

SEATTLE URBAN FORESTRY COMMISSION

Weston Brinkley (Position #3 – University), Chair • **Sandra Whiting** (Position #2 – Urban Ecologist) Vice-Chair
Steve Zemke (Position #1 – Wildlife Biologist) • **Sarah Rehder** (Position #4 – Hydrologist)
Stuart Niven (Position #5 – Arborist – ISA) • **Michael Walton** (Position #6 – Landscape Architect – ISA)
Joshua Morris (Position #7 – NGO) • **Andrew Zellers** (Position #8 – Development)
Craig Johnson (Position #9 – Economist) • **Bonnie Lei** (Position #10 – Get Engaged)
Whit Bouton (Position #11 – Environmental Justice) • **Jessica Jones** (Position #12 – Public Health)
Shari Selch (Position #13 – Community/Neighborhood)

The Urban Forestry Commission was established to advise the Mayor and City Council concerning the establishment of policy and regulations governing the protection, management, and conservation of trees and vegetation in the City of Seattle

May 1, 2019

Meeting Notes

Seattle Municipal Tower, Room 2750 (27th floor)
700 5th Avenue, Seattle

Attending

Commissioners

Weston Brinkley – Chair
Sandra Whiting – Vice-Chair
Whit Bouton
Craig Johnson
Jessica Jones
Bonnie Lei
Josh Morris
Stuart Niven
Shari Selch
Michael Walton
Steve Zemke (on the phone)

Staff

Sandra Pinto de Bader - OSE
Joe Markovich
Darren Morgan
Nolan Rundquist
Shane Dewald

Guests

Elijah Selch
Councilmember Sally Bagshaw
Daniel Strauss, Ali Penucci, Yolanda Ho

Absent- Excused

Sarah Rehder
Andrew Zellers

Public

Heidi Siegelbaum
Martha Baskin
Lance Young
Michael Oxman
Jessica Simpson

NOTE: Meeting notes are not exhaustive. For more details, listen to the digital recording of the meeting at: <http://www.seattle.gov/urbanforestrycommission/meetingdocs.htm>

Call to order

Public comment

Heidi Siegelbaum: She is interested in the code amendments to keep and grow trees in the city.

Adoption of April 3 and April 10 meeting notes

ACTION: A motion to approve the April 3 meeting notes as written was made, seconded, and approved.

ACTION: A motion to approve the April 10 meeting notes as written was made, seconded, and approved.

SDOT briefing

Joe Markovich – He is acting UF manager at SDOT. He started with the City of Seattle back in 2005 as a tree trimmer in Parks. Moved to SDOT as team lead and then supervisor.

SDOT's mission: deliver a high-quality transportation system for Seattle

Vision: connected people, places and products

The Urban Forestry section is part of the Maintenance Operations Division.

They manage street trees along streets throughout Seattle; support property owner requests for permit approval to plant, prune or remove street trees; provide design & construction direction for private and public development projects. They also oversee design and construction of SDOT Major Projects and Capital Improvements Projects; provide public information through outreach and education; by administering, maintaining, protecting, and expanding Seattle's urban landscape in the street right-of-way, SDOT Urban Forestry maximizes economic, environmental, safety and aesthetic benefits for the public.

The Move Seattle levy provides \$930 million transportation funding starting in 2016. It represents 30% of Seattle's transportation budget. Added \$4.5 million street tree maintenance funding (over 9 years).

They have been updating their inventory. Seattle has between 230,000 and 250,000 street trees and SDOT manages around 40,000 of those. The rest are managed by the abutting property owner.

NOTE: Meeting notes are not meant to capture the whole conversation. For more details, specifically for Q and A, refer to the digital recording of the meeting at:

<http://www.seattle.gov/urbanforestrycommission/meetingdocs.htm>

They exceeded the annual target for most deliverables under the Move Seattle Levy. SDOT Urban Forestry continuously plants street trees throughout the winter as it is the ideal time to plant trees for optimal survival. Both 2018 and 2019 tree planting goals will be met by the end of April 2019. In addition to the levy deliverables, UF crews plant trees in support of Seattle City Light Urban Tree Replacement program and Safe Routes to School programs.

UF question: Do you irrigate all street trees?

Answer: They have been watering trees throughout the summer for at least 3 years. It's better to water for 4 years. They have a summer tree watering program where all the SDOT-planted trees are watered (both Levy funded and Capital Improvement Program trees). They water around 2,400 per week.

The Urban Forestry Section has the following offices:

- Landscape Architect's office
 - o Design guidance for all private development beyond single family
 - o Design guidance, plan review for City-funded capital projects
 - o Lead representative on Right-of-way Improvements Manual (ROWIM), Standard Plans and Specification updates

- Plan Review for Major Utility Permits
- Construction inspection for all of the above
- Special projects
- City Arborist Office
 - Street tree and asset management (Inventory, analysis, tree selection)
 - Policy development
 - Customer service
 - Street tree inspection, tree risk assessment, and work order generation
 - Residential point of contact
- Urban Forestry Operations
 - Tree, landscape and irrigation maintenance
 - 40,000+ street trees, 50+ irrigation systems, 120+ acres of landscapes
 - Street tree and landscape maintenance (Pruning, planting, specialty tree maintenance)
 - Customer Service related to SDOT owned trees
 - Emergency Response including windstorms, snow and ice, and encampments
 - Irrigation maintenance, winterization, emergency response
 - Volunteer support

Design Review and trees (moved to a future date)

CM Bagshaw visit

CM Bagshaw is interested in hearing where there is consensus. Would like to hear from the UFC in terms of what's next.

She opened the conversation to hear from the UFC. Her committee meets twice a month and will take on continue to work on updating tree regulations.

Core principles are beginning to coalesce:

6" threshold

Permit system

Required replacement

Fee in lieu – for instances

Improved enforcement

Continued use of exceptional tree protection

CM asked the UFC who is going to do the permitting and how much it's going to cost. How many people is it going to take a fully-loaded inspector would be \$150K. How many do we need? This would require creating a whole new shop in SDCl.

The UFC responded that they haven't discussed the cost of a permit system.

Weston asked CM Bagshaw what public input she has received. She responded that she's heard interest in Natural capital valuation, canopy cover assessment and tree surveys.

Steve Z clarified that the natural capital assessment and tree survey are not necessary for the ordinance update to move forward. He also mentioned that Portland charges \$35 per permit. Keep it simple and make adjustments as time goes on. A permit would help track information on tree loss and replacement. Ensure that trees removed are replaced. The replacement requirement is based on the size of trees removed.

To keep compliance high, it would be very good to keep the cost for homeowners down.

Central staff clarified that fee in lieu funds can only be used for planting and establishment. Can't be used for maintenance. Fines and penalties could support the permit function, but it's not a reliable source of funds.

UFC is looking at not using on-site inspection to lower cost. Complaint-based system is more costly.

Being Land-use legislation, it needs procedural work that might be tight with the timeline to finish this in 2019. Council goes into budget at the end of October. That's the timeline

The UFC would like to co-create the ordinance and participate in the development of the new draft ordinance.

The main difference in Portland is that there the UF department is separate from their development department. In Seattle there is a contradiction in SDCI being in charge of developing the tree protection ordinance.

UFC discussion on CM Bagshaw's visit:

Debrief:

- Are the fees the sole funding of the program?
 - o Subsidize up front
 - o Find creative ways to think about the issue
- De-link the conversation about the fee to charge from how to keep the program effective
- UFC needs to be clear that it's not their job to figure out how to fund it
- Ask SDOT how they went about making the decision to not charge for some of their permits. SDOT is not a fee-supported department and their permit is a similar function to what we have said.

NOTE: Meeting notes are not meant to capture the whole conversation. For more details, listen to the digital recording of the meeting at: <http://www.seattle.gov/urbanforestrycommission/meetingdocs.htm>

Public comment

Heidi – speaking in her personal capacity as a Seattle resident. She's been tracking these issues for a long time. Would like emphasis on tree retention. There is very low literacy about the benefits of trees and the laws among residents. Restrict the definition of hazardous trees (invites gaming of the system). Revamp definition of Exceptional trees (currently very narrow).

Martha Beskin – She lives in Ballard, and the number of trees being lost due to development is massive. She is very puzzled by the lack of data for the last 10 years. In terms of fees, if people are taking trees down then why is it such an issue with the fee?

Lance Young – works with TreePAC. Minimum lot coverage is key. Older trees sequester carbon more rapidly than younger trees and environmental benefits increase over their lifetime only diminishing at the end of their life. Other ideas he highlighted: Keep significant trees those being 6" or higher; limit number of trees to be removed; set a minimum lot coverage (the problem is how to calculate it, which can be done with a table to convert tree diameter and canopy size). Lake Forest Park does that. They require 58% canopy cover for larger lots.

Michael Oxman – He is an arborist:

1. The formats of reports by the different departments can't be compared
2. ADU appeal is happening now

3. Green Elementary for the remodel said that it would not remove any trees (based on their SEPA) but SPR removed a tree based on risk
4. Put together an annual conference
5. Where is the legal opinion about the fee in lieu legality? Has the City received an opinion from the Law Department?

New Business

None

Adjourn

Public input:

See next page.

From: David Moehring <dmoehring@consultant.com>

Sent: Monday, April 15, 2019 7:17 PM

To: Bagshaw, Sally <Sally.Bagshaw@seattle.gov>; info@jayinslee.com; Danielle Chastaine <ppceditor@nwlink.com>; O'Brien, Mike <Mike.O'Brien@seattle.gov>

Cc: reuven.carlyle@leg.wa.gov; Bruce D Carter <brucedcarter@hotmail.com>; Stephanie Ballard (stephaniebridget@gmail.com) <stephaniebridget@gmail.com>; sdeforest@gmail.com <sdeforest@foxrothschild.com>; lynnkathrynhogan@gmail.com; noel.frame@leg.wa.gov; elka.petersonhorner@leg.wa.gov; kate.hoffman@leg.wa.gov; janistraven@comcast.net; gael.tarleton@leg.wa.gov; Pinto de Bader, Sandra <Sandra.Pinto_de_Bader@Seattle.gov>

Subject: Re: Please see attached re opposition to backyard cottage zoning revision proposal. Thank you, Bruce Carter, 3012 West Eaton, Seattle, 98199

Goodbye to single-family lots in Seattle; say hello to three residences per lot.

State Rep Joe Fitzgibbon's ENGROSSED SECOND SUBSTITUTE HOUSE BILL 1923 has passed the State Senate.

Next step would be signing by Governor Inslee.

This will mean significant changes over time for Seattle and other cities across the State.

Is this good news?

Seattle Councilperson Mike O'Brien has been selling these 3-household 4,500+ square foot developments without parking as simply little flats and cottages with existing homes to remain. Read the fine print, however, as that's not what the proposal describes for Seattle or for the State of Washington. There will be little luck enforcing that quaint vision on speculative developers who will buy single-family lots and sell them at market rate pricing with each lot having up to three homeowners as a condominium. Alternatively, non-resident owners may build three-unit apartments for rent, with one of the three units as large as 50% of the lot area distributed on three floors.

What happens when private property is over-developed without designated areas for open space or large tree protection? **Answer: Local climate change.** Unfortunately, Seattle's tree canopy within single-family zones is estimated to be reduced from its current 28% coverage to approximately just 19% (per Seattle's 2016 LiDAR study.) Seattle is already ranks 10th in the nation impacted by the local heat island effect.

Sincerely,

David Moehring

<https://crosscut.com/2018/10/seattles-decade-plus-backyard-cottage-fight-annotated>

Sent: Friday, April 05, 2019 at 11:57 AM

From: "bruce carter" <brucedcarter@hotmail.com>

To: "gael.tarleton@leg.wa.gov" <gael.tarleton@leg.wa.gov>, "noel.frame@leg.wa.gov" <noel.frame@leg.wa.gov>, "reuven.carlyle@leg.wa.gov" <reuven.carlyle@leg.wa.gov>, "kate.hoffman@leg.wa.gov" <kate.hoffman@leg.wa.gov>, "elka.petersonhorner@leg.wa.gov" <elka.petersonhorner@leg.wa.gov>

Cc: "janistraven@comcast.net" <janistraven@comcast.net>, "lynnkathrynhogan@gmail.com" <lynnkathrynhogan@gmail.com>, "Stephanie Ballard (stephaniebridget@gmail.com)" <stephaniebridget@gmail.com>, "sdeforest@gmail.com" <sdeforest@foxrothschild.com>

Subject: Please see attached re opposition to backyard cottage zoning revision proposal. Thank you, Bruce Carter, 3012 West Eaton, Seattle, 98199

April 5, 2019

Representative Gael Tarleton

Gael.Tarleton @leg.wa.gov

Representative Noel Frame
Noel.Frame@leg.wa.gov

Re: SB 5812 And HB 17972 relating to Accessory Dwelling Units

Dear Representatives Tarleton and Frame:

I am writing to request that you oppose SB 5812 (HB 17972) which would provide an unprecedented revision in local zoning regulations which should best be left to local governments to address.

Seattle currently has provision for back yard cottages or mother-in-law apartments with requirements for “off-street” parking and owner occupancy. Concerns have been expressed about many of these being rented into the AirBbB network. The Magnolia Community Council, of which I am a Past President, has supported the existing ordinance and suggested that zoning revisions for increased multi-family density in our neighborhood be located along existing bus lines (See attached letter).

More cost-effective housing would be multi-family along bus lines where building costs per square foot would be less and access to schools and retail outlets could be readily achieved on foot. Public reports suggest that there is currently an excess supply of new apartments, so there is no necessity to shoehorn backyard cottage triplexes into existing single-family zoned neighborhoods.

Although the existing back yard cottage provisions have provided for added housing, the costs of this form of housing preclude its use for the low-income housing that is so needed in Seattle. I am personally critical of Seattle’s existing pro-developer policies which allow developers to build downtown towers without any direct obligation to build and replace displaced low-income housing. Their contributions to city replacement funds, dramatically less than requirements of other west coast cities, appear to be very ineffective

This bill also makes no accommodation for tree canopy loss - most prevalent within Seattle single-family zoned lots containing 63% of tree canopy across all the land of Seattle. This bill will ultimately reduce Seattle’s urban canopy cover from the 30% target down to less than 20%. This bill will increase the effects of urban heat islands within the city (Seattle 2016 LiDAR Study) Seattle is the 10th worst in the nation.

This bill also increased density throughout Seattle to 3 dwellings per single family lot- matching or exceeding density for low rise multifamily requirements.

This bill allows for remote and foreign investment by not requiring the current provision for minimum owner- occupancy in at least 1 of 3 residences per property. This bill also removes currently required parking spaces from the lot into the street which would have the effect of increasing street parking well beyond existing 85% average capacity. Although there is talk of many new carless households in the new urban Seattle, auto registration growth statistics have not supported this overly optimistic notion.

Thus, I request that you vote against the proposed backyard cottage bill and leave these local decisions to local officials who should be directly answerable to their constituents.

Respectfully Submitted,

Bruce D. Carter

Attorney at Law (Emeritus)
3012 West Eaton Street
Seattle, WA 98199
Tel: [206-285-5556](tel:206-285-5556)
C: [206-794-0975](tel:206-794-0975)

Cc w/enclosure
Senator Reuven Carlyle
Reuven.Carlyle@Wa.leg.gov

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From: Carolyn Rodenberg <carolynrodenberg@mindspring.com>
Sent: Monday, April 29, 2019 9:54 AM
To: Pinto de Bader, Sandra <Sandra.Pinto_de_Bader@Seattle.gov>
Cc: Lynn Fitz-Hugh <lynn.fitzhugh@earthlink.net>
Subject: Comments for the Urban Forestry Commission Meeting of May 1, 2019

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hello Sandra,

I was hoping the following could be shared with the Urban Forestry Commission in advance of their meeting on Wednesday.

Dear Members of the Urban Forestry Commission,

I understand you have been working on best measurement and tree replacement practices in recent meetings, and that this Wednesday you will be adopting your meeting notes of April 3rd and 10th which reference these efforts.

We in the Tree Keepers Alliance developed a tree measurement and replacement system several months ago for the MHA Tree Amendment and realized that we had not yet shared it with you. So while the MHA has been passed, we share it with you now in a spirit of collaboration, hoping that you might be able to make use of in your ongoing work.

Our main concern is the paradigm that old, large trees can simply be replaced with new, small trees. All of the values trees bring are MUCH greater when coming from big trees, rather than small ones.

Thank you for your ongoing efforts to protect our trees - one of our most important public health infrastructures.

Carolyn Rodenberg,
Queen Anne Hill
Tree Keepers Alliance Steering Committee

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From: Cynthia Slate <cynthiaslate@gmail.com>

Sent: Tuesday, April 30, 2019 8:19 AM

To: Pinto de Bader, Sandra <Sandra.Pinto_de_Bader@Seattle.gov>

Subject: Re: New documents posted on the Urban Forestry Commission website

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Thank you Sandra-

Could you share this example. This lot had one tree, it was twinned and it might have been exceptional, but it's gone. They just removed. I even spoke to them about their lovely tree and told them it was probably 70 to 80 years old. Within 6 months they removed it.



7359 13th Ave NW, Seattle, WA 98117

2 beds · 1 bath · 750 sqft

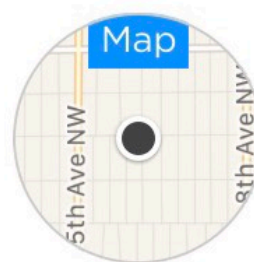
● **SOLD: \$635,000**

Sold on 07/11/18

Zestimate®: \$626,253

Est. Mortgage: \$3,108/mo

[See current rates](#)



Note: This property is not currently for sale or for rent.
The description below may be from a previous listing.



On Tue, Apr 30, 2019 at 7:12 AM Pinto de Bader, Sandra <Sandra.Pinto_de_Bader@seattle.gov> wrote:
Thank you for your email, Cynthia.

I have shared it with the Urban Forestry Commission.

Sandra Pinto de Bader | Environmental Sustainability Policy Advisor | Seattle Office of Sustainability and Environment | (206) 684-3194

From: Cynthia Slate <cynthiaslate@gmail.com>

Sent: Tuesday, April 30, 2019 12:21:22 AM

To: Pinto de Bader, Sandra

Subject: Re: New documents posted on the Urban Forestry Commission website

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Regarding the diagram for removals-seems like we dropped a criteria. Are we not requiring Single Family Lots to have a minimum canopy cover?

I thought the new protections being written had a requirement for Single Family lots to have to be covered with at least 35% tree cover?

If this is the property's only tree for the last three years and say this gets them to 36% tree cover, then they should not be able to remove it. Even if it is not exceptional.

SFZ have to protect our urban forest. We need them to hold a minimum cover of 33% -at least if they don't have a DADU. No permit should be issued that would give less than 33% canopy cover unless they are developing the property.

Cynthia

--

From: Lance Young <lance_young@yahoo.com>

Sent: Tuesday, April 30, 2019 3:29 PM

To: Pinto de Bader, Sandra <Sandra.Pinto_de_Bader@Seattle.gov>

Subject: Seattle Tree Code Draft, should keep the minimum canopy coverage requirements!

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi Sandra

Would you please share this email with the Urban Forestry Commission.

Thank You
Lance Young

+++++

To: Urban Forestry Commission c/o sandra.pinto_de_bader@seattle.gov

Subject: Seattle Tree Code Draft, should keep the minimum canopy coverage requirements!

First let me thank all of you for your continued work to refine an stronger and more effective and understandable tree code for Seattle. Times have changed since the first tree codes where written. We now have eminent environmental concerns form global warming, in city heat island effects, a lack of wildlife habitat and near continuous metropolitan area in the Puget Sound region. Our tree code needs to be updated to keep up with the urgent environmental needs of our region and beyond.

There are several areas of the last draft (D7) tree code that need work but I understand many have been working diligently to refine significant tree size definitions, maximum number of trees removable in one year, simplifying/redefining canopy coverage to DBH (diameter at standard height) ET-cetera. All of which would be more easily understood and used by a typical homeowner. I wanted to focus on only one area In the work being done to redraft and encourage passage of a revised tree code.

The latest tree code draft established Minimum Tree Canopy Cover as a percentage of lot size, which is difficult to determine without an aerial drone (or consultant with one) at your disposal. So current efforts are to go back to providing a maximum number of significant trees that can be removed per year. The problem with removal minimums is that over time all the trees can be removed from a lot if this is the intent of the owner. In our neighborhood we have a homeowner who was perhaps born in an era when trees in your yard meant you were living in the boonies and a lawn and picket fence meant you were living in a nice neighborhood. This neighbor removed the maximum number of trees when they bought into the area three big approximately 24" Douglas firs. Now just five years later they have removed three more one of which was about 30" DBH all still legal without requiring a permit and only leaving a fraction of the original stately grove that used to stand here. In another three years the remainder could be removed without serious consequence. Our new tree code should somehow discourage people from buying homes in a forested area if they don't want the trees.

In addition the minimum lot coverage should remain in the revised tree code. To make it consistent with the redefinition from canopy coverage to DBH (diameter at standard height) a conversion table could be provided to convert the percentage canopy to a summation of DBH for significant trees standing on the lot. As it turns out there is a study (see attached) that shows there is surprisingly, a liner relationship between DBH and canopy coverage (and between DBH and tree height). This study was done for a savanna revegetation project in Nigeria, but provides a basis for a conversion table between minimum canopy coverage and total DBH per lot size. So establishing a conversion table with a minimum summation of DBH diameters of significant trees would be fairly simple. For

example, say establishing a five percent (sum of DBH's) of the minimum coverage required in the section 25.11.080 table would provide the following:

1. A 5,000 sq. ft. single Family lot requires 33% canopy (x5%) gives 8.5" of significant trees DBH's
2. A 10,000 sq.ft. single family lot with 33% canopy (x5%) requires 16.5" of DBH
3. A 20,000 sq.ft multifamily at 20% coverage would require 20" of DBH, or four trees of 5-6" DBH.

This is a fairly easy to interpret minimum goal for homeowners to interpret and would work toward the goals established in the most recent Seattle Urban Forest Stewardship Plan.

One final issue is that the current code (Section 25.11.020) also exempts several city agencies from the oversight systems established in the new tree code. The Department of Transportation has their own system of preservation requirements, but Parks and City Light should not be exempted from oversight. This oversight can provide a second set of eyes looking at any developments, or significant tree removals on public property, just as we are trying to prevent these removals on private property.

Thank you for your consideration

Lance Young

ITTPS; Interurban Trail Tree Preservation Society, and Tree PAC



THE RELATIONSHIP BETWEEN CANOPY WIDTH, HEIGHT AND TRUNK SIZE IN SOME TREE SPECIES GROWING IN THE SAVANA ZONE OF NIGERIA

* Arzai, A.H. and Aliyu, B.S.

Department of Biological Sciences, Bayero University, P.M.B. 3011, Kano, Nigeria

*Correspondence author

ABSTRACT

In this study, the relationships between canopy – width, height and trunk size of the following tree species growing in Kano (12°N, 8.5 – 8.7°E), a town located in the Sudan Savanna Zone of Northern Nigeria were examined: *Parkia biglobosa* (Jacq-Benth), *Khaya senegalensis* (A. Juss), *Eucalyptus* species, *Adansonia digitata* (Linn), *Cassia siamea* (Lam), *Azadirachta indica* (A. Juss), *Delonix regia* (Boj, ex Hook) and *Acacia nilotica* (Linn). Twenty trees of each species ensured to be free from obvious ecological disturbances were selected for the study. Analyses of the data obtained indicate that, with the exception of *Eucalyptus* sp. and *A. digitata*, the relationship between height and trunk size is linear. A linear relationship between canopy width and trunk size was also observed in the eight tree species studied, except *A. digitata*. The canopy width/height study showed a linear relationship in all the tree species. The results are discussed in the context of their adaptive significance and use in determining suitability of the trees for afforestation, forest regeneration and establishment of shelter belts to arrest desertification.

Keywords: savanna trees, canopy width, trunk size, tree height

INTRODUCTION

Trees show considerably variation and flexibility in their shape and size of crowns, height and trunk diameters (Givnish, 2002; Koppers, 1989; <http://www.ncbi.nlm.nih.gov/mcm189.pdf>). These are governed by an inherited developmental tendency, which may in turn be modified by the environment where the tree grows. The size of a tree canopy and its height above the ground is significant to a tree in that it determines the total amount of light that the tree intercept for photosynthesis (Midgley, 2003; Russel *et al.*, 1989). Natural selection must generally be expected to favour trees that increase the amount of light that falls on the plant and since competition for light is often important in groups of trees, in the same respect, natural selection must tend to favour trees that grow high quickly (King, 1991; <http://www.jstor.org/stable/2462315>: The adaptive significance of tree height). Jahnke and Lawrence (1965) have shown, through a mathematical model, that the higher a tree is the more light it intercepts during the course of the day. The tree trunk size also has its own adaptive significance to a tree. It must be strong enough to withstand the forces that act on it. These forces are the weight of the tree and the drag exerted on it by the wind, as demonstrated by Fraser (1962). Experimentally, wind has been found to be much more important than weight in determining what thickness of trunk is necessary for a tree (Alexander, 1968).

The objective of this study was to examine the relationship between canopy width, height and trunk size amongst eight tree species growing in Kano and to determine the significance of these relationships on adaptation of the trees.

MATERIALS AND METHODS

Twenty specimens each of *Parkia biglobosa* (Jacq – Benth.), *Khaya senegalensis* (A. Juss), *Eucalyptus* species, *Adansonia digitata* (Linn), *Casia siamea* (Lam), *Azadirachta indica* (A. Juss), *Delonix regia* (Boj; ex Hook) and *Acacia nilotica* (Linn) trees were considered for the study. It was ensured that all the trees selected had intact parts. They were, in particular, devoid of bark – peeling and obvious signs of branch-cutting. In addition, only trees growing in areas free from ecological disturbances (such as over – grazing, anthropogenic factors, bush burning, etc) were selected. The following measurements were conducted on each specimen:-

Canopy Width (CW)

Each tree was viewed from all sides to determine the side where the canopy was widest. Two range poles were then erected to mark the extreme edges of the canopy. The distance between the two poles was measured with a measuring tape and recorded as the canopy width (in meters).

Tree Height (TH)

Measurement of tree height may be carried out by direct or indirect techniques depending on the position of the tree. Height of felled trees is measured directly with linear tape or graduated pole. An indirect method is the most commonly used for standing trees, because the tip is often inaccessible. Moreover, climbing with tape or graduated pole is dangerous (King, 1991). Using a range finder (Abney) calibrated in meters, the distance from a squatting position to the highest point on the tree crown was measured.

The distance from the same spot to the tree base was also measured with a measuring tape. Based on the Pythagora's Theorem of right angled triangles, the tree height was finally computed (<http://online.anu.edu.au/forestry/mensuration/height.htm>).

$$C = (a^2 - b^2) \times \frac{1}{2}$$

Where

a = the distance to the highest point on the tree crown (hypotenuse)

b = the distance to the tree base and

c = the tree height

Trunk Size

Trunk size was considered as the diameter at breast height (d.b.h.). To determine the d.b.h., the girth at breast height (g.b.h) or circumference of the tree was measured by tightly wrapping a tape around the tree main trunk at a height of 1.3m from the ground. The d.b.h was then determined using the Mathematical conversions.

$$2 \pi r = X$$

$$r = X / 2 \pi$$

$$\text{but d.b.h.} = 2r = \frac{X \cdot 2}{2\pi}$$

Where r = radius

X the d.b.h

and $\pi = 3.143$

Statistical Analysis

To assess the closeness of the apparent linear relationships and test their significance at population level, a regression analysis was performed. To achieve this, the product moment correlation coefficient, r, was computed from the formula.

$$r = \frac{\sum xy}{\sqrt{(\sum x^2 \sum y^2)^{1/2}}}$$

Degrees of freedom (d.f) = N - 2

At $P < 0.05$, $r = 0.4438$

For any value of r which is significant, the regression coefficient, b, was estimated by:

$$b = \frac{\sum xy}{\sum x^2}$$

This is equivalent to the slope

The intercept, a, was computed by substituting the estimated value of b in the equation:

$$a = y - bx$$

In order to obtain the regression line, the a and b values were rearranged in the equation as follows:

$$y = a + bx$$

In order to obtain the regression line, the a and b values were rearranged in the equation as follows:

$$y = a + bx$$

Two convenient values of x were selected and the corresponding y - values computed from the straight - line equation.

RESULTS AND DISCUSSION

For each of the eight tree species sampled, the means of the canopy width, tree height and trunk size measurements were calculated. The standard error for all the sample means was also computed and the results are given in Table 1. The results of the regression analysis for CW/DBH, CW/TH and TH/DBH relationships are summarized in Tables 2, 3 and 4 respectively.

The raw data obtained from the measurements of the parameters indicated in Table 1 was used to plot CW/DBH, CW/TH and TH/DBH relationships. All the relationships plotted appeared to be rectilinear.

The relationship between tree height (TH) and diameter at breast (d.b.h) appeared to be a linear one in all the eight tree species studied (Table 1).

That is taller trees have larger trunks while shorter ones have smaller trunks. The linearity of this relationships was further confirmed by regression analysis, which showed the calculated r values for all the tree species to be greater than the tabulated value of 0.4438 ($P < 0.005$, d.f. = 19). This relationship is of coherent adaptive significance since a tree trunk should be strong enough to withstand the twin forest of wind pressure and the tree's own weight, as earlier reported by Fraser (1962).

The slopes of the regression lines that the height d.b.h. ratio is more or less the same irrespective of the tree species. However, *A. digitata* and *Eucalyptus* spp. showed a deviation from this trend with *A. digitata* having a very small ratio and *Eucalyptus* species having a very large one.

This observation implies that the former has a trunk size more than what is required to buttress its height while the latter's trunk is too small to perform the same function. The deviation shown by *A. digitata* could be attributed to the fact that its tapering trunk is known to, in addition to giving support, serve the dual functions of water storage and resistance to desiccation. Hence, *A. digitata*'s trunk size may not necessarily be proportional to its height. *Eucalyptus* species on the other hand, is an exotic species recently introduced to the habitat and it might not have fully adapted to the Savanna. This is the most likely reason why *Eucalyptus* trees are very often uprooted by windstorms during the rainy season in the Savanna region of Nigeria.

A perfect linear relationship was observed between canopy width and d.b.h. for the entire tree species studied except *A. digitata* ($P < 0.05$, $r = 0.4438$). That is, trees with larger trunks have wider canopies. This relationship is of adaptive significance to the trees because canopy size also contributes

immensely to a tree's total weight. Thus, huge trunks can enable trees support wide canopies (Horn, 1976).

The relationship between canopy – width and tree – height is likewise linear in all the tree species (Table 3). In other words, taller trees have wider canopies. Also, the slopes of the regression lines do not differ significantly, meaning that importance of photosynthesis in plants, natural selection must be expected to favour developmental characters geared towards maximum light interception. As a tree increases in height, its metabolic and growth requirements would increase too. As data for these increase requirements, it is likely that trees have evolved wide canopies so as maximize light interception and thus increase their photosynthetic rate (Jahnke and Lawrence, 1965). Moreover, competition for light is important, especially in groups of trees. To tackle this problem, trees with wide crowns have probably evolved high postures. Thus, the linearity of the canopy versus height relationship is possibly an adaptation favoured by natural selection.

Table 1: Sample Means for Canopy Width, Tree Height and Trunk Size (S.E in Parentheses)

Tree Species	Canopy Width (m) ± S.E	Tree Height (m) ± S.E	d.b.h. (m) ± S.E
<i>Parkia biglobosa</i>	9.20 (0.86)	10.10 (1.09)	0.32 (0.034)
<i>Khaya senegalensis</i>	9.62 (0.73)	11.78 (0.94)	0.40 (0.050)
<i>Eucalyptus species</i>	6.36 (0.45)	10.78 (0.61)	0.17 (0.013)
<i>Adansonia digitata</i>	6.86 (0.36)	9.50 (0.43)	0.94 (0.050)
<i>Cassia siamea</i>	8.39 (0.45)	9.11 (0.67)	0.69 (0.260)
<i>Azadirachta indica</i>	8.18 (0.67)	8.81 (0.43)	0.21 (0.020)
<i>Delonix regia</i>	5.13 (0.36)	4.01 (0.26)	0.14 (0.010)
<i>Acacia nilotica</i>	4.51 (0.28)	3.89 (0.42)	0.13 (0.005)

Key: d.b.h. = diameter at breast height, S.E. = Standard error

Table 2: Regression Analysis for Canopy Width Vs. Diameter at Breast Height Relationship

Tree Species	r	b	A	Y = bx + a
<i>P. biglobosa</i>	0.824	18.942	3.500	18.94x + 3.50
<i>K. senegalensis</i>	0.898	14.421	3.780	14.42x + 3.78
<i>Eucalyptus spp.</i>	0.815	28.522	1.545	28.52x + 1.55
<i>A. digitata</i>	0.857	6.543	0.696	6.54x + 0.70
<i>C. siamea</i>	0.840	15.188	5.023	15.19x + 5.02
<i>A. indica</i>	0.903	35.020	0.881	35.02x + 0.88
<i>D. regia</i>	0.759	24.940	1.612	24.94x + 1.61
<i>A. nilotica</i>	0.484	15.525	2.550	15.53x + 2.55

Key: r = product moment correlation coefficient, b = regression coefficient/slope,

A = intercept, Y = regression line

Table 3: Regression Analysis for Canopy Width Vs. Tree Height Relationship

Tree Species	r	b	A	Y = bx + a
<i>P. biglobosa</i>	0.38	0.740	1.723	0.74x + 1.72
<i>K. senegalensis</i>	0.845	0.655	1.905	0.66x + 1.91
<i>Eucalyptus spp.</i>	0.697	0.520	0.950	0.52x + 0.95
<i>A. digitata</i>	0.819	0.690	0.281	0.69x + 0.28
<i>C. siamea</i>	0.804	0.532	3.503	0.53x + 3.50
<i>A. indica</i>	0.848	1.308	3.342	1.31x + 3.50
<i>D. regia</i>	0.50	1.065	0.857	1.07x + 0.86
<i>A. nilotica</i>	0.519	0.599	2.186	0.60x + 2.2

Key: r = product moment correlation coefficient, b = regression coefficient/slope,

A = intercept, Y = regression line

Table 4: Regression Analysis for Tree Height Vs. Diameter at Breast Height Relationship

Tree Species	r	b	A	Y = bx + a
<i>P. biglobosa</i>	0.929	27.556	1.433	27.56 + 1.43
<i>K. senegalensis</i>	0.950	19.657	3.841	19.66x + 3.84
<i>Eucalyptus spp.</i>	0.911	48.677	1.809	48.68x + 1.81
<i>A. digitata</i>	0.8812	8.022	1.950	8.02x + 1.95
<i>C. siamea</i>	0.766	20.188	4.700	20.19x + 4.69
<i>A. indica</i>	0.820	20.610	4.513	20.16x + 4.51
<i>D. regia</i>	0.783	18.117	1.456	18.12x + 1.50
<i>A. nilotica</i>	0.588	16.364	1.817	16.36x + 1.82

Key: r = product moment correlation coefficient, b = regression coefficient/slope,
A = intercept, Y = regression line

CONCLUSION

In sum, the relationships between TH/DBH, CW/DBH and CW/TH in the eight tree species are, with few exceptions linear and appear to have adaptive values. With the exception of *Eucalyptus* species, which is poorly adapted to the savanna probably because it was recently introduced to the habitat from Australia,

and it would take quite sometime to properly adapt, all the tree species are adapted to the savanna in terms of ability to withstand windstorms and to support their own weight and could therefore be suitable for use in afforestation, reforestation, or establishment of shelter belts to arrest desert encroachment.

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From: Lance Young <lance_young@yahoo.com>
Sent: Thursday, May 02, 2019 8:00 AM
To: Pinto de Bader, Sandra <Sandra.Pinto_de_Bader@Seattle.gov>
Subject: Seattle Tree Code Comments, follow up

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

To: Urban Forestry Commission c/o sandra.pinto_de_bader@seattle.gov

Subject: Seattle Tree Code Comments, follow up

At the last commission meeting I mentioned a good article in The Guardian about how large trees actually accelerated their growth rate as they get older (that article is attached). According to the international research team a single big tree can add as much carbon in a year as a mid sized tree has in it's entire lifetime. The study also shows that while old growth trees (>100cm DBH) comprise just 6% of Western US Forests they contributed 33% of the annual forest mass growth. Quite surprising findings given past preconceptions. This article highlights why it is so important to retain older larger trees.

The study attached to my last email entitled "The Relationship Between Canopy Width, Height and Trunk Size..." was quite technical and pretty heavy on the math. The important take away I thought was that they found there is a direct and linear relationship between a trees DBH and both its height and canopy width. This would then presumably allow a homeowner to measure the trunk diameter of a tree and determine a good approximation of its canopy volume. The mathematics would be too much to ask of homeowners but a simple table using an average conversion ratio would be easy enough to use for just about anyone. This would be a simple way to keep minimum lot coverage requirements in our new revised tree code. The reason for retaining these minimum limitations is of course because; if homeowners are allowed to remove one/two trees a year they could theoretically remove all or most of their significant trees in just a few years.

I also mentioned the minimum canopy coverage requirements in Lake Forest Park's tree code Section 16.14.070 which are:

Single Family lots > 15,000 sq. ft. ?????? ?????? 58%
Single Family 10k-15k sq. ft. ?????? ?????? ?????? ?????? 39%
Single Family < 10,000 sq. ft. ?????? ?????? ?????? ?????? 28%
Multifamily ?????? ?????? ?????? ?????? ?????? ?????? ?????? ?????? ?????? ?????? ?????? ?? 15%
Commercial ?????? ?????? ?????? ?????? ?????? ?????? ?????? ?????? ?????? ?????? ?????? 15%
Other Zones ?????? ?????? ?????? ?????? ?????? ?????? ?????? ?????? ?????? ?????? 5%-15%

Lake Forest Park also has an introduction to their tree code which would be important to add to our tree code since it provides a plain English purpose for the code and why it is important. It also provides future readers some insight into the Framers objectives.

Now for the feel good story! I ran across this wonderful restoration article recently about a famous photographer and his wife who retired to his native Brazil back in the 90's, only to find the tropical rain-forests gone. Over the next 20 years they planted 2 million trees and found that in their little

restoration zone all the animals came back too: 172 bird species, 33 mammal species, amphibians, reptiles ... See the link below for the photo essay.



https://www.boredpanda.com/brazilian-couple-recreated-forest-sebastiao-leila-salgado-reforestation/?utm_source=facebook&utm_medium=social&utm_campaign=BPFacebook&fbclid=IwAR3SOuvf_mXPqVwaKW-53xwiY8fLSPdOCXmt8QgV6A58KzexYC_HYEEOIw8

Thank you for your continuing work for trees!

Lance Young

ITTPS; Interurban Trail Tree Preservation Society, and Tree PAC

The Guardian



Trees accelerate growth as they get older and bigger, study finds

Findings contradict assumption that old trees are less productive and could have important implications for carbon absorption

John Vidal

Wed 15 Jan 2014 13:00 EST

Most living things reach a certain age and then stop growing, but trees accelerate their growth as they get older and bigger, a global study has found.

The findings, reported by an international team of 38 researchers in the journal *Nature*, overturn the assumption that old trees are less productive. It could have important implications for the way that forests are managed to absorb carbon from the atmosphere.

"This finding contradicts the usual assumption that tree growth eventually declines as trees get older and bigger," said Nate Stephenson, the study's lead author and a forest ecologist with the US Geological Survey (USGS). "It also means that big, old trees are better at absorbing carbon from the atmosphere than has been commonly assumed."

file:///G:/tmp/Trees/SeattleTreeCode/Trees%20accelerate%20growth%20as%20they%20get%20older%20and%20bigger,%20study%20finds%20_%2... 1/3

The scientists from 16 countries studied measurements of 673,046 trees of more than 400 species growing on six continents, and found that large, old trees actively fix large amounts of carbon compared to smaller trees. A single big tree can add the same amount of carbon to the forest in a year as is contained in an entire mid-sized tree, they found.

"In human terms, it is as if our growth just keeps accelerating after adolescence, instead of slowing down. By that measure, humans could weigh half a tonne by middle age, and well over a tonne at retirement," said Stephenson.

"In absolute terms, trees 100cm in trunk diameter typically add from 10-200 kg dry mass each year averaging 103kg per year. This is nearly three times the rate for trees of the same species at 50cm in diameter, and is the mass equivalent to adding an entirely new tree of 10-20cm in diameter to the forest each year," said the report.

The findings back up a 2010 study which showed that some of the largest trees in the world, like eucalyptus and sequoia, put on extraordinary growth as they get older.

"Rapid growth in giant trees is the global norm, and can exceed 600kg per year in the largest individuals," say the authors.

The study also shows old trees play a disproportionately important role in forest growth. Trees of 100cm in diameter in old-growth western US forests comprised just 6% of trees, yet contributed 33% of the annual forest mass growth.

But the researchers said that the rapid carbon absorption rate of individual trees did not necessarily translate into a net increase in carbon storage for an entire forest. "Old trees can die and lose carbon back into the atmosphere as they decompose," says Adrian Das, another USGS co-author. "But our findings do suggest that while they are alive, large old trees play a disproportionately important role in a forest's carbon dynamics. It is as if the star players on your favourite sports team were a bunch of 90-year-olds."

"It tells us that large old trees are very important, not just as carbon reservoirs. Old trees are even more important than we thought," said University College London researcher Emily Lines, another co-author of the paper.

Understanding of the role of big trees in a forest is developing rapidly even as they come under increasing threat from the fragmentation of forests, severe drought and new pests and diseases. Research in 2012 showed that big trees may comprise less than 2% of the trees in any forest but they can contain 25% of the total biomass and are vital for the health of whole forests because they seed large areas.

From: David Moehring <dmoehring@consultant.com>

Sent: Thursday, May 02, 2019 5:45 AM

To: PRC <PRC@seattle.gov>

Cc: Pinto de Bader, Sandra <Sandra.Pinto_de_Bader@Seattle.gov>; Marcus Green

<mgreen@seattletimes.com>; DOT_LA <DOT_LA@seattle.gov>; Suzanne Grant

<suzanne@grantharper.net>; SCI_Code_Compliance <SCI_Code_Compliance@seattle.gov>; Pederson, Art

<Art.Pederson@seattle.gov>; DOT_SeattleTrees <Seattle.Trees@seattle.gov>;

cory.crocker@udistrictsquare.org; rick@bigtimebrewery.com

Subject: Exceptional Tree removals

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Keep us informed.

There is something suspicious happening today at a LR1 zoned house and the trees surrounding it (including 3 exceptional trees) at **4711 8th Ave NE** in the U-District. How will two homes be built in the

back yard when there is no access for equipment without knocking out the trees along the street?

The developer appears to be **Alex Mason**, who is becoming infamous for his proposals to demolish a houses including axing an exceptional tree or two. In addition to the above, Mr. Mason is responsible for:

- 2813 4th Ave W
- 2000-2010 Thorndyke Ave W (3032564-LU);

Seeing the site development plans on the Seattle SDCI EDMS web page, we are fearful that the trees are going to be cut down at all three addresses. In at least two of these three Mason-project cases, the removal of trees is not necessary to achieve the allowed density and simply lack of environmentally-conscience design and decision-making.

Please advise what will be done to stop the reckless abandon of Seattle's key environmental resource: Large trees.

David Moehring AIA

Member, TreePAC 

<https://treepac.org/read-it-and-weep/>

Dmoehring@consultant.com

SUPPORTING NOTES:

Adding the duplex in the backyard of this lot 4711 (getting permit to divide into two lots, 4709 and 4711) is only possible by taking out at least the huge tree. There are three significant trees on this lot (original lot address is 4711). The two permits #6692776-CN and #6717897-CN do not reference these protected trees. We are concerned the developer will not honor the trees, and cut them down since there is no record of the trees being protected. How can we get it on record that these three trees are not to be cut down if the next phase is to demolish the current house? A tree can be cut down in less than a day, and then it is too late.

There is currently an arborist report and plans that note two exceptional trees on the property. Please post these arborist reports to be transparent on all three projects! In the last six months, it is clearly evident and unfortunate that SDCI planners are posting less documents on the public website. These Department are working in Shame for they know the public is aware of the tactics to avoid implementing the principles of tree protections.

However, I will verify the sizes of the trees and make sure all relevant codes are followed. There are times when the Seattle Municipal Code

Trees cannot be removed if permits are not yet issued by SDCI or SDOT. So if we see any work starting, we will try calling the Code Compliance number (206) 615-0808 complain and trust an inspector will be sent. Why tree protection must be complaint-based is questionable. This is not the best way to make sure that the trees are not illegally removed. We need notices on trees being removed!

Why should Code Compliance be geared towards complaints from Seattle residents, but so often they come out and affect no change saying it's per plans or -- if not permitted -- neglect to assess and apply appropriate penalties.

Seattle tree protection 2 for 1 replacement is completely unacceptable to compensate for the impacts on our environment. The very least is wood for wood and best case is always basal replacement. For a tree

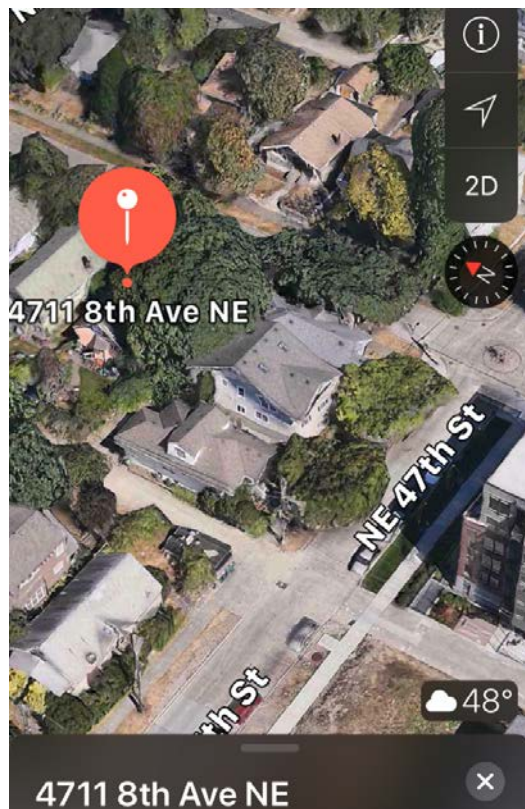
the likes of the massive tulip tree (in the Seattle Times article) that would result in the possibility of replacing over 100 new trees. Even NYC's grossly inadequate and tree-abusing Parks Department uses basal replacement (the reason for this is the \$\$ since the contractor can elect to plant the trees the formula dictates or give Parks the money and the trees never get planted out - have seen this on many jobs personally and confirmed from colleagues). We are attaching a pdf of this formula for lawmakers and policy makers to seriously consider.

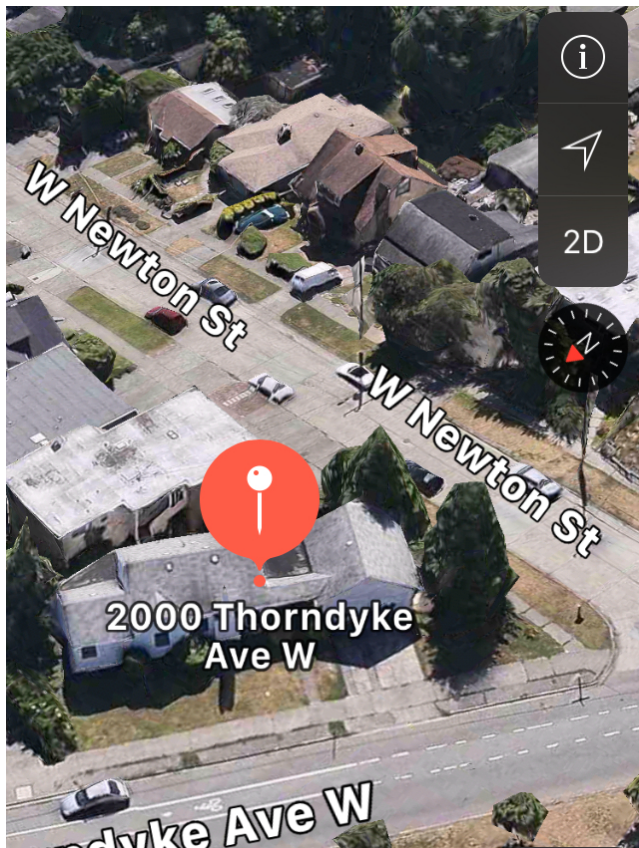
Also, Why is there a unit lot being proposed that exceeds the code-allowed maximum of 6 sides?
Why cannot the existing trees on the solar-shading south end of this development be retained?
For the non-compliant plans at 2000 Thorndyke Ave W
Seattle, WA 98199

(Backhoe on site yesterday), see:

<http://web6.seattle.gov/dpd/edms/GetDocument.aspx?id=3820427>

I hate to suggest this, but we need our city stewards to do their jobs: protect our tree canopy per the mayor's Executive Order! Please!





Basal Area Replacement Formula



The basal area replacement formula calculates the number of trees needed to do a wood-for-wood replacement of a felled tree. Measure the circumference or diameter of the tree at breast height, and follow this formula to compute the number of replacement trees needed:

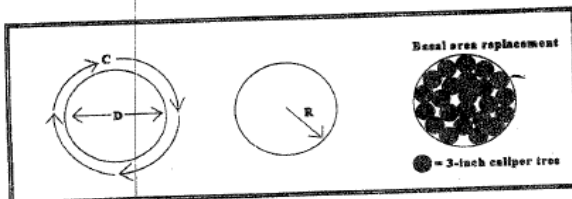
KEY

C = circumference $\pi = 3.14$ D = diameter R = radius B = basal area
 $a = \text{squared (multiply the number by itself)}$ 7.1 = basal area of a 3-inch caliper tree

CALCULATE:

Step #1:	C/π	This will give you D.
Step #2:	$D/2$	This will give you R.
Step #3:	$R^2 \times \pi$	This will give you B.
Step #4:	$B/7.1$	This is the number of replacement trees required.

The replacement value for each 3-inch caliper replacement tree is \$500, the data sheet on the reverse will show you the amount of restitution money which should be sought.



City of New York
Parks & Recreation



Rudolph W. Giuliani, Mayor
Henry J. Stern, Commissioner

Basal Area Replacement Formula
Circumference and Diameter measured in inches

Size of Damaged or Destroyed Tree		No. of Replacement Trees	BARF Restitution Dollar Amount
Circumference	Diameter		
8-10	2.5 - 3	1	\$500
11-14	3 - 4.5	2	\$1,000
15-16	4.5 - 5	3	\$1,500
17-19	5 - 6	4	\$2,000
20-21	6 - 6.5	5	\$2,500
22-23	6.5 - 7	6	\$3,000
24-25	7 - 8	7	\$3,500
26-27	8 - 8.5	8	\$4,000
28	8.5 - 9	9	\$4,500
29-30	9 - 9.5	10	\$5,000
31	9.5 - 10	11	\$5,500
32	10 - 10.5	12	\$6,000
33-34	10.5 - 11	13	\$6,500
35	11 - 11.5	14	\$7,000
36	11.5	15	\$7,500
37	11.8	16	\$8,000
38	12	17	\$8,500
39-40	12 - 12.5	18	\$9,000
41	13	19	\$9,500
42	13.5	20	\$10,000
43	13.7	21	\$10,500
44	14	22	\$11,000
45	14.3	23	\$11,500
46	14.7	24	\$12,000
47	15	25	\$12,500
48	15.3	26	\$13,000

Size of Damaged or Destroyed Tree		No. of Replacement Trees	BARF Restitution Dollar Amount
Circumference	Diameter		
49	15.6	27	\$13,500
50	15.9	28	\$14,000
51	16.2	29	\$14,500
52	16.6	31	\$15,500
53	16.9	32	\$16,000
54	17.2	33	\$16,500
55	17.5	34	\$17,000
56	17.8	36	\$18,000
57-58	18 - 18.5	38	\$19,000
59	18.8	39	\$19,500
60	19	41	\$20,500
61-62	19 - 19.5	43	\$21,500
63	20.1	45	\$22,500
64	20.2	46	\$23,000
65	20.7	48	\$24,000
66	21	50	\$25,000
67	21.3	51	\$25,500
68	21.7	53	\$26,500
69	22	54	\$27,000
70	22.3	56	\$28,000
71	22.6	58	\$29,000
72	22.9	59	\$29,500
73	23.2	61	\$30,500
74	23.6	62	\$31,000
75	23.9	64	\$32,000

Basal Area Replacement Formula

Circumference and Diameter measured in inches

Size of Damaged or Destroyed Tree		No. of Replacement Trees
Circumference	Diameter	
76	24.2	65
77	24.5	67
78	24.8	69
79	25.2	70
80	25.5	72
81	25.8	74
82	26.1	76
83	26.4	78
84	26.8	80
85	27.1	82
86	27.4	83
87	27.7	85
88	28.0	87
89	28.3	89
90	28.7	91
91	29.0	93
92	29.3	95
93	29.6	97
94	29.9	100
95	30.3	102
96	30.6	104
97	30.9	106
98	31.2	108
99	31.5	110
100	31.8	113

Size of Damaged or Destroyed Tree		No. of Replacement Trees
Circumference	Diameter	
101	32.2	115
102	32.5	117
103	32.8	119
104	33.1	122
105	33.4	124
106	33.8	126
107	34.1	129
108	34.4	131
109	34.7	134
110	35.0	136
111	35.4	139
112	35.7	141
113	36.0	144
114	36.3	146
115	36.6	149
116	36.9	151
117	37.3	154
118	37.6	157
119	37.9	159
120	38.2	162
121	38.5	165
122	38.9	167
123	39.2	170
124	39.5	173
125	39.8	176

UNIT LOT SUBDIVISION NO.

Assigned Addresses:
Unit Lot A) 2010; B) 2008; C) 2006
F) 2000 Thorndyke Ave W

