



# Tree Protection Plan Manual

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## I. General Instructions

Tree Protection Plans include the following elements.

- A completed 'Tree Protection Plan Application Packet'. (Required)
- A 'Tree Inventory' list that documents trees that may be impacted. (Required)
- Drawings of tree protection plan elements overlaid on the project plans (Required)
- Narrative written descriptions of tree protection measures. (Required)
- Construction 'detail' drawings or descriptions to clarify the dimensions of certain elements, such as depth of pavement, size of excavation for footers, specifics of a root protection matting system, or the installation detail for tree protection fence. (Required when relevant)
- Any reports from professional arborists, engineers, etc. (Recommended when relevant)

All tree protection elements drawn on your plan must either be drawn at scale by a qualified professional or drawn with the distances noted.

Trees are living things that rarely fit neatly into a set of standards or expectations as we encounter them in the real world. A professional arborist may be able to employ a more advanced approach to assessing the location of roots, the condition of the tree, and strategies for tree protection. If you are in doubt about how to develop a Tree Protection Plan that will adequately preserve your trees while accomplishing the goals of your project, hire a qualified arborist.

A Tree Protection Plan should be considered as you develop the plans for your project, not after the fact. Please share this guiding document with your designer early on in the process to guarantee that tree protection is adequately considered.

The 'Tree Protection Plan Checklist' in the application packet is a guide for ensuring that you submit a complete plan. The checklist must be completed. Please do not check a box if you have not yet made the appropriate addition to your plan.



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## II. Tree Protection Plan Checklist Instructions

### 1. Tree Inventory/List

A tree inventory documents each Urban Forest Tree (trees over 24" circumference or 7 and 5/8" diameter) on the project property and adjacent properties. It is comprised of a list of the trees with their inventory number and details as well as a map that locates each tree with its number.

A key component of a tree inventory is the diameter of the trunk measured at 4.5' from the ground, also called the tree's Diameter at Breast Height (DBH). This in turn is used to calculate the tree's Critical Root Zone. Please see the Tree Permits page on the City of Takoma Park website for instructions on how to measure DBH.

A Tree Inventory must include at least the following:

- Tree inventory/map number (1, 2, 3, etc...)
- Tree species (best guess by applicant is acceptable)
- Tree diameter in inches measured at 4.5' from ground level

Some more complex and high impact projects may also benefit from additional details determined by a qualified arborist:

- Tree species (verified by a qualified arborist)
- Tree condition
- Tree condition comments
- Tree canopy radius
- Special tree protection measures (root prune, stress mitigation measures, etc...)

Note that having a qualified arborist conduct your inventory can be helpful in determining which trees may be in decline and not worth preserving, which trees are especially vigorous and tolerant of construction impact, and/or what the typical rooting pattern of a tree of a given species is likely to be. This knowledge can aid in your design process and make for a smooth tree protection experience.

### 2. Critical Root Zones (CRZ)

The CRZ is the area around a tree in which its roots may be expected to be found. According to industry best management practices, a tree's CRZ may vary between 0.5 and 1.5 feet of radius per inch of trunk diameter. The size varies based on species susceptibility to root loss, age of tree, and condition of tree.

For projects that are simpler in scope and that have less substantial tree impacts, the CRZ of every tree does not need to be professionally determined or drawn onto the plans. However, the Urban Forest Manager will be reviewing your project with tree CRZ's in mind and may require adjustments if a sufficient portion of a tree's roots have not been adequately protected.

For more complex and high-impact projects, the UFM may require the CRZ of the trees to be drawn onto the plans under the guidance of a qualified arborist.



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## 3. Tree Protection Fence (TPF)

TPF is fencing that excludes construction activities from as much of the CRZ of a tree as possible or as deemed required by the UFM.

TPF is required only in areas in close proximity to concerning impacts, which include:

- Equipment traffic
- Heavy foot traffic over soil with roots
- Excavation
- Materials and equipment storage

The type of fencing used should be one of the following, considering the type of impact.

- 6-foot chain link – (in cases where substantial heavy equipment use will occur)
- Welded wire - (in cases where projects involve moderate intensity of activity)
- Orange 'snow fence' – (in cases where projects are shorter in duration and only hand tools and foot traffic will be used.)

In some cases, TPF may not be required if:

- Only low-intensity foot traffic is passing near a tree with no other work or storage.
- Excavation is sufficiently far from a tree.
- A sufficiently small amount of materials will be stored for the project and there is no risk of stored materials compacting soil within the CRZ.

## 4. Equipment Usage

Heavy equipment can damage trees in many ways including the following:

- Excavation can damage roots
- Equipment movement and storage can compact soil and damage roots
- Equipment movement near trees can lead to collisions and scrapes that cause damage

It is important to document the type of equipment to be used so that the Urban Forest Manager can assess likely impacts appropriately. Be as specific as possible with the type and model of equipment and whether it operates on wheels or tracks.

## 5. Trunk Protection

When equipment or vehicles are planned to move close to a tree trunk it is at risk of being struck or scraped. In these cases, the trunk must be protected to mitigate the risk of injury. Tree protection fence alone is insufficient to protect a tree's trunk when equipment will pass close.

Trees receiving trunk protection should be noted on the plan drawing or tree inventory.



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Some key items to keep in mind when protecting the trunk of a tree

- The movement of a bucket or attached equipment can pose risk to a broader area than just the main body of the equipment. Plan for trunk protection accordingly.
- Trunk protection should account for the full height of any trucks, dumpsters, or equipment that may pass close to a tree
- Tree trunks can grow at angles and may appear out of harms way near the base but may lean into the vicinity of equipment traffic higher up. Plan accordingly.

## 6. Root Protection Matting/Soil Compaction

Root protection matting seeks to reduce the soil compaction caused by construction activities within a tree's CRZ in cases where the CRZ cannot be completely protected by TPF. Construction activities can lead to soil compaction in the following ways:

- Heavy equipment traffic
- Storage of materials and/or soil spoils
- Excessive foot traffic

The type of root protection matting required will vary based on the intensity of the traffic it needs to support.

- 6-inch layer of woodchips (for moderate foot traffic)
- 6-inch layer of woodchips plus secured pieces of  $\frac{3}{4}$  plywood or polyethylene mats (for extended periods of heavy foot traffic and for light equipment traffic)
- 12-inch layer of woodchips with polyethylene mats. (for extensive equipment usage)

A few tips with root protection matting:

- Polyethylene mats are more expensive than plywood but can be reused multiple times and so can be a more cost-effective product in the long run for contractors. They also do not degrade in the weather and so are a more reliable option for longer projects.
- Adding a layer of filter fabric under the woodchips makes for easy removal at the end of the project.

## 7. Materials Storage

Storage of a substantial amount of construction materials, excess soil, or equipment on the ground within a CRZ can substantially compact the soil that the tree's roots depend on. Longer term storage can also inhibit the flow of water and air to the roots and leads to more severe compaction. For this reason, it is important to specify the location where materials will be stored in advance and ensure minimal impact to soil within a tree's CRZ. The designated materials storage area should be noted on the plan drawings.

Existing paved surfaces are great places to store materials to limit impact to the landscape.



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If the only space available for storage is inside a tree's root zone, root protection matting may need to be installed depending on the volume and weight of materials. If the amount and weight of materials is sufficiently small there may be no concern of soil impact. This must be justified by detailing the type, amount, and weight of materials in your TPP.

## 8. Silt Fence/Erosion Control

Silt fence is required on some projects to control sediment runoff caused by excavation and activity. Silt fence commonly involves excavating an 8" trench to secure the filter fabric, which can destroy a substantial portion of a tree's roots. In situations where silt fence must be used, its location and the detail for its installation must be specified.

In cases where silt fence must cross a CRZ, it must be of a trenchless design. The following are acceptable:

- Filter sock
- Modified trenchless/no-dig silt fence

## 9. Excavation and Grade Changes

Excavation is one of the key concerns when considering tree protection planning as it can cause extensive damage to tree roots. A large percentage of a tree's roots grow in the first 18 inches of soil so seemingly minor excavation can decimate a tree's root system. Plans will be reviewed closely for the extent to which tree roots may be damaged during the course of excavation.

Grade changes are when the level of the soil is either excavated down or built up, often referred to as a 'cut' or a 'fill'.

- Cuts, or lowering of the grade, can impact trees by damaging roots during excavation
- Fills, or the raising of the grade, can impact trees by compacting existing soil due to the weight of the added material and by starving roots for air and water.

All grade changes must be sufficiently far from trees to minimize impact to roots and must be depicted on the plan drawings.

A fill of 3 inches of soil or less is allowable. In some cases, a cut up to 3 inches may be allowed, though this will depend on the rooting pattern of the tree

## 10. Root Pruning

Root Pruning is the proactive severing of roots using a clean cut in advance of a future excavation. Root pruning can be used to accomplish the following:

- Avoiding risk of machine excavation pulling uncut roots and causing impacts to roots intended to be preserved
- Timing the cutting of roots for the dormant season when the tree is better equipped to handle the stress of root-loss.

Any mechanical excavation of a significant portion of a CRZ will require root pruning in advance.



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Root pruning can be conducted using one of the following methods

- Root-Pruning Machine (Only with oversight of a MD Licensed Tree Expert)
- Vibratory Plow (Only with oversight of a MD Licensed Tree Expert)
- Hand digging and hand cutting the roots with a sharp saw or loppers.

Root pruning should typically be done to a minimum depth of 18 inches. 24 or 36 inches may be required in cases where the UFM determines that roots may be growing deeper. You must note the depth of root pruning to be conducted in your plan.

The location of root pruning must be specified on the plan drawings.

## 11. Utilities Installation

Utility lines, including water, sewer, gas, electric, and telecommunications, often involve digging of trenches during installation, which can have severe impacts on tree roots.

The two options for handling the installation of underground utilities near trees are:

- Adjust the location to be sufficiently far from the tree to minimize root loss, using root pruning as well if still within the tree's CRZ.
- Use a method of installation that involves no root damage.

Root-preserving methods of underground utility installation include:

- Super-Sonic Air Excavation to preserve roots during excavation and install the utility underneath. (Must be done under the supervision of a MD Licensed Tree Expert)
- Hand-digging and excavating under substantial roots to preserve them.
- Directional/Horizontal Boring. This typically must be done at a depth of at least 48" to avoid roots. This method typically includes the need for one or more access pits to be dug. Root loss during access pit excavation must be considered as well.

## 12. Preliminary Exploratory Excavation

In the real-world tree roots do not grow with a perfectly predictable distribution and spread. Some projects requiring greater than typically acceptable impact to a tree's CRZ will require preliminary exploratory excavation to demonstrate that a smaller volume of roots than expected is present in the intended area of impact. The following are some key aspects of an acceptable preliminary exploratory excavation:

- The excavation must be done in a manner that does not damage roots. The default method should be Super-Sonic Air Excavation (SSAT), often referred to as 'Air-Spading'. In some cases, hand digging with shovels may be an acceptable method, though this requires a digger to be very careful to avoid roots as they work.



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- The excavation must be done to the depth that a significant percentage of the roots are likely to be found. Typically, this will be 18 inch minimum, though it may be deeper for especially large trees.
- In most cases it must be done under the guidance of a Maryland Licensed Tree Expert.
- The results of the preliminary exploratory excavation must be documented in a report that includes:
  - Photos of the area that was excavated.
  - Written documentation of the sizes and number of roots over 0.5 inch diameter encountered.
  - The dimensions of the excavated area and the distance from the tree's trunk.

This exploratory excavation must be approved in writing by the UFM before being conducted and must follow the guidelines included here. The documentation of the results of the exploratory excavation must be included in your TPP. Most projects will note require this step.

## 13. Landscaping

Landscaping often involves excavation and can impact tree roots. When substantial landscaping is to occur, the extent and the methods used must be specified and guaranteed to not excessively impact trees. In these cases, a landscaping plan must be included with the TPP. The following are some considerations:

- The proximity, number, and size of plants to be installed must be limited such that the excavation involved will not excessively impact the roots of an Urban Forest Tree.
- Grading/leveling and sod installation must not excessively impact the roots of an urban forest tree.
- Rain gardens, swales, French drains, drainage ditches, and other landscape alterations can involve excavation that damages tree roots, as well as backfilling of soil that can limit air and water to roots.
- The methods of excavation should be conducted so as to preserve tree roots. Planting locations must be flexible so as to avoid roots if encountered.
- Machinery used for moving plants and materials and for excavation must follow the instruction on Equipment Usage, discussed previously.
- The installation of irrigation systems can involve excavation that damages roots. Include any irrigation system plans in your landscaping plan as needed.

You must explain in narrative form your approach to preserving roots during landscaping activities.

## 14. Pruning

Pruning of tree branches will sometimes be required to provide clearance for a new structure or for the passage of equipment.



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Pruning of any urban forest tree as part of your project should be specified in the Tree Protection Plan. The inventory number of the tree to be pruned and a description of the pruning to be conducted and the reasons for the pruning should be included and described.

## 15. Tree Healthcare / Stress Mitigation Plan

In cases where a higher degree of impact and stress to a tree is expected due to the proposed activities, measures to improve its health and mitigate the stress will be required. If this is the case, you should already be working with a competent arborist to have designed your project to cause the least tree stress possible. You should also work with an arborist to develop a tree healthcare plan for the time before, during and after the project is complete.

The following are some items that may be considered as part of a tree healthcare plan:

- Root prune in the dormant season to prepare the tree for the expected stress
- Apply a mulch layer throughout the tree's CRZ to retain water and improve soil health.
- Develop a watering plan for during and after construction. Be as specific as possible, including the amount and frequency of watering, who is responsible for watering, what method will be used to apply the water, what the source of the water will be (which may change during the course of construction), and who will be responsible for watering after construction is complete.
- Soil remediation may be warranted in cases where existing soil conditions or expected post-construction conditions are poor and/or compacted. There are a variety of approaches to soil remediation and can include decompaction and a combination of amendments or fertilizers.
- Pest and/or disease control may be warranted in cases where a tree is of a species known to be especially susceptible to certain insect, fungal, bacterial, or viral concerns.
- Tree growth regulating compounds, such as paclobutrazol, may be warranted in cases where a tree is expected to experience an increased level of root loss and stress.

All elements of your Tree Healthcare / Stress Mitigation Plan should be specified in detail. Include any relevant proposals from tree care companies to help document the specific actions that will be taken.

## 16. Construction Methods that Require Special Consideration

Certain construction techniques bring with them special concerns to tree health that must be addressed. Please check if any of the following apply to your project and address as needed in your Tree Protection Plan. Note that this list is not exhaustive and special tree protection considerations may be required for other construction techniques.

- **Retaining Walls:** New installation and renovation of existing retaining walls often involve the excavation of soil below grade for a footer and excavation into the slope behind the wall, both of which can damage tree roots. For this sort of work, you must include the construction detail drawing or a thorough written description of the proposed retaining wall including the full extent of excavation required. Retaining wall installation close to a tree may require special methods such as zero-excavation footers, footers that bridge over roots, or minimal back cut. The Urban Forest





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Manager must be convinced that the design and methods of construction will not excessively impact the tree's roots.

- **Pier Footings:** Pier footings are a great way to minimize impact to trees, particularly as an alternative to continuous footers. However, there is still a chance that the location of a pier footing will happen to land where a sizable root is. For this reason, the following are required in plans with pier footings if there is an elevated concern of root impacts:
  - The holes must be dug by hand.
  - The plan must explicitly commit to flexibility on the exact placement of the footing based on roots encountered during excavation. To accommodate this, the following, or similar, note must be added to the plan:

*“The design allows for flexibility in the placement of the footers by up to 12” to allow for position adjustment if sizable roots are encountered during hand digging. The foreman will oversee excavation and guarantee that major roots are not cut and footer locations are adjusted as needed. Adjustment is recommended when any root over 1” diameter is encountered and is required when any root over 2” diameter is encountered. The City of Takoma Park Urban Forest Manager will be contacted before proceeding if there is a root conflict that cannot be avoided.”*

- **Floating Slab or Pavement:** This is an advanced system of preserving roots by installing a slab or pavement on grade beams supported by pier footings. It must be designed and installed under close supervision by an experienced arborist.
- **Root Aeration Matting for Soil Additions:** In cases where the grade must be raised substantially, advanced root aeration systems that preserve root health may be warranted. These systems vary and are not all supported by scientific studies. You should work closely with an experienced arborist to propose a system that is supported by the most up-to-date research and industry guidance available.
- **Pavement Installation:** The installation of pavement typically involves some depth of excavation. Depending on the proximity to the tree and the portion of the tree's CRZ impacted, the tree can suffer significant root loss. Therefore, your Tree Protection Plan must include a construction detail drawing and/or a detailed written description of the excavation required.
  - **Special Note on Permeable Pavement:** Permeable pavement systems are a popular method of controlling additional stormwater on-site. It is often assumed that permeable systems are by definition good for trees because they allow additional water to flow to the roots but it is not quite that simple. Permeable pavement systems usually involve a reservoir below the pavement that must be excavated sometimes 12 inches deep or more. This can substantially increase the number of roots that must be cut. This excavation should be considered when planning for tree protection.
- **Removing Existing Pavement:** Tree roots can grow underneath pavement. In cases where sizable trees grow near pavement care must be taken in the removal of existing pavement so as not to damage roots. A jackhammer is the preferred method. If heavy equipment is to be used, you must



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include detailed written description of how the machine is to be operated so as to guarantee that roots under pavement are not impacted. Specifically, the plan should specify in writing that the equipment will only operate from the existing paved surface and will work backwards so as not to drive over any roots that may be exposed during pavement removal. This is required only when a substantial portion of pavement is being removed within the CRZ of a tree.

- **Stormwater Management Devices:** Stormwater management on-site often requires excavating reservoirs to hold the surplus water. When close to a tree, this excavation can cause root damage. It is important to consider tree protection requirements when designing a stormwater management plan and to locate any needed excavation as far from trees as possible.
- **Over-Dig for Foundations:** Poured concrete foundations often require some amount of additional excavation beyond the extent of the proposed installation, often called an 'over-dig'. In cases where an over-dig is required within a CRZ this must be spelled out explicitly in the plan and the extra width of excavation required must be specified. In some cases, a no-over-dig method may be required to limit root impacts.
- **Clearing and Grubbing:** Some development projects involve clearing the existing ground cover down to bare soil at beginning of the project. This can have a substantial impact on tree roots. Extents of clearing and grubbing must be specified in the Tree Protection Plan and tree CRZ's must be protected. Clearing and grubbing is not permitted in advance of Tree Protection Fence being installed and fence may not be taken down for this work.



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## III. Approved Tree Protection Installation Details

The following are descriptions of tree protection measures that may be required for your Tree Protection Plan. Please add the language for the applicable installation to your plan narrative or drawing as needed. Modified or alternate details that provide equivalent protection may also be accepted.

### *Tree Protection Fence: Chain Link*

6-foot high chain link fence on round steel posts 2-inch diameter or bigger buried two feet into the ground spaced a maximum of 10 feet apart.

### *Tree Protection Fence: Welded Wire*

4-foot high 14-gauge welded wire or thicker installed on six-foot metal t-stakes sunk two feet into the ground spaced a maximum of 10 feet apart.

### *Tree Protection Fence: Orange Snow Fence*

4-foot high orange snow fence or similar fencing material installed on six-foot metal t-stakes sunk two feet into the ground spaced a maximum of 10 feet apart.

### *Root Protection Matting: Light Duty*

6-inch layer of woodchips spread evenly over area to be protected. Install geotextile/landscape fabric underneath for easy removal and clean up.

### *Root Protection Matting: Medium Duty*

6-inch layer of woodchips spread evenly over area to be protected. 3/4-inch plywood or 1/2-inch polyethylene mats installed over top of woodchips. Install geotextile/landscape fabric underneath for easy removal and clean up.

### *Root Protection Matting: Heavy Duty*

12-inch layer of woodchips spread evenly over area to be protected. 1/2-inch polyethylene mats installed over top of woodchips and secured to one another with manufacturer metal clips and to the ground with 18-inch landscape nails or #4 rebar with 90-degree bend at top. Install geotextile/landscape fabric underneath for easy removal and clean up.

### *Trunk Protection*

2" x 6" wooden boards or similar material placed vertically on trunk over closed cell foam or similar padding material. Boards are strapped with metal cable or similar durable securing implement. Boards only need to be installed on the activity side of the trunk, but the cable must be padded so as not to come in contact with tree trunk. Boards are 10 feet long or an appropriate length to adequately protect tree from equipment.

### *Trenchless Silt Fence*

Any typical silt fence detail but with zero-excavation for turning fabric into soil. 12" of fabric should turn at a 90-degree angle to lay on top of the soil and should be secured to ground with sod staples or nails. Turned fabric should be covered with gravel or haybales adequate to secure it.