City of Aspen

COMMUNITY FOREST MANAGEMENT PLAN

December 2007

OBJECTIVE

The objective of the City of Aspen Community Forest Management Plan is to provide direction for the future of our forest via management by the City of Aspen Parks Department. This plan will outline the implementation of strategies to maintain a fully stocked, healthy, dynamic, and aesthetically pleasing forest for the citizens and visitors of Aspen.

BACKGROUND

Trees have contributed greatly to the rich history of Aspen, Colorado. The native forests surrounding our city provided the first settlers with the necessary basic resources that have made our city what it is today. The mining business, with the help of the stately trees surrounding this area, put Aspen on the map back in the late 1800s with the history and benefits of our community forest outlined below.

History

After several shipments of eastern trees were planted with little success, the miners began relocating trees that were growing in the drainages and along our streams. Primarily, these trees consisted of narrowleaf cottonwood, Colorado Blue and Engelmann spruce, quaking aspen, Douglas-fir, and were planted methodically in a grid system to imitate the large east coast cities like Philadelphia, New York, and Boston.

These cities had already established street tree plantings, as we know them today, along main traffic corridors. The single most important development was the installation of water carrying ditches, which were the lifeblood of the trees planted in early Aspen. These ditches can still be seen throughout town even today and can be credited in keeping many of the trees alive during the slow times following the silver boom.

In the 1960s and early 1970s, the City of Aspen hired tree contractors to address the community forest. During those days, tree topping was common practice and was conducted on many of the trees slated for maintenance. Unfortunately, most of these trees died within the next 10 years as a result of these pruning techniques. The community forest was almost entirely comprised of just 3 species of trees, spruce, aspen, and cottonwood. The need for diversification was evident in order to avoid the potential threats when monocultures exist. In the 1980s, the City of Aspen created the Parks Department, and the community forest fell under its jurisdiction. During this time, the Parks Department started planting varying species of trees in addition to the traditional species throughout the community. Community diversification was greatly enhanced with the introduction of the backyard forestry portion of the annual Arbor Day celebration, during which several different species of trees that thrive in our climate are given to residents. Also in the 1980s, the City of Aspen began the process for developing tree protection ordinances within the municipal code. In 1995, the City introduced the first tree ordinance, which called for the permitting process to remove

trees (Appendix A). In addition, this ordinance gave definition to individual tree values and how these values are determined. The need for a professional forester/arborist arose in 1998, coinciding with the failure of several large trees throughout town. The Parks Department's forest management team consists of the Director of Parks and Recreation, Director of Parks and Open Space, City Forester, and the Forestry Crew. Now, in 2007, the relatively new Parks Department, amongst Aspen's long tree history, is working toward providing a long term, defined direction to perpetuate Colorado's premier high altitude resort community forest, located here in Aspen.

This premier forest is currently at a crossroads due to the many over mature narrowleaf cottonwoods that comprise much of the canopy cover throughout town. Many of these individual trees have thrived in our community for upwards of 80 to 90 years, and are now approaching the end of their life span. In a natural setting, given ideal conditions, these trees could last several more years, but the urban environment with its various stresses usually reduce the life span of most trees. It is the primary objective of this plan to maintain these heritage trees through arboriculturally sound practices up to the point when the tree becomes a liability in terms of community safety and its potential threat to the surrounding forest.

The loss of several narrowleaf cottonwoods throughout town due to natural maturation will render a community forest that will look quite different from the one we have today. The City of Aspen's plan to address this situation of an over mature forest has been detailed within this document, and has also already begun implementation. Upwards of 300 new trees are planted annually, along with the replacement of each large cottonwood that is removed. This younger, healthier forest will ensure that the citizens of Aspen and all who visit will enjoy our forest well into the next century.

Benefits

It is well known that trees have a number of positive effects on the surrounding area. Here in Aspen we are fortunate to have an extensive urban forest as well as the natural surrounding forested areas. In both cases, these trees contribute to our high quality of life in the following ways:

- Root systems significantly reduce erosion in many types of landscapes and slopes. In addition, as stated by the U.S. Forest Service, root systems can reduce peak storm runoff up to 20%.
- The photosynthesis process of trees cleanses our environment. Carbon dioxide is sequestered during this process and oxygen is created. In addition to sequestering carbon dioxide, many sulfur dioxide and nitrogen oxide particles (major components in acid rain and ozone) are removed from the air.
- Trees have historically increased property values as well as economic stability. A University of Washington study (Wolf, 1998) shows that consumers are willing to pay 11% more for goods in

a landscaped business district than a non-landscaped district. This figure was as high as 50% for convenience goods.

- In addition to the aesthetic benefit of our numerous street and right of way trees, they provide a hidden benefit. Trees lining the streets give the impression of narrowing the street, which encourages slower driving.
- Our forest provides excellent habitat for a wide variety of wildlife. There are many areas in town that contain contiguous stretches of uneven-aged tree canopies, which represent the ideal habitat for a number of wildlife species that otherwise would not survive in an urban setting.

The benefits of the urban forest are not limited to the above-listed items. In fact, research reveals increasing benefits as time passes. A visit to the library or an internet search will yield a seemingly endless list of benefits, including studies showing the decreased recovery time in hospitals from patients with views of trees in the landscape.

INVENTORY

The City of Aspen Parks Department has just completed a comprehensive geographic information system (GIS) based tree inventory. In conjunction with the Colorado State Forest Service, all trees located within rights-of-way (ROW) and parks were included in this inventory. This lengthy project has yielded a dynamic inventory that can be utilized in a number of capacities.

The following information can be found within the new inventory, though this is not an all-inclusive list: tree species types, management needs, tree diameters, insect and disease concerns, and tree conditions. A full defective tree analysis was conducted on all trees with diameters of 25-inches or greater. This analysis has provided a clear and precise description of all trees that need to be monitored periodically for health and safety reasons. City of Aspen Parks Department staff, in order to maximize the benefit of this data and to keep it relevant to our future forest goals, will update this database utilizing Geographic Positioning System (GPS) hardware, as well as manual updating, on a quarterly basis. In addition to GPS inventory updating, field crews currently fill in spreadsheets delineating the actions taken upon each tree. These spreadsheets are then submitted to the City Forester in order to appropriately update the tree inventory. This will ensure the usefulness of the inventory into the future. It will be important to re-inventory the trees at approximately five-year intervals in order to keep tree diameters in the inventory consistent with the diameters in the field. These updates may be done in-house, or outsourced, depending upon the staffing levels at the time of need.

The following information represents our current urban forest condition as determined by the 2006 tree inventory, which is broken into two categories, street trees and park trees. Under each category we will look at the following four areas with the entire inventory attached as Appendix B.

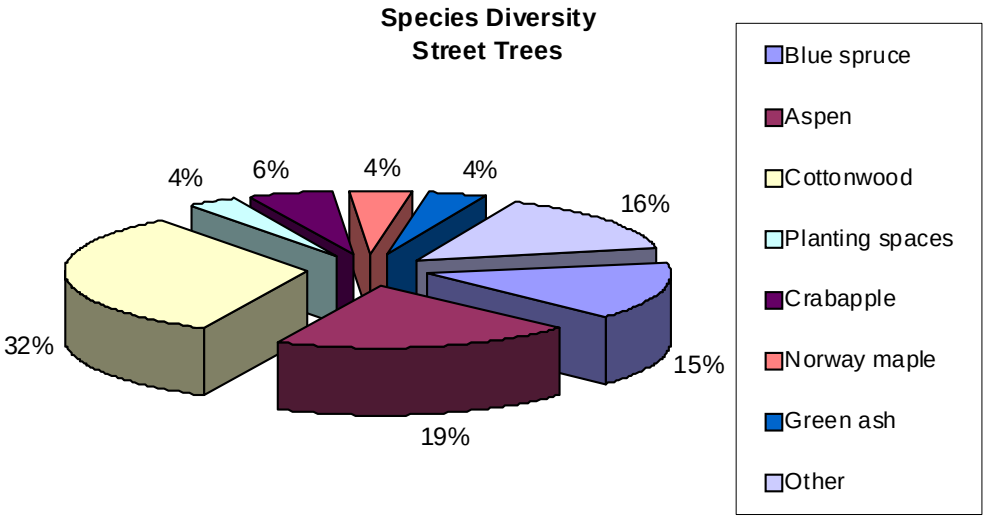
1. Species Diversity
2. Size Diversity
3. Monetary value
4. Management Needs

Street Trees

Trees located in public areas along the right of way.

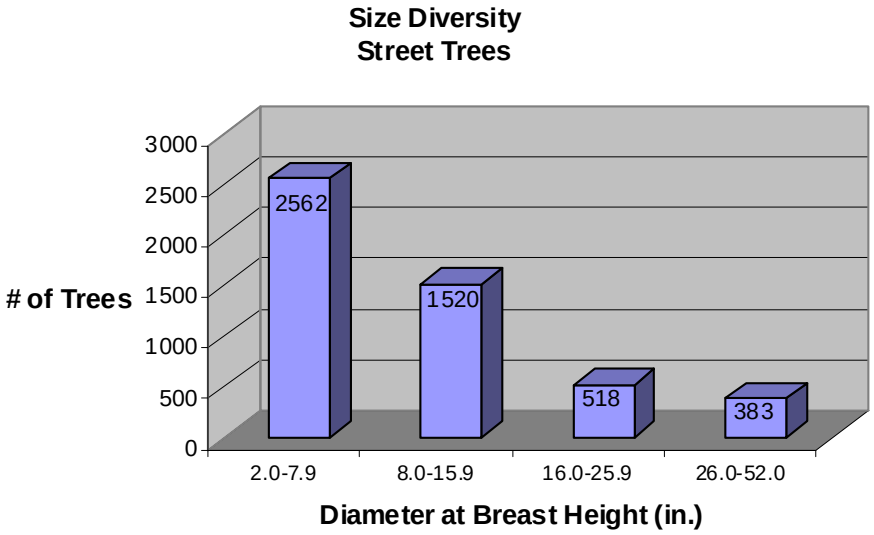
1. Species Diversity

The following pie chart shows the diversity of species currently found throughout the community forest. This chart represents the composition of the top six species of trees, while the remainder has been compiled into the 'other' category. For a complete listing of tree species and their stocking levels, please refer to Appendix B, the street tree summary report.



2. Size Diversity

The following graph is a representation of the size diversity for the street trees found within the City of Aspen. Varying tree sizes is very important to the overall health and value of the community forest. The graph includes all species of trees included in the inventory; therefore it does not clearly define any age classes. Some species of trees, such as a hackberry, will retain a smaller trunk diameter over the same number of years as a species with a more rapid growth rate such as a cottonwood. In addition, a poor growing site, insects and diseases, poor soils, and lack of maintenance are just a few of the factors that can also contribute to a slower growth rate, therefore size is not always a good indicator of age.



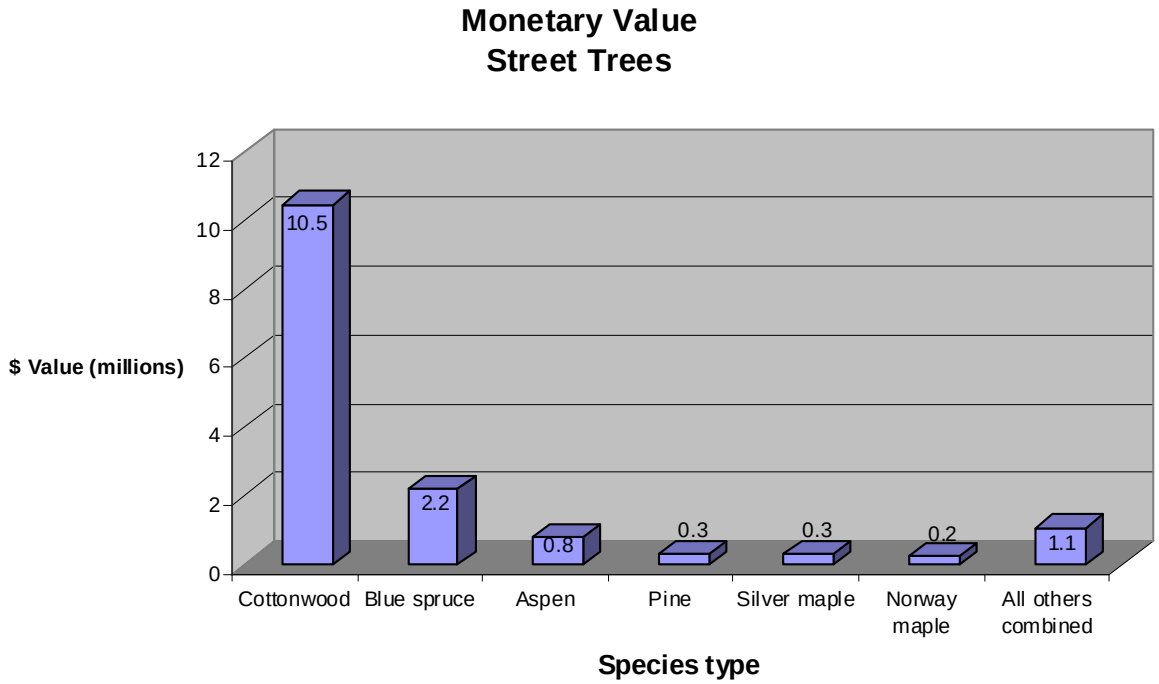
3. Monetary Value

The 2006 tree inventory provided a comprehensive, as well as individualized, value of the community forest. A standard tree value formula, produced by the International Society of Arboriculture (ISA)-Rocky Mountain Chapter, was utilized to determine these figures. An important element of this formula is the basic value for each specific tree type, which was also determined by the ISA-Rocky Mountain Chapter. This basic value is an actual dollar amount determined by the *2004 Species Ratings and Appraisal Factors Guide.* The ISA basic price list can be found in Appendix B. The Guide is in the process of being updated, and a 10% increase in appraisal values is anticipated, therefore the values listed below are expected to increase. The tree value formula is listed below:

ISA Basic Price ***X*** Basal Area in inches ***X*** Species factor ***X*** Condition factor;
Where condition factor equals---1.0 is excellent, 0.8 is good, 0.6 is fair, 0.4 is poor, and 0.2 is very poor.

An example of this formula is as follows:
A 20" diameter narrowleaf cottonwood in good condition would have the following value. $43 ***X*** (.785 **x** 20 **x** 20) ***X*** 0.7 ***X*** 0.8 = $7,561.00

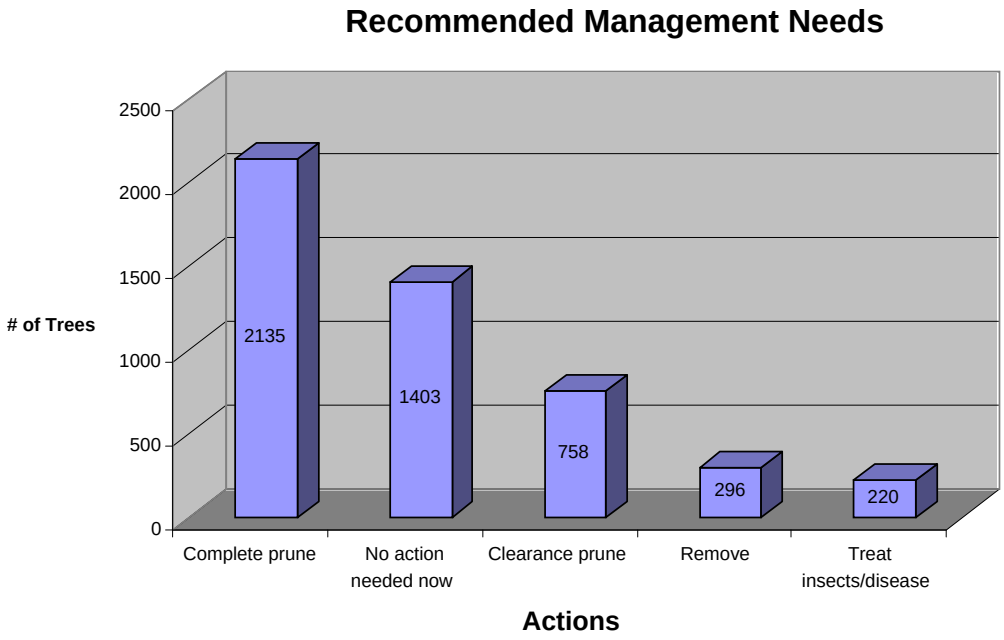
In the following graph, the value of our community forest is delineated. The top six species of trees contributing to the value of the community forest is listed, while the others are grouped together. The value as a whole of each individual species can be found in Appendix B.



4. Management Needs

The Colorado State Forest Service (CSFS) provided the City of Aspen with a summary of recommended management needs on an individual tree basis while compiling data for the City-wide tree inventory. The following graph represents those recommendations, though many trees have more than one management need. In instances where multiple actions should be taken, the most

crucial was indicated in the recommendations, as the data collection method would not allow multiple entries in that field.



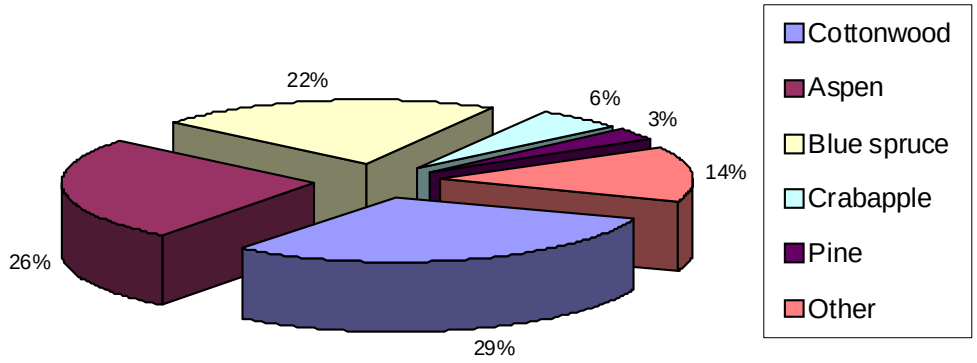
The categories listed in the graph above are further described in the Tree Maintenance portion of this document. For the purpose of understanding this graph, a complete prune includes thinning the crown, removing dead/dying branches, and structure pruning. Clearance pruning only accounts for the removal of branches to provide adequate space above sidewalks/streets and around structures. Removal indicates the need for the complete removal of the tree including the stump. The treat insects/disease category refers to all trees that have been determined to have any one of a variety of insects and diseases found within the community forest.

Park Trees

Trees that are located within the City park system.

1. Species Diversity

The following pie chart shows the diversity of species currently found throughout the community forest. This chart represents the composition of the top six species of trees, while the rest have been compiled into the 'other' category. For a complete listing of tree species and their stocking levels, please refer to Appendix B, the street tree summary report.



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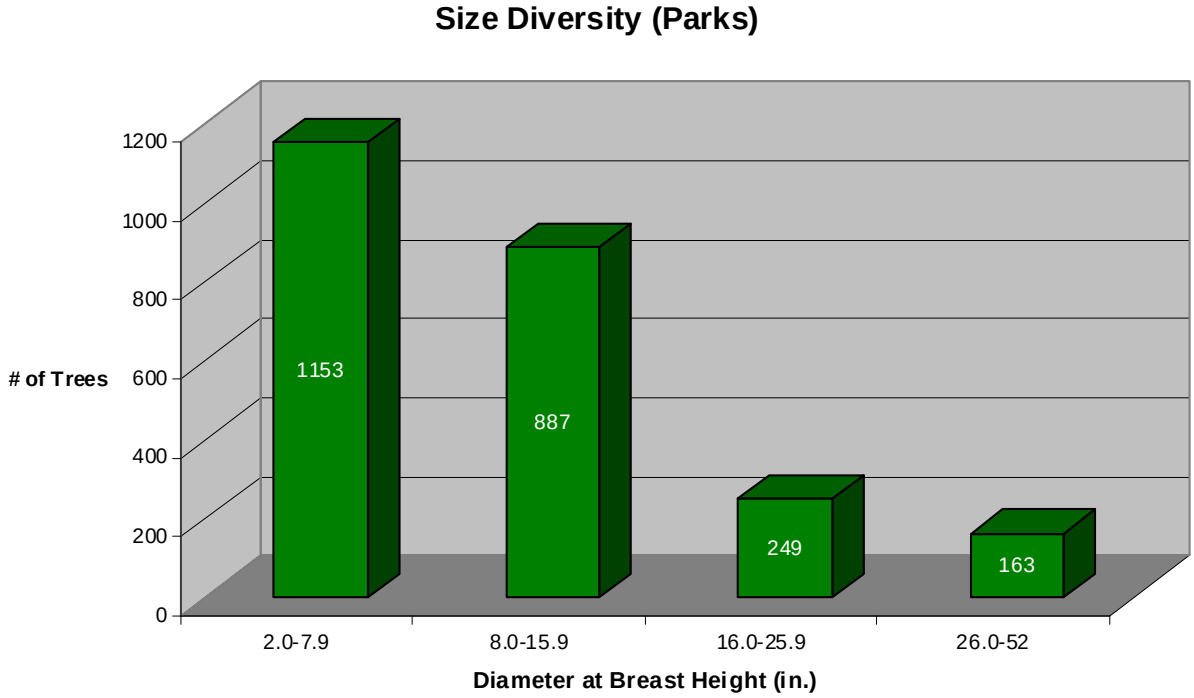

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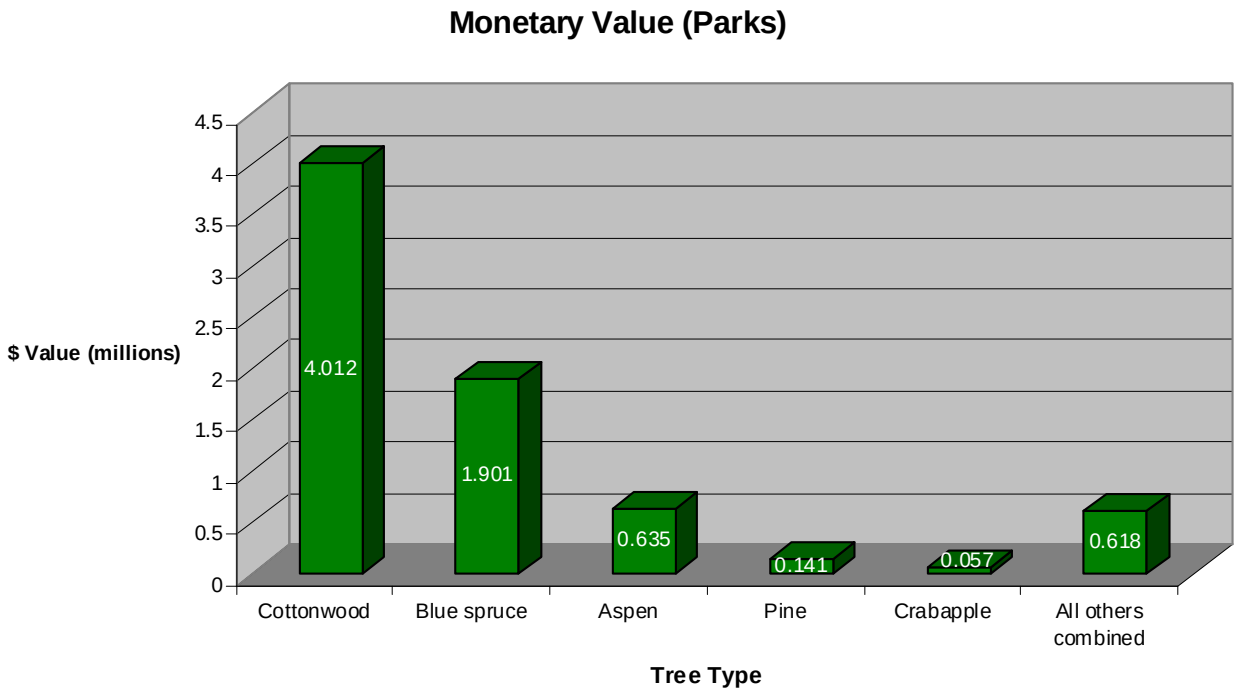

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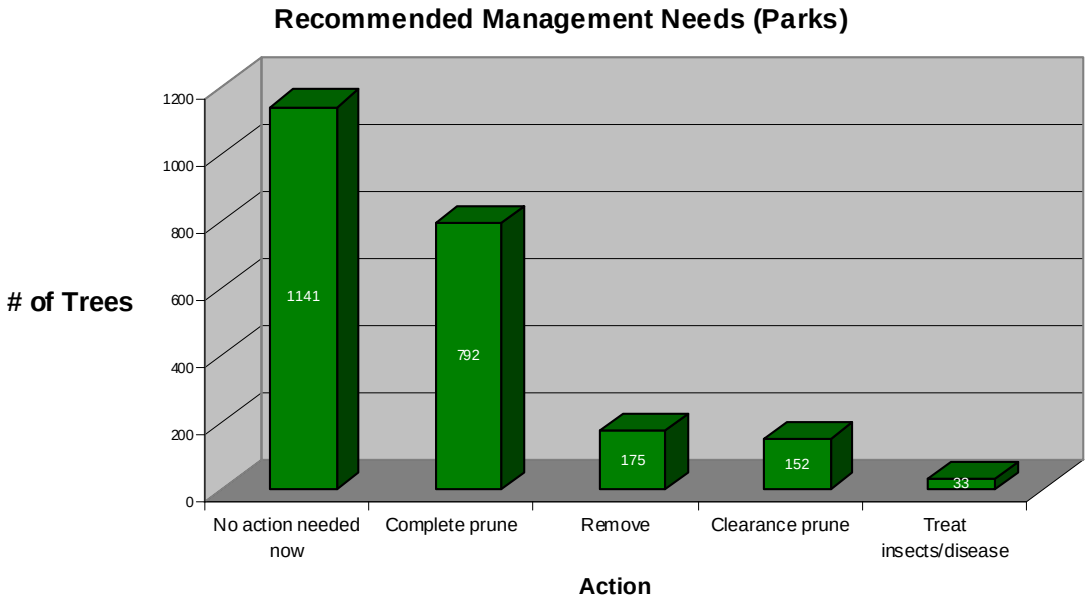

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FOREST MANAGEMENT

The City of Aspen's Community Forest is constantly under pressure from natural factors, as well as the challenges presented by people and development. Every day, many entities strive to keep a sensible balance in this urban interface. In order to effectively address the pressures on our forest and keep the functional aspect of this management plan efficient, it will be broken up into the following sections:

- Support
- Goals and Strategies
- Maintenance
- Insect Threats – Immediate
- Insect and Disease Threats - Other
- Tree Preservation
- Implementation Schedule

Support

The City of Aspen has taken a lead role in management by employing a full-time position designated as the City Forester. The Forester is responsible for making sound management decisions to perpetuate the health and safety of the community forest, as well as sharing tree-related concerns with the Director of the Parks Department, the City Manager, City Council, and the citizens of Aspen. Sharing information with all of the persons listed has enabled the most practical and effective management of our forest.

The Parks Department also employs a part-time staff, under the direction of the City Forester, from the months of April through October each year. Pruning, planting, insect/disease control, and removals comprise the primary duties of this temporary three-person crew. In addition, the Parks Department employs several contractors to maintain publicly-owned trees when in-house management capabilities are surpassed. Contracted services are hired through a public bidding process, and contracts are awarded to the successful bidder usually on a 2 year contract basis. The bidding information can be found in Appendix C. The need for contracted services is related to the City of Aspen's extensive community forest, which will be further described in the forest inventory section of this document.

Goals and Strategies

The community forest is one of Aspen's most distinguishing characteristics that set it apart from other mountain towns. We are fortunate to have such a resource; therefore it is imperative that we set reasonable goals with corresponding strategies for the management of these trees into the future. There are five goals with corresponding strategies within this management plan, which are described below.

1. Species Diversity

This goal is intended to increase the species diversity, while maintaining the historical perspective of the native cottonwood plantings. The current forest is somewhat diverse in species however; some improvements can be made to increase this diversity. The purpose for this goal is to avoid potential threats from host specific insects and diseases that could cause devastating impacts to any one entire species of tree within our community forest. This goal has already started to take shape with the introduction of new tree species on special street tree planting projects throughout town, during the Arbor Day celebration when trees, very diverse in species, are given away each year. In addition, nurserymen throughout Colorado and the country are continuously developing new varieties of trees that are optimal for our environment. These are being planted in Aspen as available. Attaining this goal of species diversity will be addressed through strategies implemented within public right of ways and parks as follows.

- Public Right of Ways
  The forest's current right-of-way (ROW) stocking levels consist of 32% cottonwood, 19% aspen, 15% spruce, and 34% "other" species comprised of, but not limited to, ash, maple,

crabapple, hawthorn, pine, and vacant planting spaces. The high percentage of cottonwood reflects the City of Aspen's focus on keeping this historic planting regime as a high priority. The species diversity goal will target the reduction in percentage of blue spruce to 10%, aspen to 15%, increasing the "other" category's percentage to 40%, and increasing the cottonwood level to 35%. The increased "other" percentage value will incorporate the available planting spaces; which constitute 4% of the current stocking level of the community forest.

The reduction of blue spruce and aspen in the ROW must be done over the course of many years due to the large numbers of these trees that greatly contribute to the current community forest. These large, established trees will not be removed to simply reduce their species percentages on the ROW. Rather, they will be removed when health and safety concerns render the removals necessary. Once this is done, replacement trees will be planted of a species type congruent with the desired ROW planting type determined by the Parks Department/City Forester, and not another coniferous species or aspen.

- Parks
  The City of Aspen's parks system is dominated by these species of trees, which are 29% cottonwood, 26% aspen, and 22% spruce. Since the parks are currently well stocked with trees, increasing diversity by creating new planting spaces will not be a management strategy. When trees are removed for health and safety reasons, diversity can be achieved by careful selection of replacement trees. Ideal percentage diversity must be managed on a park-by-park basis since each has a very unique, often native, composition. The Parks Department/City Forester will determine appropriate replacement trees according to the desired characteristics and functionality of the trees within each park as determined by the long-range plans for any given park.

2. Size/Age Diversity

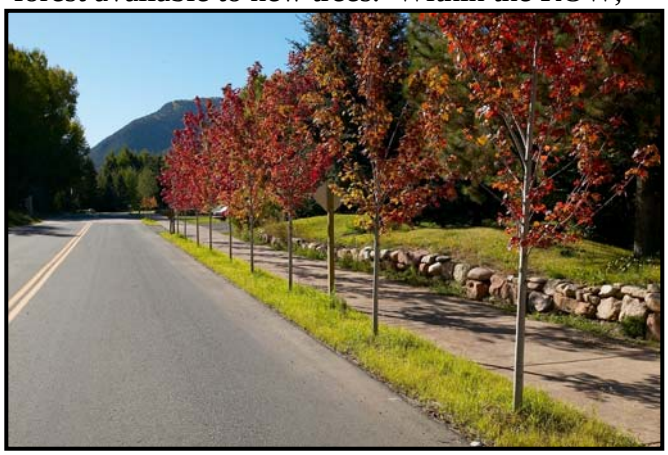
A forest diverse in size and age provides a healthy eco-system, with a benefit for wildlife habitat and aesthetics. Additionally, it increases the monetary value and sustainability while reducing management costs.

Currently, our forest has the majority of its trees falling into the 8-inch to 25-inch diameter range. The second part of this diversity goal is to shift the size diameter from predominately small diameter trees (2-7.9 inches) to a forest comprised of many sizes, with the majority falling into the 8-inch to 25-inch diameter range. This medium size diameter range, considering the species index in Aspen, will better provide the desired characteristics of a healthy, sustainable community forest, as well as potentially reduce the large expense of managing it. Since age cannot be determined without extensive surveys, size class will substitute for age class determinations. Currently, only 2,038 ROW trees fall within the target range indicated in this plan.

There are now 2,562 ROW trees in the 2-7.9 inch diameter category alone, with 383 trees falling into the category of 26 inches or more. The many small diameter trees within our community forest are a tribute to the resolute strategy of occupying all possible planting spaces throughout our community. Most of these small trees will move into the target diameter range within the next ten years, while the new plantings to satisfy the species diversity goal will occupy the small tree size category. Success for this goal will be measured by reducing the smallest and largest size class categories to a number lower than the 8-24 inch diameter combined size classes. There should be a shift in the dominant size classifications at that point, which can be used to predict the long-term sustainability of this goal. Park trees are not included in the size class portion of this goal due to the need for individual management of each park according to desired characteristics and functionality set forth by the long-range planning for that particular park.

3. Maintain Full Stocking Level

Maintaining a full stocking level throughout our available planting spaces is our third goal. This goal will be met by 2012 in a tandem effort with the species diversity goal. In order to achieve this goal, at least 41 trees per year will need to be planted over the next five years in all designated planting sites. In addition, trees that are removed shall be replaced with appropriate plantings. These planting sites, 4% of ROW and 0.08% parks, are well defined within the tree inventory and represent the percentage of the entire community forest available to new trees. Within the ROW, 206 trees must be planted to reduce the 4% figure to 0%. Only two trees within the parks system will fulfill that planting need. Success for this goal can be easily determined by a simple query of the inventory to assure all planting spaces are full. The implementation section of this plan will define the number of trees to be planted each year, not including replacement of existing trees. In the event that a tree is removed from an undesirable location, a replacement tree may not be planted in that space. An example of such a location includes: too narrow of a planting strip, inadequate room for canopy growth, inappropriate growth medium, or future development of the site.



4. Meet and/or Exceed National Arbor Day Foundation Requirements

The fourth goal is to meet and/or exceed the requirements demanded by the National Arbor Day Foundation to obtain the designation of Tree City USA. The National Arbor Day Foundation has recognized the City of Aspen as a Tree City U.S.A. since 1992. This is an honor that shows the City's commitment to maintaining a premier community forest. Achieving this goal will be accomplished by the following:

- Maintaining a tree board or a city department designated for tree care (City Forester)
- Keeping a community tree ordinance
- Following a community forestry program with an annual budget of at least $2 per capita
- Observing Arbor Day annually

Proof of these criteria must be submitted in December of ever year to the Colorado State Forest Service, Grand Junction District. They will ensure all necessary information has been submitted, and will then approve and send it to the Arbor Day Foundation.

5. Inventory Monitoring

The fifth goal will target the existing tree inventory. The inventory will be examined to determine the success rate for the goals described above. In addition, the inventory should be evaluated for its relevance and contribution to the community forest at that time. The inventory's quality standards and functionality in relation with new and upcoming technology that was not available when the 2006 inventory was completed should be studied. It would be pure speculation to say that the current inventory could simply be updated during this plan's 5 year implementation plan due to ongoing, rapid technological advancements in tree inventories.

Maintenance

Our urban forest will continue to be maintained to the highest possible level regarding health, safety, functionality, aesthetics, and sustainability. This portion of the document is designed to illustrate four technical strategies and practices of the City of Aspen's various maintenance needs within the community forest. Most management needs are accomplished by the Forestry Crew housed within the Parks Department. This 3 person crew is directed by the City Forester to handle insect/disease identification and control, pruning, removal, and planting. The b Forestry Crew uses a wide variety of equipment including a brush chipper, chainsaws, stump grinder, soil injector, pesticide sprayer, resistograph, water tanker, skid steer, trencher, and

back hoe. All persons conducting any tree maintenance within the City of Aspen must adhere to all standards set forth by the American National Standards Institute (ANSI) regarding tree work and safety within the industry of arboriculture. These standards can be found in Appendix D.

1. Pruning

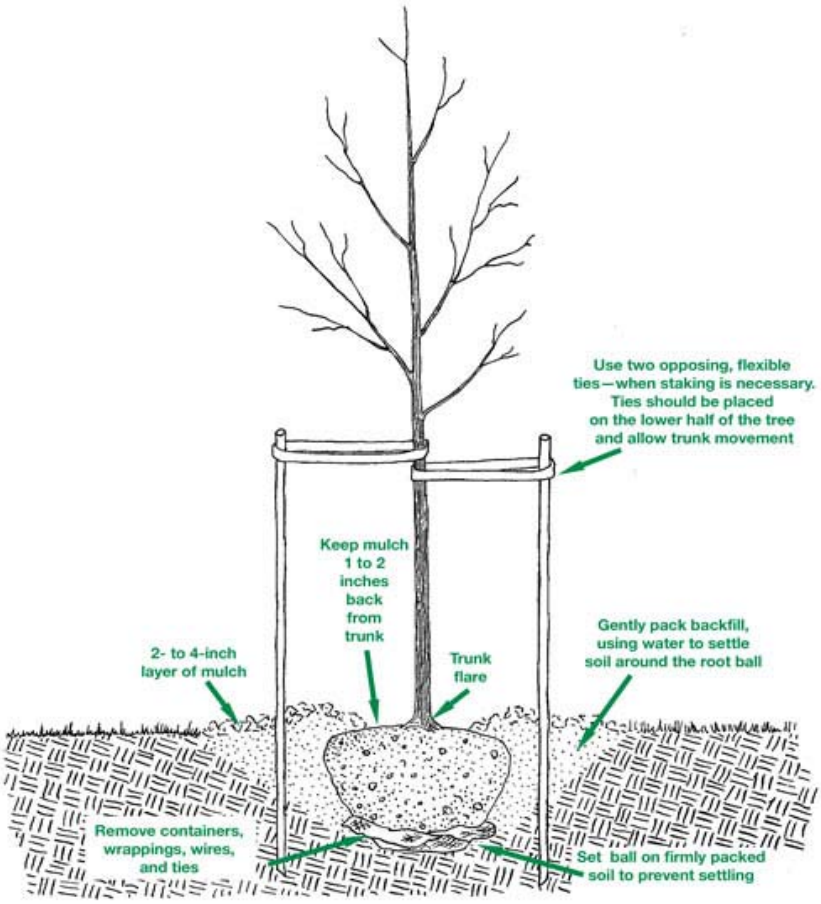
Maintaining a highly functional, safe, and sustainable community forest requires extensive pruning efforts year after year. It is crucial to have a clear definition for each pruning prescription assigned to address the needs of each individual tree. It is highly beneficial when contracted services are involved to clearly define the City of Aspen's expectations regarding tree work. The following list introduces the terms and their definitions to be utilized when pruning within the City of Aspen:

- Complete prune – Thinning the tree's crown to increase light penetration and air movement, removal of crossing and interfering branches, removal of dead, dying, broken, and diseased branches, removal of branches to obtain appropriate clearance around structures, streets, and sidewalks, and removal of branches to improve or create appropriate structure. This applies to ¼ inch and greater diameter branches.
- Crown clean – Removal of dead, dying, diseased, broken, crossing/interfering, poorly attached, and insect-infested branches with diameter of one half inch and greater.
- Selective prune – The removal of selected branches, storm-damaged limbs or other specialized pruning for trees and shrubs.
- Crown restoration – The removal of selected branches to improve and/or restore structure in trees significantly damaged by storms, previous pruning, or vandalism.
- Crown raise – The removal of the lower branches from a tree in order to provide clearance for buildings, vehicles, and pedestrians.
- Removal – The complete removal of a tree, this includes the removal of all wood unless otherwise specified, as well as removal of the stump.

All pruning cuts must adhere to the International Society of Arboriculture pruning standards. Tree topping is not permitted within the City of Aspen. When significant trees along ROW and in parks are to be removed, the Parks Department will attach to the tree a notice of removal to remain in place for no fewer than seven calendar days.

2. Planting

When planting along ROW or in parks, the selection of tree species is crucial to achieve the desired conditions for that site. Prior to installation of new trees, the site will be evaluated for its growth medium, irrigation requirements, above ground growing space, aesthetic possibilities, and future use requirements. These factors will dictate the species of tree selected for the site. The successful installation of a new tree can be accomplished according to the following diagram:



The City of Aspen no longer permits the planting of coniferous trees within the ROW in an effort to prevent encroachment by the tree into the street and walkways, to reduce snow and ice buildup from shading on streets and walks, and to increase visibility for pedestrian and vehicular traffic.

3. Hazard Tree Management

The City of Aspen Parks Department has developed a hazard tree management plan, which is currently in use and has been for several years. The purpose of this plan is to detect, monitor, and take action upon trees within our community forest that may pose a threat to persons and/or property. The plan primarily concentrates on trees located on rights-of-way, parks, trails, open spaces, and any other lands that may fall under City jurisdiction. The management of hazard trees within our community is paramount in order to provide a healthy relationship between the citizens and visitors of Aspen and the trees surrounding them.

In order to better manage these trees, it is important to clearly define what constitutes a hazard. A hazard tree is any tree with at least one defect and one target. The defect could be a number of things, including but not limited to dead wood, cracks, decay, root problems, or poor structure. These defects can, and do, occur throughout the entire tree, from under ground to the very top of the canopy. The target portion of the hazard tree equation could be people, animals, or structures. The target does not have to be a stationary

item such as a house; it could be mobile such as children playing in a park. In addition to this definition, it is important to know that any and every tree is a candidate for failure if exposed to the proper conditions. In our sometimes-harsh environment, this is always an unfortunate possibility.

Hazard trees have varying ratings of severity and monitoring needs. These differences are determined by the defect and by the target. For example, a small decay pocket in a 2-inch diameter tree branch would not rate as highly as a severe crack in the trunk of a 30-inch diameter tree. In addition, a very seldom-used open space would not rate as high as a busy playground in a park. These differences can sometimes be very subjective. In order to reduce these discrepancies, the City of Aspen has adopted a standard defective tree rating system that was developed by the Colorado Tree Coalition and the International Society of Arboriculture. Along with this standardized rating system, a defective tree action priority analysis is also being utilized. All hazard tree evaluations, identification records, maintenance schedules, and recommended actions will be kept on file at the City of Aspen Parks Department. The information collected for the hazard trees will now be inserted into the new GIS-based tree inventory. This will geographically identify all of the hazard trees, as well as house the information regarding monitoring and management of each individual tree.

There are currently 98 trees along ROWs and 24 in parks that have been identified by the tree inventory as trees that need to be monitored according to the program described in this section. A spreadsheet detailing these trees can be found as Appendix E. Monitoring the identified hazard trees will need to occur on an annual basis once initial inspections have been made (described in implementation section). This is a crucial part of effectively managing these trees, since changes can occur rapidly depending upon each site and its characteristics. When a hazard tree is identified, the date is recorded and the next inspection will occur no later than 12 months from that date. During each inspection, the defect analysis form will be completed and management strategies for that tree will be evaluated. The defect analysis form has a second part that is called the priority rating sheet. This will aid in prioritizing management needs for individual trees. Both of these forms are provided by the Colorado Tree Coalition in conjunction with the International Society of Arboriculture. A copy of the hazard tree forms can be found in this document as Appendix F. In addition, these hazard trees will be visited after major storm events, where a visual inspection will be conducted. The visual inspection will be documented and the need for action will be determined.

4. Insect and Disease Management

The community forest plays host to many different insects and diseases. It is imperative to recognize the threats of the undesirable insects, though it is just as important to understand the benefits of the desirables and the role that each plays within the forest. Due to the dynamic nature

of insects and diseases, an all-inclusive list will not be provided here, but a list of the desirables and the undesirables can be found in many forms of reference materials located at the City of Aspen Parks Department.

The undesirable insects can cause various types of problems to trees, depending upon several factors such as: infestation levels, tree parts targeted, timing of damage done, nature of the landscape, and predisposition and species type of particular trees. There are several signs and symptoms to look for when investigating tree health, including: foliage color and density, foliage size, twig growth, fungal bodies, soil conditions, and insect remnants, just to name a few. All of the listed factors are an integral part of managing insects and disease.

Correctly identifying the species of the tree in question is the single most important factor in managing insect and disease problems. After this initial step, investigative techniques must be applied to recognize the pest or disease causing damage to the tree. Understanding the life cycles and general characteristics of all pests associated with a particular species of tree provides the best chance of identifying the problem. Once this is done, control methods can be developed while taking into consideration the surrounding environment as well as the economic and social benefit of that particular tree. It is important to recognize the most severe and threatening pests to our environment and strive to control them before the management of a less dangerous threat. This is both economically and environmentally effective.

In cases where a positive identification of an insect or disease cannot be made by Parks Department staff, a sample will be collected and sent to Colorado State University Extension offices (CSU) or the Colorado State Forest Service (CSFS). Samples must be collected and sent no later than Tuesday of any week to prevent the chance of being left over the weekend en route through the postal service. This ensures a better opportunity of a positive identification from CSU or CSFS.

The City of Aspen is very fortunate to have so many citizens and visitors alike that are passionate about the community forest. The detection of insects and diseases that may threaten the trees lies mainly on citizen response, the Parks Department's continual monitoring practices, and the contracted services provided in day-to-day maintenance. The City Forester will respond to concerns expressed by citizens regarding possible insect and disease issues with a site visit free of charge. This provides the opportunity of possible early detection of a new problem that could challenge other trees in the community.

Integrated Pest Management (IPM) is the current strategy implemented within the community forest. This type of system allows for the most effective and efficient control of insects and disease while perpetuating a safe and healthy forest. The following control methods are used within the IPM strategy: mechanical, cultural, chemical, and mapping. The goal in each strategy is to eliminate or reduce the targeted problem to a level that is economically and environmentally acceptable.

Mechanical controls are often a quick and inexpensive way to address specific insects and diseases. This method usually consists of simply removing the infected/infested portions of the tree by appropriate pruning practices, though the removal of the entire tree may sometimes be necessary. The removed portions of the tree or the entire tree must be processed through a chipper or moved to an appropriate site such as a landfill to eliminate the possibility of spreading the insect or disease to adjacent trees. All machinery and equipment used in these operations should be cleaned and disinfected before entering another site.

Cultural control is a preventative technique that attempts to hinder or deter the possibility of foreseeable problems through proper care and planting of individual trees. This includes watering schedules, care for root systems, adequate growing space, species selection, and overall suitable growing conditions. When trees are properly selected for the site and their vigor is maintained through proper care, these trees provide their own defenses against potential insect and disease threats. Cultural control methods yield healthy, vigorous trees that provide aesthetically pleasing results while minimizing the costs associated with many years of other treatments if natural defenses had not been encouraged through proper care and selection.

Chemical control is utilized throughout the community forest on an individual tree basis. Pesticides are selected for their phytotoxicity to the target species and used at the lowest possible effective rates. Any chemical applied within the community forest will adhere to local, state, and federal regulations, with particular attention to public safety. All types of control efforts will be researched and fully exhausted before chemical applications are carried forward.

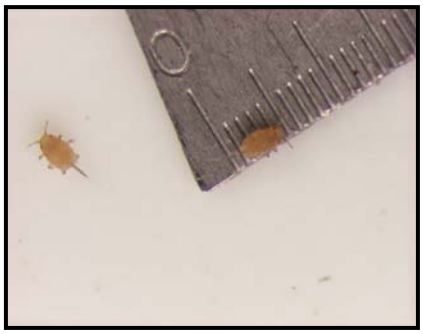
The mapping portion of IPM within the City of Aspen is housed within the GIS based tree inventory. The inventory can be queried to show, geographically, where major insect and disease problems occur. This capability aids in determining movement of the pest or disease throughout the community, while also showing reduction or enlargement of infested areas due to the effectiveness of other control methods. When maps reveal a certain direction or spread pattern, other control methods within the IPM scheme can be implemented in the zones of future infestation.

INSECT THREATS - HIGHEST PRIORITY

The two largest threats to the community forest at this time are willow scale, followed by the recent attack of mountain pine beetle. The City of Aspen is actively researching and managing these pests both in-house and with the help of contracted services.

Willow Scale

Willow Scale is an insect that has become a major pest in the Aspen area within the past 5 to 6 years. It targets trees in the Populus genus, which is a major portion of the community forest here in Aspen. The pest started off as a problem to small, low vigor aspen and cottonwood trees, but has now begun to kill seemingly high vigor trees with diameters upward of 14 inches. The City of Aspen and the Colorado State Forest Service are currently researching this pest in an effort to better understand its lifecycle and how to effectively control its spread throughout town, other communities, and the surrounding populations of Populus within the native forests. At this point, the insect has been identified in other community forests in the Roaring Fork Valley, in one city in southern Colorado, and in native stands of aspen trees located in the Central Rockies of Idaho. The reproduction methods and timing is still widely unknown at this point, though it is thought that there is more than one cycle of egg laying and hatch each year. Crawlers



(insects recently hatched from eggs) have been detected from early April throughout late July/early August here in Aspen. This could explain the massive numbers of these insects throughout the community.

The insects are predominantly stationary, feeding via sucking mouthparts on the tree while under their protective covering, and can be detached by gently scraping with a fingernail or rubbing with a scouring pad. The actual pest itself is reddish-orange in color and is very tiny in size (2-5 millimeters in length). The insect emerges from underneath the protective covering at intervals still being determined, crawls to a new area on the trunk or branch, forms a new protective covering, and begins feeding. The insects feed on the water and nutrients flowing throughout the tissues under the bark layer of the tree. This feeding results in the loss of vigor and health in infested trees. The tree's limbs begin to die back which causes a gradual decline in the tree until death occurs if the tree goes untreated. The decline in health and vigor of the trees also allows other problems to occur, since the tree no longer has the ability to protect itself through natural defense systems. An example of a common secondary problem moving into the trees after willow scale is cytospora canker, which is a fungal disease very common in the Aspen area.

The most effective control method being employed at this time is a systemic pesticide called Safari. This product is injected into the soil within the root zone of infected trees. Thereafter, it is moved through the tree effectively killing the insects feeding on the tree's water and nutrients. At this time, we are seeing varying degrees of success depending upon tree species and tree location. It seems that control is much higher in the narrowleaf cottonwood as opposed to aspen trees. In addition, traditional street tree settings seem to lend themselves to better control than a more native setting. The manufacturer of the Safari product is scheduled to implement an official study in cooperation with the Colorado State Forest Service in 2008 here in Aspen, test plots have already been determined. Current information regarding this product can be found in Appendix G.

The Forestry Crew has treated approximately 90% of the cottonwoods and aspen that currently hosts willow scale. Most treatments were applied early in the growing season, and results were found as soon as two weeks after application. At this time, reapplication intervals have not been determined. Trees will be tagged in the GIS inventory and visited every year to check for reintroduction of the pest, which will lead to subsequent treatments when needed. The Safari product is not being used as a preventative due to its rapid translocation rate through the tree. In other words, if there are no insects in the tree, it is pointless to treat it since the active ingredients in the pesticide will almost always be gone by the time the insect may reach that tree.

Mountain Pine Beetle

Mountain Pine Beetle (MPB) was introduced into the City of Aspen's pine trees via flight of the insect in the summer of 2007, though it is a native insect that has been in the Rocky Mountain region for thousands of years with outbreaks occurring approximately every 15 to 30 years. MPB is currently threatening the entire lodgepole pine forest in the state of Colorado. Some counties have reported a 90% to 95% mortality rate in their native lodgepole pine forests. Many factors have led up to this epidemic outbreak which predominately include drought and fire

suppression. In Aspen, several lodgepole and Scotch pine trees were hit by beetles this year, though there are many trees within these species that were untouched. Unfortunately, 2007 is just the beginning of the local outbreak of this beetle that is sure to continue for at least 3 to 4 more years. Therefore, appropriate management must continue as long as the threat of this insect is present.

The insect itself is a small black beetle, no larger than ¼" in length. In late July and early August (in our region), these adult beetles fly from the trees hit in the previous year to neighboring pines. The beetles then chew their way under the bark where the female constructs chambers in which to lay eggs. It is very noticeable if the tree has been hit due to these holes in the bark from the beetles chewing. These holes will almost always have sap flowing from them, which looks like chewed bubble gum stuck to the tree. The sap flow is the tree's natural response in an effort to push the beetles out. The eggs hatch in early winter and the larva begin to feed horizontally outward from the original vertical chamber. This larval feeding essentially girdles the tree, preventing the passage of water and nutrients to the canopy. By late summer, these feeding larva have molted into adult beetles, emerge from the tree and repeat the cycle all over again. It is unknown how far the beetle will fly in order to find the next tree.

Several trees in the Pinus genus can be attacked including lodgepole, Austrian, Scotch, ponderosa, and rarely bristlecone. Once trees have been attacked, there is no way to treat the tree that will successfully kill the insects already under the bark. Mass attacks on a tree (30-40 hits) will almost always kill the tree within one year. It is imperative, and enforceable by the Parks Department, to remove these trees prior to the beetle's flight in the following month of July. The removed trees must be sent through a chipper, debarked, or taken to an appropriate processing facility for adequate disposal. The only proven, effective way of protecting pines from attack is the use of preventative sprays prior to the introduction of beetle to the tree. Trees should be sprayed no later than June in order for this treatment to be effective. The spray will only be useful for approximately 9 months, therefore trees should be sprayed yearly until the MPB threat has ceased in our area.

The Parks Department did not suffer the loss of many trees in 2007 due to the low number of susceptible species found in the right of ways and parks. However, the pines that are significant in the rights of way and parks have been identified using the GIS inventory and have been scheduled for preventative spraying in the spring of 2008. This will continue until the MPB threat in this area is gone.

Additional information regarding this native pest and specific control methods can be found in Appendix H.

INSECT AND DISEASE THREATS - OTHER

This section is an overview of a few other pests that affect the community forest here in Aspen. All of these insects and diseases are fairly common throughout Colorado and have been studied by many entomologists leading to very precise and effective control methods. Due to these studies, fact sheets have been created by Colorado State University which are followed by the City of Aspen Parks Department for control of these pests.

The following are the most commonly found insects and diseases in the community forest here in Aspen:

- Cytospora canker; fungal disease. Fact sheet attached as Appendix I.
- Spider mites; insect pest. Fact sheet attached as Appendix J.
- Pine needle scale; insect pest. Fact sheet attached as Appendix K.
- White pine weevil; insect pest. Fact sheet attached as Appendix L.
- Cooley spruce gall; insect pest. Fact sheet attached as Appendix M.
- Aphids; insect pest. Fact sheet attached as Appendix N.
- Aspen / Poplar leaf spots; fungal disease. Fact sheet attached as Appendix O.

TREE PRESERVATION

The City of Aspen requires that a tree removal permit application be submitted when excavating within the dripline of a tree, and also when removing trees whether they are on public or private land. The City Forester as well as the Director of the Parks Department reviews these applications. The application itself can be found in this document as Appendix P. The City of Aspen Municipal Code, section 13.20, describes the parameters of the tree preservation code and provides the background for which all tree removal permit application reviews are based. This section of the Code can be found as Appendix A.

IMPLEMENTATION SCHEDULE

The Parks Department has been following a pruning cycle of 6 years in order to achieve the necessary levels of pruning throughout the City, which has proven to be successful. In other words, every public tree within the city limits of Aspen, will be examined and properly pruned when necessary every 6 years. In response to the exemplary amount of management done in the 2007-growing season, the previous pruning cycle will be reduced to 5 years starting in 2008. In order to accomplish this task, the City has been geographically divided into 5 management units, with all parks acting as one of these units. A map showing these delineations is available as Appendix Q. This new pruning cycle will be examined for achievability every December, and changes will be made if necessary prior to the next year's growing season.

This schedule will include the next five years, beginning in January 2008 and continuing through December 2012. The quarterly updating of the tree inventory will provide the necessary means for determining the success rate of this implementation schedule. At the end of each calendar year, through 2012, the City Forester will examine this portion of the document and adjust, if necessary, the coming year's management strategies to achieve the goals set forth in this document.

2007

- Unit I pruning was completed.
- 50 street trees were planted.
- Willow scale and mountain pine beetle were researched. Safari was applied to approximately 90% of known infected trees. Trees hit by mountain pine beetle were identified and mapped.
- GIS-based tree inventory was utilized for the first time.

2008

- Complete all pruning within management unit II. This will include in-house and contracted services, when necessary. Each tree in this unit will be examined for pruning needs, then that need will be addressed by the following: complete prune, crown thin, selective prune, crown raise, crown restoration, removal, or nothing needed.
- Plant at least 41 trees along ROW in various locations throughout the City, not just within management unit II. Replacement trees must also be planted in the event that a tree is removed within management unit II. This will ensure that the planting goal will not fall behind due to necessary tree removals.
- Soil inject Safari into root zone areas for all known willow scale infected aspen and cottonwood trees on public land, including ROW.
- Treat all significant and susceptible pines on public land and ROW with preventative spray against Mountain Pine Beetle.
- Identify, treat, and monitor all insects and diseases found within the community that could devastate the health and safety of the forest. The City Forester will determine priority for treatment of individual insects and diseases.
- Perform initial inspections of the 122 "monitor" trees identified by the tree inventory. This will be accomplished by visiting 5 trees per week from April through September.
- Complete all inventory updates within the GIS. Evaluate success and adjust management for 2009 accordingly.

2009

- Complete all pruning within management unit III. This will include in-house and contracted services, when necessary. Each tree in this unit will be examined for pruning needs, then that need will be addressed by the following: complete prune, crown thin, selective prune, crown raise, crown restoration, removal, or nothing needed.
- Plant at least 41 trees along ROW in various locations throughout the City, not just within management unit III. Replacement trees must also be planted in the event that a tree is removed within management unit III. This will ensure that the planting goal will not fall behind due to necessary tree removals.
- Examine previously treated aspen and cottonwood trees for the possibility of another infestation of willow scale. Treat with systemic soil injection if insects are present.
- Treat all significant and susceptible pines on public land and ROW with preventative spray against Mountain Pine Beetle.
- Identify, treat, and monitor all insects and diseases found within the community that could devastate the health and safety of the forest. The City Forester will determine priority for treatment of individual insects and diseases.
- Perform inspections of the 122 "monitor" trees identified by the tree inventory. This will be accomplished by visiting 5 trees per week from April through September.
- Complete all inventory updates within the GIS. Evaluate success and adjust management for 2010 accordingly.

2010

- Complete all pruning within management unit IV. This will include in-house and contracted services, when necessary. Each tree in this unit will be examined for pruning needs, then that

need will be addressed by the following: complete prune, crown thin, selective prune, crown raise, crown restoration, removal, or nothing needed.

- Plant at least 41 trees along ROW in various locations throughout the City, not just within management unit IV. Replacement trees must also be planted in the event that a tree is removed within management unit IV. This will ensure that the planting goal will not fall behind due to necessary tree removals.
- Examine previously treated aspen and cottonwood trees for the possibility of another infestation of willow scale. Treat with systemic soil injection if insects are present.
- Treat all significant and susceptible pines on public land and ROW with preventative spray against Mountain Pine Beetle.
- Identify, treat, and monitor all insects and diseases found within the community that could devastate the health and safety of the forest. The City Forester will determine priority for treatment of individual insects and diseases.
- Perform inspections of the 122 "monitor" trees identified by the tree inventory, and determine management need accordingly. This will be accomplished by visiting 5 trees per week from April through September.
- Complete all inventory updates within the GIS. Evaluate success and adjust management for 2011 accordingly.

2011

- Complete all pruning within management unit V (parks). This will include in-house and contracted services, when necessary. Each tree in this unit will be examined for pruning needs; then that need will be addressed by the following: complete prune, crown thin, selective prune, crown raise, crown restoration, removal, or nothing needed.
- Plant at least 41 trees along ROW in various locations throughout the City. Replacement trees must also be planted in the event that a tree is removed within management unit IV. This will ensure that the planting goal will not fall behind due to necessary tree removals.
- Examine previously treated aspen and cottonwood trees for the possibility of another infestation of willow scale. Treat with systemic soil injection if insects are present.
- Treat all significant and susceptible pines on public land and ROW with preventative spray against Mountain Pine Beetle.
- Identify, treat, and monitor all insects and diseases found within the community that could devastate the health and safety of the forest. The City Forester will determine priority for treatment of individual insects and diseases.
- Perform inspections of the 122 "monitor" trees identified by the tree inventory, and determine management need accordingly. This will be accomplished by visiting 5 trees per week from April through September.
- Complete all inventory updates within the GIS. Evaluate success and adjust management for 2011 accordingly.

2012

- Complete all pruning within management unit I. This will include in-house and contracted services, when necessary. Each tree in this unit will be examined for pruning needs; then that need will be addressed by the following: complete prune, crown thin, selective prune, crown raise, crown restoration, removal, or nothing needed.
- Plant at least 41 trees along ROW in various locations throughout the City, not just within management unit I. Replacement trees must also be planted in the event that a tree is removed

within management unit I. This will ensure that the planting goal will not fall behind due to necessary tree removals.

- Examine previously treated aspen and cottonwood trees for the possibility of another infestation of willow scale. Treat with systemic soil injection if insects are present.
- Treat all significant and susceptible pines on public land and ROW with preventative spray against Mountain Pine Beetle.
- Identify, treat, and monitor all insects and diseases found within the community that could devastate the health and safety of the forest. The City Forester will determine priority for treatment of individual insects and diseases.
- Complete all inventory updates within the GIS. Evaluate success and adjust management for 2011 accordingly.
- Perform inspections of the 122 "monitor" trees identified by the tree inventory, and determine management need accordingly. This will be accomplished by visiting 5 trees per week from April through September.
- Determine the need for a large-scale update of the tree inventory.