



Pruning Cycles

Participants were asked: How did you establish your pruning cycle? What was the rationale? What factors specific to your region did you have to take into account?



Tree species affects the type, frequency, and timing of pruning. Pin oaks (*Quercus palustris*) tend to become crowded with dead or unproductive branches and benefit from thinning. Photo by Brett O'Brien

People used to ask me, “When is the best time to prune the City’s trees?” My immediate response was, “When we have the money.” In most cities, there is more work to do than there is money or time to complete. There are a couple of cities in California where the staff has received support for a consistent four-year cycle whereby one-quarter of the City’s trees would be pruned each year. I have never been that fortunate.

The timing of pruning for some tree species has to take into account how that timing will affect the occurrence of pests and diseases. For example, elms shouldn’t be pruned when the elm bark beetles are flying. In Bay Area California, Monterey pines shouldn’t be pruned when the red turpentine and *Ips* bark beetles are active. Pruning wounds attract these insects.

The most efficient method of pruning is “block pruning,” where we prune a pre-determined area, minimize travel and notification time, and educate the public about our tree management program as we go. Determining the cycle time is the challenge.

The cycle time varies by species and situation. In Redwood City, our downtown evergreen ash and Bradford pear trees were planted within 10 feet of two-story buildings. They required a 30-month or fewer pruning cycle to keep the trees from rubbing buildings and neon signs. Other neighborhoods had large Modesto ash, camphor, sweetgum, and sycamore that were on much longer cycles, as long as 10+ years, depending on budget.

In developing a pruning cycle, include an inventory to understand how many and what types and sizes of

trees have to be maintained, set a specification for how the work will be performed, and predict how long it should take to prune each tree. From that information, determine how much time each cycle will take. Then, either request the necessary budget to perform the work or divide the hourly rate by the available budget to ascertain the number of hours funded and therefore, the number of trees that can be pruned. In either outcome, you will have developed a base pruning cycle. Time should be planned in the urban forest management scheme for storm damage, citizen requests, and special projects that will pull crews away from scheduled pruning work.

—Gordon Mann, Mann Made Resources Consulting Arborists, Auburn, CA

As the community forester for the City of Hayden, Idaho, establishing the pruning cycle was very easy; there is none. The abutting property owner is responsible for all street tree maintenance. Hayden's community forest is in the development and planning stages, with Council recently adopting a long-term management plan. The City's goal is to develop and implement a street tree planting and maintenance program. Implementing the program will be difficult, since current city tax levies do not cover city operating expenses.

During my tenure as the urban forester for Chico, California, the pruning cycles were based upon specific tasks to be done, such as sign and signal clearance trimming, street light clearance trimming, young tree formative pruning, palm tree pruning, downtown pruning, and roadway clearance pruning. Service request pruning, winter storm damage, and summer limb drops were always factored into the equation.

In Chico, money budgeted for street tree maintenance was not adequate for cycled pruning. In 1999, staff developed a five-year management plan for maintenance street tree budgeting and staffing using information from the street tree inventory. In the analysis, staff noted that pruning cycles of two to three years were not sustainable financially. Pruning cycles beyond six to seven years yielded a diminishing return. The "sweet spot" for a pruning cycle was four to six years. Staffing and equipment projections needed to establish a six-year cycle were included in the report.

Like most cities, there was not enough money to go around. Our task was to be as effective as possible in the tasks at hand with limited staff. Efficiency and effectiveness are two different concepts. You can be very efficient, yet very ineffective. When money for additional staff was available, the urban forest program *faired* better than other programs because of our effectiveness.

The pruning cycle was based upon public safety needs. Sign and signal clearance pruning was done every year.

Street light clearance trimming was done every other year, unless the street light was associated with a traffic signal. Roadway clearance pruning was done on a six-to seven-year schedule. Palm tree trimming was done every three to four years. Downtown clearance pruning was done every year. Young tree formative pruning was done two years after planting by the Chico Tree Education and Enhancement (CTrEE) program, with a follow-up pruning by staff five years later.

To keep crews focused on pruning, certain maintenance activities were contracted out, primarily tree removals, stump grinding, and pest control. This eliminated the capital equipment, licensing, and training costs associated with these activities.

Mark Twain once said there are three kinds of lies: lies, damned lies, and statistics. Statistically, every tree in Chico was trimmed about every nineteen years. In reality, that was not the case. The pruning cycle was skewed by the trees serviced every year to address public safety needs.

The two major factors affecting pruning cycles were annexations and growth. At one time, Chico had more unincorporated county territory within its city limits than any other city in the United States. As these county pockets were incorporated into the city, old, over-mature, and neglected street trees were added to the inventory of existing city street trees. Rapid, new development also added additional young trees to the inventory. Neither addition added any new staff. If possible, I suggest advocating for additional incremental staffing levels as new areas are annexed into the city and/or new trees are added through the development process.

Throughout the late 1990s and into the 2000s, the State of California repeatedly shifted state costs onto local agencies. It was not uncommon to report to work on the news that the city lost one to two million dollars in General Fund revenue to the state, and budget cuts of five to ten percent were mandatory. Because our pruning cycles focused on public safety maintenance activities, urban forest maintenance activities were somewhat insulated from significant budget cuts. The money set aside for contractual work could be chipped away at if needed, leaving the trimming crew money largely intact.

In this time of economic uncertainties, the key is to be flexible. You may need to rethink operations. And most of all, my recommendation is to be effective in what you do.

—Chris Boza, Community Forester, City of Hayden, Idaho

In the City of Surrey, we have two different pruning cycles, one for our street trees and one for our park trees. Both cycles are based on the rationale that the



Pruning from the ground in Winnipeg, Manitoba • Photo by Karen Asmundson

best practice is to ensure sound tree structure. This requires having a cycle that has a shorter cycle in the early life of the tree (young tree training) and longer cycle in the later life of the tree (mature tree pruning). The advantage of shorter cycle, early life pruning pays dividends when the tree is more mature, as there are simply fewer issues to contend with such as poor structure, low branching, etc.

The second rationale considered in Surrey is the amount of available funding. Our street tree pruning program has a shorter cycle than our park tree program due to a bigger budget. The street tree pruning cycle is as follows: trees are pruned in years 3, 6, 9, 14, 19, and every 5 years thereafter. The park tree pruning cycle is as follows: trees are pruned in years 4, 8, 12,

19, and every 10 years thereafter. We find the street tree pruning cycle is adequate and ensures an inventory that is reasonably structurally sound, acceptable to the engineering department in terms of sightlines and clearances, and meets the needs of adjoining neighbours. The park tree pruning cycle is generally inadequate. Although we can usually establish a sound structure, we are often removing too much of the canopy and leaving larger than ideal wounds.

In terms of factors specific to our region, it would be ideal to take into account presence/absence of pathogens, such as fungal spores, to reduce risk of the effects of attack or infection. In light of all the other challenges associated with large-scale tree maintenance management programs, we are not able to tune our delivery to consider such factors.

One factor we do take into account in our pruning cycle, not necessarily specific to our region, is how to respond to the needs of our clients or civic leaders. For instance, we do schedule inspections of our high-profile streets and civic centres twice per year to ensure the trees at these sites are in prime condition, pruning any dying or dead branches as necessary. Or, if a disease is prevalent on any given street, we may respond to client requests and conduct a mid-cycle pruning to remove affected branches.

—Greg Ward, Manager, Urban Forestry and Environmental Programs, City of Surrey, British Columbia

The total urban forest in Winnipeg consists of an estimated 2.7 million trees on both private and public properties. Our urban forestry branch is responsible for the maintenance of approximately 250,000 planted trees on boulevard and park property. These numbers are estimates at best because we do not have a tree inventory. This fact has made the establishment of a pruning cycle even more challenging because we really do not have an accurate picture of what we manage. We are now in the process of creating an inventory of boulevard and park trees in Winnipeg.

Currently we have an averaged 1:12-year pruning cycle. Our target is an averaged 1:8-year cycle. During the 90s and early 2000s, budgetary and service level changes caused both service levels and the urban forest to decline. This decline led to increasingly poor customer service but more importantly, more unsafe trees in Winnipeg's neighbourhoods. During this period, we shifted from years of systematic block pruning by in-house and contractor crews to minimal block pruning by contractors only, leaving in-house crews to respond to what developed into an average of about 7,000 customer complaints per year—the second highest level of complaints in our public works department. It got to the point where we could not address or complete the

service complaints coming in, resulting in an increasing backlog that would take a minimum of five years to get to. Essentially, low-priority pruning requests (general maintenance pruning) received the response, “work cannot be done due to lack of resources.”

Through the perseverance of our previous city forester and support from senior management, reports and presentations were made to Council outlining the declining state of the urban forest and the reduction in service levels, the consequences, and the funds needed to improve the situation. It is important to note that our Mayor and Council generally recognize the value of the urban forest to our quality of life and that Winnipeg has strong citizen action in this regard too. In 2007, Council approved additional funding for systematic pruning. This budget increase allowed us to shift the pruning cycle from 1:35 years in 2003 to the current 1:12 years. Of course, the challenge is always present as we need to hold on to current funding amidst continuous rounds of budget reductions. We still need more funding to get to 1:8 years, and we have to meet the targets operationally.

Our target of an averaged 1:8-year pruning cycle is based on research of other urban forestry programs in Canadian cities of similar size and growing conditions to Winnipeg. This review confirmed that 1:8-years is an overall standard. The cycle is averaged due to the range of tree sizes that occur in the urban forest—small trees in our climate generally require 3 to 5 years, medium trees 5 to 10 years, and large trees 10 to 12 years. Another important consideration for our pruning program is our Dutch elm disease management program which is governed by the Manitoba DED Act and Regulations. Elm pruning is banned from April 1 to July 31.

—Martha Barwinsky, City Forester, Winnipeg, Manitoba

The City of Milwaukee has a rich urban forestry heritage that dates back to 1918 when the first city forester was appointed. By 1925, the forestry bureau had grown to include 50 tree trimmer positions. Since its inception, Milwaukee forestry has pruned the City’s street trees primarily from rope and saddle. While it is unknown to current staff when the City may have formally adopted a cyclical pruning program, given the even-aged monoculture of American elm (*Ulmus americana*) trees that formerly graced Milwaukee’s streets, it is likely that cyclical pruning was simply an expansion from block or street based pruning to current quarter-section (160-acre)-based scheduling. Photographs from the 1940s show multiple climbers pruning large elms on a block-by-block basis. However, the arrival of Dutch elm disease in Milwaukee in 1956 forced a 20-year partial hiatus in cyclical pruning with most forestry resources reallocated to the removal of tens of thousands of American elm trees.

Milwaukee’s current pruning cycle is rooted in numerous academic and consultant studies based on tree population parameters (quantity, size and species distributions, growth projections, and tree value), cost benefit analyses, and resource capabilities. An economic evaluation of Milwaukee’s pruning cycle conducted by Miller and Sylvester in 1981 (*Journal of Arboriculture* 7 (4): April 1981) established an optimum pruning cycle of five years, using marginal cost and return analysis on loss in tree value versus pruning cost savings from longer cycles. This study found a significant correlation between condition class and the number of years since pruning, with years since pruning accounting for 89.8% of the variation in condition class.

A subsequent study completed by Churack, Miller, Ottman and Koval (*Journal of Arboriculture* 20 (4): July 1994) analyzed pruning (rope and saddle), wood stack time (waste wood stacked at curb for later chipping), and wood waste yield from four different species over seven 2” diameter classes (4 -16” diameter range). The four species studied included Norway maple, green ash, honeylocust, and littleleaf linden. Regression analysis was used for each species to determine the relationship between pruning time versus diameter, waste wood stack time versus diameter, waste wood yield versus diameter, and average annual diameter growth versus diameter.

While significant differences were noted among species beyond 8” diameter (116 minutes average pruning time for 16” honeylocust versus 64 and 85 minutes, respectively, for Norway maple and green ash), this study found a 6-minute increase in average pruning time for all species for each 1” increase in diameter. Similarly, increases in waste wood stack time and wood waste yield accompanied an increase in tree diameter, with honeylocust accounting for the largest increase. For all species combined, approximately 3 lbs. of waste wood was removed for every minute spent pruning. A 20.5-lb. increase in waste wood for each 1” diameter increase was calculated for all species combined. The study also projected population growth for 100 years through computer simulation, which predicted average diameter increases through the first 65 years, followed by a decline to year 85, where the population stabilizes. Anticipated mean diameter increases are useful for forecasting long-term pruning (and other maintenance costs) and staffing levels. This timed pruning study also provided a measurable performance standard for evaluating the pruning proficiency of new urban forestry specialists trained by the forestry division.

Between 1982 and 1993, Milwaukee’s 5-year pruning cycle drifted to 6 years due to a 2” increase in mean diameter, integration of natural target pruning methods, and the loss of 35 arborist positions between 1975 and 1993. The loss of personnel over this time period



In Columbia, Missouri, most pruning needs in larger trees are a result of either storm damage, structural defect, or some negative abiotic influence such as construction damage. Removing hazardous deadwood from this oak was a high priority because of significant foot traffic under the tree. Photo by Brett O'Brien

and accompanying maintenance challenges prompted a comprehensive management and operations review of the bureau of forestry in 1993. The consultant who completed this review utilized information from the two referenced studies in conjunction with increasing out-of-cycle pruning needs to contrast various pruning cycle options.

Scenarios analyzed included straight 5- and 6-year pruning cycles, as well as two-staged 3/6- and 4/8-year pruning cycles. Two-staged pruning cycles address the disproportionate pruning frequencies accompanying more rapidly growing trees in the 10-14" diameter range, which comprised the bulk of Milwaukee's pruning requests. In this analysis, two-staged pruning cycles pruned trees less than 14" diameter at twice the frequency of trees larger than 14" diameter. The study concluded that a two-stage, 3/6-year pruning cycle best met the needs of Milwaukee's street tree population, based on population characteristics and a projected 50% reduction in out-of-cycle pruning requests.

In 1994, Milwaukee transitioned from a straight 6-year pruning cycle to a 3/6 pruning cycle. During the first full cycle (6 years), heavy biomass accumulation resulting

from the previous 6-year cycle made for a challenging conversion to a 3/6 pruning cycle. However, during subsequent cycles the 3-6 pruning cycle proved to be highly efficient and effective and resulted in a sharp decline in out-of-cycle pruning requests. Out-of-cycle pruning requests declined because crews were in each quarter section every 3 years and could attend to incidental maintenance needs of larger trees mid-cycle (year 3) to remove any dead or obstructing branches that would have otherwise generated a service request.

Unfortunately, budget reductions in 2004 funded Milwaukee's cyclical pruning program at a straight 5-year cycle, which predictably has grown beyond 6 years due to increased mean diameter growth in the street tree population and a 100% increase in out-of cycle pruning requests. The severe economic challenges accompanying the 2008-09 recession will require highly creative strategies for financing pruning and maintenance of our nation's municipal forests.

—David Sivy, Forestry Services Manager, City of Milwaukee, Wisconsin 🌿