

Southwest Tree Committee

Tree Protection and Preservation in Portland A Call for Reforms

December 16, 2005

The Southwest Tree Committee began meeting in March of 2005 in response to an ongoing and serious loss of trees in southwest (SW) Portland. The core committee members are Greg Schifsky, Margot Barnett, John Gibbon and Leonard Gard. Appendix 1 lists individuals who have attended one or more meetings of the committee. The committee wanted to start a dialogue in SW Portland regarding current city policies related to tree cutting and see if there were regulatory and non-regulatory changes that could be made to prevent the ongoing unnecessary loss of the tree assets of the city. The committee researched tree policies in Portland by inviting speakers from city bureaus to meetings as well as meeting with city representatives in person or over the telephone to gain insight into city codes, policies and actual enforcement practices. Considerable research into current urban forestry literature was done, as well as review of tree cutting ordinances from a variety of municipalities in the western United States. Since the committee began its work within the Southwest Neighborhoods Incorporated coalition we limited our review to issues that impacted trees in our area of SW Portland. We have had some dialogue with representatives from neighborhoods in other parts of the City and realize the concerns we raise are also felt by residents in other parts of the city, that tree issues have been discussed at City Wide Land Use meetings and at a meeting of the City-wide Parks Team. There are many tree preservation issues that we did not address that are important in other neighborhoods. This document is just the beginning of a needed broader citywide dialogue regarding tree preservation in Portland.

Trees perform valuable functions enhancing the beauty of our city as well as providing valuable health, and environmental benefits to residents. Tree-lined streets provide shade and serve valuable stormwater control functions. The urban tree canopy provides wildlife habitat, oxygen, lower temperatures in summer, and noise and wind protection.^{1,2} Energy savings resulting from the presence of trees help support the City's goals of sustainability.^{3,4,5} The importance of mature trees in terms of ecological function is emphasized by the fact that a mature tree may store up to 1000 times the amount of carbon dioxide than a small immature tree.⁶ This function is critical for controlling temperature and air quality. Thus retention of mature trees is critical for public health.⁷ There are even some indications that vegetation including high canopy trees can reduce crime.⁸

The committee has focused on tree losses that directly or indirectly result from human activities on private property. Examples are the intentional cutting of trees, or the death of trees from construction or post-construction abuse. These losses occur because of

inadequacies in regulations and public education. Our purpose is to address those inadequacies.

The Portland area continues to grow and change with more residents moving here from out of state. While individuals often move here because of the ecological amenities the area has to offer, they need to be educated on how to help maintain our green infrastructure. Growth results in an increase in impermeable surfaces and the addition of curbs and sidewalks in areas of the city that have not had these types of improvements in the past. As part of the concept of sustainable development we must work to find ways to prevent economic incentives for development and the need for housing from overriding the need to preserve our valuable tree assets. Mitigation and penalties do not instantly restore the lost aesthetic and ecological functions when a mature tree is cut down. Although many mitigation and revegetation activities by volunteer groups, non-profits and the city bureaus have helped to curtail the loss of native tree canopy we are concerned that the habitat and quality of the canopy are still under threat with the existing system of protections.

A variety of human activities adversely impact trees besides cutting trees, decreasing pervious soils and surfaces, and damaging tree root zones during development. Some examples include the unnecessary and extreme cutting or pruning of trees especially when done outside of the dormant season (December, January, February), not protecting root zones by parking vehicles over root zones, storing soil, firewood, bricks, etc. over root zones, incorrect pruning practices, failing to water large trees after the water table (below grade) has dropped (usually in early August for any year), contour grading during a landscape project impacting root zones especially during dry months. Another serious threat to trees is the spread of invasive species which is also related to human activities since we often plant invasive species, and they grow more easily in soils disturbed by development. While many of us are also working to address invasive species threats, they are outside the scope of this committee's work. (We certainly encourage the city to look further at developing policies across all bureaus that consistently work to prevent the spread of exotic and invasive plant, insect and animal pests).

As stated earlier, we are aware that the issues identified here have impacts elsewhere in the city. Our focus on southwest Portland means we may have missed other issues related to differing types of terrain and development in other areas of the city. We would like to continue to work on these issues on a citywide basis with partners from city bureaus and other neighborhood coalitions.

The problems that we felt we could address are the gaps in existing codes and policies that are directly related to the cutting of trees and preservation of trees. Trees are cut at different stages in the use of land:

1. When land is developed or re-developed with a land division or new construction.
2. During pre-development or post-development occupation and use of the land.

Examples of problems we have seen in southwest Portland include the following:

- inadequate tree preservation plans
- inadequate tree protection zones
- lack of enforcement of the required tree preservation plans
- lack of enforcement of other regulations
- need for public education and outreach regarding the role of trees.

Background of Current Regulations Pertaining to Tree Preservation

There are several city agencies that have regulatory responsibility related to trees. The Bureau of Planning is the bureau that develops policy and is responsible for writing new regulations and modifying existing regulations in Title 33. The Bureau of Development Services (BDS) Land Use Services division implements the zoning code. Urban Forestry in Portland Parks and Recreation regulates street trees, trees on public property, some trees on private property such as heritage trees, historic trees, and trees at least 12 inches diameter on dividable lots not currently proposed for land division. They coordinate with Portland Office of Transportation on issues related to streets and street trees. The Bureau of Environmental Services also impacts tree preservation within the city through the Stormwater Management Manual, Watershed Management Plans and Revegetation Program. The Portland Watershed Management Plan that will be submitted for comment this fall may also inform and influence tree preservation regulation once it is adopted. It is not clear what the process will be for integrating that document into the City's regulatory framework.

Our committee calls for three reforms: A) changes to city code and procedures, B) an expanded and invigorated tree liaison program, and C) a program of education and incentives for tree preservation. Issues which were identified as needing resolution, but where no specific reforms are suggested are included in section D.

Proposed Reforms

A. Changes to city code, interpretations of city code, and procedures

1. Individual lot owners must receive notice when their lots are subject to preservation plans.

If homeowners are unaware that a tree plan exists it will most likely be violated, making the plan inadequate. The plans are complex and difficult to enforce, and therefore inadequately enforced. City Code Section 20.42.050.A provides in part that "Trees may be cut on unregulated property without a permit except where the tree proposed to be cut: 1. Has been expressly protected through an applicable land use regulation or required to be preserved as a condition of approval; ..."

Tree preservation plans in fact are conditions of approval in land division cases, and 33.630.200.C provides in part that "Trees to be preserved on individual lots must be permanently preserved through a tree preservation plan, ..."

It is clearly the intent that tree preservation plans be permanently in effect, and yet there is no framework for notifying individual lot owners of their responsibility. It is important that individuals are aware of constraints on cutting of trees prior to purchasing property. Owners are cutting trees that should be protected sometimes out of ignorance of the tree's protected status. There is also no clear definition in the code of what *permanent* means. It should be stated that trees must be replaced at the end of their natural lifespan. The city tree guide should have some guidance in it for each species regarding the average lifespan for each species.

Methods of getting notice to lot owners:

- Add some information currently in the GARTH system into the data and mapping system accessible to the public (heritage trees, significant trees) and add a field to indicate whether a tree plan exists for the site;
- Consider affixing 'permanent' metal tags to all trees protected by tree preservation plans.
- Ensure that individuals are given a disclosure form that indicates the zoning code(s) and other regulations in effect on a property for sale within the City of Portland. This form should provide clear instructions on how to use the City of Portland BDS website to determine what additional zoning regulations apply to the property in question, and if applicable, how to obtain documents such as site plans for tree preservation and stormwater management facilities. The coversheet should include information on how to obtain the information without web access such as requesting the information by telephone, in writing or in person for a small fee. A similar coversheet should be attached to all title reports for properties sold within the City of Portland. We recognize that requiring this type of a disclosure form or fact sheet may require some legal changes. We feel that when homebuyers are aware of restrictions prior to purchase they are less likely to violate codes once they purchase property. Individuals moving to Portland from other areas are often unaware of the types of zoning codes and development restrictions that may impact the ability make changes to property.

2. All tree preservation plan options must include some protection of significant trees.

The current code allows tree preservation plans that are inadequate in that they do not protect significant trees. The concept of the "significant tree" is an important one in the tree preservation chapter (33.630) of the land division code. The existence of a single significant tree triggers application of 33.630 to a land division. A significant tree is a) a tree more than 20 inches in diameter that is not a nuisance or prohibited plant or b) a tree belonging to one of 18 tree species that are significant at varying diameters less than 20 inches. While defining *significant trees* the provisions of the chapter fails to adequately protect them.

Chapter 33.630 gives the land division applicant five different options for preserving trees. Option 1 requires the applicant to preserve at least 35 percent of the total tree diameter on the site but does not require the applicant to preserve a single significant

tree. Options 2, 3, and 4 give the applicant incentives to preserve significant trees by lowering the percentage of total tree diameter to be preserved. Option 5 focuses on tree canopy for sites larger than an acre. A final option is to do mitigation in lieu of preserving trees.

Nearly all land division applicants are choosing option 1, the option that doesn't require protection of significant trees. Option 1 needs to be modified to protect some percentage of the significant trees.

3. Modify codes with prescriptions or incentives so that more builders choose to preserve trees rather than cut and plant.

It is too easy to cut mature trees within the current land division and development system. Chapter 33.248.020.H.2 applies to new residential development. It gives builders three options for meeting tree requirements. Option 1 requires some trees on site to be preserved. Option 2 allows all the trees on site to be cut but requires replacement plantings. Option 3 allows payment into a tree fund when preservation or plantings are not practicable.

In practice, builders are not choosing Option 1. They are cutting the trees and planting new trees that are poorly monitored and have high mortality rates. The code should be changed to favor more preservation, either through incentives or prescriptive rules. This Chapter should be amended to include incentives for preservation of *significant trees* as noted for the land division code in item 2 above.

4. Trees selected for preservation must be adequately protected during construction and given adequate root protection zones.

Monitoring is insufficient to ensure that current root zone protections and construction practices are sufficiently protective of trees. More protective practices used in other jurisdictions with substantive tree protection program should be considered for adoption (such as Lake Oswego, OR (Ch.55.08.030) or City of Palo Alto, CA⁹), combined with active monitoring of tree protection in Portland, can be used to ensure that code reflects 'best management practices' for preserving trees. Updated protections and monitoring, enforcement when practices are not adhered to, incentives for preservation, and replacement of trees when trees die following development are key to protecting the urban forest canopy. For example, rigid chainlink fences may be more effective than the permitted flexible fencing. There should be a tickler system for random selection for inspection at 3 years after the final inspection to determine if protected and preserved trees are alive. This is an area where partnering with the tree liaison program, watershed councils, Master Gardener and other stewardship programs maybe helpful in providing some additional resources.

5. Without a good tracking and monitoring system the existing codes are not protective due to an inability to enforce and evaluate the efficacy of the codes.

There is no easy way to obtain statistics on violations of all aspects of tree cutting and tree preservation. Without this it is difficult to evaluate the effectiveness of the code

in preventing inappropriate tree cutting or in preserving trees. As mentioned in item 3 above, we need to develop a systematic approach to evaluate whether the root protection zones are adequate, and what areas of the code are most problematic. This information can be linked with tree inventories of public and private trees to evaluate the program. It is not clear how enforcement can be at optimally effective if the data system is insufficient to easily track the permitting, inspection and violation process.

6. BDS staff should be able to challenge arborists' reports claiming exemption of trees from preservation under Chapter 33.630.030 to ensure that tree protection plans are truly protective.

This code section exempts dead, diseased, and dangerous trees from protection “as determined by the City Forester or an arborist.” Arborists in practice are liberal in determining that trees should be exempted, and the above language puts BDS staff in a weak position to challenge an arborist’s determination. The exemption of trees by an arborist should be challengeable by BDS staff. A consulting arborist should be available to resolve conflicting assessments of tree health and hazard status if one is unavailable on BDS staff.

7. Portland needs a residential certificate of occupancy (COO) to provide better tools for enforcement and ensuring compliance with tree protection, landscaping and tree planting required as part of the development process.

The requirement for a residential COO was deleted from the city code in 2002. A certificate is required for commercial buildings and change of occupancy for commercial and mixed use buildings. By not requiring a COO there are minimal incentives or enforcement mechanisms to make sure that inspections are completed and all of the permit requirements especially those not associated with building codes, are met. Builders can sell houses and homeowners can occupy homes before a final permanent erosion control measure inspection is done, thus there are limited incentives for ensuring that the work is completed. The data system and resources for enforcement are insufficient to track whether work is completed and to check on landscape certification forms that are received. This issue is particularly problematic since the COO is still referenced in 20.40.070G. “All trees required by this Section must be planted prior to the issuance of a certificate of occupancy.”¹⁰

8. Protection should be consistent within the city codes for ease of public understanding and to ensure that the tree canopy is preserved as infill occurs and the city reaches full built capacity within the established zoning.

Current regulations in the different bureaus are not consistent with regards to the criteria used to determine which trees should be protected. For consistency and to meet the goals of the urban tree preservation it would be helpful to have Chapter 20 apply to all *significant trees* as defined in Chapter 33 and remove the exemption for fully developed lots that do not have existing tree plans. (This would require a change in the definition of regulated property under 20.42.020, as well as changing the purpose of the tree cutting regulations to align them more with the Urban Forestry Plan and sustainability goals. This change will help ensure that the goals and requirements of land use regulations of Title 33 are met. Note that Clearing, Grading

and Erosion Control 24.70.020 would also need to be reviewed and modified to achieve consistency.) This approach would avoid confusions related to differing tree diameters that trigger protection in BDS zoning and land division compared to the diameters protected by Urban Forestry, while ensuring that native species and large specimens of non-native species are adequately protected. (BDS protects trees at least 6 inches diameter at breast height (DBH), Urban Forestry at least 12 inches DBH.)

This is just one possible solution to resolve the noted inconsistency and provide an equal level of protection of trees on properties in the city while simplifying the permit process for property owners.

9. The code that governs permits for clearing, grading and erosion control (24.70.020) is unclear and contradictory in how it addresses cutting trees.

Wording of this section of code makes it difficult to understand how it fits with other codes governing tree cutting. It describes that a tree cutting permit is needed for operations where slopes in whole or in part exceed 25%. The permit is needed if the area to be cleared is greater than 2500 feet, or when 5 or more trees of six-inch diameter are going to be cut. This section of code does not refer back to 20.40.040 requiring a permit for cutting all trees at greater than 12" DBH.

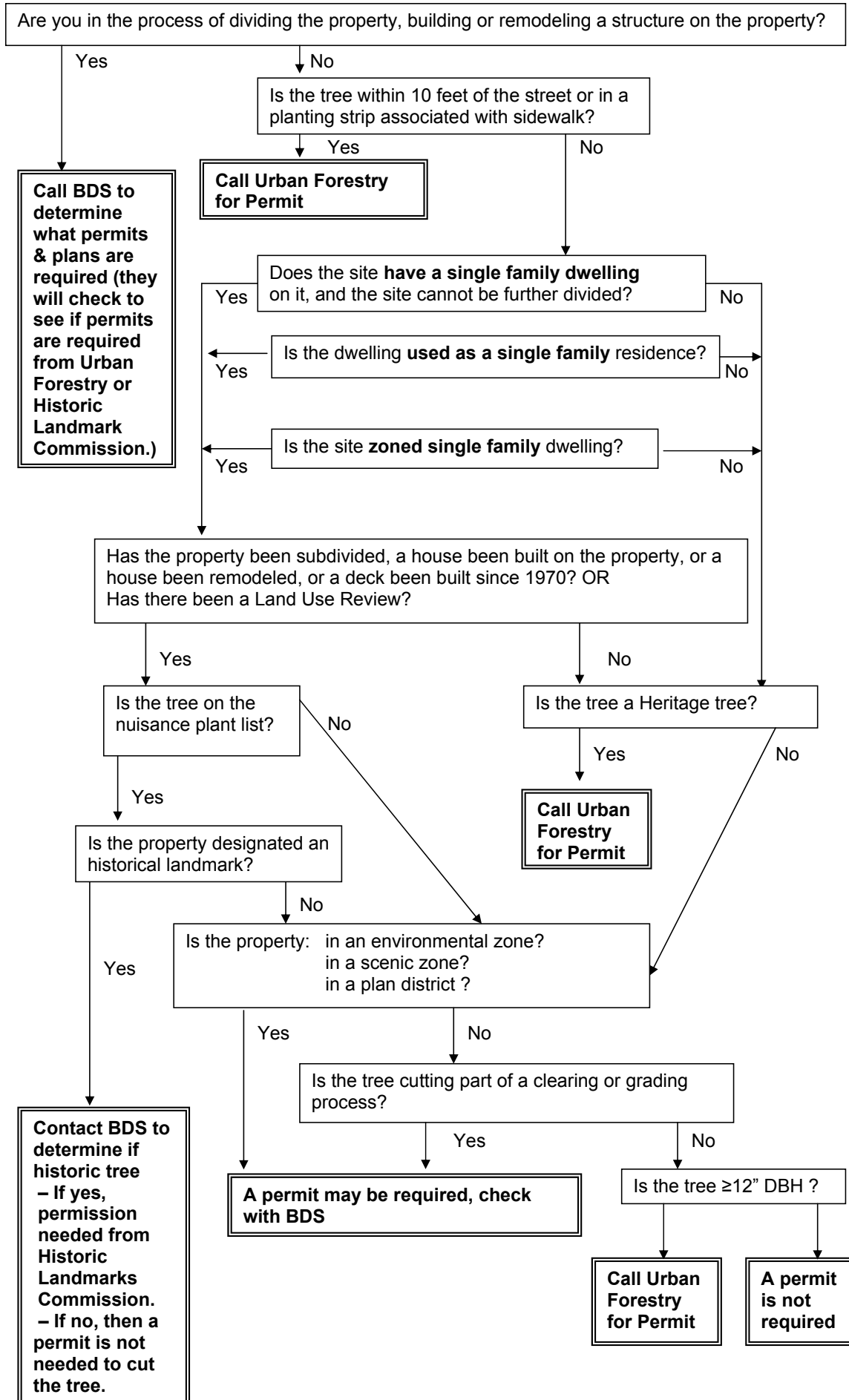
10. When mitigation is required under section 20.42.100 there are requirements (C) that the replacement tree must live for three years after planting or be replaced, and must not be cut without a permit. A system to tag and track trees required for mitigation must be developed otherwise this is requirement is unenforceable.

There are no clearly established mechanisms to track these trees which are supposed to have some form of permanent protection. Trees required as mitigation must be put into a centralized data system, and the homeowner must be made aware of the tree's protected status as described in item A.11., below. The mitigation requirements under this code are different than those in the zoning code Chapter 33.248. The requirements in 20.42.100 should be reviewed to determine if the two chapters can be made consistent.

11. Currently individuals who want to determine if they need a permit to cut a tree on their property must call several bureaus, or actually visit the permit center. Information on tree cutting regulations is not available from a centralized source, either by telephone or the internet. There is no way from the internet to determine if there is a tree plan recorded for a particular property. As part of increasing public education, awareness and providing easy mechanisms for compliance a central repository of information is needed

The complexity of the current scheme that a property owner must use to determine: a) if they need a permit to cut a tree on their property; and b) which bureau has jurisdiction, is shown in Figure 1. The city needs an easily accessible and well-publicized central repository of information on tree regulation, preservation, and

Figure 1: I want to cut a tree on my property, do I need a permit?



planting. The Bureau of Development Services should be the steward of that repository since they currently enforce a majority of the regulations and maintain the permit center which should be a one stop office for permits providing information to the public. Permit requests that should be provided by Urban Forestry can be routed to them rather than requiring residents to call multiple offices or wade through the wording of the tree ordinance to determine which code applies. Planting guidelines from all bureaus should be integrated into a single document.

BDS should have a tree hotline that gives the public a single place to go to for information and complaints. Complaints arriving at this central number could then be directed to the appropriate office, similar to manner that PDOT uses to route calls received at through 823-SAFE.

Website information should:

- a) Lead viewers through a decision matrix that encourages tree preservation and replacement, and clarifies which regulatory process and permit applies if tree removal or cutting is needed (The same matrix should be used to respond to telephone inquiries.)
- b) Provide instructions on how to identify whether a tree preservation plan, heritage tree designation, historic landmark tree designation, tree protection required for violation mitigation applies to a particular property
- c) Link to other sources of information, such as Portland Maps for environmental and scenic zone overlay information.
- d) Describe the city's regulations relating to trees and vegetation.
- e) Describe the tree liaison program and give contact information.
- f) Include information and/or give links to related subjects such as naturescaping and invasive vegetation management..

12. The handouts and website from Urban Forestry are unclear and lead individuals to determine early on, that their property is “unregulated” when they actually may fall under zoning codes. Simplify and update handouts from Urban Forestry.

Give citizens one phone number to call. Brochures that advise the reader to call other bureaus or to read an ordinance to determine if they are covered tend to alienate the public and result in people just going ahead and cutting, since it is too hard to figure out if a permit is needed and where to get it.

13. Apply a consistent approach to trees on both private property and public property

BDS, BOP, PDOT, and Urban Forestry should cooperate to make sure the city has a consistent approach to the planting, preservation, and cutting of trees, whether on private property, in the street, or on other public property.

14. All code language should specify tree circumference rather than diameters, which is more easily measured and recordable by property owners.

While we recognize the measurement of tree size as diameter at breast height (DBH) is standard in forestry and landscaping it is not readily understood by some homeowners and requires an extra computational step or use of special measurement tools. Current code explains how to measure DBH in terms of the vertical height on the tree, and how to manage when there are multiple leaders, but nowhere is there an explanation of how to measure diameter. If DBH remains as a standard of measure then there should be an explanation of how to calculate diameter or describe tools and methods to be used. (See Appendix 2 as an example.) To make the measurement simpler for the lay public, and not require computation we suggest providing circumference measurements in parentheses. For large and complex tree plans we would expect standard tools to be used to determine diameter at breast height, but for determining whether a permit is needed to cut a single tree it seems that providing a circumference should be adequate.

15. Violations and recurrent violations should be dealt with in a tiered system similar to the recently adopted (August 24, 2005) changes to the Environmental Zone Codes.

We feel very strongly that the City should reexamine the practice of citing only the property owner for tree cutting violations. The system should include citing contractor responsible for tree damage. This is particularly true when examining the issue of topping trees, and/or cutting protected trees. There should be a tracking system to monitor property owners, landscaping, arborist services and other contractors that repeatedly violate these protections with increasing penalties.

16. Anecdotal information indicates that topping and cutting of trees to obtain and maintain views is one of the common violations of tree preservation and tree cutting ordinances. The city should develop a best management practices standard for this type of pruning.

We suggest that the city provide guidance on the best methods for pruning and structuring trees to provide and maintain a view. A standard could be a useful tool to help preserve trees and enforce the prohibition of topping. Existing standards such as the ANSI A300 Standard and the ISA Tree Pruning Recommendations might be a good starting point. Developing this standard should include input of Urban Forestry, BDS and other partners from the arborist community. It should be available to the public through various outreach programs including home and garden shows. This information should also be provided to industry contacts as noted in item 3b. Guidance should include cost information about penalties for violations related to illegal cutting and topping, including the costs for required long term professional pruning correction for topped trees.

17. Integrate information to prevent urban wildfires into the code and planting guidelines.

Information on fire-resistant species and the fire-resistant index of tree species should be integrated into the landscaping and planting guidelines from the city for areas that are particularly vulnerable to urban wildfire. This will require coordination between Portland Fire Bureau, the Bureaus of Planning, Development Services and Parks and

Recreation. A column indicating fire resistance of tree species could be added to the Tree and Landscape Manual, and information on fire resistance should be added to the Portland Plant list. This information could be made available at home and garden shows and nurseries.

18. Code should be clear and consistent regarding management of tree on property lines.

All sections of code where this is a pertinent issue (land division, rights-of-way, undeveloped and fully developed sites, street trees) should be clear and consistent.

19. Evaluate and amend code to require revegetation for areas cleared of nuisance trees and invasive plants, when there are no significant trees present.

There may be times when areas are cleared of nuisance trees and invasive plants leaving an area devoid of vegetation and open to significant erosion. The code should require revegetation when areas are cleared and no ground cover or trees remain.

20. To strengthen the City's commitment to tree preservation and green infrastructure code should reinforce the need for flexibility and innovative solutions to preserve existing mature trees when new streets and sidewalks are developed or existing sidewalks are being damaged by mature trees.

Citizens at times have to struggle with conflicting messages from City bureaus relative to the development and maintenance of sidewalks. There should be flexibility to encourage the use of alternative approaches to preserve trees. Inclusion of language similar to that below in appropriate code sections would encourage the development and use of alternate approaches.

When new sidewalks and street improvements are designed the City Engineer should consult with the City Forester to preserve as many significant trees as possible using innovative design methods and materials for sidewalk and street construction.

Where sidewalk or curb damage due to tree roots occurs, every effort shall be made to correct the problem without removing or damaging the tree. The City Forester shall be responsible for developing or approving corrective measures in consultation with the City Engineer.¹¹

21. The City should institute a 24 hour Hotline violation number that is tied to an on-call inspector to respond to violations of tree cutting (and other development codes) that occur on weekends and after working hours.

Anecdotal information indicates that violations of tree cutting (and other development codes) frequently occur on weekends, when there are no mechanisms for getting an enforcement action. (While there may be some established mechanisms for code enforcement outside of usual business hours, the protocols are not publicized and are not clear among all of the partner city agencies. Therefore, whatever protocols might exist they are not effective enforcement tools.) Since cutting a tree is not an action

that can be undone a mechanism to provide rapid response outside of regular working hours would help prevent loss of valuable resources.

22. Public notice should be given of applications to cut trees in the right-of-way.

Recently, in the West Portland Park neighborhood, housing went in on a site that was subdivided sometime in the past, perhaps many years ago. Therefore, the current development was done with administrative permits without public notice or review. The development included the cutting of trees in the public right-of-way. PCC 20.42.110B provides for notice to the affected neighborhood coalition when an applicant applies for a tree cutting permit on private property. PCC 20.40.100 should be amended to give similar notice to the affected neighborhood association and/or coalition when permits are sought to cut trees in the public right-of-way. Cuts in the public right-of-way can be as or more significant than cuts on private property, and because the right-of-way is publicly owned, the public has a clear interest.

B. Enhance the Tree Liaison Program

Develop an enhanced tree liaison program to ensure that citizens understand the resources in the community that are available to help them plant and maintain tree cover on their own property and within their neighborhoods.

The tree liaisons can function as mediators and information resources on planting and maintenance of street trees, tree preservation in areas without sidewalks, and tree preservation on private property. The current tree inventory program should be expanded to include methodology for collecting data on trees in public rights of way where there are no sidewalks and curbs. In depth information on tree codes and enforcement processes will be part of this comprehensive program. Linkages with resources for homeowners needing assistance with tree identification, maintenance, ivy removal and fall leaf removal will be part of the program.

Provide neighborhood associations with an annual updated list of active trained tree liaisons within their neighborhood boundaries to insure the integration and use of the tree liaisons at the neighborhood level. It would be helpful to have the tree liaisons come to a neighborhood association meeting after they complete training to introduce themselves to association members and to let them know of any specific projects or interest they have related to trees in the neighborhood.

While some tree liaisons may choose to be involved in specific planting or inventory projects others may choose to serve as citizen resources related to tree-related codes, tree identification and to help provide linkages for tree preservation, and ways to obtain assistance for leaf cleanup and pruning for low income residents. In depth training should be provided to meet these needs.

C. Other Education and Incentive Programs

The regulatory program is insufficient without additional educational and incentive programs to ensure that the public and professionals that provide services such as landscaping, gardening and tree removal are all aware of the benefits of preserving

mature trees, the codes, and the consequences of not following them. Programs should be developed that encourage the preservation of trees through incentives. We are making some suggestions here with the understanding that other approaches may be more effective and sources of funding need to be identified. Some of these activities can be carried out by non-profit organizations or other city partners.

1. Develop a ‘CALL before you cut ‘ outreach program

This program would be similar to the “call before you dig” program for utilities. Ads could be placed in phone books, Business Service Directories, Home Shows, Farmer’s Markets, local newspapers, web sites, and other locations where the public would look for tree cutting services. Information should include warnings about costs if they cut first without checking.

2. Educate arborists, tree specialists, landscapers, and gardeners regarding codes/regulations related to tree preservation.

This can include outreach to professional associations, professional training programs, office of licenses and the State Contractors Licensing Board. Coupled with education about code should be education and encouragement for arborists, gardeners and landscapers to educate clients regarding the benefits of tree preservation - a repeat tree customer is better than just taking a tree down once.

3. Create a city/environmental welcome basket for new homeowners that introduces them to city information, identifies their neighborhood association and coalition, city services, and provides educational materials regarding trees, tree values, naturescaping, etc.

4. Tree cutting violation fees should be put into the Tree Fund established under 33.248.H.c. The uses of the fund described in 33.248.H.c.(1) should be expanded to include: ivy removal programs, educational programs like Naturescaping and cost sharing mechanisms for replacement trees for low-income homeowners.

5. Create incentives for removal of ivy and other invasive plant species

D. There were four issues identified as needing resolution, but where no specific reforms were suggested or examined to our satisfaction. These are included here to stimulate broader city-wide discussion.

1. Cutting trees to create views

For years, property owners have cut trees to create views. Sometimes they cut trees on their own property. Sometimes, with or without permission of the owner, they cut trees on other private or public lands. Sometimes they seek city permits, sometimes not. City code and policy validate public views, but our code is silent on the issue of whether private views are a legitimate use that justifies cutting protected trees. In one recent case, the city granted environmental review approval for tree cutting to create a view, and declined to address the issue of the use. LU 04-002118 EV EN. In a

process that includes a public discussion, the city needs to address and resolve this matter.

2. Loophole in scopes of 33.630 Tree Preservation and 33.248 Landscaping and Screening that does not adequately protect trees.

There are cases where a developer will build first, and later apply for a land division, which lets them avoid the rules in 33.630 during development. This issue should be examined to determine if there is a way to integrate 33.630 and 33.248 to protect trees better by preventing this from happening.

3. Updating and amending tree preservation plans

Tree preservation plans primarily address conditions at the point in time when the plan is approved. But plans can become out of date as time passes; trees mature and die naturally, and new trees and vegetation arise through natural processes and human intervention. A discussion is needed on what should happen to plans when they reach a certain age, say ten years. One idea is to have an expedited amendment process to update plans.

4. There may be insufficient resources to enforce tree regulations.

The SW Tree Committee is concerned that BDS and Urban Forestry will not have the resources to enforce regulations related to trees. The city must determine the resources needed for effective enforcement of tree preservation codes. We need to determine if consolidating responsibility for tree protection within one bureau would be a more effective regulatory approach.

¹ Portland Parks and Recreation, Portland Urban Forestry Management Plan 2003. March 2004. Portland Parks and Recreation, Portland, OR

² United States Department of Agriculture. Benefits of Urban Trees, Forestry Report R8-FR 71, United States Department of Agriculture Southern Region. Sept. 2003.

³ City of Portland. Sustainable Infrastructure Report. 2001. City of Portland, December 2001.

⁴ Sacramento Municipal Utility District (SMUD). Tree Benefits Estimator. Accessible on the American Public Power Association's website. <http://www.appanet.org/treeben/default.asp> Accessed on August 10, 2005.

⁵ McPherson, G.E., Maco, S.E., Simpson, J.R. et. al., 2002. Western Washington and Oregon Community Tree Guide: Benefits, Costs and Strategic Planting. Center for Urban Forest Research, USDA Forest Service, Pacific Southwest Research Station, Davis, CA. 2002.

⁶ Environmental Protection Agency 2005. EPA: Heat Island - What Can Be Done - Trees & Vegetation, <http://www.epa.gov/heatisland/strategies/vegetation.html>, Accessed on August 19, 2005.

⁷ Frumkin, H. 2001. Beyond toxicity: Human health and the natural environment. Am J Prev Med 20(3):234-240.

⁸ Kuo, FK and Sullivan, WC Environment and Crime in the Inner City. *Environment and Behavior* 33(3):343-367 (2001).

⁹ Tree Technical Manual City of Palo Alto, Palo Alto Municipal Code Chapter 8.10.030. June, 2001 First Edition. Department of Planning and Community Environment. Pages 1-5, 6 and Chapter 2.

¹⁰20.40.070 Planting of Trees. (Amended by Ordinance Nos. 163739, 173534 and 176955, effective October 9, 2002.) http://www.portlandonline.com/auditor/index.cfm?cce_28635_print=1&c=28635
Accessed on 5/12/2005

¹¹ Bernhardt, E. A., Swiecki, T.J. 1999 Guidelines for developing and evaluating tree ordinances. Research Prepared for: Urban Forestry Program, California Department of Forestry and Fire Protection, Sacramento, CA.

Appendix 1

SW Tree Committee Core Members

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Greg Schifsky
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Additional individuals who attended one or more meetings

Rich Adelman
Neil Blatner
Micki Carrier
Jayne Cronlund
Tim Cushing
Lillie Fitzpatrick
Steve Mullinax
Susan Murray
Victor Von Salza

Appendix 2

Tree Measurement



Extension FactSheet

School of Natural Resources, 2021 Coffey Road, Columbus, Ohio 43210

Measuring Standing Trees Determining Diameter, Merchantable Height, and Volume

Randall B. Heiligmann

Extension Specialist, Forestry

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Woodland owners often need to measure the merchantable board-foot content (termed “volume”) of certain trees in their woodland. In order to sell timber, for example, an estimate is needed of the quantity to be sold. If trees are to be cut to provide lumber, an estimate of volume is needed to determine what size and how many trees to cut. Using the methods described in this article, a woodland owner can estimate the board-foot volume in one or several trees. If an estimate is needed for several acres, however, it is recommended that the woodland owner engage the services of an Ohio Department of Natural Resources Division of Forestry Service Forester, a consulting forester, or an industry forester. Methods needed to accurately and efficiently inventory timber volume on large areas are beyond the scope of this publication.

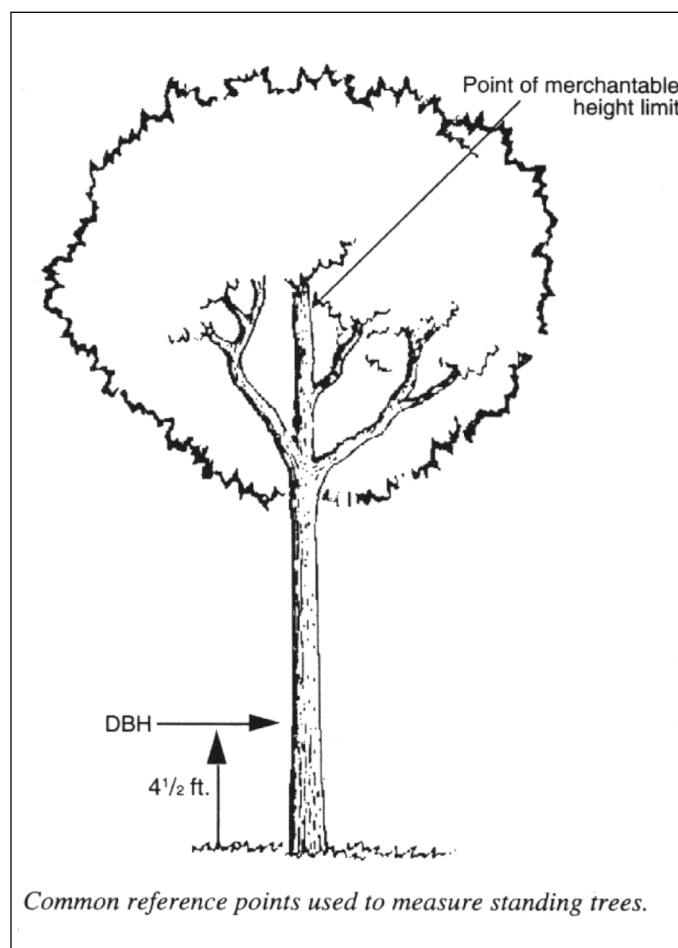
Tree Volume Estimation

In the United States, the most common measure of lumber volume is the board foot, defined as a piece of wood containing 144 cubic inches. It can most easily be visualized as a board 12 inches square and one inch thick ($12" \times 12" \times 1" = 144$ cubic inches). However, any piece of wood containing 144 cubic inches is a board foot (e.g., $3" \times 4" \times 12"$; $2" \times 6" \times 12"$; etc). The board-foot content of any board may be determined by multiplying the length by the width by the thickness, all expressed in inches, and dividing by 144 cubic inches.

The board foot is also the most common volume measure for trees and logs to be used for lumber and veneer. The board-foot volume of a tree or log is an expression of the number of board feet of lumber that can be cut from that tree or log. The lumber volume that can be cut from a tree or a log depends on a great many variables, including how the tree is cut into logs, the dimensions of the lumber, how much of the log is lost in sawdust and waste, and the efficiency of the sawmill and workers. Because of these variables, the board-foot volume of a tree or log cannot be measured exactly but is estimated.

Numerous methods (called “rules”) have been developed to

estimate board-foot tree volume. Two board-foot volume rules are commonly used in Ohio, the Doyle and the International 1/4-Inch rules (Tables 1 and 2). Both of these rules provide an estimate of the board-foot content of a tree based on tree-trunk diameter breast high and merchantable tree height (discussed later). The Doyle rule is the most common rule in Ohio. It is used



by the timber industry and many professional foresters. The International 1/4-Inch rule is used by state agencies and the U.S. Forest Service.

A comparison of these two volume tables will show that they are not identical. The International 1/4-Inch rule is generally considered to be the best estimate of the amount of lumber that can actually be sawn from a tree or a log under optimum conditions. The Doyle rule substantially underestimates the volume of trees in the smaller diameter classes. The International 1/4-Inch rule should, therefore, be used when the most accurate estimate of yield is important, as when determining how many trees to cut to obtain a specified amount of lumber. When marketing timber stumpage, however, the choice of volume rule is less critical. Confusion on quantity should not arise as long as both buyer and seller know which rule was used to estimate volumes. Timber stumpage prices are commonly adjusted based on which rule is used.

Measuring Tree Diameter

Tree-trunk diameters are measured at breast height (termed diameter at breast height or DBH), defined as the diameter of the tree 4-1/2 feet above ground on the uphill side of the tree. If a tree forks below breast height, each trunk is treated as a separate tree. DBH can be measured with a tree caliper, a Biltmore stick, a tree diameter tape, or a flexible measuring tape (e.g., cloth or steel). Tree calipers, Biltmore sticks, and tree-diameter tapes can be purchased through forestry equipment supply companies. The flexible measuring tape can be used to measure tree trunk circumference and circumference divided by 3.14 to determine diameter.

Measuring Merchantable Height

Merchantable height is the height of the tree (or the length of its trunk) up to which a particular product may be obtained, usually minus a one-foot stump height. Merchantable tree heights for sawlogs and veneer are generally estimated to the height where the trunk diameter tapers to 10 inches, or until heavy

branching or defects are encountered. The merchantable height of very valuable trees, such as veneer black walnut, may be measured to the nearest foot or two feet. The merchantable height of most other trees is measured in units of 16-foot logs and 8-foot half-logs. Merchantable height measurements are rounded to the nearest half-log. Thus, a tree with a merchantable height of 42 feet would be measured as having 2-1/2 logs of merchantable height.

Merchantable heights may be measured with a number of special instruments designed specifically for tree-height measurements such as clinometers, altimeters, relascopes, or hypsometers. These instruments are available through forestry equipment supply companies. Merchantable heights can also be measured with a long pole if only a few trees are being measured and they have relatively short merchantable heights. With some practice, merchantable heights in log and half-log units can be estimated quite accurately, particularly for trees with short merchantable heights.

Using the Tables to Estimate Merchantable Tree Volume

Once the diameter at breast height and the merchantable height of a tree have been measured, Table 1 or 2 may be used to estimate its volume in board feet. For example, a 20-inch DBH oak tree with a merchantable height of 2-1/2 logs contains 260 board feet Doyle rule or 350 board feet International 1/4-Inch rule.

When using these tables, it is important to remember that only that portion of the trunk that will produce a useable product should be measured. Portions of the trunk or entire trunks that are hollow, excessively crooked, rotten, etc., should not be measured. You may hear foresters or buyers talking about gross and net volume. Gross volume is the estimated tree volume without deduction for defects (i.e., the DBH and merchantable heights of all of the trees were measured ignoring defects, volumes were determined, and the volumes were added up). Net volume is the estimated tree volume with proper deductions made for defects.

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Table 1. Standing Tree Board Foot Volumes — Doyle Rule

Dbh (inches)	Number of 16-Foot Logs							
	1/2	1	1-1/2	2	2-1/2	3	3-1/2	4
	Board Feet							
12	20	30	40	50	60			
14	30	50	70	80	90	100		
16	40	70	100	120	40	160	180	190
18	60	100	130	160	200	220	40	160
20	80	130	180	220	260	300	320	360
22	100	170	230	280	340	380	420	460
24	130	220	290	360	430	490	540	600
26	160	260	360	440	520	590	660	740
28	190	320	430	520	620	710	800	880
30	230	380	510	630	740	840	940	1,040
32	270	440	590	730	860	990	1,120	1,220
34	300	510	680	850	1,000	1,140	1,300	1,440
36	350	580	780	970	1,140	1,310	1,480	1,640
38	390	660	880	1,100	1,290	1,480	1,680	1,860
40	430	740	990	1,230	1,450	1,660	1,880	2,080
42	470	830	1,100	1,370	1,620	1,860	2,100	2,320

From: Ashley, Burl S. 1980. *Reference handbook for foresters*. USDA NA-FR-15. 35 pp.

Table 2. Standing Tree Board Foot Volumes — International 1/4-Inch Rule

Dbh (inches)	Number of 16-Foot Logs							
	1/2	1	1-1/2	2	2-1/2	3	3-1/2	4
	Board Feet							
12	30	60	80	100	120			
14	40	80	110	140	160	180		
16	60	100	150	180	210	250	280	310
18	70	140	190	240	280	320	360	400
20	90	170	240	300	350	400	450	500
22	110	210	290	360	430	490	560	610
24	130	250	350	430	510	590	660	740
26	160	300	410	510	600	700	790	880
28	190	350	480	600	700	810	920	1,020
30	220	410	550	690	810	930	1,060	1,180
32	260	470	640	790	940	1,080	1,220	1,360
34	290	530	730	900	1,060	1,220	1,380	1,540
36	330	600	820	1,010	1,200	1,380	1,560	1,740
38	370	670	910	1,130	1,340	1,540	1,740	1,940
40	420	740	1,010	1,250	1,480	1,700	1,920	2,160
42	460	820	1,100	1,360	1,610	1,870	2,120	2,360

From: Ashley, Burl S. 1980. *Reference handbook for foresters*. USDA NA-FR-15. 35 pp.