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4 / 11 / 07

Overview

Damage occurred to a home within the Red Hawk Community following a severe storm in December 2006. The tree failure occurred within the Native Growth Protection Area. Part of that area was inspected and documented in a previous report. A request was made for a proposal to expand the Tree Inspection to assess the remainder of the NGPA's and provide guidance. The proposal was made on the following basis:

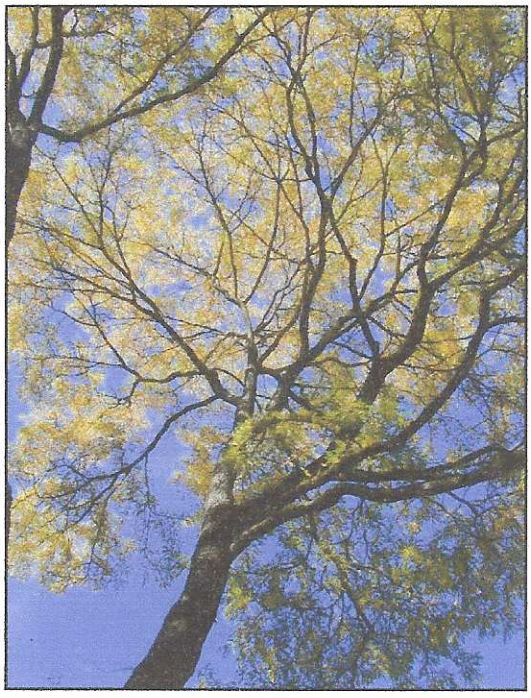
- To inspect trees within the native growth protection areas at Red Hawk.
- To evaluate the health and structural condition of the trees relative to risk of failure.
- To test the trees as necessary with the Resistograph to determine the nature and extent of any defect or decay.
- To collect samples for examination analysis to assess the nature and degree of any pathogens.
- To provide a report with recommendations for action to reduce the likelihood of failure.

The proposal was accepted and the inspection took place on 4 / 10 / 07.

Tree Inspection

To develop an accurate picture of tree health and condition, information must be gathered about the multiple, changeable, factors which influence tree vitality and stability. Vital, healthy tree growth is the result of a complex association of internal and external influences and to consider each tree as an isolated entity is to fall short in understanding the whole picture. As a practical matter, this information must be gathered and structured in the best way to communicate the results of the observations and to impart any recommendations for treatment.

Individual tree inspection begins at ground level; tree genus and species is determined and soil quality, rooting conditions, soil level, irrigation and drainage characteristics are observed. Soil is a living micro-system that relies on an active working relationship between structural and living organic components. The structural condition of the soil is most commonly adversely affected.

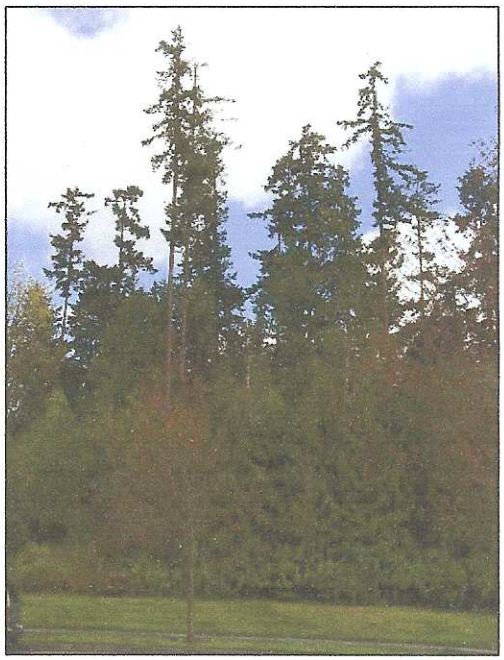


The quality of the soil may be assessed in its ability to contain and disperse available moisture and the level of soil compaction may be tested to evaluate the aeration capacity of the soil. Some soil types are easily compacted and although they are high in nutrient quantity, little of that nutrient quality is available to the growing tree. Compact soils also cause problems by restricting the trees ability to discharge the gasses produced as part of the growth cycle.

The visible parts of the tree, the trunk, branches and leaves live in balance with the unseen roots. Damage to the soil leads to inhibited root growth and

causes a lack of vitality and decline within the tree as a whole. Soil compaction is commonly the result of heavy traffic in the root zone. The effects of soil compaction may not become apparent in the tree for decades following the initial compaction event.

If signs of stress are present, a soil test may be made to assess the fertility of the soil. Testing establishes the presence and degree of vital nutrients and micro-flora. Vital soil is essential to vital tree growth, the presence of nutrients and organisms within the soil mean that growth can continue. An imbalance of nutrients can cause poor vitality; often exhibited by leaf discoloration or lack of annual growth. Poor nutrition will slow growth and can diminish the trees natural defense mechanisms and expose the tree to disease.

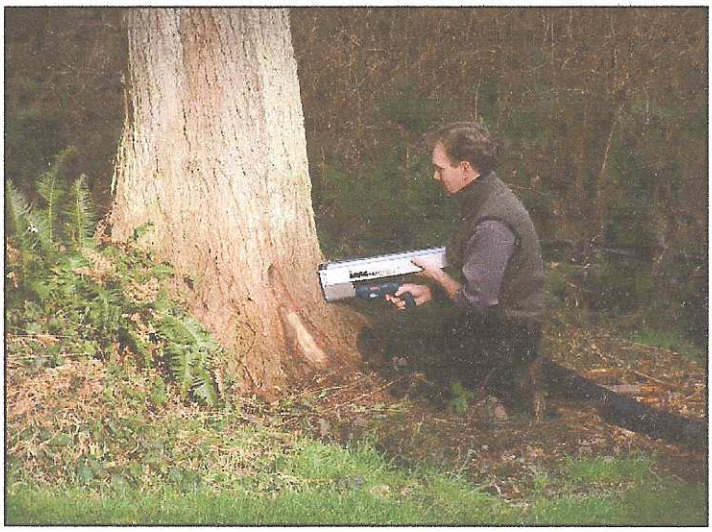


In nature, few tree species grow alone; the forest is their natural and protected setting. Whether native or introduced, irregardless of a trees origin, trees in a landscape setting demand special attention. Although bound by the genetic code of its predecessors each tree is also the product of its local environment in terms of health and stability.

Looking at the overall picture, the health of the soil, turf and other plants and trees can reveal the cause of disease, or indicate potential problems. The presence of certain species of fungus can indicate decay. Certain decay fungi may destroy support tissues and leave conductive tissues unharmed. The tree may appear healthy and continue to grow until the internal decay outpaces the new outer growth.

A root crown examination may be necessary if root decay is suspected. By removing the soil at the base of the tree, the location, health and condition of the absorbing and support roots can be determined.

In the primary examination of the root crown and trunk a mallet is used to test for loose bark. Bark lifting can indicate dead or hollow areas and give signs of the presence of decay in the root crown zone and at the base of the trunk. The mallet may be used to "sound" for decay but has limited reliability. If decay is suspected the tree will be tested using the Resistograph. The Resistograph is an instrument that inserts a constant velocity probe into the suspect area of the tree.



The resistance to the probe is graphed by the machine. The graph profile can tell a great deal about the internal character of the wood. Internal defects can be detected, cracks, hollows and early stage decay. The type of decay and its effect on the stability of the wood depends on the species of fungus involved. Soil and root tissue samples may be taken to determine the cause of disease by laboratory testing.

The inspection continues with an evaluation of the tree crown, first by eye or with the use of binoculars then, if necessary, by climbing into the canopy of the tree. The color, size and condition of the leaves, trunk, branches and twigs is assessed. The form and formation of all the trees components give information about health, vitality and structural strength. The crown density, the number of leaves on each stem, and past and current growth extension, indicate current health and reveal previous problems. Changes in growth rate in past growth may indicate prior disease or injury.

An evaluation of the general growth habit will reveal any problems related to vigor, or the genetic component of tree growth. Previous treatments such as pruning or cabling are observed, the quality of the work, and its effect on the tree.

Any growth abnormalities are noted: weak limbs, discolored or missing bark, cracks or cavities in branches or trunks. Indications of disease are observed within the canopy of the tree, disease may be indicated by leaf blight, stem canker, fungal growth or insect and bird activity.

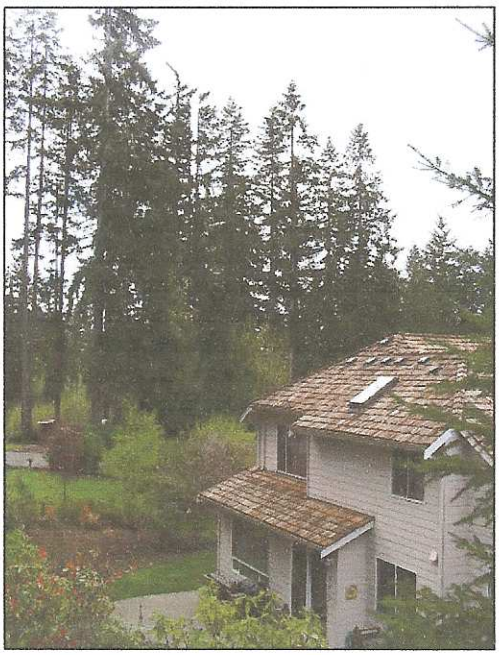
Trees produce adaptive growth to compensate for the stress related to growth and injury. The shape and formation of limbs and trunks can show the ability of the tree to compensate for weakness or indicate internal problems that may lead to limb or trunk breakage. The interpretation of these changes in form is part of a growing body of knowledge pioneered in Europe. The knowledge is not new but the application is: Dr. Claus Mattheck of the Karlsruhe Institute and colleagues, have developed a system of structural evaluation based on the principals of bio-engineering. We have chosen to use this approach to augment our own knowledge and experience.

Observations

The Red Hawk community contains three distinct Native Growth Protection Areas. The trees within the NGPA's represent several species which include:

- Douglas fir (*Pseudotsuga menziesii*)
- Western redcedar (*Thuja plicata*)

- Bigleaf Maple (*Acer macrophyllum*)
- Red Alder *(Alnus oregona)*
- Western Hemlock (*Tsuga heterophylla*)



The trees inspected in each area showed a variety of condition from healthy and defect free trees, to those displaying severe defects with some trees standing dead. As within any native area, dead trees provide highly desirable habitat for nesting birds, insects, amphibians and mammals and in most cases, do not present a serious problem. Problems occur when trees in decline and with structural problems are located in close proximity to homes.

The focus of the inspection was the trees on the periphery of the NGPA's; those trees that may represent a hazard to the homes they border. Some of the trees are exposed with little to buffer the effects of a severe wind. Where structural defects are present the risk of failure is elevated. In addition where endemic root disease is present tree failure is likely. Where there is an increased risk of failure there is an elevated likelihood of damage or injury to the surrounding homes and members of the community.

Red Hawk contains three distinct separate NGPA's, the areas are shown on the attached sketch plan. Within the Areas the plan shows the sites where trees were found to have significant defects that may lead to their failure. The trees were marked with colored tagging; the colored tagging designates either removal or habitat snagging. No diagnostic evidence of endemic root disease was found within the areas. It should be noted that the examination of the Native Growth Protection Areas was limited to a certain extent by the dense growth of Salal (*Gaultheria shallon*) around the base of the trees.

Conclusions and Summary of Recommendations

Tree failure occurred in trees within the Native Growth Protection Areas that border the residences in the Red Hawk community. To evaluate the circumstances of failure a Tree Inspection took place in February of 2007. A request for an expanded inspection precipitated this report. The purpose of the expanded inspection was to identify trees with an elevated risk of failure in the rest of the NGPA's within the community. The expanded inspection de-lineated the NGPA's into three Areas and identified a site of concern with two trees in both Areas A and B and one site of concern with one tree in Area C. The Areas and sites are shown on the attached sketch. The trees within each site were marked with flagging tape. Florescent green tape designates trees that should be cut to the ground. The orange tape designates trees that may be converted to wildlife snags. Snags are created by cutting the tree to a high stump of approximately 25' and 'carving' the top of the stump to resemble a natural break.

I hope the preceding information proves useful, please let me know if you have any questions.

Yours sincerely,

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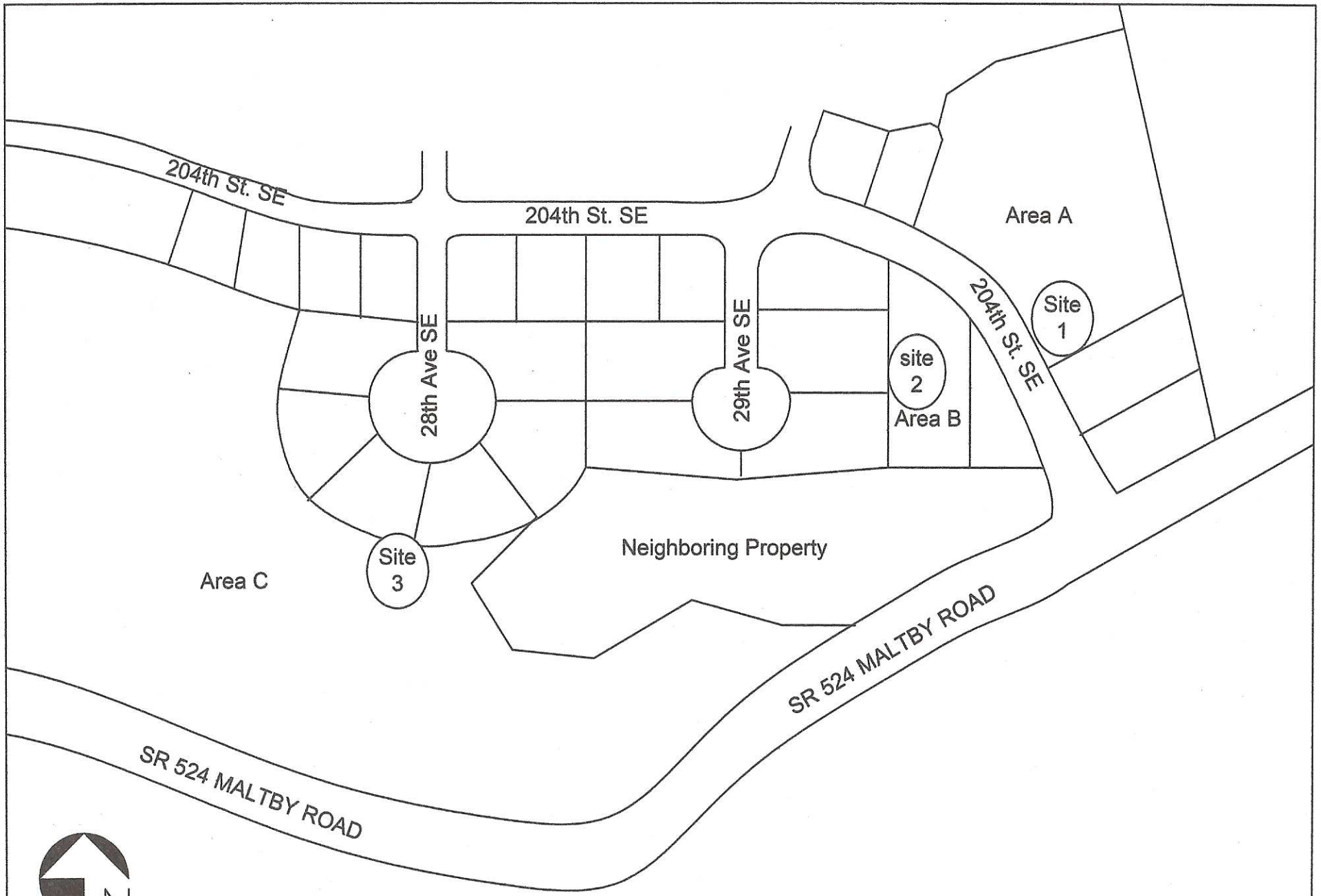
Consulting Arborist, PN0176A



Sketch Showing the Areas and Sites identified in the Arborist's report for the Red Hawk community

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