatement through pruning can be addressed as part of the cyclic pruning program.

Tree Inspections

Conditions affecting trees change constantly; none of us will ever be able to predict every tree failure. Conducting a tree risk assessment neither assures nor requires perfection. Risk assessment should, however, ensure that all reasonable efforts have been made to identify extremely and potentially high-risk trees present at the time of assessment.

Currently tree risk assessment is the responsibility of CBS staff. The parks and recreation staff inspects trees drawn to their attention, reported by the public, or identified through operational activities. There is no systematic inspection interval process to identify trees at risk largely due to current resources.

Tree risk assessment is the systematic process to identify, analyze, and evaluate tree risk (Figure 4). It is a systematic process of assessing the tree or tree parts for the likelihood of failure impacting a target and the consequences of failure impacting a target. Inspections are the first line of defense in proactive risk management and maintenance programs. The city can prioritize tree inspections and corrective actions needed based on a process that divides the city into zones; establish inspection methods and schedules according to the zones; and implement corrective actions in a reasonable and timely manner.

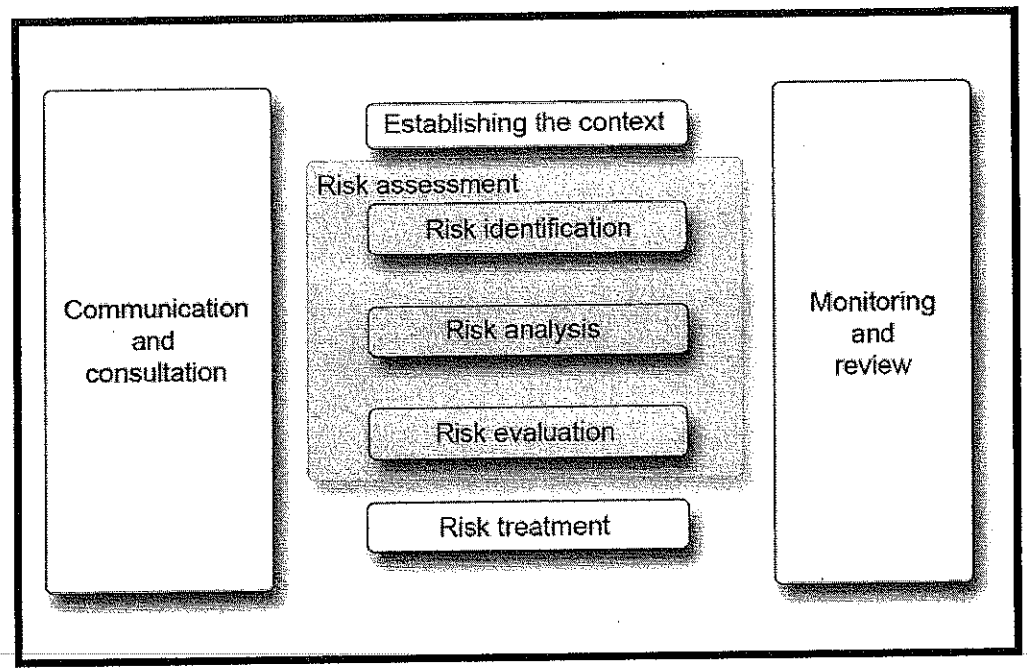


Figure 4 – Contribution of risk assessment (highlighted) to the risk management process (ISO31010)

The evaluation cycle or inspection interval may be range between one and five years, depending on the age of the tree, level of risk, specific conditions, CBS goals and resources, or regulations. The inspection may occur prior to normal storm seasons for the area. Mature trees and species with known failure histories may need to be inspected more frequently. Occurrence of tree or branch failures between inspections will indicate the adequacy of the interval between inspections. Additional inspections should be made following storm events.

Intervals of 18 months between inspections alternate between leaf on and leaf off provides opportunities for assessment during different growing seasons. An advantage to risk assessment during leaf off allows for a clear view of tree structure.

The CBS will benefit and reduce the possibility of structural defects being missed by using a certified tree risk assessor for tree inspections. Inspections should follow consistent protocol established by the arboriculture industry and described in this management plan; the problems should be documented and appropriate arboriculture recommendations made or future monitoring as necessary.

Completing a CBS-wide tree inventory and implementing an urban forest risk management strategy creates an opportunity to develop a more comprehensive risk tree program to address the CBS's responsibilities with respect to "duty of care".

CBS should adopt the ISA Tree Risk Assessment protocol into the urban forestry management program. It includes determining a level of assessment, assessing and evaluating the likelihood of tree failures and impacts, assessing and evaluating the consequences of tree failure impacting targets, and categorizing a risk rating using a set of matrixes (Figure 5).

Likelihood of Failure and Impact	Consequences of Failure			
	Negligible	*Minor*	*Significant*	*Severe*
Very Likely	Low	Moderate	High	Extreme
Likely	Low	Moderate	High	High
Somewhat Likely	Low	Low	Moderate	Moderate
Unlikely	Low	Low	Low	Low

Figure 5 – Tree risk matrix (ISA, 2013).

TREE MAINTENANCE

Tree Maintenance and Care

CBS staff makes decisions on the maintenance and mitigation options and schedules the work. With populations of trees, such as in CBS, scheduling becomes more important and requires prioritization. Pruning plans are essential, not only to ensure healthy, aesthetically pleasing trees but also to increase public safety and to decrease public or private liability.

A variety of requirements can inform pruning plans, some more desirable than others. Common factors that determine pruning priorities are residential or business requests and emergency pruning. This kind of "reactive management" is most common in jurisdictions where no planning exists. Scheduling pruning based on these factors may actually increase liability for damages because many high and extreme risk trees remain unidentified until a failure occurs.

Healthy trees confer numerous benefits, yet poorly maintained trees can pose a considerable risk to the surrounding community. Broken branches and even entire trees can fall down, especially during inclement weather. In paved areas, roots can cause cracks and buckles in pavement which may be tripping hazards. Leaves can clog gutters and fruits can rot and smell.

While the benefits of trees far outweigh the costs, careful maintenance is needed to manage risks that are often predictable, detectable, and preventable. Excluding immediate, acute problems (blow downs, pest outbreaks, and extreme vandalism) tree maintenance should be performed following a two to five year pruning cycle based on a management plan developed by CBS staff or a consulting arborist.

Tree health can be greatly increased by regular pruning, especially when the tree is young. Immature trees that are not pruned can develop many structural problems such as weak branch structure, crossing branches, and co-dominant leaders (International Society of Arboriculture 2005) (Figure 6). If corrected early, the tree can develop a strong support structure with a healthy canopy. This in turn will reduce the necessity of more expensive and often intrusive corrective pruning during the normal life of the tree. If tree condition is improved at a young age and maintained during the tree's life, there will be less need for a reactive approach to pruning.

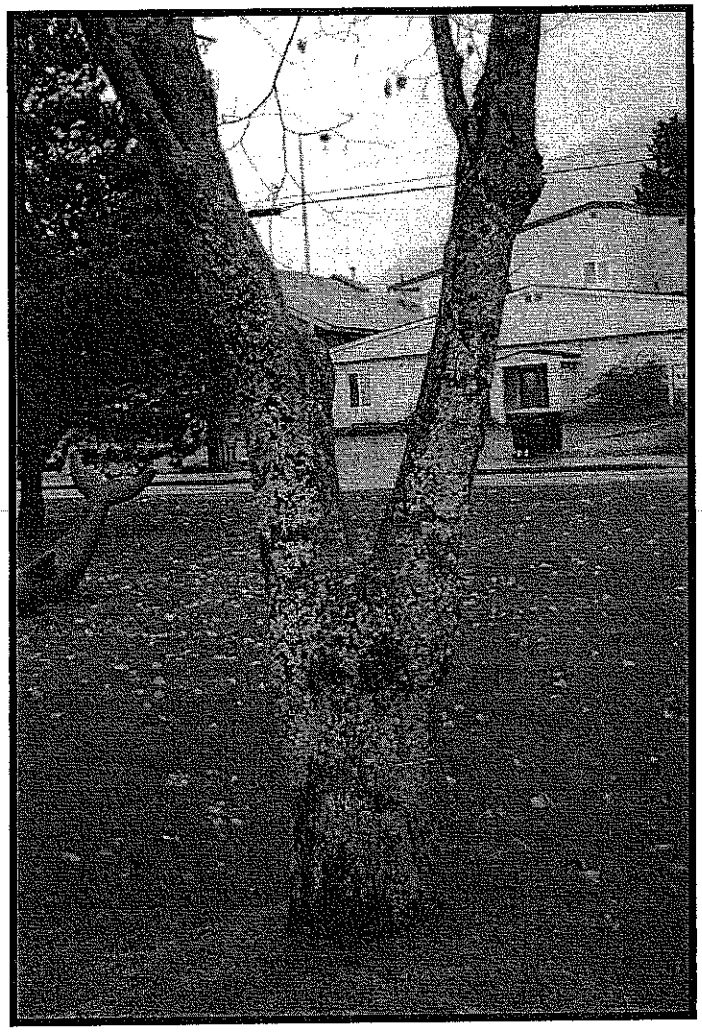


Figure 6 - Co-dominant stems are easily fixed on a young tree but often fail if not pruned correctly early in the life of a Sitka tree.

Most communities try to implement a two to five year pruning cycle. The ability to implement a cyclic pruning program is limited by the staff and financial resources of CBS and most cities and towns cannot afford to contract services for all trees. There are options available to deal with budget constraints. For example, contract pruning of large trees with significant structural defects near high use areas may be an initial management recommendation while small tree pruning is performed by CBS staff or trained volunteers. The objective is to start and maintain a cyclic pruning program within the fiscal and personnel resource constraints of CBS.

Industry standards such as ANSI 300, 133.1, or 60.1 define the standards and terms of arboriculture; specifications and best management practices determine how the agency applies the standards to manage its trees. The standards and specifications are applied universally to all public trees regardless of who is doing the work – CBS staff or contractor. The standards and specifications guarantee that, if invoked, a healthy, structural sound urban forest will be perpetuated. The standards and specifications also demonstrate CBS is implementing currently accepted practices by the urban forestry and

arboriculture professions. The arboriculture specifications should, at a minimum, include specifications for removal, pruning, planting, species, tree preservation, risk rating system, and inventory methodology.

Objective for tree care maintenance that should apply to CBS staff and contractors.

- Pruning treatments should follow the best management practices established by the ISA, ANSI Z133.1 and ANSI A300 standards and employ ISA certified arborists or certified tree workers to perform tree maintenance. In addition to ANSI standards, the city should develop pruning specifications that serve to define treatments for different species, ages of trees, pruning techniques and other pruning issues.

Proper pruning adds value to the landscape and is one of the few active management techniques that helps a landscape appreciate in value while minimizing liability concerns. Proper pruning, with an understanding of tree biology, can maintain good tree health and structure while enhancing the aesthetic and economic value the community forest creates for CBS.

Mature Tree Care

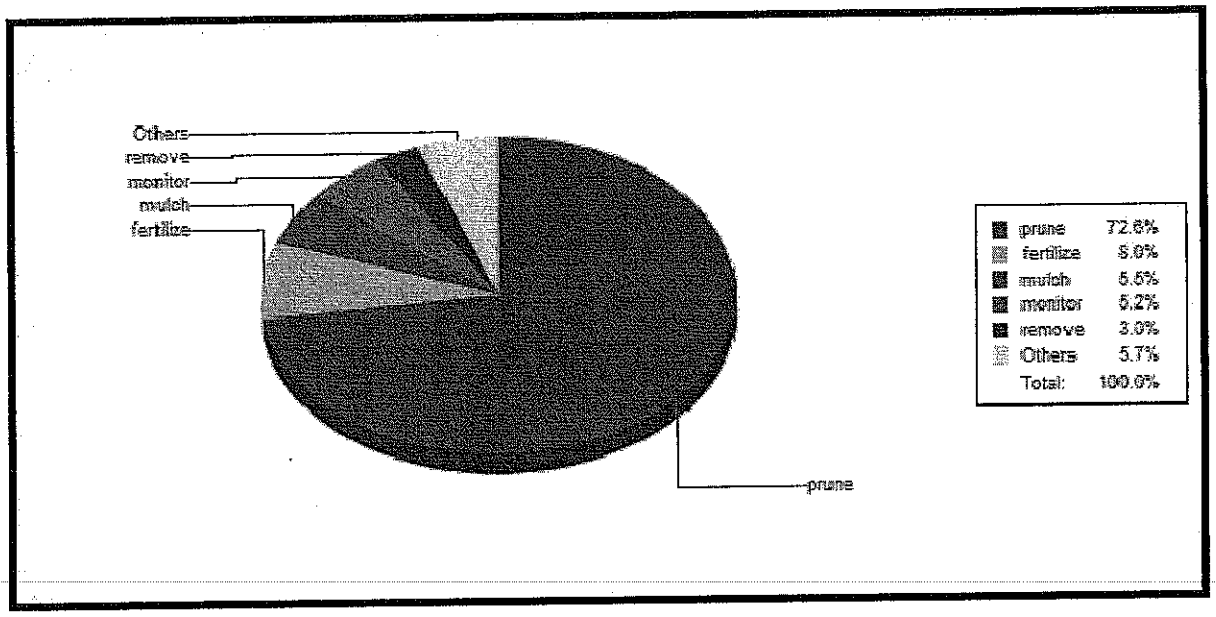
The benefits and values of trees are maximized when trees reach maturity and become established in their growing location. To maintain this high level of benefits for a longer period, CBS should commit to providing regularly scheduled maintenance to its mature trees and prepare for other, non-routine arboriculture treatments as needed. A comprehensive mature tree care program primarily centers on routine or preventive pruning, and the ability to provide fertilization, irrigation, insect and disease control, and cabling and bracing when necessary.

If regular pruning is planned in a systematic manner, crews and equipment can work much more efficiently than if pruning is only done by request or in case of emergency. The cost difference can be dramatic. The ISA has compared efficiencies of both methods and found planned pruning to be at least twice as productive. When crews examine the urban forest regularly for possible risks and tree health problems, there is a reduction in citizen calls for emergency pruning (Luley et al. 2002). Additionally, the crews often find problems that would not have been reported by residents. Regular pruning cycles can also focus on certain species that may require more attention; this is common when a pest needs to be controlled, for example. Regular, cyclic pruning maintains a greater safety level in the urban forest and can decrease liability for the municipality (McGauley et al 2000).

A regular pruning cycle is a critical component of an effective community forestry program. Over 55% of the trees inventoried require pruning (Table 3). Regular pruning of CBS's trees will improve the condition rating of a large number of trees, reduce the potential for storm damage to trees, reduce the risk associated with community trees, and demonstrates proactive management of CBS's tree resources (Table 4).

Maintenance requirements and condition of trees found during inventory data collection are summarized in the following charts.

Planned Maintenance



CBS Tree Maintenance Task Details	
Task	Tree Count
Remove	19
Replant	11
Prune – Crown clean	158
Prune – Subordinate	165
Prune – Clearance	113

Table 3 – Tree maintenance tasks and task frequency determined during inventory data collection.

Removals: There are 19 trees (3%) of the 636 inventoried that require removal. Typical inventory results for tree removal are less than 3% of the population. Removals are primarily due to structural defects. Some of the removals are caused in part by trunk damage that led to decline of the tree. The trunk damage is caused by mower decks and weed eaters striking the trunks frequently (Figure 7).

Prunes: There are 376 trees that require some type of pruning treatment. The most common defect is co-dominant stems which can be corrected by subordination pruning treatments.

Condition Distribution

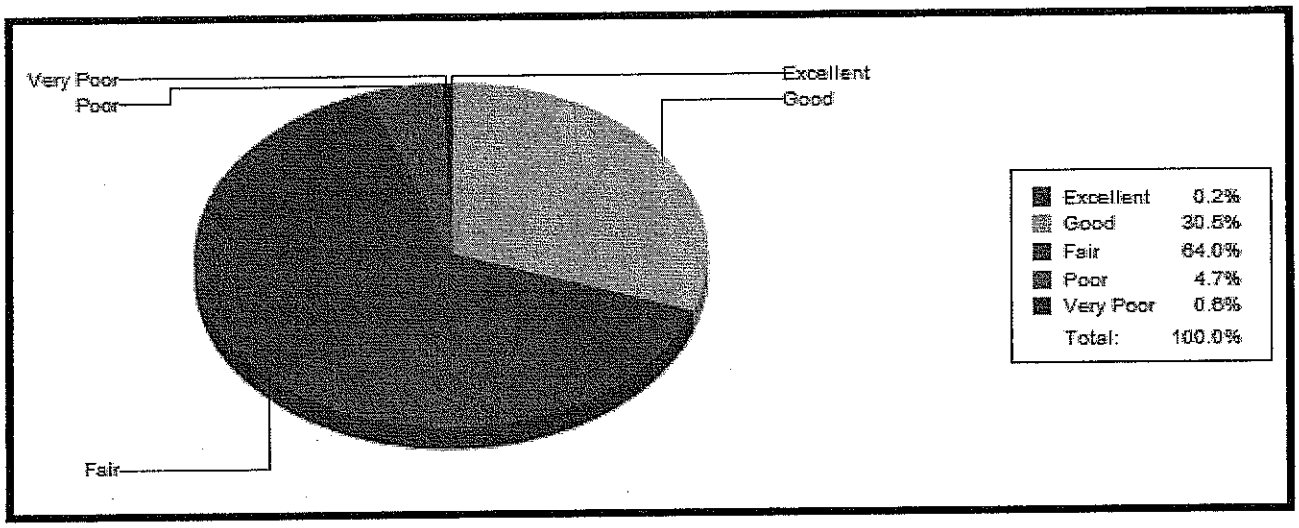


Table 4 – Condition ratings of inventoried trees.

Condition	Percent	Count
Excellent (90%)	0.2%	1
Good (80%)	30.5%	194
Fair (70%)	64.0%	407
Poor (50%)	4.7%	30
Very Poor (30%)	9.4%	4
Dead (0%)	0.0%	0
Total		**636**

Young Tree Pruning Program

There are many newly planted or young trees in CBS. More new trees will be added as trees are removed, development changes, and to diversify the existing tree population. It is critical then to understand the proper maintenance techniques required to ensure the longest and safest service life of these trees. The major components of a young tree care program are pruning, mulching, and watering.

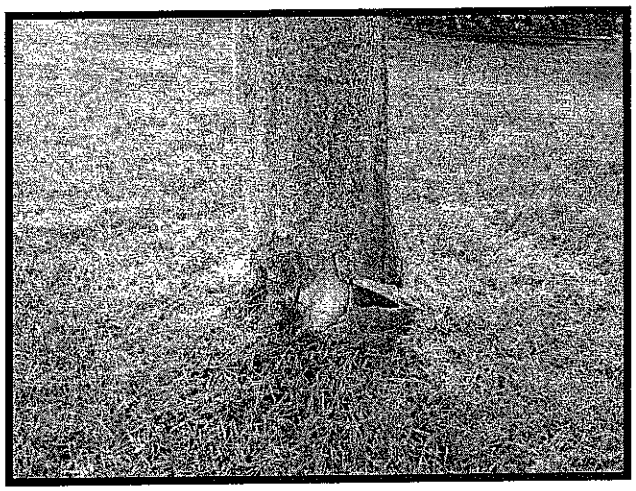


Figure 7 – Frequent wounding by mowers and weed eaters allows decay to enter the tree.

Training pruning is used to develop a strong structural architecture of branches so that future growth will lead to a dominant central leader, strong branch attachment and proper branch spacing along the trunk. It also consists of the removal of dead, dying, diseased, interfering, conflicting, and/or weak branches.

Many young trees may have branch structure that can lead to potential problems as they grow, such as codominant stems, many limbs attaching at the same point on the trunk,

or crossing/interfering limbs. When trees are small, these problems can be remedied easily and inexpensively. If structural problems are not corrected while trees are young, they can lead to poor branch attachment. Trees with poor branch attachment can become safety risks as they grow larger and could create potential liability for CBS in the near future.

All newly planted trees should receive their first training pruning the third year following planting. Training pruning should not be done when a tree is planted, because it is already under stress from transplanting and needs as much of its leaf canopy as possible in order to manufacture food and increase root growth for proper establishment in its new site. Only dead or broken branches should be removed at the time of planting, and in the next two years.

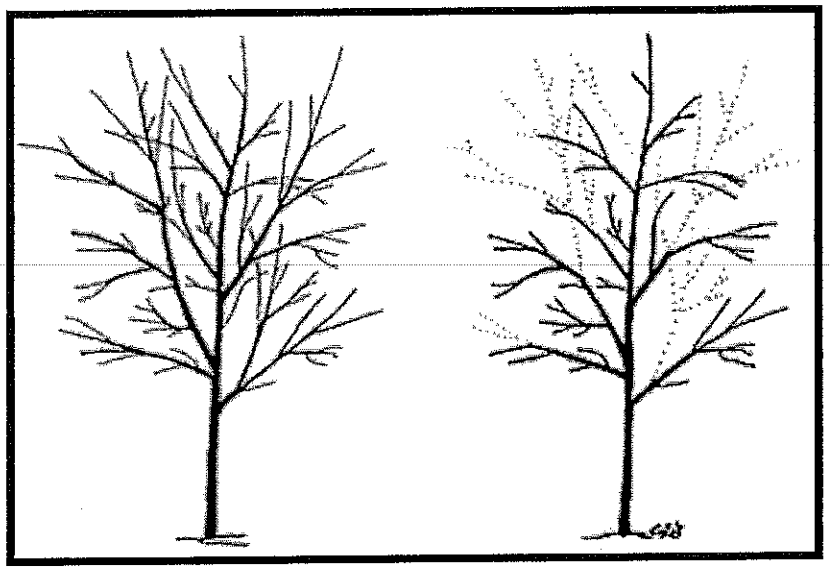


Figure 8 – Proper pruning cuts applied to develop good structure in young trees.

The training pruning program would also be accomplished on a cyclical basis, but the work would be scheduled during a three year cycle rather than the two to five year cycle for the routine pruning of larger established trees. As mentioned above, newly planted trees should receive their first training pruning three years after planting. This work can be accomplished throughout the year (Figure 8).

CBS staff and volunteers would require training in how to prune young trees to obtain good structure. Additionally, these workers would require an understanding of the growth-habits of the various species being planted and an understanding of tree biology, anatomy, and physiology.

This type of work is also highly suitable for properly trained summer interns, part-time employees, and/or volunteers. Since no bucket truck is required, city staff or volunteers can perform this work at any time. Training pruning can be accomplished from the ground with a minimum amount of equipment. The city should develop an organized, documented approach to cyclical tree maintenance that can be easily managed by city staff and properly trained volunteers, if budgetary issues are a concern.

An optimum time to perform this pruning is late winter–early spring prior to bud break. The leaves are gone allowing clear visibility of the branches and trees will react positively to pruning at this time of year. Also it is usually a time of the year when city work loads are less demanding.

Objectives that promote stewardship, longevity, structural integrity, and health of the community forest.

- Educate mower and weed eater operators about equipment operation around tree trunks.
- Maintain the GIS-based inventory to manage the composition, character, and distribution of the urban forest.
- Establish a long-term tree care and management program for public trees to enhance urban forest and ecosystem health and function, that includes structural pruning of young trees, cyclical pruning and crown cleaning of older trees, line-of-sight and height clearance pruning of street trees, removal and replanting efforts, risk identification for street and park trees.
- Coordinate with City Planning and Public Works, and the Alaska Department of Transportation to identify and address serious and persistent tree-related infrastructure conflicts, to include street, sidewalk and utility impacts along with maintenance and installation impacts within utility easements.
- Consider opportunities to expand the use and marketing of wood waste bi-products such as turning wood from removals into lumber.
- Maintain industry-appropriate storm and risk tree response protocols.
- Maintain, promote, and apply industry-appropriate pruning and planting standards through staff and volunteer training and reference in city codes and outreach materials.
- Monitor tree population for insect pests and diseases, particularly invasive.
- Review and update the Urban Forestry Management Plan on a 5-year cycle, or as needed, to adjust to changing circumstances.

TREE RESOURCE EXPANSION

Tree Resource Expansion

There is a clear need for a tree planting plan to guide the arboriculture future of CBS's community trees. Such plans will minimize the unintended but gradual degradation of the urban forest over time, as well as maximize the potential for a sustainable and diversified tree canopy and the associated benefits. The trees in CBS—a relatively young, even-aged, limited, and undiversified population—are not only significant design elements but also represent the future canopy cover at this stage in their growth.

A challenge for CBS is to plant enough new and replacement trees each year to increase the canopy cover. Removals without replacement and planting small trees in large spaces lead to net canopy loss. Without a clear plan to guide tree plantings, the CBS may plant trees but not achieve a net increase in tree canopy.

Tree planting plans include input from local citizens, state agencies, organizations, businesses, planners, developers, CBS staff, affiliated green industry professionals, and elected officials. They are integrated with other comprehensive agency plans and create a blueprint for administration and management of the street and park tree planting program.

The goal is to provide specific guidelines on locating, planting, and caring for trees within the urban and urban/rural interface. Removing, pruning, planting, and preserving trees; educating stakeholders; and improving coordination and communication among citizens, STLC, CBS staff, and elected officials are critical components in the development of the tree planting plan. A tree planting plan will help department managers quickly determine how best to apply funding that often becomes available in small and unpredictable amounts. A plan should not only specify what (species) and where (location) but when (timeframe) and why (underlying goals).

The community tree plan should address some important questions about landscape design, development impacts, including the kinds of neighborhood and other landscapes that are present, their function, and their attractiveness; how the landscapes should look and function in the future; and how the landscapes should be protected or modified to reflect community goals.

Design objectives can include the following:

- Increase tree and shrub planting on CBS-owned property, including parks, public buildings, harbor grounds, ball fields, and other developed sites.
- Promote additional street tree plantings while considering infrastructure (e.g., utility) limitations.
- Review new site development proposals to maximize tree planting and preservation opportunities.
- Encourage tree planting and preservation on private property.
- Develop guidelines for reviewing tree selection and/or location with regard to the aesthetics of specific architectural and development projects in the community core.
- Consider the development of a CBS Master Street Tree Plan as a means to express unified visions and themes for street trees across the community.
- Important landscapes, such as the downtown business district, neighborhoods, and main entrances and exits, will be identified and considered in tree and flower planting. An overall image of CBS will be developed through the coherent planting of trees along streets.
- The final selection of trees and their placement for a landscape shall be made in the field while considering the many elements of that landscape.
- The tree species chosen for planting, besides meeting design criteria, must be biologically adapted to site conditions and well suited for the level of care they will receive.

Implementing a tree planting plan and using inventory data to prioritize planting and maintenance establishes a systematic program which actually reduces costs. This is primarily because systematic, planned maintenance in general leads to healthier trees that require less expensive maintenance over the long run than unhealthy, high risk

trees. Maintenance practices and standards for new tree plantings should be a component of the tree landscaping plan as well as strategies for funding maintenance programs. Developers should be encouraged and expected to use creative design strategies to achieve the intent of the tree planting plan.

Tree planting in CBS can significantly impact that community's landscape for years to come. Yet planting decisions, including the selection of species and location, are often made without the benefit of a long-term strategy or plan. Tree planting might occur as part of a larger capital construction project, or be driven by a donor request or the need for a volunteer project.

As the inventory of existing trees continues, places where trees could be planted should also be noted. These sites are potential spots where the urban forest can be enhanced and where the first possibilities lie for increasing the number of trees in the community. Knowing the number of available planting sites can also help when the community is budgeting for, and ordering new trees.

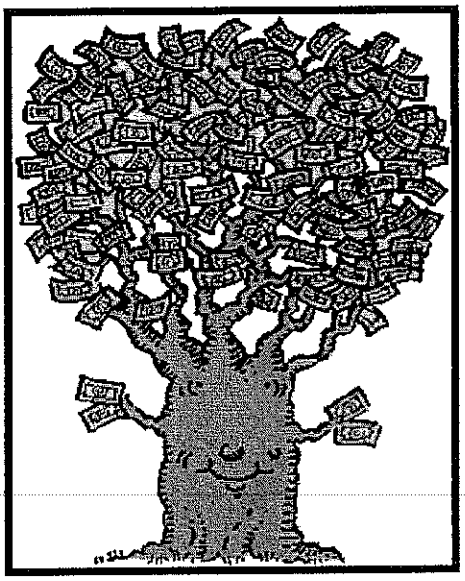


Figure 9 - For every dollar spent on tree planting and establishment, a 250% return on investment is provided to the city in terms of the total services provided at tree maturity.

The opportunity to plant trees exists in many areas in CBS. Each year communities are transformed by planting tens of thousands of trees in parks, landscapes and along city streets. It is a common activity promoted by cities, local and national trade, and professional and citizen organizations. These new trees are the future environmental, economic and social fabric for our communities (Figure 9).

The key to maintaining a healthy, sustainable community forest is the implementation of regular, annual tree plantings, regardless of grant money or catastrophic events. A large number of trees do not need be planted, but a consistent annual addition of trees to the community forest is critical to maintain a perpetual canopy.

Objective to guide the CBS tree planting program.

- The annual quantity of trees to plant is directly dependent on the quantity of trees CBS staff, STLC, and other volunteers can maintain.

Tree Planting Practices

Across the country we are striving to restore our community forests but the road from nursery to working forest is arduous. The sight of new trees struggling rather than thriving in the landscape is common whether the site is residential or commercial, public or private.

Past installation practices used in CBS were planting trees too deeply. Root collars were buried and trees in this situation fail to thrive. Installation practices need to insure the root collar is at grade level and the root system is free of defects (Figure 9).

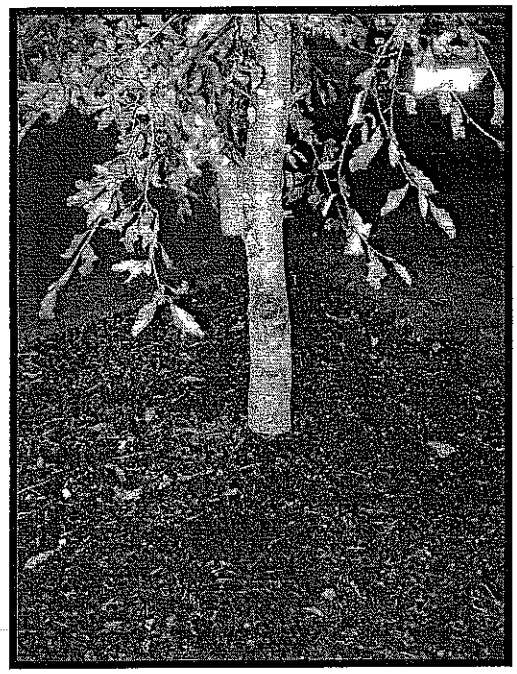


Figure 9 - Root collar below grade on a beech tree.

In general, the tree-planting holes should be relatively shallow (typically slightly less deep than the measurement between the root collar and the bottom of the root plate) and quite wide (three to five times the diameter of the root system). Care should be taken so that the root collars of the new trees are at the same level or slightly higher than the surrounding soil grade (Figure 10).

In most situations, it is not recommended to add soil amendments to the planting holes, as this can lead to differences between texture and structure of soils inside the planting holes and the surrounding soil. Such differences can lead to either water being wicked away from or accumulating in the planting holes.

Tree staking or guying should be the exception and not the rule. Tree staking hardware should only be installed when necessary to keep trees from leaning (*e.g.,* windy sites) or to prevent damage from pedestrians and/or vandals. Stakes should only be attached to trees with a loose, flexible material, and all staking material must be removed as soon as the root system anchors the tree.

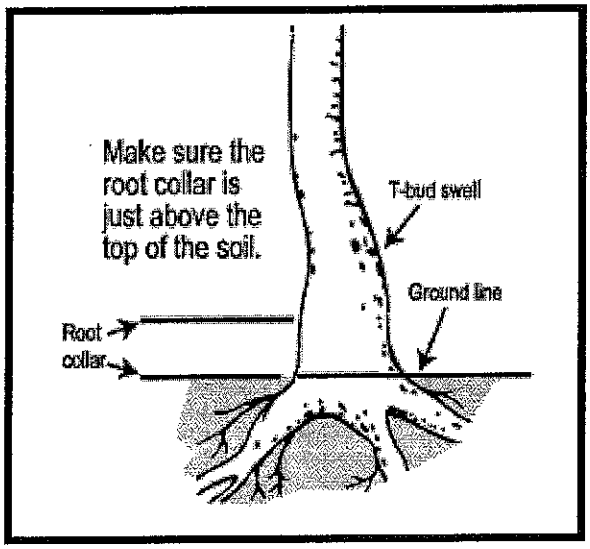


Figure 10 – Root collar at grade level

Mulch should be applied to the surface of the soil around each newly planted tree. Mulch should never be piled up around the trunk (creating mulch volcanoes), but rather should be pulled away from the root collar (Figure 11). Mulch that buries the root collar provides shelter for insects, fungi, and mammals that could damage the tree. Mulch should be applied to an area three times the diameter of the root system to a depth of two to four inches. Mulch not only suppresses competition from grass and weeds, but also provides a zone where turf maintenance is not needed, thereby keeping lawn mowers and string trimmers safely away and thus preventing mechanical damage. Mulch also helps to hold moisture in the surface of the soil where most of the feeder roots are to be established.

Figure 11 - Incorrect mulch applications can degrade trunk tissue causing tree mortality.

Diversification

The 2012 tree inventory included more than 630 trees. There are more than 50 different species found in CBS's tree population (Table 5). This appears to be a diverse population but distribution figures indicate the population is dominated by a few genera. Over 65 percent of the trees are represented by six genera. The six genera are maple, arborvitae, spruce, flowering crabapple, mountain ash, and pine.

Species diversity in new plantings throughout the city should be a primary concern. The dangers (*e.g.*, disease and insects) of planting monocultures have proven to be devastating throughout the United States. A common guideline for maintaining species diversity in urban settings is the 10-20-30 rule. That is, no single species should make up more than 10 percent of the trees in a population, no more than 20 percent of any one genus, and no more than 30 percent of one family in the total tree population (Santamour, 1990).

Diversity is an important measure of a forest's resilience. A more diverse forest, both in total number of species represented and in their relative abundance, is better able to adapt to environmental changes as well as disease and insect infestations. When just a few species dominate the composition of a tree population, these changes or infestations will significantly impact the entire population.

Objectives to increase species diversity.

- The city should adopt tree planting diversity guide that states that no more than 10% of the tree population is comprised of any one genus as a guiding principle.
- The city should emphasize a diversity of species in the planting program. Species should be avoided that have high maintenance costs, invasive characteristics, high storm damage potential or a history of failure.

Species Distribution

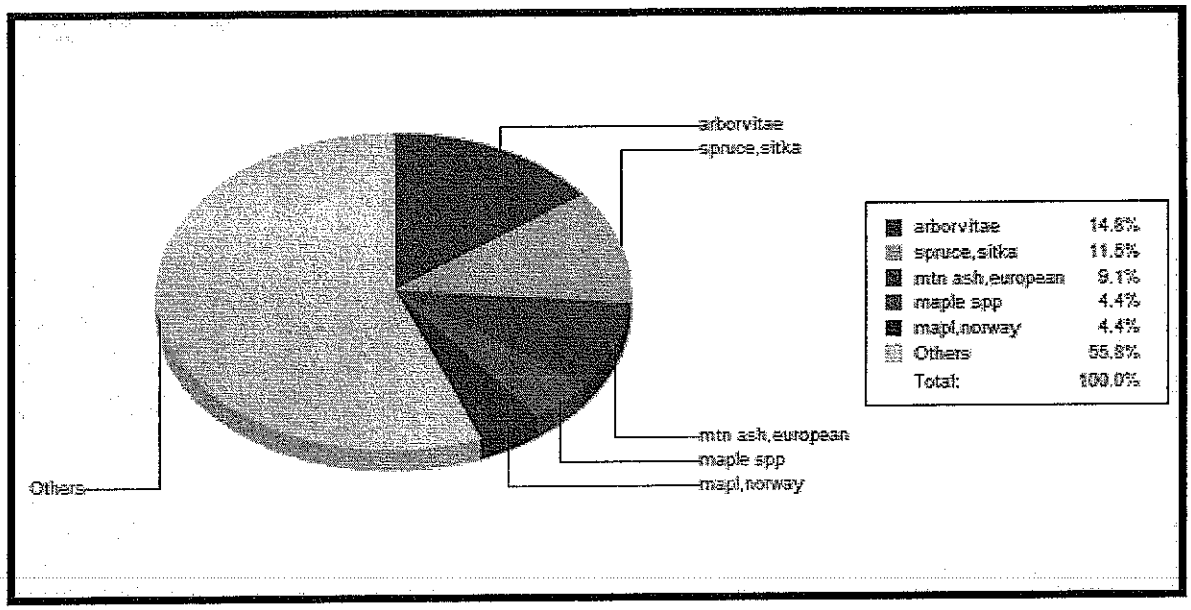


Table 5 – Species distribution. The top five species are shown.

Over 65% of the public tree population is represented by five genera.

Genus	Count	Percent
Maple	110	17.3%
Arborvitae	98	15.4%
Spruce	78	12.2%
Crabapple	65	10.0%
Mountain ash	58	09.0%
Pine	34	05.3%
Others	193	30.8%
Total	**636**	**100%**

Diameter Distribution

The graph (Table 6) below depicts the diameter distribution for the trees inventoried. A population exhibiting the diameter distribution characteristics would indicate the CBS has planted many trees recently.

A well distributed age-class helps maintain a stable canopy cover. If all the trees within a particular area or neighborhood are approximately the same age they will mature and decline more or less at the same time, leaving that area with a deficient urban forest canopy plus expense of replanting. In many parts of the CBS, young trees of similar age class dominate the landscape. To mitigate the impacts of an even age canopy maturing at the same time, the CBS should take steps to increase the age class and species distribution where possible.

For example, western cities established the following standard for desired age structure:

- 40% young (< 6 inch DBH)
- 30% maturing (6 – 12 inch DBH)

- 20% mature (12 – 24 inch DBH)
- 10% old (> 24 inch DBH)

CBS's tree population ranges for the same categories of desired age structure are:

- 50% young (< 6 inch DBH)
- 30% maturing (6 – 12 inch DBH)
- 16% mature (12 – 24 inch DBH)
- 3% old (> 24 inch DBH)

The graph indicates trees may not be surviving to reach maturity or many small ornamental trees have been planted in recent years that never will reach large diameter. Management activities should strive to improve CBS's population distribution to reflect current industry standards and plant species that will become large trees.

Diameter Distribution (inches)

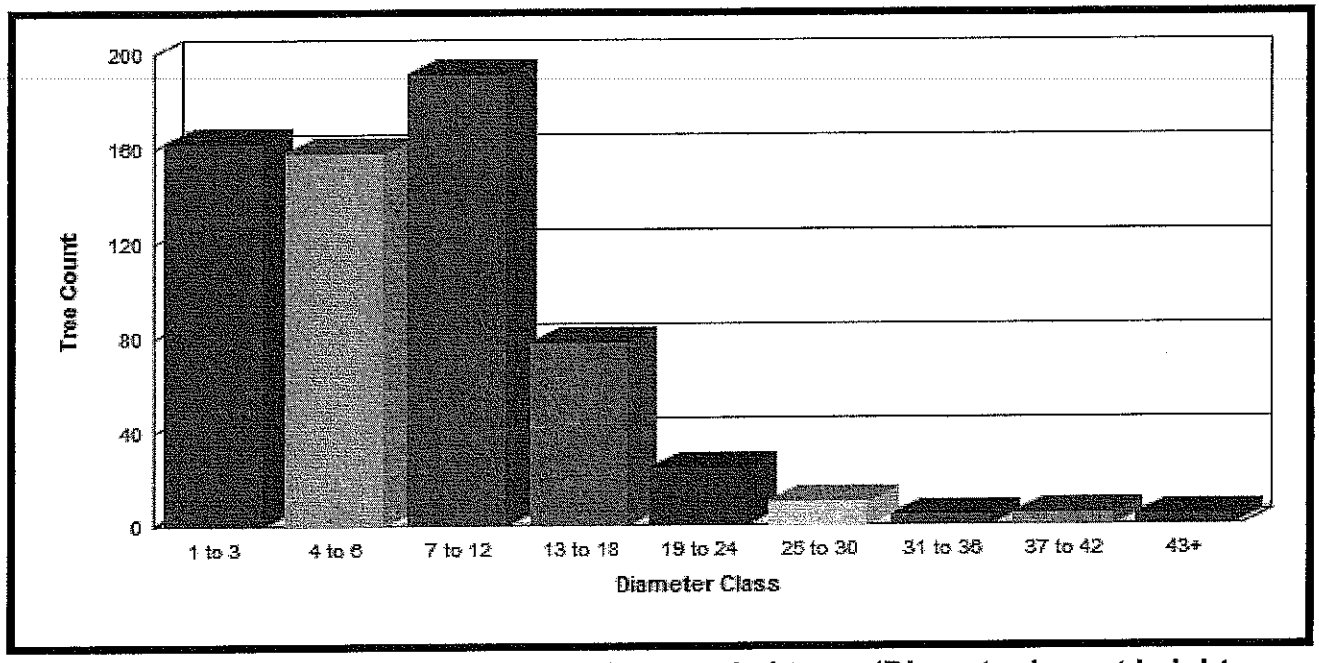


Table 6 – Diameter distribution of inventoried trees (Diameter breast height – 54 inches above grade level).

Diameter Class	Percent	Count
1 to 3	25.5%	162
4 to 6	24.8%	158
7 to 12	30.0%	191
13 to 18	12.3%	78
19 to 24	3.8%	24
25 to 30	1.6%	10
31 to 36	0.6%	4
37 +	1.4%	9
Total	**100%**	**636**

TREE PROTECTION

Tree Protection - Vandalism

It is impossible to constantly police every street and park tree. It is possible, however, to raise awareness in the community about tree health and to increase people's respect for the trees in the community. Educating residents, park patrons, tourists, and school children about street trees or trees in the parks may reduce incidents of tree vandalism (such as girdling and peeling bark, and carving bark) and encourage reporting of observed tree damage.

Accidental tree damage is also primarily a matter of education. Most people do not realize that slamming a car door (or fender) into a tree, urinating on a tree, hammering a nail into a trunk, or dumping hot coals at the base of a tree may all cause irreparable damage that can eventually lead to hazardous conditions and tree mortality. Even walking on a tree's roots, when done by hundreds of people a day, can seriously injure a tree.

Programs that raise the public's awareness of the trees in the community through emphasizing their benefits they provide can help influence resident and visitor behavior. See the education and outreach sections of this UFMP for more information on this topic.

Tree Protection – Young Tree Protection

As more young trees are planted along streets or in the parks, the need for a young tree maintenance program will rise. Young trees require more frequent care than older trees. Depending on conditions they may need to be watered, mulched, pruned, and/or protected with temporary fencing, as they are more susceptible to vandalism and adverse environmental conditions.

Trunk protectors and fence used during the winter season will reduce damage from vandals and animals. It is worth the investment, as a year's worth of new tree planting losses can quickly exceed the cost of fencing, trunk protectors, maintenance, and upkeep. Planting larger caliper trees from the onset may alleviate some problems with animals or vandalism.

Encourage volunteers to adopt young trees in the parks and their neighborhood. Volunteers trained in basic tree maintenance, and watering techniques, provided with tools (a hose, trowels, garbage bags, gloves, etc.) and are given the responsibility for the care of the adopted tree. This program promotes citizen involvement in tree care and awareness of the urban forest. This program could be implemented in CBS for street or park trees – individuals, families, Master Gardeners, or school groups could adopt newly planted trees. The city should attempt to organize a 'Tree Stewards' program and utilize the opportunity this group provides for more volunteer hours.

CBS TREE ORDINANCE REVIEW

Communities use tree ordinances as tools to protect trees, preserve green space, and promote healthy, managed urban forests. To protect trees and prevent their loss in the urban environment, communities need to understand tree ordinances, their limitations, and their proper implementation.

Properly applied ordinances prescribe community tree management to maximize the benefits provided by trees. Different kinds of ordinances can be used to conserve urban forests near streets, in parks, around public and commercial buildings, and in neighborhoods.

Enacting laws and policies that make public prohibitions and direct action in a certain way is not a popular way of influencing behavior. However, sometimes an issue is so important and complex that legislation and official policies are appropriate tools for local governments to use to protect its citizens and property. Managing urban forests is an important complex issue.

In recognition of the many benefits conferred by trees, hundreds of local governments are adopting street and park tree ordinances. Street and park tree ordinances apply mostly to publicly owned trees, as well as nuisance trees on private property.

Tree ordinances reflect the values of a community and the worth of a community's trees. A tree ordinance encourages tree maintenance to secure the beautification, air purification, noise and dust abatement, storm water management, water quality, property value enhancements, public health and safety benefits trees provide.

Fostering Community Support

Fostering community support is absolutely critical to ensure ordinance effectiveness. The community needs to be centrally involved in the ordinance process, from development and implementation to the evaluation of its effectiveness. Successful tree ordinances rely upon citizens' support. Before you start drafting an ordinance, develop a working relationship with interested civic groups:

- STLC
- Community clubs such as garden clubs, Rotary, Women's Club, Sitka Health Forum
- Environmental groups
- Heritage or preservation societies
- Homeowner and neighborhood associations
- Non-Profit associations such as the Sitka Education Consortium, Commission on Health Needs and Community Services, Sitka Fine Arts Council, Sitka Parks and Recreation Committee, Alaska Native Sisterhood, Sitka Tribe of Alaska, Sitka Long Range Planning and Economic Development Commission
- Central business district, downtown, and harbor front businesses
- Local developers and land planners
- Green industry businesses

A balanced ordinance is one that:

- is created in a decision process accessible to all groups who want to participate;
- is based on the best available data and information that is deemed relevant by all stakeholders;
- satisfies the interests and values of multiple stakeholders through creative management strategies;
- and spreads the benefits and costs of tree management among members of the community.

Developing an ordinance takes time. It may take months or even years to accomplish. To be successful you will need community support and a patient, thorough approach.

Ordinance Review and Revision

A review of CBS municipal code provides no clear definitive language or tree ordinance that addresses the urban forest. There is no ordinance detailing CBS's responsibilities for public trees, tree protection and preservation, enforcement and penalties for violations, or planting guidelines. Aside from the establishment of the STLC and a few sections related to trees the CBS municipal code lacks any specific language for the management of the urban forest. The CBS has no over-arching administrative or regulatory policy for managing public trees. A comprehensive ordinance with a formal administrative policy from the CBS will result in improved coordination, increased efficiencies, and enhanced urban forestry management.

Each municipality needs to author a tree ordinance based upon their own particular needs, financial and personnel resources, political and public acceptance and abilities and not rely only on model ordinances from other places. Although ordinances may vary widely in form, content, and complexity, an effective tree ordinance may contain the following elements. The comments and examples are intended to help in developing the city tree ordinance. Appendix A contains resources for writing tree ordinances.

The key benefits to developing and adopting a tree ordinance are:

- Helps establish the tree management program;
- Provides reference to permanent procedures and legal authority;
- Legalizes a tree program through authorization of a tree commission;
- Establishes a permit review, approval, and appeal process for tree removal, planting, and pruning;
- Establishes the nature and degree of public responsibilities to community's trees according to specific standards and specifications;
- Establishes an official tree policy for the community;
- Specifies and ordinates arboriculture standards for public tree planting, pruning, and other tree work;
- Identifies standards and regulations for arboriculture practices;
- Ensures that the people who perform work on public trees are well qualified.
- Criteria requirement to meet Tree City USA designation.

A major problem is too many tree ordinances are stand-alone laws that are not incorporated into zoning, subdivision, or other development codes, and consequently go

unnoticed by the development, planning, and economic professional communities. Tree ordinances, landscaping provisions, tree protection and planting requirements, street tree provisions relating to the right-of-way, and other tree regulations, if they cannot be kept entirely within the same chapter in the code, ought at least to cross-reference one another.

Table 7 - COMMON ELEMENTS FOR ORDINANCE EVALUATION

Element	Explanation
Location	Defines section in municipal code where ordinance should be placed (public works, parks and recreation, zoning, or planning departments)
Purpose	The goals and objectives of the ordinance. These are crucial to implementation, enforcement, and defense of the ordinance if challenged.
Authority	The source of the local government's authority to regulate – usually its own police powers and relevant state statutes (enabling legislation).
Definitions	Terms and phrases with special meaning within the body of the ordinance. Clear, concise definitions are important to ordinance comprehension.
Designation of Administrative Responsibility	The specification of a position, department, or committee responsible for enforcing the ordinance and carrying out specified duties. Ideally, limits of authority and responsibilities are clearly defined.
Permits and Plan Review Process	Establishes actions that will require permits such as tree planting, pruning, and removing. Explanation of how a new/proposed development or other action will be reviewed. Should detail information to be submitted with permit or platting requests, such as site survey of trees and proposed building locations.
Incentives	The methods that can be used to achieve conservation & compliance with ordinance (e.g. preserved trees credited to required project landscaping).
Preservation	What is to be preserved and how it is to be accomplished. There are many approaches to this, such as retaining ≥30% of existing tree canopy.
Construction Protection Measures	Specific measures required to protect trees during construction activities. Usually involves providing a protective zone for trunk and root structures.
Nuisance Trees	Provides authority to remove trees on private property that are diseased or threaten public safety.
Maintenance After Development	Specification of required maintenance of trees and vegetation after project has been completed, often including replacement for damage-killed trees.
Appeals	Provides for possible flexibility with a process for appealing decisions, which serves as a check on authority, but can potentially undermine management.
Enforcement	Provision for enforcement, and penalties for ordinance violations. May include fines, imprisonment, withholding of permits, work stoppage, etc.

Tree ordinances are among the tools used by communities striving to attain a healthy, vigorous, and well-managed community forest. Tree ordinances cannot assure that the trees in and around CBS will be improved or even maintained. Tree ordinances simply provide the city an opportunity to set policy. The degree of regulation and levels of enforcement or authority are tailored to each community's capacity and resources. It provides the city clear authorization for public tree management activities (planting, pruning, removing, and other maintenance). If these activities are not integrated into an overall management strategy, problems are likely to arise. A comprehensive strategy will result in effective, efficient, and proactive management and a sustainable community forest.

Objectives that provide for developing and adopting a city tree ordinance.

- Determine the goals and scope of the ordinance
- Write a draft ordinance that reflects community goals and arboriculture standards
- Include relevant ordinance elements from Table 7

There are many existing tree ordinances and tree ordinance-writing resources. For a detailed listing of provisions for tree ordinances, see *How to Write a Municipal Tree Ordinance* by the National Arbor Day Foundation or contact your Alaska Community Forestry Coordinator for other resources.

OPERATIONAL REVIEW

CBS's goal is to have a larger, healthy, diverse, and functional urban forest and thriving residential and business communities. The dynamics of balancing urban forest management and other infrastructure needs, responsibilities, and assets are diverse and complex.

Budget

The lack of dedicated and adequate financial resources for tree management and maintenance precludes making consistent improvements to the community trees. Currently, there is limited funding dedicated toward tree planting, preventive tree maintenance, tree removals, staff and support personnel, staff training, or equipment.

Existing public funds for urban forest management are provided from park and recreation funds for various maintenance tasks, are usually expended on park trees, for removal of CBS risk trees threatening private property, for storm related emergencies, for individual capital projects, or for certain aspects of public tree management, such as park tree maintenance. Limited tree equipment resources are available for tree maintenance and sometimes equipment not typical to arboriculture is borrowed from other city departments as needed.

To compete successfully with other municipal projects and services, a proposed budget should accurately estimate the program's annual costs. It should also clearly justify the need for annual and long-term funding for the program. Obtaining funds from municipal leaders can be difficult. Here are some points to remember:

- Budgeting happens every day of the year. Regular communication with elected officials regularly and including them in tree planting and other positive opportunities is an effective approach. Key decision makers and the public should be kept well informed about the program's accomplishments and needs.
- Citizens are reluctant to support new programs or increased taxes. Without an increase in revenues, municipal managers cannot provide new services unless they cut others. To obtain funding, the officials must be persuaded that a community tree program is a wise investment. Most municipal officials are not familiar with the benefits or technical details of community forestry, so the budgeting process should be educational as well.
- Sound information is crucial in developing good budgets. Annual work plans should be used to calculate the program's costs.
- A cost-effective community tree program will better compete for scarce budget dollars. The program's costs can be reduced through sound administrative practices such as employee training, accurate record keeping, preventive maintenance, and selection of well-adapted trees for planting. Contracting out services can also be cost effective. For instance, a consulting arborist or community forester can be hired part time, on a retainer, or on a cost-sharing basis with surrounding municipalities. These costs could be lower than paying a full-time salary.
- Public participation in the program is important and grassroots public support can help generate funding. The media and service organizations can be intermediaries for disseminating information regarding the value of the community forestry program.
- Accurate records of work and expenditures can provide convincing information on the need for funding. The budget for a tree program should adapt to the changing needs of a program as work is accomplished and the program becomes established. New programs may need larger proportions of a budget dedicated to tree maintenance, tree removal, and public education. Established programs may dedicate more funding for tree planting as progress is made in the removal and maintenance of trees neglected in the past.

Society of Municipal Arborists (SMA), a trade association that establishes accreditation criteria for municipal urban forest programs, is the standard to measure funding for CBS's urban forestry program.

When developing annual budget plans the following percentages, which are samples from established programs may be used, but should be modified for the particular needs of CBS's street and park trees.

- About 20 percent of the maintenance budget should be allocated for tree removal. If there are trees that need to be removed, this should be made a budget priority.
- About 40 percent should be allocated for tree maintenance activities such as pruning, watering young trees, mulching, or controlling insects and diseases.
- Public safety and caring for existing trees should take priority over planting new trees. Too many communities make the mistake of planting

new trees while neglecting older, more valuable trees. Only about 20 percent of the annual budget of an established program should be allocated for new tree plantings.

- Administrative activities are an integral part of every tree program and should receive about 20 percent of the budget. When starting a program, much more of the budget should be dedicated to obtaining authorization, gaining legislative and public support, and educating the public.

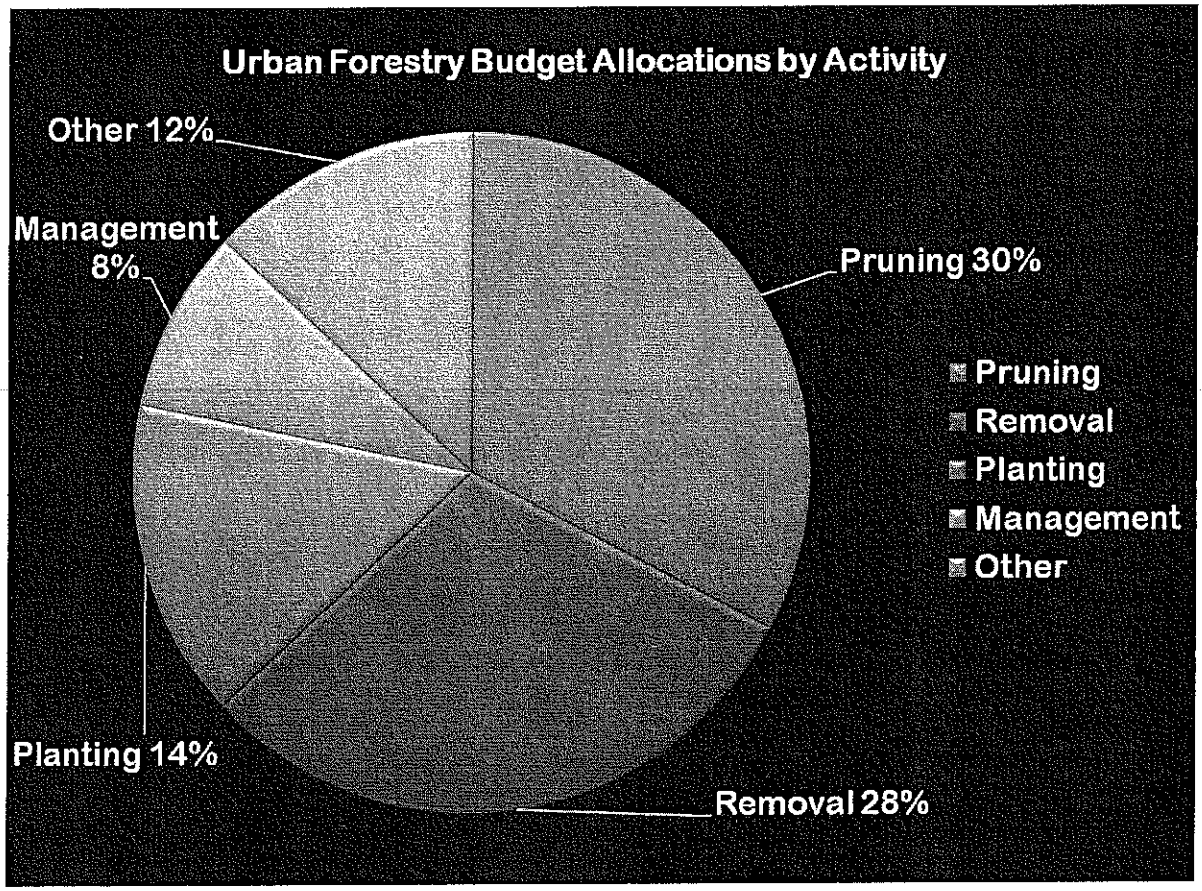


Figure 12 – Typical fund use in urban forestry tree budget allocations

Objective: The annual maintenance allocation of $10,450.00 represents funding and supplies to perform removals, pruning, and planting by CBS staff, contractors, or combination of both. Costs are based on historical contract costs and/or CBS staff costs, inventory results, maintenance requirements, equipment, and program management needs. All work should be accomplished by ISA certified arborists. All work shall meet or exceed current industry and best management practices. The figure considers the current needs of the program. It represents a program goal to provide a level of service to the community to maintain, sustain, and ensure the urban tree canopy thrives.

- *Pruning maintenance cost: $1,800.00 (Average tree maintenance cost: 90 trees annually @ $20.00/tree).
- *Removal cost: $2,500.00 (Average removal cost: 5 trees annually @ $500.00/tree).

- *Planting cost: $2,250.00 (Average cost to plant 2 to 3 inch caliper shade tree: $450.00).
- Supplies: $3,900.00 (Includes fertilizers, amendments, arborist tools).

Projected Multi-Year Maintenance Budgets

Typical tree budget allocations found in urban forestry programs across the United States allocate funding in these areas (Figure 12). These are approximations but provide an accurate representation of fund allocations. The priority should be to take care of what you have before substantially adding to the street tree population.

The National Arbor Day Foundation (NADF) suggests $2.00 per capita for urban forestry funding criteria to meet minimum TREE CITY USA standards. The funding criterion includes many activities that do not involve tree maintenance. CBS has a population of approximately 9,000 residents. To qualify for TREE CITY USA standards the city should spend approximately $18,000.00 on various tree activities included in TREE CITY USA criteria.

TREE CITY USA standards do not focus on the major urban forestry program tasks of removal, pruning, and planting. Actual program budgets and program funding should be based on maintenance requirements determined in the tree inventory and recommendations in the UFMP.

One thing many municipalities have in common is a limited budget and shortage of personnel. Traditionally, the budgets for public trees and parks are the first to be cut when money becomes tight. Many municipalities simply cannot afford a community tree program nor have enough staff to cover all the activities.

Objectives to ensure funding for urban forestry programs:

- An annual report, work plan, and budget will be used to inform elected officials of the tree board's work and funding needs (Table 8).
- An annual meeting will be held to discuss the tree board's work and funding needs.
- News articles and releases will be used to explain worthy activities, including planting, tree removals, pruning, and funding needs.
- A "memorial or heritage tree" program may be used to raise money for tree planting on streets and in parks.
- Local civic organizations and businesses may be contacted annually to discuss their participation and support of commission activities.
- Community, family, and corporate foundations will be identified and considered for support of commission activities.
- State and other government grants will be identified and considered for support of commission activities.
- Emphasize the solutions to community problems that trees offer such as stormwater abatement.

Annual Community Tree Budget Worksheet

MUNICIPALITY AND YEAR

Materials		
Trees (Multiply number of trees _____ by the average cost per tree $_____)	$_____	
Stakes, soil, mulch, fertilizer	$_____	
Pesticides/herbicides	$_____	
Computer inventory software	$_____	
Administrative and public education materials (paper, copies, brochures, educational books)	$_____	
Other	$_____	
Materials subtotal		$_____
Equipment and buildings use		
(Divide total cost by years of service life and add maintenance, utilities, and fuel costs.)		
Office space	$_____	
Equipment storage/building	$_____	
Climbing gear	$_____	
Pruning tools, chain saws, handsaws	$_____	
Trucks/aerial lifts, backhoe/front-end loader, leaf collection equipment, chipper, stump grinder	$_____	
Spray equipment	$_____	
Equipment rental (types_____)	$_____	
Other	$_____	
Equipment and building subtotal		$_____
Services (municipal, volunteer, and contracted)		
Salaries and fringe benefits (based on % of employees' time spent working with trees)	$_____	
Tree board volunteer time	$_____	
Labor (paid or volunteer) or total cost of services		
(When using volunteer labor, estimate the wage based on task.)		
Planting (Multiply hours_____ by average wage $_____)	$_____	
Pruning (Multiply hours_____ by average wage $_____)	$_____	
Removal of trees and stumps (Multiply hours_____ by average wage $_____)	$_____	
Tree inventory (Multiply hours_____ by average wage $_____)	$_____	
Emergency storm damage cleanup (Multiply hours_____ by average wage $_____)	$_____	
Mulching, watering, fertilizing (Multiply hours_____ by average wage $_____)	$_____	
Leaf and branch cleanup (Multiply hours_____ by average wage $_____)	$_____	
Leaf composting (Multiply hours_____ by average wage $_____)	$_____	
Insect control (Multiply hours_____ by average wage $_____)	$_____	
Utility pruning and other services (Obtain estimate from company and pro-rate per year.)	$_____	
Consultant services	$_____	
Educational programs	$_____	
Delivery/transportation charges	$_____	
Administration (permit review, grant writing, Arbor Day planning, site inspection, etc.)	$_____	
Memberships in tree organizations (state council, ISA, etc.)	$_____	
Other	$_____	
Services subtotal		$_____
Other		
Unpaid insurance claims for damaged trees	$_____	
Grant funds expended, if not included above	$_____	
Total expenditures (Use this amount in Tree City USA formula):		$_____

Table 8 – An annual budget, no matter how small, should be presented to the CBS assembly by the tree committee (STLC).

There is no magic formula for determining how much funding is needed for a proactive, sustainable urban forestry program. Every urban forest is different, and urban forestry programs may be at differing stages of development. The simple answer is that there should be sufficient funding for staff or hired contractors to carry out preventive tree maintenance, perform emergency response, as well as support management, staff, equipment, staff training, and community education and outreach.

DOWNTOWN CORRIDOR

Public streets and sidewalks constitute a large percentage of the CBS's impervious surface, generating runoff and pollutants. Reducing the amount of impervious surface, implementing low-impact development (LID) stormwater techniques and increasing vegetation planting within CBS rights-of-way can assist in creating greener business districts and neighborhoods in CBS. Techniques to accomplish this include reducing the amount of pavement, utilizing pervious pavers, installing rain gardens, and installing traffic circles and medians which can be planted with vegetation. These techniques can also help to achieve traffic calming goals and a better balance between vehicles, pedestrians and bicycles, and are part of a "complete streets" approach.

"Complete streets" is a term used to describe streets designed to enable safe, attractive, and comfortable access for all users. Transportation engineers define "green streets" as a subset of complete streets where implementation of green infrastructure practices such as reducing road widths is integrated in the design. Within green streets, LID techniques and vegetation planting will be prioritized.

As CBS grows, Complete Streets would contribute by providing public open space that integrates amenities including street trees and landscaping, street and sidewalk lighting, transit facilities, street furniture, water features, and public art work. The policies also promote the planting of street trees and other vegetation, the construction and maintenance of non-motorized transportation facilities, general support for transit, and streetscape improvements. The concept of the complete streets design guidelines supports tree planting and tree maintenance and provides additional information supporting the goals and objectives of the UFMP.

Trees in small city business districts influence retail and shopping behavior in positive ways. The results of several studies suggest that trees are good for business. Shoppers prefer trees and consider trees an important amenity. They spend more, shop longer, and are willing to pay more for goods in business districts with mature, healthy trees.

Yet, city trees are too often placed into "tree coffins", cutouts in the sidewalk with an insufficient soil volume, oxygen level and water availability for roots, where trees grow poorly and die young. The sidewalk cutouts are enclosed with iron grates to create a contiguous surface for pedestrian travel. The iron grates usually girdle the trunk as the tree grows, damaging the tree they were intended to protect, and often lead to trip-and-fall hazards for people causing severe injuries.

Those trees that do survive tend to experience stunted growth, pest and disease problems, mutilation described as pruning for clearance issues, exposure to road pollution, and vandalism. The trees are stressed and often decline and die, creating a public eyesore during the process. It is not surprising that some city officials and the public have a poor opinion of trees in downtown business districts and along city streets. The trees never reach their potential to provide the benefits for city dwellers.

One of the biggest challenges for arborists, urban foresters, city planners, landscape architects, soil specialists, engineers, and public works staff is to provide sufficient soil

space for root growth and tree health, in a situation where space is at a premium. The trend is to downsize the urban forest and plant smaller trees.

The CBS downtown business corridor is under constant competition for space. Many infrastructure items must share the same space and co-exist (Figure 13). The key site condition factor to consider in resolving tree-sidewalk conflicts is to integrate trees into the infrastructure design up front. The fundamental solution to most city tree problems is simple: Give each tree access to more and better soil.

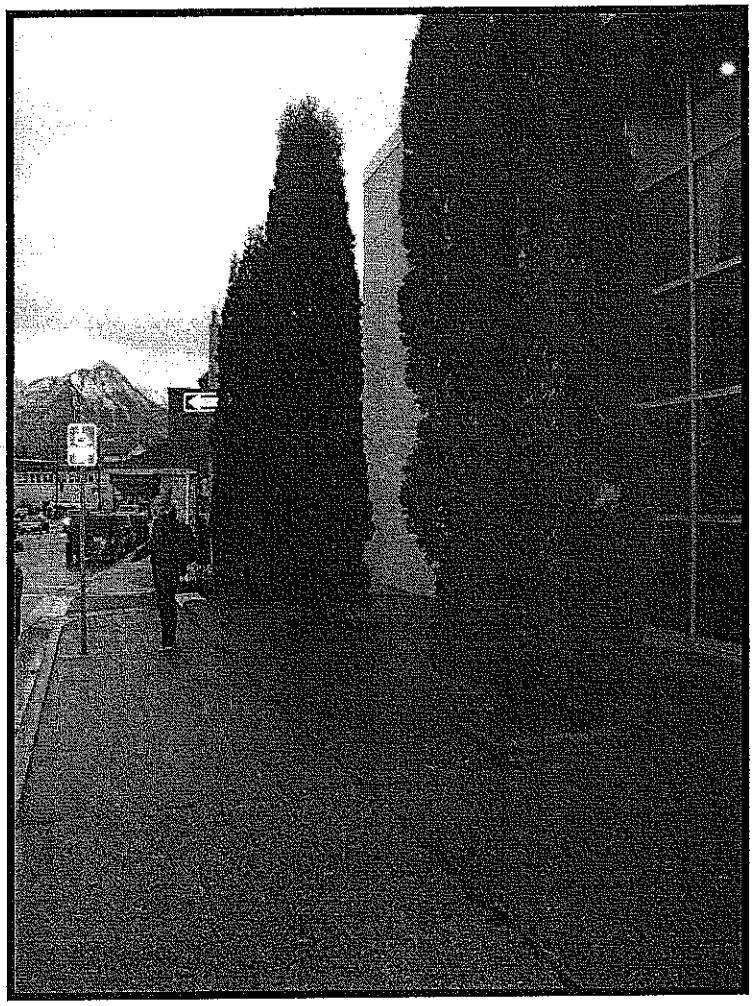


Figure 13 – Trees located in tree pits are usually short-lived.

The downtown business district is the heart of Anchorage. As might be expected in the downtown, several organizations, property owners and tenants are stakeholders in the management of trees. Most of the downtown is planted with trees, many are recent installations, and most are planted in tree pits. Development and redevelopment of property in the downtown can mean additional planting opportunities or it can mean facing the loss of established trees to development of buildings, parking lots and street redesign.

When development does occur where trees currently grow, great care must be taken to protect those trees that are healthy and structurally sound whether on public or private property.

An American Forests article published in the early 80's stated that an oak or maple tree is capable of living up to 400 years in the forest, up to 80 years on a college campus, up to 30 years in a heavily used park, up to 20 years along a city street and about 4 years in a downtown planting pit. Thirty years after the article was published, the same design mistakes are still being made in cities across the United States.

Tree plantings in the downtown business district add greatly to the economics and aesthetic appeal of the city. Tree selection for business and shopping areas must take into consideration the need for shoppers to view storefronts, as well as the need to

provide enough shade for shoppers. Tree canopies should be open, as in thornless honeylocusts (Gleditsia triacanthos inermis). The branching habit must be high enough to allow pedestrians to walk comfortably beneath the trees. Other options are tall, narrow growing (fastigiate) species. These trees can provide beauty, a look of uniformity, and a formal appearance to the shopping district.

Several city plans provide for and recommend trees and landscaping in the downtown business district.

- **Visitor Industry**
  2.13.54. To enhance the visitor experience in Sitka by providing conveniences and information and by improving the scenic qualities of the townscape, as follows:
  A. Support efforts to clean up and landscape publicly owned portions of the downtown area. This includes lawns, landscaped areas and street trees.

- **Greenspace and Landscaping**
  2.13.41. To create and maintain a program of urban landscaping which includes:
  A. Landscaping for all public facilities.
  B. A street greenery program, especially in the Central Business District.
  2.13.42. Support the Tree and Landscape Committee's implementation of a Community Forestry Program and the Sitka Landscape Plan
  2.13.43. Provide information and guidance to the public about the benefits of trees and landscaping, about proper tree selection and pruning.

Objectives of urban forestry program for the downtown business district and other commercial corridors:

- To preserve existing trees in parks and green belts on public lands in the downtown core.

- Improve appearance of downtown public spaces/sidewalks – add trees and landscaping. Improve appearance and sense of welcome in key areas of downtown including: area in front of the movie theater; sidewalks, street landscaping around church. Improve the appearance and function of the several narrow, asphalt pathways linking downtown and uses along the waterfront.

PROGRAM ACTIONS

Actions and recommendations required to work toward the management goals that are prioritized and undertaken by the city staff working in concert with the tree committee, contractors, and citizens of CBS.

Short-Term Action Items

There are five program management elements that must be addressed on an annual basis: Community Forestry Management Plan Adoption and Implementation, Tree Inventory, Proper Tree Maintenance, Tree Planting, and Program Administration. Although each is essential to the maintenance of the community forest, an annual operating plan should be established to determine where budget dollars will be spent. CBS staff has established public safety, responsible management of existing trees, and tree planting as high priorities.

Priority: Adoption and Implementation of the Urban Forestry Management Plan.

The UFMP is straightforward and comprehensive, and contains appropriate goals and activities for this community. The objectives of the UFMP are clear and far-sighted. The goal is to change the forest as it is today into one that reflects the goals of the management plan. The five year plan should be reviewed annually to determine progress, review the activities accomplished, aid in the development of annual operating plans, and plan for future activities to complete the UFMP recommendations. This ensures important components of the UFMP are accomplished and progress is made towards achieving a sustainable tree program. Long-range planning time horizons can be several years or a decade, but five years is most commonly used and is a realistic time frame for implementation of the goals and recommendations of the UFMP.

Priority: Tree Inventory Maintenance

A significant component of an urban forest program is a professional analysis of the tree population. Using the TreeWorks™ software, the inventory of all public trees should be maintained to provide an accurate accounting of public trees. Using accurate, consistent inventory data and professional interpretation and planning, leads to healthier, safer, trees with lower maintenance costs and increased benefits to the community provided by public trees.

Priority: Proper Tree Maintenance

After planting an appropriate species at a site that can support adequate growth, maintenance practices such as mulching, watering, and pruning should be employed for three to five years. If trees are pruned properly three or four times during the first twenty years, they will need less frequent and less costly pruning in later years. Pruning promotes sound structural development of a tree's trunk and branches. The most important period for pruning occurs when the tree is young. Pruning large trees is costly and usually consumes a large part of any tree program's budget. By prioritizing the proper planting and pruning of young trees, a substantial savings can be realized by the entire tree program.

Early pruning performed properly will lead to long-lived healthy and safe mature trees. Pruning young trees properly produces substantial cost savings for CBS. Training

young trees can provide a strong branching structure that requires less frequent pruning as the tree matures. Improved stewardship to increase the health and survival of recently planted trees is one strategy for increasing cost-effectiveness.

Additional training in young tree structural pruning and education regarding the growth habits of the various species being planted, as well as tree biology, anatomy, and physiology would be beneficial for CBS staff responsible for this task. This training can be received through several sources, including urban forestry consultants, the state's Community Forestry Program, and the Pacific-Northwest Chapter of the International Society of Arboriculture. The tremendous aesthetic and financial benefits to be gained in the years to come from proper pruning of young trees are a strong incentive for educating tree crew personnel concerning proper pruning techniques. The added knowledge gained by the individuals could augment the sense of professionalism in their jobs.

Large trees are the most significant component of the CBS's community forest. They form a canopy over streets, parks, and private properties. A mature tree is a costly management element, but it is important element because of safety and tree health issues. The consequences of lack of care for large trees are the creation of more risk trees and poor tree health.

Enforcing standards for pruning and other tree care is crucial in providing correct and consistent plant health care. The International Society of Arboriculture has developed pruning standards for trees. The standards are divided into four categories: crown cleaning, crown thinning, crown raising, and crown reduction.

Crown restoration, pruning for views, and other pruning are considered specialty pruning. Other helpful sets of standards to consider and include are the ANSI Standards for Arboricultural Operations—Pruning, Trimming, Repairing, Maintaining, and Cutting Brush—Safety Requirements (ANSI Z133.1, 2000) and the ANSI Standards for Tree Care Operations—Tree, Shrub, and Other Woody Plant Maintenance–Standard Practices, Pruning (ANSI A300(Part 1), 2001, Pruning). These safety and pruning standards are designed specifically for tree care operations and should be incorporated into CBS standards for tree care.

Systematic pruning of large trees reduces maintenance costs, increases the value of the trees, sustains the benefits of trees, and is a clear demonstration the city is exhibiting reasonable care in maintaining its trees. Cyclic pruning shifts tree management from reactive to proactive. The overall condition of CBS's trees will be increased by improving the quality of pruning, storm damage will be greatly reduced, and the cost to prune trees will decrease as problems are addressed before they become costly. The CBS should establish a pruning cycle of two to five years.

Priority: Tree Planting

New tree planting is an essential part of the community tree management. The health and stability of the city's future forest depends in large part on judicious tree selection, location, and tree planting today, as well as regular maintenance of young public trees.

The key for successful tree planting is to plant quantities the CBS has the ability to maintain. If you cannot maintain 100 new trees, don't plant 100 new trees. Increase

new plantings each year, but in quantities that match the maintenance abilities of staff, STLC, volunteers, and CBS resources.

To ensure that newly planted trees thrive and are healthy provide planting standards. These can best be expressed as general guidelines with references to technical publications. A great deal of information about the size of planting pits, staking, and other planting practices has been developed by International Society of Arboriculture. The Alaska Community Forestry Program can provide other resources and training programs to ensure successful tree planting programs. For copy of Plant a Tree: An Alaskan guide to tree selection, planting & care, see http://forestry.alaska.gov/pdfs/PlantATreeWeb2011.pdf

Priority: Program Support and Administration

The CBS's concern for and level of dedication to urban forestry is exemplified by the Tree and Landscape Committee's twelve years of dedicated efforts which include: twelve major planting projects with 190 trees planted, numerous education and workshop efforts and two major beautification projects. The Committee has been involved in activities too numerous to list but all efforts have brought the value of trees to the forefront of the community thinking. Other items that show a commitment to urban forestry and management of the community forest are: a tree inventory and landscape plan being completed in 2012; ISA arborist training for staff; and a dedicated line item in the budget for tree and landscape project activity. More recently projects include: a second computerized tree inventory and management plan project and Sitka Health Summit support for the Downtown Beautification.

However, the elected officials are keys to the growth and success of the CBS's urban forestry program. As the ultimate policy-making group and representatives of the citizens, the mayor, assembly, and commissions can have direct influence over the current and future management of the urban forest. They can approve new and improved tree ordinances, support increases in program funding, support additional staffing levels, and generally make urban forestry issues a priority for the city.

Support from elected officials and the citizens are critical to implement and maintain an effective comprehensive urban forest management program. The citizens own both the public and private urban forests, and without greater political support and increased citizen understanding and commitment, urban forest management in CBS may not reach its full potential.

Program administration refers to the supervision, scheduling, coordination, planning, and education for the city's tree program. These tasks are varied and numerous and should be addressed through the coordinated effort of city administration, staff and an advisory tree committee. It is the responsibility of the city administration, city staff, tree committee, and residents to ensure that the best management practices are used for treatments to the city's trees.

Long-Term Action Items

Long-range planning mainly concerns program enhancement and involves the completion of recommendations in the management plan. There are three program management elements that must be addressed to sustain the community's tree program and trees: Increase Funds Spent on Community Trees, Community Outreach and Education, and Tree Ordinance Revision Development.

Priority: Increase Staff and Funds Spent On Community Trees

Community trees are a local responsibility. Federal assistance, state assistance, donations and special grants provide important help for community tree activities. However, no source of funds should be considered a substitute for including trees in the CBS's budget. Abundant, healthy trees are of value to the entire CBS and region. A tree program is as much a CBS responsibility as streets, water and fire protection. Incorporating trees into the mainstream of the CBS's fiscal responsibility should be a goal in CBS's strategic planning for the future.

The lack of dedicated and adequate CBS financial resources for the community trees precludes making significant improvements to the tree population. Currently, there is very limited funding for tree planting, preventive tree maintenance, risk management, cyclical pruning, staff training and support personnel, or equipment.

The resources for urban forest management should be increased. A truly proactive and comprehensive urban forest management program benefits greatly when the Parks Division is adequately funded and staffed. The important duties of tree planting, tree maintenance, risk assessment, site inspections, project management, contract administration, citizen education, and public outreach will require additional staff, equipment, and other program resources.

Priority: Community Outreach and Education

Collaboration is necessary for a tree program to serve the physical, social and ecological needs of the city's infrastructure and contribute to the community. The citizens of CBS will need to be informed and educated to ensure the success of a tree program and to carry out and accomplish the recommendations of the management plan. Education is one of the best investments to garner support for the tree program. Workshops, stewardship programs and collaboration with volunteers, schools, and other civic groups can serve as a conduit for support of the program. Staff and the STLC have hosted many educational and outreach events and produced tree information brochures in cooperation with the Alaska State Division of Forestry. Annual Arbor Day projects have been hosted for the last twelve years as well as educational outreach program and activities in schools.

Methods of educating the public and encouraging participation by volunteers are important parts of a community tree plan. Examples of strategies for public education and participation that have been successfully employed by the STLC and staff include all of the following. These are the type of efforts that will need to continue in support of the tree program.

- Residents, civic organizations, and environmental groups will be offered opportunities to participate in tree planting and maintenance.

- Educational materials concerning trees and other natural resources will be provided to schools, particularly grades three through ten.
- Arbor Day and Earth Day will be celebrated—with the involvement of public officials and school children—as reminders of the importance of the community forest.
- Workshops on tree planting and care and other educational programs will be provided for community residents.
- Contacts with commercial arborists and the utility company will inform them of community expectations for the quality of work on public and private trees.

Identify and involve local stakeholders, decision makers, and other people in your community. The number one reason people volunteer is because they are personally asked.

Identify community and nonprofit groups, churches, and schools that could provide support in the form of people and meeting space. Seek and publicly acknowledge support from local banks, utility companies, and other organizations for special projects.

Identify and contact council members, state legislators, and city departments using the city's resources as leverage to attract additional funds, influence, skills, and other resources.

Priority: Tree Ordinance Development

A review of the CBS's documents exposed several issues not addressed in city code regulations. Tree ordinances to be effective must provide three functions: provide authority, define responsibility, and establish minimum standards for management and maintenance. The tree ordinance suited to CBS, and most likely to be approved in CBS, is written with a thorough understanding of the natural resource, ethnic tradition, political-economic climate, legal framework of the community, and the need to manage with an ecological perspective the supports the green infrastructure.

Most forestry programs exist as a reflection of community interest in trees and operate as specified in the tree ordinance. Passage or revision of an ordinance can be a complex issue. There are many diverse groups that have a stake in tree ordinances. I recommend a broad base of community support be developed prior to attempting to develop the ordinance. The tree inventory and UFMP can provide the basis for support and the need to develop the current ordinance.

CONCLUSION

Community Forestry Consultants, Inc. has completed its assignment of evaluating and making recommendations regarding the community forest of CBS. This management plan provides CBS with the framework to implement the best management practices for the community forest. The management and maintenance needs for a successful urban forestry program have been developed from the best management practices available in the urban forestry and arboriculture industry.

The urban forest management plan should be considered a "living," working document. The work objectives recommended in it should be reviewed annually and adjustments made appropriately for the following year. The entire document should be reviewed on a five or ten year basis to determine if management and urban forest conditions have changed significantly.

Timely action needs to be taken to prevent tree failures, preserve tree resources, and maintain the trees of CBS. Trees are valuable assets to the community. The healthier the trees are in the community the more CBS's livability is improved. To realize these benefits, tree planting, pruning and removing; increased education, preservation and volunteerism is needed. The focus goes beyond the individual tree to trees throughout the city.....to the working community forest.

The recommendations will help conserve CBS's tree resource and sustain the tree canopy for future generations. Although this commitment will come with costs, the long-term benefits are significantly greater and will result in a sustainable asset for the citizens of CBS today and tomorrow.

APPENDIX A – Tree Ordinance Writing Resources

Guidelines for Developing and Evaluating Tree Ordinances
Bernhardt, E.A. and Swiecki, T.J.
California Dept. of Forestry and Fire Protection
http://www.isa-arbor.com/tree-ord/ordintro.htm

Tree Ord Software
Unique software for cities is available to help them develop ordinances that will ensure the future of their community forests. TreeOrd, an interactive CD-ROM, was developed by the Tree Trust with a grant from the USDA Forest Service. The cost is $60 plus shipping and handling. http://www.mnstac.org/RFC/tree_order_form.PDF

Tree Ordinance Development Guidebook
Georgia Forestry Commission
http://www.gfc.state.ga.us/CommunityForests/documents/2005TreeOrdinance-100.pdf

Landscape Ordinances Research Project
A resource home page for urban design, city planning, urban forestry, site design, landscape architecture, architecture, site engineering, land use law and land development--highlighting legal standards and technical requirements for site development plan
http://www.greenlaws.lsu.edu/sitemanager.htm

U.S. Landscape Ordinances: An Annotated Reference Handbook
by Buck Abbey, D. Gail Abbey
This comprehensive reference brings together and explains the planning ordinances which govern the landscapes of 300 U.S. cities. In it, the author demystifies the complex planning laws that regulate such areas as the design of parking lots, vehicular use areas, landscape buffers, and tree plantings.

Guide to Developing a Community Tree Preservation Ordinance
Presented by the Community Tree Preservation Task Force of the Minnesota Shade Tree Advisory Committee, this guide describes the planning process, typical ordinance elements, and resources available for the task.
http://www.mnstac.org/RFC/preservationordguide.htm

Guide to Writing a City Tree Ordinance – Model Tree Ordinances for Louisiana Communities
http://www.greenlaws.lsu.edu/modeltree.htm

Research Article – Kathleen Wolf
http://www.cfr.washington.edu/research.envmind/Roadside/Trees_Parking.pdf

Developing a Successful Urban Tree Ordinance
Charles C. Weber, Alabama Forestry Commission

Tree City USA Bulletin #9 How to Write a Municipal Tree Ordinance
National Arbor Day Foundation
http://www.arborday.org/programs/treecitybulletinsbrowse.cfm

Tree City USA Bulletin # 31 Tree Protection Ordinances
National Arbor Day Foundation
http://www.arborday.org/programs/treecitybulletinsbrowse.cfm

Guidelines for developing urban forest practice ordinances Bell, P.C., Plamondon, S., and Rupp, M. Oregon Department of Forestry, Forest Practices Program, Urban and Community Forestry Program. This guide is designed to assist cities and counties in the development of urban forest practice regulations.
http://www.oregon.gov/ODF/URBAN_FORESTS/docs/Other_Publications/UrbanFP.pdf

Urban and community forestry: A guide for the Northeast and Midwest United States Ascerno, M. et al. U.S. Forest Service, Northeastern Area State and Private Forestry. 216 pp. + appendix. 1992. This manual updates a 1990 edition which focused on the interior western region of the U.S. Includes chapters on history, benefits (aesthetic, social, recreational, wildlife, economic, and physical), programs, inventories, planning, ordinances and policy, site evaluation, tree selection and planting, soils, and maintenance. Undated; probable publication date, 1992.

Municipal tree manual. Hoefer, P.J., Himelick, E.B., and DeVoto, D.F., Urbana, IL, International Society of Arboriculture. 42 pp. Prepared in cooperation with the Municipal Arborists and Urban Foresters Society. The purpose of this manual is to be a guide for preparing new, or revising old, municipal tree ordinances.

General Code Publishers
www.generalcode.com/webcode2.html

LexisNexis Municipal Codes
http://municipalcodes.lexisnexis.com

American Legal Publishing Corporation
http://www.amlegal.com/library

Municipal Code Corporation
www.municode.com
http://www.municode.com/resources/code_list.asp?stateID=49

APPENDIX B – Potential Landscape Plant List

The plant list below is composed of many species not in the tree population of CBS. These trees may be hardy to the CBS, and are not natives but will adapt to the area. Diversification and willingness to try new species are the keys to a successful planting program.

Small Trees – Less than 25' mature height for narrow parking strips and under utility lines

Hedge Maple
Acer campestre

Height: 25-35'
Spread: 20-30'
Hardiness: -25
Tree with a dense, round canopy. Leaves are deep green with a yellowish fall color. Extremely adaptable, tolerant of dry soils and compaction. Excellent street tree in residential areas and for use under power lines. Noted for its corky, ridged and furrowed bark.

Amur Maple (treeform)
Acer ginnala

Height: 20'
Spread: 20'
Hardiness: -50
A small, hardy tree with rounded outline, glossy green leaves changing to shades or yellow and red in fall. Fragrant, but not showy flower. Very adaptable to a wide range of soils and tolerant of some shade.

Miyabe Maple
Acer miyabei

Height: 25-30'
Spread: 20-30'
Hardiness: -30
An upright oval to rounded tree. The leaves are 3 to 5 lobed, dark green with a pale yellow fall color. Tolerates some dryness and prefers full sun. No serious pests and a good choice for a small shading tree.

Pacific Sunset Shantung Maple
Acer truncatum x A. platanoides 'Warrenred'

Height: 25'
Spread: 25'
Hardiness: -30
An upright, spreading, rounded crown tree with a regular branching pattern having dark green, glossy leaves and an outstanding yellow-orange to bright red fall color. A hardy tree that has great potential for urban areas.Red

Autumn Brilliance Serviceberry
Amelanchier x grandiflora 'Autumn Brilliance' (treeform)

Height: 20'
Spread: 15'
Hardiness: -30
Tree form of serviceberry with an upright spreading crown, white flowers and a reliable, bright red fall color. The fruit is edible. Tolerates some drought.

Cumulus Allegheny Serviceberry
Amelanchier laevis 'Cumulus' (treeform)

Height: 25'
Spread: 20'
Hardiness: -30
A serviceberry with a distinct upright and oval tree habit, fleecy white flowers in spring and a yellowish to orange-scarlet fall color. Smooth gray bark.

American Hornbeam
Carpinus caroliniana

Height: 25'
Spread: 25'
Hardiness: -40
A small tree with an irregular spreading habit, with a rounded outline. Dark green leaves change to yellow, orange and scarlet in the fall. Smooth, gray, irregular twisting bark adds interest in winter. Will grow in heavy shade and wet soils.

Lavalle Hawthorn
Crataegus x lavallei

Height: 25'
Spread: 20'
Hardiness: -40
A small, dense oval canopy tree with shiny dark green foliage turning to bronzy copper-red in the fall. Usually thornless or with small one inch thorns. Quite free of rust and very adaptable.

European Euonymus
Euonymus europaeus

Height: 15-30'
Spread: 10-20'
Hardiness: -30
A narrowly upright tree in youth broadening as it ages with a rounded outline when mature. Early leaf out with a flat dark green color turning from yellow to reddish purple in fall. Fruits ripen pink to red in September and are quite attractive.

Amur Maackia
Maackia amurensis

Height: 25'
Spread: 25'
Hardiness: -25
A small round headed tree. Leaves emerge a silvery gray and gradually become dark

green. Fragrant pale white flowers light the tree in July and August. Bark peels with maturity exposing a shiny amber to brown color, becoming curly in texture. Prefers moist, well drained soil, but is quite adaptable to environmental conditions.

Merril Loebner Magnolia
Magnolia x loebneri 'Merrill'

Height: 30'
Spread: 30'
Hardiness: -30
An upright habit becoming round with age. Leaves are thick and rigid, dark green and turn yellow in fall. Flowering peaks in April, where the tree resembles a white cloud covered with fragrant snowy blossoms. A vigorous grower and cherished landscape tree.

Yulan magnolia
Magnolia denudata

Height: 35'
Spread: 30'
Hardiness: -30
Tree with spreading branches somewhat irregular, producing an informal outline. Leaves are thick and resilient turning yellow in fall. Flowers are fragrant, white and 4-6 inches wide, blooming in spring. New nursery stock.

Galaxy Magnolia
Magnolia x 'Galaxy'

Height: 20 - 25'
Spread: 15'
Hardiness: -20
A tree form magnolia with a strong central leader and pyramidal to oval shape. The foliage is lustrous green and flowers are large, 8 to 10 inches wide, blooming in spring on bare stems, pink outside and white inside. Good selection for a landscape or street where space is limited or confined.

Royal Star Magnolia
Magnollia stellata 'Royal Star'

Height: 20'
Spread: 15'
Hardiness: -30
A hardy, compact, rounded tree with deep green foliage and yellow fall color. The large fragrant flowers bloom in early spring, before the leaves break. An excellent ornamental tree for small sites in urban landscapes.

Flowering Crabapples
Malus sp. (Red Flowers)
Hardiness: -20 (-30)

'Adams'
Height: 20'
Spread: 20'
Dense and rounded symmetrical habit. Pink flowers, red persistent fruit.

'Amazam' American Masterpiece
Height: 25'
Spread: 18 - 20'
Pyramidal habit. Bright red leaves emerge and mature to dark maroon. Brilliant red flowers change to unique pumpkin orange fruits in fall that persist through winter.

'Bechtel' Klehm's Improved Crab
Height: 15 - 20'
Spread: 15 - 20'
Rounded form, dense dark green foliage, turning orange to orange red in fall. Large double pink flowers cover the tree in spring. Improved strain for disease resistance. Seldom fruits, very tidy tree.

'Centzam' Centurion Crabapple
Height: 20'
Spread: 15'
Narrow upright habit, spreading slightly with maturity. Purple emerging leaves changing to bronze-green. Rose-red flowers ripen to bright red fruits persisting through the winter.

'Prairifire' Prairifire Crabapple
Height: 20'
Spread: 20'
Upright spreading habit becoming rounded. Reddish stems with foliage changing from purple to red hued green. Excellent color change from crimson buds to dark pink flowers to deep red fruits which persist through winter.

Flowering Crabapples
Malus sp. (White Flowers)
Hardiness: -20 (-30)

'Adirondack'
Height: 18'
Spread: 10'
Densely upright inverted cone shape. The cut of this cultivar combined with an overabundant white flowers in spring makes this a "standard" to which other flowering crabs are compared. Bright red fruits carry interest through winter.

'Hargozam' Harvest Gold Crab
Height: 25'
Spread: 15'
Upright, moderately columnar habit. White flowers in spring are but a precursor to the golden fruits which adorn this tree through winter making it a show stopper in the landscape.

Professor Sprenger'
Height: 20'
Spread: 20'
Stark upright habit makes for a larger more stately looking tree than other crabs. Red buds bloom white with pink tones ripening to orange-red fruits and endure on the noble frame through winter.

'Sentinel'
Height: 20'
Spread: 12'
Vase shaped, an unusual form for a crab makes its mark as an excellent street tree under power lines. Flowers are white with a touch of pink , fragrant, with bright red fruits that carry through the winter.

like drops of rain from this elegant tree.

Persian Parrotia
Parrotia persica

Height: 20 - 30'
Spread: 15 - 25'
Hardiness: -20
Small single stemmed tree with upright to wide spreading branches, oval outline. Pink to purple emerging leaves blend to glossy green and turn a beautiful succession of yellow to orange to red in fall. An excellent selection for streets and landscapes, given size, color display and remarkable resistance to pests and disease.

Columnar Sargent Cherry
Prunus sargentii
'Columnaris'

Height: 35'
Spread: 15'
Hardiness: -30
Upright, columnar to narrowly vase shaped at maturity. Flowers, foliage and bark with the same attractive qualities as the species. The narrow habit lends itself for street tree use.

Prairie Gem Pear
Pyrus ussuriensis
'Mordak'

Height: 25'
Spread: 20'
Hardiness: -30
Densely branched and compact tree with a round canopy. Leaves are bright green, thick and leathery turning golden yellow in fall. White flowers blanket the tree in early spring. Excellent pear for urban Plantings.

Ivory Silk Lilac
Syringa reticulata
'Ivory Silk'

Height: 25'
Spread: 15'
Hardiness: -20
Tree form lilac, oval and compact with upward curving branches. Foliage is dark green, flowering when young. Displays large white flower clusters in early July.

Medium Trees – 25 to 50' mature height

Fairview Maple
Acer Plantanoides
'Fairview'

Height: 45'
Spread: 35'
Hardiness: -30
Upright oval form, slightly tapered. An improved 'Schwedler' (red-leaf) type, more narrow and upright. Leaves emerging garnet purple and mature to bronze-green. Care should be taken not to encourage diseases and pests by overuse of Maple cultivars.

Parkway Maple
Acer Plantanoides
'Columnarbroad'

Height: 40'
Spread: 25'
Hardiness: -40
Narrow oval form with a good central leader. Leaves are dark green and turn yellow in fall. Very hardy Norway cultivar and an excellent maple for city u se due to it's narrow shape and well behaved branching. A healthy tree performs well along wide streets and corridors of green. Be cautious about overuse.

Emerald Queen Maple
Acer Plantanoides
'Emerald Queen'

Height: 50'
Spread: 40'
Hardiness: -30
Forms a well shaped, dense, oval habit with upright spreading branches. A excellent green-leafed cultivar for Urban Planting. Can tolerate environmental extremes and has consistent yellow fall color.

Superform Maple
Acer Plantanoides
'Superform'

Height: 45'
Spread: 40'
Hardiness: -30
Broadly oval to rounded form. As the name suggests this tree was selected for its symmetrical and uniform growth. Leaves are green with yellow fall color. The trunk is straight and develops an excellent branch structure, very formal and solid looking maple.

Sycamore Maple
Acer pseudoplatanus

Height: 40'
Spread: 30'
Hardiness: -30
Upright spreading branches and a slightly irregular rounded crown. Leaves are dark green with no discoloration on the lower surface. Adaptable to a variety of environmental conditions, poor soils and exposed sites. Makes an excellent, informal street tree.

Armstrong Maple
Acer rubrum
'Armstrong'

Height: 45 - 55'
Spread: 15'
Hardiness: -30
Rapidly growing columnar tree. Leaves light green turning orange in fall. The bark becomes a beautiful silver-gray as the tree matures. Widely utilized in urban Plantings where space is limited for spreading types.

Bowhall Maple
Acer rubrum 'Bowhall'

Height: 40'
Spread: 15'
Hardiness: -30
Tightly formed columnar cultivar. An excellent selection for street Plantings. Nice contrast to broader species with medium green foliage. Smaller and slower to mature than 'Armstrong' with better fall color.

Northwood Maple
Acer rubrum

Height: 40'
Spread: 35'
Hardiness: -40
Broadly oval to rounded shape. Foliage is medium green. The tree can tolerate harsher winters than most, but fall color is not as reliable as other Red Maples. The trunk is rectilinear with strong branch connections. Selected from the University of Minnesota.

Red Sunset Maple
Acer rubrum
'Franksred'

Height: 45'
Spread: 35'
Hardiness: -30
Hailed as one of the best Red Maple cultivars. Trees have vigorous and symmetrical growth, developing into pyramidal to oval forms Good branch angles display dark green leaves transforming to brilliant shades of red and orange in Fall.

Black Alder
Alnus glutinosa

Height: 40 - 50'
Spread: 30 - 35'
Hardiness: -30
Fast growing tree with a broadly pyramidal habit, somewhat irregular. Dark green leaves change to yellow in the fall. These trees thrive near water and perform well in poor soils. Good tree for an alternative to willows and other poplars. The 'Pyramidalis' cultivar has an excellent narrow form and recommended for confined space areas.

European Hornbeam
Carpinus betulus

Height: 25 - 40'
Spread: 25 - 35'
Hardiness: -20
Pyramidal shape, quite dense with dark green leaves. Fall color is usually yellow but

during cold winters can turn dark red. Heat and drought resistant.
'Fastigiata', a columnar cultivar, is taller, but only spreads 15', making it preferable for confined urban spaces.

European Beech
Fagus sylvatica

Height: 40 - 50'
Spread: 15 - 40'
Hardiness: -20
Stately tree, narrowly compact to densely pyramidal to broadly oval, branching close to the ground. Leaf color varies dramatically between cultivars. It is said that the right cultivar of this tree can enhance any landscape. Care should be used with Planting lower branching trees to avoid creating a traffic nuisance.

'Fastigiata'
Fastigate Beech
Trees deep green, tight form makes it one of the most striking columnar trees.

'Riversii' Rivers Purple Beech
Broadly oval habit, foliage has striking purple shades, spring through summer.

'Zlatia'
Golden Beech
Upright pyramidal habit, young leaves are yellow maturing to golden green.

White Ash
Fraxinus americana

Height: 45 - 55'
Spread: 30 - 40'
Hardiness: -25
A variety of forms usually oval. Bark is ash-gray to grayish-brown aging with diamond furrows with slender ridges. Leaves are pinnately compound with a range of green and a variety of fall colors. Most cultivars have been selected or breed with disease and pest resistant characteristics. The trees are widely used and make good selections for urban Plantings.

'Autumn Purple'
Rounded habit, purple fall color. Signature purple ash.

'Champaign County'
Dense oval habit, yellow fall color. Thick trunk and strong branches.

'Rosehill'
Upright oval habit, bronze red fall color.
Strong central leader.

Green Ash
Fraxinus pennsylvanica

Height: 45 - 50'
Spread: 25 - 35'
Hardiness: -30
A variety of forms usually oval. Bark is ash-gray to grayish-brown aging with diamond furrows with slender ridges. Leaves have a range of green and yellow fall color. Cultivars have been selected or breed with disease and pest resistant characteristics, the tendency towards irregular growth has been reduced as well. The trees are widely used and make good selections for urban Plantings. Care should be taken not to encourage diseases and pests by overuse of any tree species.

'Bergeson'
Strong, upright growth, oval. Tends to be smaller in size.

'Cimmaron'
Narrow oval habit, Glossy green foliage, brick red fall color

'Patmore'
Symmetrical branching, oval canopy. Yellow in fall.

'Summit'
Uniform branching, narrowly oval with a good leader. Yellow fall color.

Maidenhair Tree
Ginkgo Biloba

Height: 40 - 55'
Spread: 15 - 35'
Hardiness: -25
Young trees are irregularly shaped, but finish broadly symmetrical. Usually all marketed trees are male due to the offensive smell of the female trees in fruit. The leaves are uniquely lobed and bright green on both sides, changing to bright to golden yellow in fall. Having outlived most of its enemies Ginkgo is a fine specimen for urban Planting.

'Autumn Gold'
Very uniform and balanced pyramidal tree. Spreading at maturity.

'Magyar'
Narrow pyramidal form with a strong central leader. Well spaced branches.

'Princeton Sentry'
Narrow tapering growth almost columnar. Tallest of the three.

Honeylocust
Gleditsia

Height: 35 - 45'
Spread: 35 - 40'
Hardiness: -20
Usually a tree with a squat trunk and open spreading branches. Cultivars are thornless, or have very few thorns. Often overused in landscapes which can promote pest and disease problems.

'Halka'
Heavy caliper and full even crown with an oval form. Yellow in fall.

'Moraine'
Rapid growth with a vase shape and rounded outline. Golden fall color.

'Shademaster'
Irregular vase with rectangular outline. Good form for street use. Yellow in fall.

'Skyline'
Broadly pyramidal, good branch angles. Form lends itself to urban design.

American Hophornbeam
Ostrya viginiana

Height: 30 - 45'
Spread: 25'
Hardiness: -30
Rounded oval shape made up of slender branches, sometimes arching up or down. Leaves are bright green turning yellow to brown in fall often persisting adding winter interest along with the hop like fruits. Tolerates dry conditions and free of major disease and insect problems.

Amur Corktree
Phellodendron amurense

Height: 30 - 45'
Spread: 40 - 50'
Hardiness: -30
Broadly spreading tree, leaves deep to lustrous green with a brief display of yellow or bronze in fall. The bark of mature trees is unusual and quite striking. Remarkably free of pests, pH adaptable, tolerant to drought and pollution making it a great urban tree if given enough space to fill out.

'His Majesty'
Male, free of seed litter. Thick leathery leaves on stout branches.

Korean Mountainash
Sorbus alnifolia

Height: 40 - 50'
Spread: 20 - 30'
Hardiness: -30
Form changing from pyramidal to rounded outline at maturity. Leaves differing from other mountain ashes, look more beech like, as does the trunk. Striking tree with an excellent combination of form, foliage, flowers, fruit and bark. Considered the best of the Mountain Ashes.

American Linden
Tilia americana

Height: 35 - 50'
Spread: 20 - 35'
Hardiness: -40
Tall stately trees, cultivars generally smaller in size especially when used in urban areas. Leaves are generally 4 to 8 inches long and about as wide in a range of green shades. Bark is gray to brown with narrow lateral furrows. The wood is soft and easily prunes, but is elastic enough to handle most weather extremes. These trees will entirely block the sun in their shadow so place them appropriately.

'Boulevard'
Dense, narrow pyramidal habit with ascending branches. Yellow in fall.

'Legend'
Rounded pyramidal habit, yellow fall color.

'Lincoln'
Slender, upright and compact form with light green leaves, 25' by 15' in 25 years.

'Redmond'
Full pyramidal form, uniform with large leaves and red branches, winter interest.

Littleleaf Linden
Tilia cordata

Height: 40 - 45'
Spread: 45'
Hardiness: -30
Trees are pyramidal, rounding with maturity. Leaves are generally smaller, 2 to 3 inches long and wide, (except Glenleven) finely serrated and turn yellow in fall. Trunks are usually straight and bark smooth. Likes well drained alkali soils, but pH adaptable and tolerates pollution well. Makes an excellent selection for any urban Planting.

'Chancellor'
Fastigiate in youth, becoming pyramidal with age. Good branch development.

'Corzam' Corinthian Linden
Narrowly pyramidal, 15' spread. Yellow in fall. Excellent tree for limited space.

'Glenleven' Glenleven Linden
Fast growing with a straight trunk, leaves twice the size of 'Greenspire'

'Greenspire'
Single straight leader, good branch angle. Tolerates difficult conditions.

'Olympic'
Very symmetrical pyramid form, better branching than some other cultivars.

Kentucky Coffeetree
Gymnocladus dioicus

Height: 50 - 65'
Spread: 40 - 50'
Hardiness: -30
Sharply ascending branches, rising to form a narrow oval crown. The bark is unique, developing on young stems. Spring leaves are late to emerge, their pinks and purples are a nice contrast to greening trees. Seldom bothered by pests or disease, pollution tolerant and strong, upright growth make this an excellent street tree.

'Stately Manor'
Male selection, no seed pods.

Butternut
Juglans cinerea

Height: 40 - 60'
Spread: 30 - 50'
Hardiness: -30
Round topped tree with wide spreading crown of large horizontal branches and stout laterals. Leaves are dark green and woolly, white ridges and gray furrows make up the mature bark. Fruit debris may be a nuisance. Performs well in the rocky, dry and limestone based soils, a prevalent soil type in Spokane. Usable as Boulevard and Park tree.

LARGE TREES – 50' OR LARGER AT MATURE HEIGHT

Black Maple
Acer nigrum

Height: 60 - 75'
Spread: 40 - 55'
Hardiness: -25
Extremely similar to Sugar Maple with darker green leaves which have a tendency to look droopy. The fall color is more consistently in yellow or shades of yellow and some say the Black Maple can survive harsher conditions than Sugar Maple.

'Green Column'
Upright narrow oval, 20' spread. Tolerates heat. Great fall color.

Sugar Maple
Acer saccharum

Height: 60 - 75'
Spread: 40 - 55'
Hardiness: -25
Trees branch upright developing into a large oval to rounded canopy. Foliage is medium green turning bright yellow and burnt orange with red tones in fall. Urban uses in larger lawns, parks and islands of green, recommended against confined or pollution prone sites.

'Green Mountain'
Broadly oval. Very cold tolerant. Reliable fall color.

'Commemoration'
Oval to rounded. Thick, dark green leaves, reduces leaf tatter.

'Endowment'
Columnar form, well suited for confined urban sites.

'Legacy'
Very symmetrical form. Thick stem and branches. Drought tolerant.

Hackberry
Celtis occidentalis

Height: 50 - 75' (100')
Spread: 40 - 50'
Hardiness: -50
Cold tolerant tree will uncommonly obtain heights of 100 feet, but in urban settings usually does not exceed 60'. Rounded or vase shaped crown with graceful splaying of the branches. No spectacular foliage or flower display, more the trees unique character and ability to tolerate adverse conditions that make it an excellent choice for a Park or Boulevard.

Tulip Tree
Liriodendron tulipifera

Height: 70 - 90'
Spread: 35 - 50'
Hardiness: -20
Tree develops quickly with a tall straight trunk , several large sinuous branches develop a narrow oval frame. The leaves actually appear tulip like medium green changing to yellow and golden in autumn.

Cucumbertree Magnolia
Magnolia acuminata

Height: 50 - 80'
Spread: 40 - 80'
Hardiness: -25
Pyramidal growth habit when young aging to a broad-rounded outline with massive spreading branches often arching towards the ground. Foliage is dark green, flowers are smaller than some magnolias, but in abundance. Makes a great tree for parks, golf courses and other open areas, where it can have room to spread.

Black Walnut
Juglans nigra

Height: 50 - 75' (100')
Spread: 50 - 75'
Hardiness: -20
Develops a rounded well formed crown that is devoid of branches a third to two thirds the way up the tree. Leaves are finer than Bitternut and less furry. Bark is brown to grayish black and roughly diamond shaped. May inhibit the growth of other plants near the site. Tolerates dry conditions and can be used for streets where ground clearance is needed, but performs best when used for Parks and Boulevards, due to dropping fruit.

Dawn Redwood
Metasequoia Glyptostroboides

Height: 60 - 100'
Spread: 25 - 40'
Hardiness: -20
Deciduous conifer, tall pyramidal or conical form. Large basal spread. Bright green foliage, renewed every year. Grows rapidly and tolerate wet sites if drainage is not restricted. In winter the skeletal frame of larger trees is starkly majestic. Definitely a tree for large areas so select sites appropriately.

Bloodgood London Planetree
Platanus x acerifolia 'Bloodgood'

Height: 50 - 80'
Spread: 40 - 60'
Hardiness: -15
Broadly pyramidal, rounding with thick spreading branches at maturity. Large basal spread. Large maple like leaves turn yellow in fall. Bark is peeling creating a brown/cream mottling with year round interest. Better resistance to anthracnose disease than other sycamores but still can be a problem if trees are over used.

White Oak
Quercus alba

Height: 60 - 80'
Spread: 50 - 70'
Hardiness: -30
Juvenile shape is pyramidal maturing with a broad and majestic crown. Leaves are bluntly lobed, dark green to blue-green. Autumn color varies from brown to red. A challenge to transplant and establish, but worth the effort.

Bur Oak
Quercus macrocarpa

Height: 55 - 80'
Spread: 50 - 70'
Hardiness: -40
Weakly pyramidal or oval to start, developing into a large broad-rounded tree with a massive trunk. Foliage is partially lobed, dark green above and grayish below, turning yellow-brown to purplish in fall. Corky bark on smaller branches adds interest. Adapts to a wide range of soil types, drought and pollution tolerant, makes an excellent tree for urban areas where acorn debris can be managed.

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- Minimal tree maintenance for existing trees
- Trunk damage from lawnmowers and weed eaters
- Past improper planting practices and placement of trees
- Limited species diversity
- Education and training opportunities for CBS staff and community

Goals of the UFMP

The management plan supports the mission of improving CBS's community through proper management of a valuable City asset – trees. The UFMP follows the vision to retain a high quality of life by improving Sitka's urban forest management and thereby increasing the numerous, proven benefits derived from trees.

The following is the vision statement for the plan:

City and Borough of Sitka Urban Forestry Vision Statement

Sitka's residents value a thriving, sustainable community forest that will be effectively managed to improve the quality of life and sense of community and maximize environmental, economic, social, and aesthetic benefits.

Relying on the UFMP for guidance, the CBS in partnership with community members, organizations, and volunteers will actively encourage tree planting and stewardship; preserve and protect existing trees; promote public safety, tree health, and structure; implement cost-effective enhancement and proper arboriculture maintenance of the community forest; increase public education and awareness of the value of the community forest; and maximize the social, economic, and environmental benefits of the community forest for current residents and future generations.

City and Borough of Sitka Urban Forestry Mission Statement

The City and Borough of Sitka is dedicated to managing, maintaining, and preserving public trees by informing the community, protecting and expanding the public tree resource, utilizing proper arboriculture practices, and engaging community forestry partners to ensure the long term safety, health, viability, and aesthetic quality of the public tree resource.

The UFMP guidelines promote consideration of CBS trees as major and important urban infrastructure. It outlines best practices to incorporate trees into the city fabric. The UFMP provides for the development of a progressive long-range urban forestry program that will result in a healthier and safer forest in CBS. Acknowledging trees' major contribution to CBS, the goal of this management plan is to provide a strategic approach to sustaining community trees. The UFMP is a tool to use in guiding the tree program and garnering support, cooperation, and funding for the tree program.

Lastly, it is understood that woody shrubs and ground cover plant communities are part of, and integral to, the overall health of the urban forest, but the primary scope of this plan is to focus on trees – the largest, longest-lived and most significant member of the landscape community. The implementation of the UFMP will ultimately contribute to the quality of life in CBS through enhancements to the tree population.

The UFMP establishes these management goals for the CBS:

- Adopt and implement the Urban Forestry Management Plan.
- Increase urban forestry funding.
- Continue to educate staff about current arboriculture work practices.
- Implement a cyclic pruning program for young and mature trees.
- Eliminate trunk damage caused by lawnmowers and weed eaters.
- Create a tree planting plan; promote proper planting of new trees and diversification of species; incorporate tree planting into community planning.
- Coordinate and integrate local urban forestry goals into city/borough and regional planning processes.
- Maintain the inventory of public trees.
- Revise the tree ordinance to incorporate the recommendations and goals of the city's tree management plan, adopt the ordinance into the CBS code, and implement ordinance enforcement practices.
- Provide education and public awareness of the importance of trees to the community; educate CBS staff and the community on proper tree care; and encourage greater participation in tree steward activities.

The recommendations made in this plan are intended to be considered and implemented over a period of five years. Trees are long-lived organisms. Maintaining existing trees and planting trees today will provide benefits for current and future generations. By having systematic tree planting and maintenance programs in place, and by having adequate funding, staffing, regulations, and public education resources today, the future public tree population and overall urban forest will thrive, expand, and be sustainable.

The contribution of the community forestry program to the development of CBS will depend mainly on the decisions people make concerning the tree based resources, i.e. whether to invest in developing them and manage them sustainably, or to allow them to degrade. The success of this plan is based on people's expectations as to the benefits they may receive from the community forest.