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# Great Falls Oak Tree Risk Assessment 121007

## BACKGROUND AND HISTORY

Events related to large white oaks in the Great Falls Commercial area include:

An oak tree on one corner of Georgetown Pike and Walker was damaged by construction of a signal device, and cut down. The signal device was subsequently moved.

The oak tree at the corner of Georgetown Pike and Walker was damaged when the road was widened. The damaged area was exposed to wind and water erosion. Silt filled in the curbing, creating a puddle next to the trunk.

July 2012: An oak tree on Georgetown Pike was damaged by severe pruning for utility clearance 5-10 years previous, and had roots subject to periodic flooding. A man was dead after the tree failed onto a car a short time after the derecho wind storm.

August and October 2012: Arborists recommend the removal of the two oak trees at the corner of Georgetown Pike and Walker Road.

## ASSIGNMENT

I was asked to assess the risk associated with the remaining two oak trees, and review management options. The assessment includes an aerial inspection of the two remaining oaks by climbing, and reviewing data gathered during previous observations. The use and purpose of this report is to guide tree management and increase tree safety and contributions. I am limited by time, money, a lack of knowledge about the landscape below ground, the site history, and conditions noted in Appendix A.
I was also asked to review and comment on previous reports on these oak trees. This review will follow in a supplemental report. Images and captions will also follow in a supplemental report, which is considered an integral part of this report.

## EXECUTIVE SUMMARY

The removal of two *Quercus alba* white oak trees was recommended due to interior decay and other factors. Following a root crown examination and aerial assessment, likely causes of decay were identified, and the tree's adaptive growth was exposed and assessed. Specifications for mitigating the risk of failure to a reasonable level by managing the soil, roots and branches and installing supplemental support are provided below. Based on our inspection, research, and

analysis, and review of industry standards, pruning alone can reasonably reduce the risk to a very low level, while retaining the benefits provided by the trees.

TREE BENEFITS

Benefits include air and water filtration and purification, moderation of weather and climate, wildlife values, aesthetic beauty, and carbon retention. From the county website: "Trees provide significant levels of environmental, social and economic benefits to our community. For over 30 years, Fairfax County has been proactive in raising awareness about the importance of trees and forests in our community. Fairfax County's Urban Forest Management Division ensures that tree preservation and tree planting takes place on construction sites within the county and implements programs to protect existing forest resources."

Fairfax County recognizes that "even a single tree can benefit the environment. One mature tree with a 26-foot canopy can absorb the emissions of a vehicle driven 11,500 miles every year. Homeowners, residents or groups can recommend individual trees for protection...The preservation ordinance supports the county's 30-Year Tree Canopy Goal adopted by the board in July. The county aims to blanket 45 percent of the county with tree cover by 2037. It is important to preserve existing trees because the county expects to lose 4 percent of its canopy during the next 30 years...".

From *Diagnosis and Prognosis of Wood Decay in Urban Trees:* "In the past there has been an increasing tendency to simplify complex concepts in tree risk assessment. The danger is that with any simplification, a certain degree of inaccuracy has to be taken into account. A simplification can be used to explain how the white rot fungus *Inonotus c*an breach reaction zones in a London plane, but on the basis of this simplification a reader may classify this fungus as extremely hazardous on that post, although under normal circumstances the London plane can fully compartmentalize decay. Thus, a person who applies a simplification but does not understand the facts behind it, will probably err on the side of caution. Infected trees (with good decay resistance, such as London plane and white oak—Ed.) will be condemned although they could be retained... There appears to be a trend in tree risk assessment to substitute information on wood anatomy and host fungus associations with quick and simple measurements using invasive diagnostic techniques.

… that both trees and wood decay fungi are two complex organisms, and the decision whether to retain or condemn a tree has far-reaching consequences for the urban environment. Trees have evolved over millions of years to become incredibly efficient and powerful at withdrawing carbon from the atmosphere, which is precisely the role that we need right now in cities or carbon is produced abundantly. It is a tragedy that we are not taking advantage of what could be potentially our most powerful partner in the fight against climate change. We need to be planting trees and maintaining them by the billion.

Trees are effective carbon sinks while they remain alive and the wood is sound. After all, any carbon that is held in the world of the tree is carbon that is not contributing to the problem of global warming. Trees can hold onto carbon for thousands of years. Ultimately, we are all dependent on trees had other plans to mediate the suns energy, to cool our planet, and to maintain healthy ecosystems. Any arborist who undertakes tree risk assessment should have a

profound knowledge of not only the procedures and diagnostic techniques, but first and foremost of host-fungus associations."

OBSERVATIONS and DISCUSSION

October 6-7 2012 I inspected images and reports on the trees. October 8 2012 I inspected the trees. I reviewed with GFCA board member Bill Canis and five other local citizens the points of concern in the trees and other background and history. I climbed the trees and observed the following:

**Overall vitality** in the upper crown of both oak trees appears to be very good. There are no signs of dieback in branches or in the overall tree systems. Leaf color is dark green, with annual twig extension in the range of 2-4", less on the corner tree. Associated organisms include leaf and twig galls, spiders, ants, All of these organisms appear to be in a facultative mode, with no signs of harm to the trees. Wounds from branches shedding or being pruned are "compartmentalizing" by adding woundwood, and closing normally. Woundwood can be over 140% the strength of normal wood. (Kane 2008) New growth is sprouting to replace small branches that were shed, all normal processes in mature oak trees.

Only one dead branch of a size, that could be expected to hurt if it fell on someone, moved under pressure of my foot. It was under 3" in diameter and in the eastern tree, far from the road or sidewalk. (We did no pruning during our assessment.) If it is not pruned but shed naturally, it will be highly likely to break into smaller pieces, and lodge in branches below, 20 feet from the side of the roadway. This is an unusually small amount of dead or "hazardous" material in trees this size and age, far from posing an "unreasonable risk", unless there was a playground directly below. Moreover, this branch did not die because of shading, or because the tree is in progressively decreasing condition or "decline". Scientists and practitioners warn against using "decline" as a term because it conveys little meaning. See Clark 2010, Ostry et al 2011, Meilleur 2012 below. The branch died because of a lightning strike.

**Lightning**-caused wounds are all on the eastern tree and closing normally. Judging from the amount of woundwood, the strike may have been 5 or more years ago. The central leader of the eastern tree died back to a point that living tissue could grow around it, and it did. Three smaller branches affected by lightning died back and compartmentalized in a similar fashion. Three patches on one larger scaffold limb was indirectly damaged by sideflash. The exposed wood is hardened and shows no sign of decay. Woundwood is closing over it from all edges.

Down the stem, I observed a few narrow patches of missing bark from lightning damage, no more than two inches wide. All of these are closing normally. Most of the length of the stem has no bark damage, and appears and sounds and feels unaffected by the lightning. No interior cracking is evident by sight or from sounding with the mallet. Near the base, the streak is continuous, but less than two inches wide and one inch deep. To observers whose assessment is limited to the bottom of the wound, it may seem potentially serious. Considering the adaptive growth in the crown, the response to this lightning strike appears no less significant than the damage from the strike itself. Looking at the whole tree, its health and stability are not compromised by the lightning strike.

**<u>Lower stem of the eastern oak</u>** has damage measured at 6' long by the first report. This damage is not recent: the number and style and degree of corrosion in the hundreds of nails, staples and other metallic fasteners driven through the living outer layers of the tree indicate this damage has been ongoing for decades. The fasteners attached signs for motorists waiting at the red light to see. Vertical cracks emanate from these nail wounds, which accelerates drying, death and decay of tissues in this section of the tree. This is not an indication of tree "decline", but of tree abuse. Response by the tree to this wounding is not strong, first because it is in a sinus, an indentation between two buttress roots, and second because it is dispersed around each wound. , With treatment, the living tissues still in this area may begin to seal the lesion. The area does sound hollow, but probing showed some living tissue. Other reasons for the poor response can be seen at ground level.

**<u>The flare of the eastern oak</u>** looks and sounds normal on most of the circumference. On one buttress root is a bacterial infection that was noted in the second report, and accurately diagnosed as structurally insignificant. In the sinus damaged by nails, a conk of *Inonotus dryadeus* was identified at ground level in August, when the fruiting body was young. On the October 8 inspection it was dry, overmature and coated with green. The buttress root on one side of the infection sounds hollow on that side Signs of a wood decay fungus such as *Inonotus dryadeus* associated with an urban tree is cause for a systematic inspection. The first report measured the depth of decay facing west at 24", which is 44% of the 55" diameter at the point measured. The base measures 16' in circumference at ground level, and the damaged area measures 2', or 12.5%.

These measurements are well within parameters for reasonable retention of the tree. When assessing the outside of a tree, horizontal damage is considered critical, while vertical damage is much less serious. Assessing the inside of the eastern tree with the resistograph indicated decay 5" deep on the south and 6" deep, or 11% of the diameter on the southwest side of the infection. The majority of buttress roots appear unaffected, so support is fairly continuous around the root collar.

> Schwarze (2008, page 36) outlines a reasonable response to this decay, taken by arborists who are familiar with *Inonotus dryadeus* in oak: "Wood decay fungi often infect trees via damaged roots and subsequently colonize the dysfunctional wood in the roots and butt. In some cases such as *Inonotus dryadeus* in Oak, decay only spreads slightly into the main stem. For this reason the size of the decay column markedly decreases as it tapers out from the butt to higher levels of the stem. If the decay column has a certain size, the decay fungus can colonize the sapwood and kill cambium and bark. At that stage the first external symptoms in the form of cracks within the bark develop between the buttress roots. This decay symptom will eventually appear in different regions between the buttress roots around the base of the trunk. As long as the buttress roots are intact and show no signs of weakened growth, the strength and stability of the tree is not impaired.
>
> From their own experience, Reichartz and Schlag 1997 stress that infected trees only pose a risk in the advanced stages of decay, and only when wood decay fungi damage all of the buttress roots. It depends on the total number of buttress roots and their conditions. A tree with nine sound but only one decayed buttress root will rarely pose a risk. In contrast, the same tree with only two sound and one severely decayed buttress roots will definitely pose a

hazard. They conclude that the risk posed by an infected tree for people and property depends on the type and amount of compensation growth produced by the tree. If the tree response to damage was strong compensation growth by the buttress roots or by the formation of secondary roots, it is capable of compensating for a central decay column over a long time…"

**Insect activity** was noted in this area in August, but not October. The tan powder in the infected sinus shown in the August picture resembles signs of powder-post beetles in the family Lyctidae. These typically scavenge on dead tissue, and do not invade living wood. Small infestations like this one can be treated with low- or no-toxicity material. At this stage the pest is a transient scavenger, not an indicator of the tree's health or structure. The fact that its frass was evident on only a 1' square area may indicate that the surrounding wood is still alive enough to resist woodborers. Trees have adapted to insects and fungi for a long time, so the presence of either is not unusual. "Some insects can cause injury and damage to trees and shrubs. In many cases, however, the pest problem is secondary to problems brought on by a stress disorder or pathogen." from http://treesaregood.org/treecare/resources/insect&disease.pdf

Despite the previous report, there was no sign of bark beetles in either tree. Bark beetles invade and feed in the bark and the phloem tissue immediately inside the bark. The fine grain sawdust pictured is not bark or phloem tissue, which is too dark and moist and sticky to form fine grains. Only dry, dead wood could make grains that powdery fine, when bored out by a woodboring insect. Bark beetles are from the subfamily Scolytinae, unrelated to the Lyctidae beetles in the eastern oak. They are an occasional pest on pines, but rarely a pest on hardwoods. Their frass is more granular, coarser and darker, because unlike powder-post beetle frass, it includes bark and dried sap, but little wood.

**The flare of the corner oak** has 5' of its 16' circumference damaged by grading. Roots were cut over 2' inside the curb, apparently by VDOT or its contractors when the road was widened. Some decay is visible inside of some of these grading wounds, but woundwood is growing around each of these small cavities. Resistograph readings indicate decay over 9" deep on the northeast side and over 12" on the east side, where the grading damage is most severe. Away from the road, the buttress is relatively intact, and we saw and heard no signs of infection. The integrity of the roots extending parallel and away from the road was consistent or stronger, according to sounding tests. No scavenging or invasive pest was seen feeding on the outside of the corner oak.

ROOT COLLAR EXAMINATION: BACKGROUND

Inspecting the trunk flare and above ground roots is a mandatory requirement for all tree risk assessors, per ANSI A300 Part 9., 93.4.2.2.1. Water goes up and around from the woody tubes and channels inside of the tree. Sap flows down and around from the leaves and bark on the outside of the tree, where the food is made and moved. Much of the food goes down to the lower trunk and woody roots, to be metabolized and used for vital processes such as defense against fungal attack from soil on trunk tissue. The tree's natural defensive process is called Compartmentalization of Decay (/Disease/Dryness) in Trees, CODIT.

As trees mature, the buttresses at the base extend upwards. The sinuses, concave areas between the buttresses, are squeezed by bark on both sides being folded inward, or "included", like codominant branch unions. These sinuses are often degraded to some extent by microbial or insect activity. Since the buttresses are the primary supporting structures of the tree, sinus problems are typically not structural problems, unless they extend into buttress roots with no adaptive growth.

Declining tissues in sinuses over time can divide trees into columns, functioning more or less independently. From a structural view, this type of disintegration is not desirable, but it can be managed responsibly--even in an urban landscape. These white oaks may not reach the disintegration stage of life for many decades, perhaps another century, depending on their care, and how they respond. Many oaks in Europe standing on solid-but-thin shells, at age 600+, are managed by periodic pruning to reduce the load and risk while rejuvenating sprouts arise on interior of the trees.

## TREE RISK ASSESSMENT: Great Falls Oaks

From NBCWashington.com: "A man died when a huge tree fell on his car Tuesday evening. Arborists determined the tree fell because it was completely decayed at the roots... Another tree in the area also was found to be decayed at the roots and will be removed." This medium's quick report did not capture all that arborists determined: the tree stood near a ditch subject to periodic flooding, so many roots were subject to drowning and decay. White oaks close their stomata, the holes in their leaves where water vapor is emitted, as a defense against drought. Summer rains and standing water are well-known to decay and destabilize white oaks.

Competitive turfgrass was managed in its rootzone. On top of this, the crown had sustained an extreme loss of branches 5-10 years before, after new federal regulations were interpreted as a reason to take off more branches than before for additional utility clearance. This degree of pruning cuts off the downward flow of hormones and nutrients, so the roots on the side away from the road—the roots that prevented the tree from falling on the road--were severely starved. The bark on the inside of the tree was newly exposed to sun and wind, aggravating the desiccation and further straining the tree system. This branch removal visibly altered the balance and movement of the tree's structure, leaving it lopsided. Then came a violent derecho windstorm, to further loosen its hold on the earth. Root decay was definitely a factor, but there were many other predisposing conditions not shared by the remaining trees, which have:

- Placement on high ground, limiting decay potential, except for the puddling at the curb.
- No severe pruning, relatively good mechanical, nutritional and hormonal balance.
- Intertwined crowns with substantial growth against the leans, sharing loads from storms.

The basal decay on both remaining trees is physically connected to grading damage. The trunks are hollow in these specific places on the outside, but relatively solid on the inside. The

buttresses are intact, aside from the grading damage;  all are uncut and undamaged on the outside.  If root failure is a concern, in which direction?  Because compression strength is lost on the east side of the eastern oak, the crown can be reduced on that side with three cuts where orange ribbon is hung, and other pruning specified below.  Strength in the corner oak is visibly lost facing the road, so reducing the branches over the road would be an obvious response to mitigate this construction damage.

**The eastern oak** is weighted parallel to and away from the road.
**The corner oak** is leaning over the intersection.
The pruning specified below would lessen both of these leans substantially, away from the road. The trees appear too short to hit the building, so the sidewalk and the lawn are the primary targets for a failure away from the road. None of these targets is of great value or likely to be occupied during the kind of extreme weather event that it would take to topple the eastern oak, even with its present size and weight. Both of these trees have good growth in the interior of their crowns, so they would still make a lot of food for themselves and benefits to the community if they were cut back to "retrench", lessen loading, and increase stability.

So how much risk is there?  We cannot say exactly, but we do know:
The trees have stood up to everything thrown at them so far.
The risk of one oak sustaining limb damage or uprooting would be greater if the other oak is removed.
The present benefits of the trees would be lost forever if they are removed.
The uppermost clumps of foliage make stems whip, pulling the tree off center.
to lessen loading and imbalance.
There will be less risk, if soil and roots and trunk are managed properly, and the trees are pruned to lessen their lean, the load placed on them by wind and rain and gravity, and
their lever arms, at the ends of the long branches.
That a supplemental support system, such as a cable connecting the trees, would additionally lessen the risk of either tree falling away from each other, .

APPROPRIATE RESPONSE PROCESS
When features on or in a tree cause concerns about health or structure, those concerns can be resolved by examining them from the tree's perspective, over time.  This approach allows time for  incorporating arboricultural treatments such as root invigoration, proper fertilisation, pruning, mulching, pest management, companion planting and irrigation.  Signs of strength and adaptive growth, like callus and woundwood and reinforcing ribs of bright orange reaction wood showing through, are documented with images and measurements, as the tree constructively responds to stressors.

Signs of weakness include cracking or shriveled or sunken areas. The length, height and width of dead, infected and infested areas are also recorded, to get a balanced account of tree condition. The resulting host/pathogen ratio can be calculated after each monitoring visit, and factored into treatment decisions.  Since the trees' fate is at stake, it seems only fair to give them a say in the matter.  At present, tomography is the most effective technology for monitoring interior trunk condition.  With this technology, a white oak with 85% interior decay and leaning toward a 4-

lane road is being managed with pruning and monitoring. Assessing response on the exterior of these trees should give adequate guidance to future management decisions. For instance, if buttresses and roots are growing thicker, and no new signs of decay are evident, the amount of pruning recommended in 3-5 years may be small.

The prognosis for continued health and low risk seems favorable for these trees, if these specifications are followed:

TRUNK AND ROOT MANAGEMENT (to reach a net reduction in maintenance costs)

1. Put a stop to nailing signs to the tree. Pull out the loose metal, rinse, and drench the area with fungistatic minerals such as phosphite.
2. Replace the silt from the road to the roots exposed by grading, and cover with coarse mulch that will stay in place. Consider a retention device.
3. Confirm location of underground utilities.
4. Maintain sterile zone 6" radius from trunk; aggregate or rosaceous mulch
5. Kill grass to lessen conflicts with turf management.
6. Mulch >6" from trunk, up against or covering exposed roots.
7. Monitor. If a change in the foliage indicates a nutrient issue, diagnose systematically.

Any fertilization rates should be low to moderate.

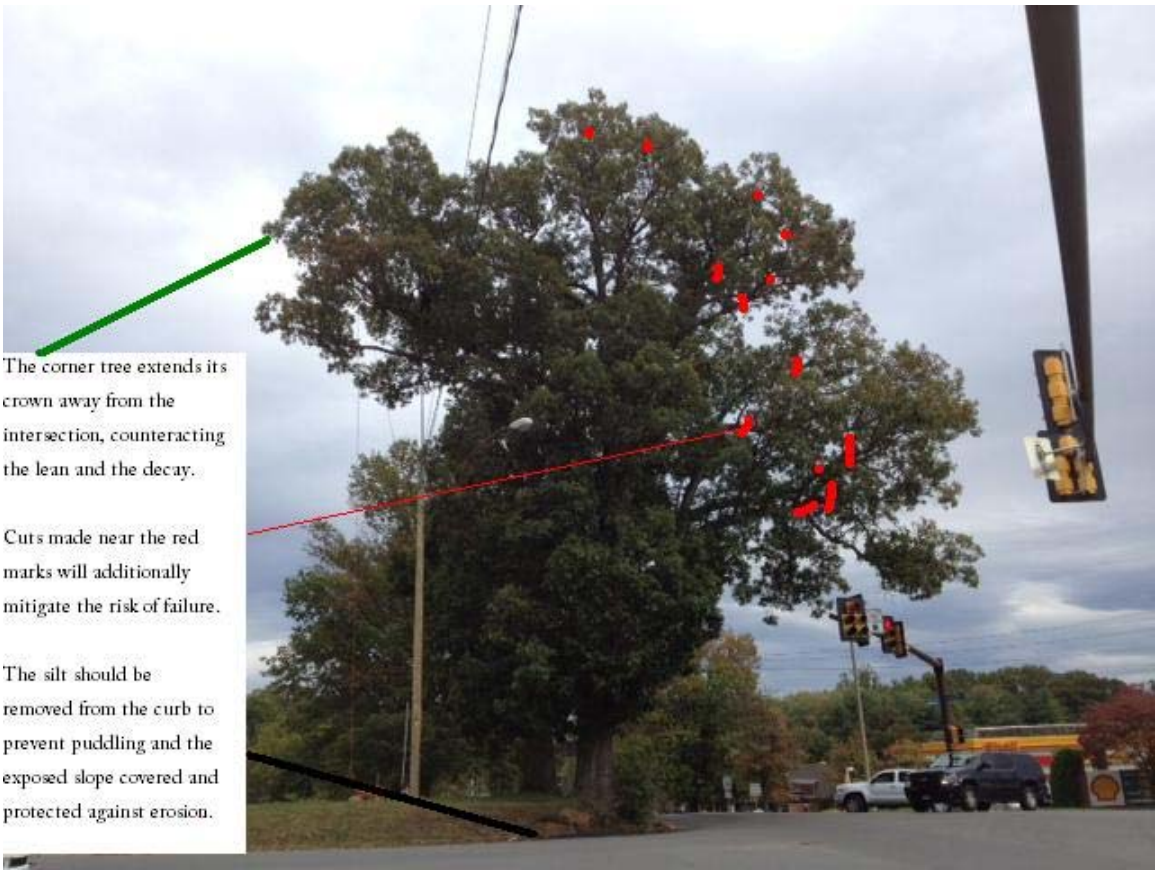
Pruning specifications on eastern oak:

1. **Crown cleaning**: Prune dead branches >3 cm.
2. **Crown thinning**: Reduce downward and horizontal segments from the interior of branches above the lower tier, to lessen risk and allow upward growth on each branch below. Prune crowded branches back to the trunk. <4% total living buds, <8 cm cuts
3. **Crown reduction**: Reduce westward portion of the westward leader with three cuts at the orange flagging, back to vigorous growth.
4. Reduce top portion 15% with <4" cuts at lower, vigorous lateral(s) growing upright or to another desired direction.
5. Reduce downward and horizontal segments from the outside of sprawling branches in the top half of the crown. <8% total living buds, <3"cuts, ~<6' long.
6. **Monitor** tree condition and prune more if desired every 2-3 years. All work should be done or supervised by an insured arborist with specific experience at these tasks, on site. All specifications shall be followed, after clarification and changes in subsequent years as needed.

Pruning specifications on corner oak:

**1. Crown cleaning**: Prune dead branches >1" diameter.
**2. Crown thinning**: Reduce downward and horizontal segments from the interior of branches above the lower tier, to lessen risk and allow upward growth on each branch below. Prune crowded branches back to the trunk. <4% total living buds, <3" cuts
**3. Crown reduction**: Reduce lower half of crown, the horizontal limbs over the road by 10-40%, back to vigorous growth, upright where possible (Harris et al 2009).

**4**. Reduce <20% of the top portion toward the road with <4” cuts at lower, vigorous lateral(s) growing upright or to another desired direction.
**5**, Do NOT reduce the leaders at the top that grow away from the road.
**6.** Reduce downward and horizontal segments from the outside of sprawling branches in the top half of the crown. <8% total living buds, <3” cuts, ~<6’ long.




**7. Monitor** tree condition and prune every 3-5 years. All work should be done or supervised by an insured arborist with specific experience at these tasks, on site. Specifications to be adjusted in subsequent years as conditions warrant.

14. OPTIONAL: If additional stabilization is desired, install a 3/8” cable between the trees, at points 40-50’ above the ground, through upright stems at least 12” in diameter. Use a 7/16” drill to go through both trunks in as straight and level a line as possible. Use through-fasteners according to manufacturer’s directions. Inspect periodically, every 1-3 years, and after major storms.

After assessing the trees and reviewing the other reports, I believe that the differences are fundamentally due to the scope of the assignments, and the protocols, thresholds and methods

followed during the assessments. No criticism of the qualifications or performance of any other arborist is expressed or implied.
This concludes my report. I can be available to clarify any portions of it.

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2) the inspection is limited to visual examination of accessible items without climbing, dissection, excavation, probing, or coring. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the plants or property in question may not arise in the future.

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