

**STANDARD  
FOR TREE PROTECTION DURING CONSTRUCTION**

**Definition**

The protection of trees from environmental and mechanical injury during construction activities.

**Purpose**

To protect trees for erosion and sediment control, shade, aesthetics, wildlife, dust control, noise abatement, and oxygen production.

**Water Quality Enhancement**

Limiting areas of site disturbance and re-vegetating with permanent cover, minimizes off site and negative downstream water quality impacts caused by stormwater runoff. Mature trees provide structural stability for soils, promote proper water movement through the soil profile and moderate changes in temperature along streams and other water bodies.

**Where Applicable**

On new development sites with existing trees.

**Methods and Materials**

1. Reconnaissance should be performed before land clearing begins to identify dead and weak trees to be removed and healthy trees to remain, to create aesthetically pleasing development site with vegetation rather than the presence of dead or dying trees. Inventory the site and clearly mark the trees and stands of trees to be saved. Consider relocating streets, houses, or other structures if necessary and feasible. Once clearing begins and damage to the trees occurs, valuable specimens may be lost.
  - A. Characteristics of trees to be protected and saved. The following lists characteristics that should be evaluated before deciding to remove or protect a tree.
    1. **Tree Vigor**

Tree health is the overall condition of the tree. A tree of low vigor is more susceptible to damage by environmental changes than healthy trees and is more susceptible to insect and disease attacks. Indications of poor vigor include the dying of the tips of branches and entire limbs, small annual twig growth, stunted leaf size, sparse foliage, and poor foliage color. Avoid saving hollow or rotten trees, trees cracked, split, leaning or crooked, oozing sap, or with broken tops. Use woodchips generated from removal of trees of poor health and spread them around the root zones to help protect the trees that remain.
    2. **Tree Age**

Large, picturesque trees may be more aesthetically valuable than smaller, young trees, but also require more extensive protection measures. If leaving an older tree, be sure it is sound and healthy.

3. **Species** (the right trees for the right locations)

Many species of trees found in New Jersey woodlands are not suitable for shade tree uses around buildings. Avoid protecting trees that are short-lived, brittle, have soft wood, messy leaves, fruit, or are frequently attacked by insects and disease. Tree root systems which do not adapt well to cuts and fills may not be a suitable alternative. The following are severely affected by compacted construction fills: Aspen, Beech, Paper birch, Eastern red cedar, Black cherry, Dogwood, Katsura tree, Linden, Paperbark maple, Sugar maple, Black oak, Pin oak, Red oak, White oak, Pines, and Tuliptree. See Table 9-1 for a more complete list of construction impacts to individual tree species.

4. **Resistant to Insects and Diseases**

Avoid leaving trees in highly visible areas or specimens that are frequent targets of insects and diseases. American Elm, for example, could be lost due to Dutch Elm Disease. Wild Cherry, another example, is a favorite host of the tent caterpillar, which causes defoliation of the trees in early summer. The following are susceptible to insects (I) and disease (D): White Ash(D), Birch (I), Butternut (D), Crabapples (D), some Elms (D), Hawthorn (D), Hemlock (I), Linden (I), Sugar Maple (D), Mountain Ash (D), Sassafras (I), Scholartree (D), Redbud (D)

5. **Tree Aesthetics**

Choose trees that are aesthetically pleasing, exhibiting good shape and form. Avoid leaning, crooked, and misshapen trees. Occasionally, an odd-shaped tree or one of unusual form may add interest to the landscape if strategically located. Be sure the tree is structurally sound and vigorous.

6. **Spring and Autumn Coloration**

Species differ in fall color. Some are bright red, others orange and yellow. Other species exhibit no autumn color, such as walnut, locust, and sycamore.

7. **Wildlife Benefits**

Favor trees that are preferred by wildlife for food, cover, and nesting. A mixture of evergreens and hardwoods is beneficial. Evergreen trees are important for cover during the winter months. The hardwoods are more valuable for food.

8. **Air Pollution Susceptibility**

Tree species vary greatly to susceptibility to air pollution. Symptoms vary from browning on the edges of the leaves and needles, to stunting of growth, to death of the tree. The following show tolerance to urban stress and are less likely to present problems with sidewalks: Baldcypress, Corktree, Amur maple, Kentucky coffee tree, Crabapple, Dawn redwood, Ginkgo (male), Goldenraintree, Hackberry, Hawthorn, Honeylocust, European hornbeam, Horsechestnut, Lindens, Oaks (excluding pin), Pear, Scholartree, Sourgum (tupelo), Sweetgum, Yews, Zelkova.

9. **Species Longevity**

Favor trees whose life span is long, such as oak, beech, and tulip poplar. Short-lived

trees; (Black locust, Gray birch, Aspen) should be avoided for use as shade, lawn or specimen trees. Although some short-lived trees have an attractive form or pleasing coloration in the spring or fall, such trees may not live for a long time and thus may not be worth preserving.

B. Criteria for protecting remaining trees:

1. General mechanical damage - see Figure 9.3 for correct root zone calculation and placement of tree protection.
2. Box trees within 25 feet of a building site to prevent mechanical injury. Fencing or other barrier should be installed beyond the *Critical Root Radius*. See Figure 9.3. Tree root systems commonly extend well beyond the drip line.
3. Boards will not be nailed to trees during building operations.
4. Feeder roots should not be cut in an area inside the *Protected Root Zone* (PRZ).
5. Damaged trunks or exposed roots should have damaged bark removed immediately and no paint shall be applied. Exposed roots should be covered with topsoil immediately after excavation is complete. Roots shall be pruned to give a clean, sharp surface amenable to healing. Roots exposed during hot weather should be irrigated to prevent permanent tree injury. Care for serious injury should be prescribed by a professional forester or licensed tree expert.
6. Tree limb removal, where necessary, will be done as natural target pruning to remove the desired branch as close as possible to the branch collar. There should be NO flush cuts. Flush cuts destroy a major defense system of the tree. See Figure 9-1. No tree paint shall be applied. All cuts shall be made at the outside edge of the branch collar (fig. 9-1 and 9-2). Cuts made too far beyond the branch collar may lead to excess sprouting, cracks and rot. Removal of a "V" crotch should be considered for free standing specimen trees (see Figure 9-2) to avoid future splitting damage.

Note: For more specific data on certain tree characteristics by species, see Table 9.1, *Tree Characteristics* or consult with a Licensed Professional Tree Expert, Soil Conservation District or Rutgers Cooperative Extension.

Figure 9-1- Removal of Tree Limb

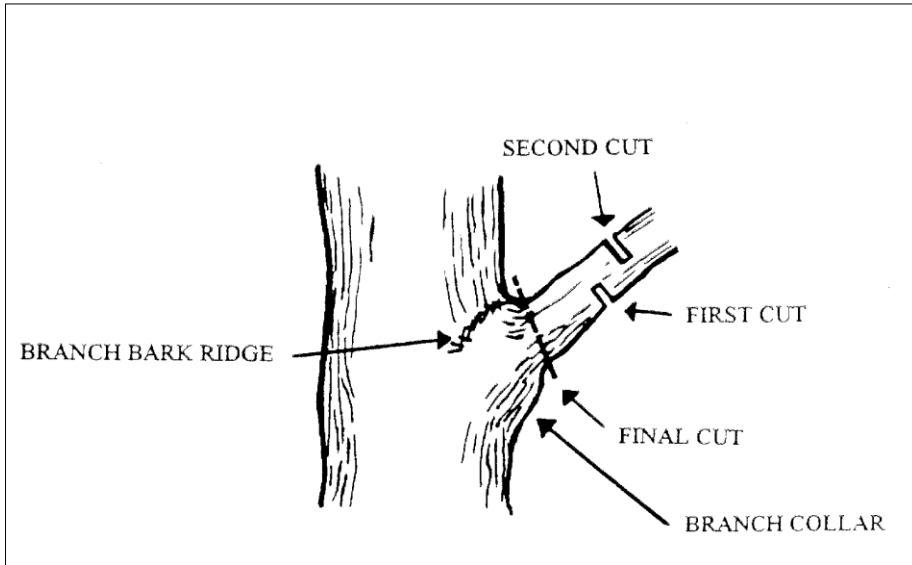
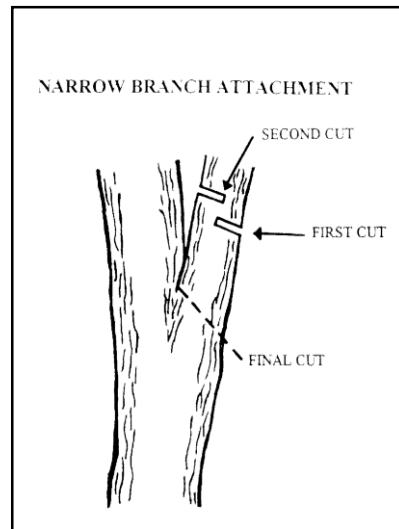


Figure 9-2 - Removal of "V" Crotch Limb



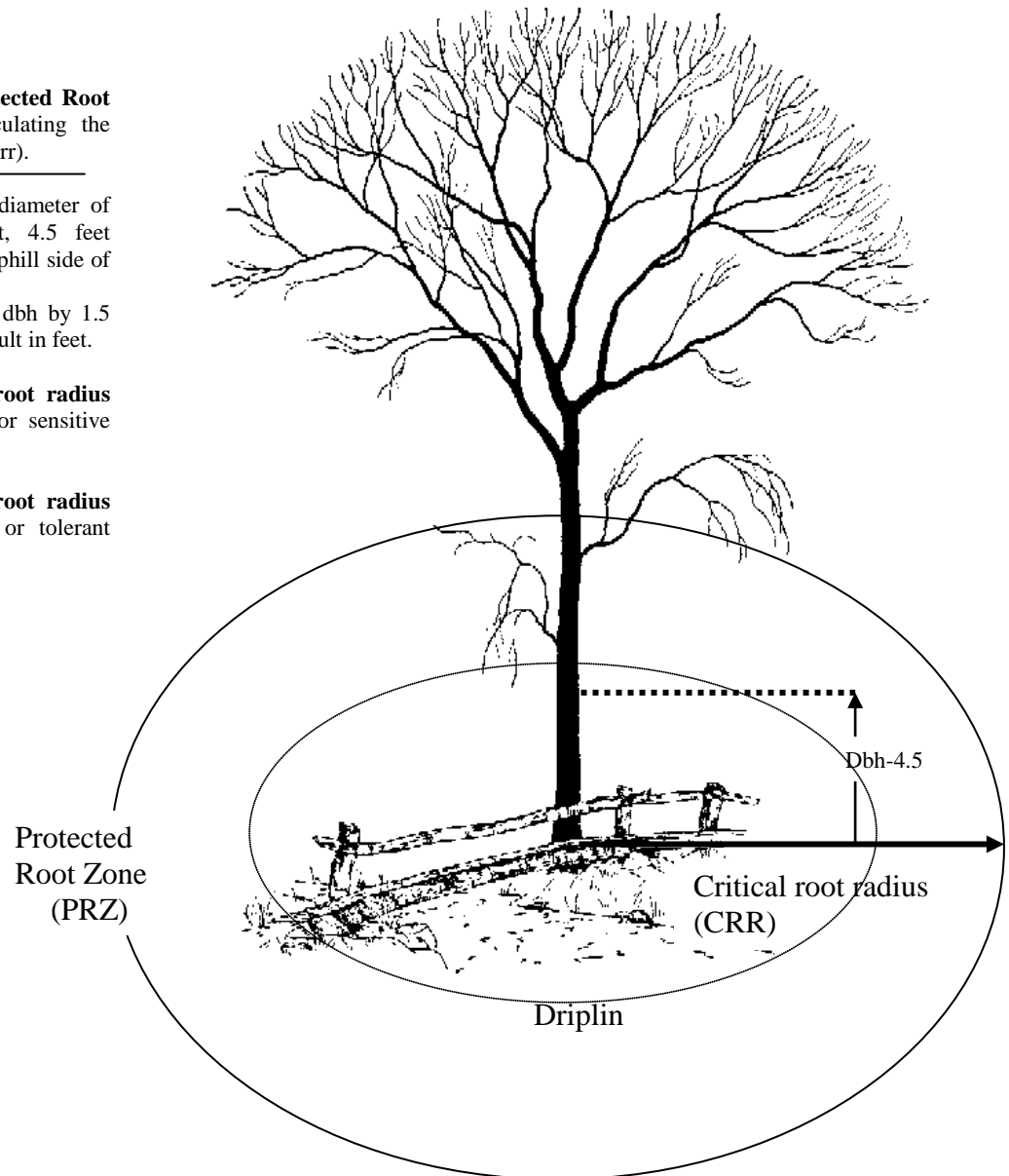
### Figure 9-3: Root Protection During Construction Guide

Estimate a tree's **Protected Root Zone (PRZ)** by calculating the Critical Root Radius (crr).

1. Measure the dbh (diameter of tree at breast height, 4.5 feet above ground on the uphill side of tree) in inches.
2. Multiply measured dbh by 1.5 or 1.0. Express the result in feet.

Dbh x 1.5: **Critical root radius** for older, unhealthy, or sensitive species.

Dbh x 1.0: **Critical root radius** for younger, healthy or tolerant species.



1. *Protecting Trees from Construction Damage- A Homeowners Guide*, Gary R. Johnson, University Of Minnesota Extension Service, Saint Paul, MN, 1999.

Figure 9-4: Tree Protection in Fill Areas

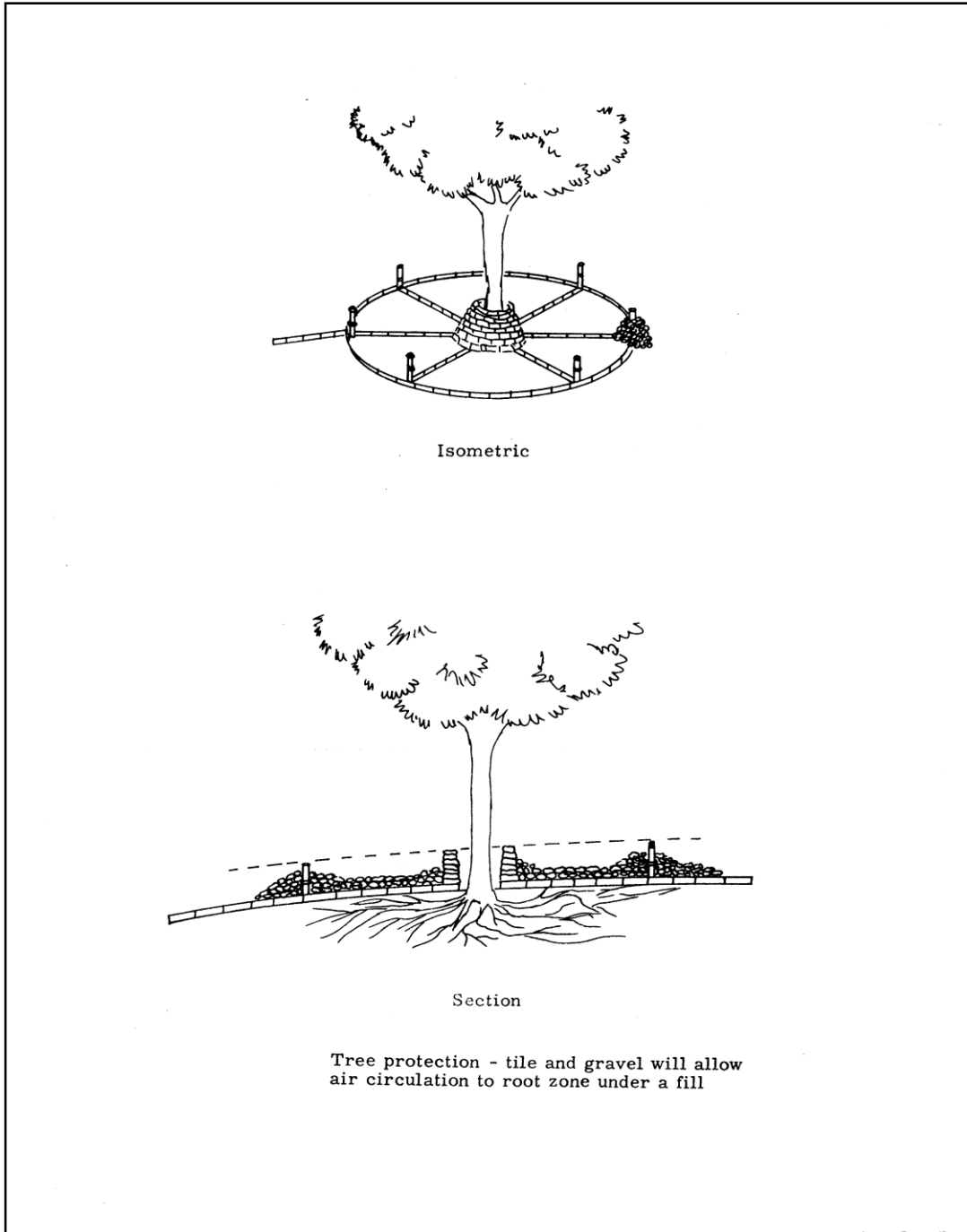
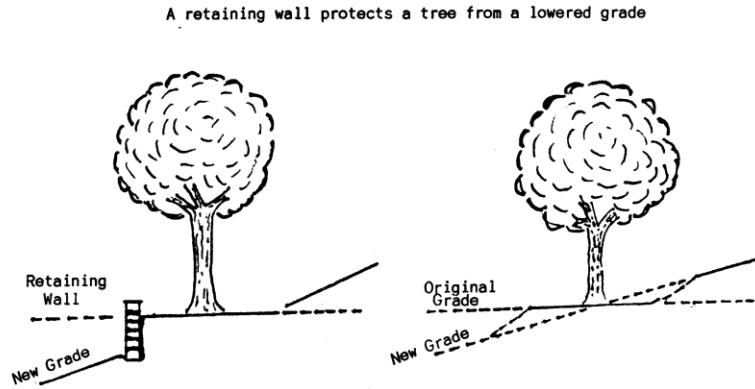
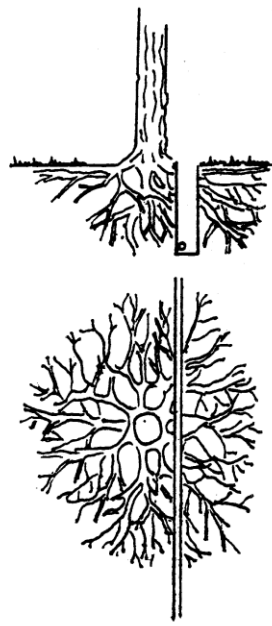


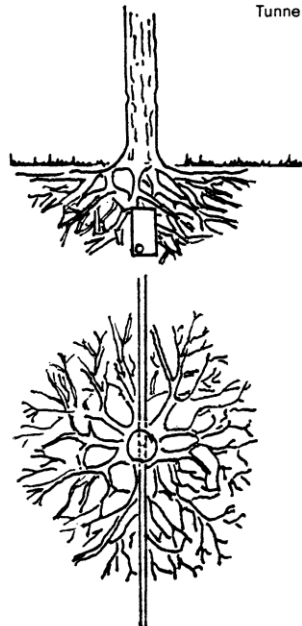
Figure 9-5: Tree Protection in Cut Areas



Trenching



Tunneling - Preferred



Utilities should be tunneled beneath tree roots. The drawings on the left show trenching that would probably kill the tree. The drawings on the right show how tunneling under the tree will preserve many of the important feeder roots.

Figure 9-6: Tree Protection - Underground Utility Installation

Tree Protection During Construction

Table 9-1:

Tree Characteristics <sub>1</sub>

<b>SPECIES</b>	<b>ROOT SEVERENCE</b>	<b>SOIL COMPACTION &amp; FLOODING</b>	<b>SOIL pH PREFERENCE</b>	<b>MATURE TREE HEIGHT (feet)</b>	<b>MATURE CROWN SPRED (feet)</b>	<b>HAZARD TREE RATING*</b>	<b>DAMAGE CAUSING ROOTS</b>
Northern white cedar	Tolerant	Tolerant	6.0-8.0	40-50	10-20	Low	No
Balsam fir	Tolerant	Tolerant	4.0-6.0	40-60	20-35	Medium	No
White fir	Tolerant	Sensitive	4.0-6.5	50-75	10-20	Medium	No
Tamarack (Larch)	Tolerant	Tolerant	4.0-7.5	50-75	15-25	Medium	No
White pine	Tolerant	Sensitive	4.5-6.5	80-100	50-80	Medium	No
Jack pine	Tolerant	Sensitive	4.5-6.5	30-80	20-30	High	No
Red pine	Tolerant	Sensitive	4.5-6.0	50-80	20-40	Medium	No
Scotch pine	Tolerant	Sensitive	4.0-6.5	60-100	30-50	Medium	No
Eastern redcedar	Tolerant	Sensitive	4.7-7.8	40-50	10-20	Low	No
Black spruce	Tolerant	Tolerant	3.5-7.0	30-70	15-30	Medium	No
Colorado spruce	Intermediate	Tolerant	4.6-6.5	50-100	20-30	Medium	No
White spruce	Tolerant	Intermediate	4.5-7.5	40-80	20-30	Medium	No
Black ash	Tolerant	Tolerant	4.1-6.5	40-70	30-60	Medium	No
Green ash	Tolerant	Tolerant	6.0-7.5	30-60	30-50	Medium	No
White ash	Tolerant	Intermediate	5.0-7.5	70-80	50+	Medium	No
Bigtooth aspen	Tolerant	Sensitive	4.8-6.3	50-75	20-35	Medium	Yes
Trembling aspen	Tolerant	Sensitive	4.8-6.5	40-60	20-35	Medium	Yes
Blue beech	Sensitive	Sensitive	6.5-7.5	20-30	15-20	Low	No
Paper birch	Intermediate	Sensitive	5.0-8.0	50-70	30-50	Medium	No
River birch	Tolerant	Tolerant	4.0-6.5	40-70	30-50	Low	No
Yellow birch	Intermediate	Sensitive	4.5-8.0	50-70	50-70	Medium	No
Boxelder	Tolerant	Tolerant	6.5-7.5	40-60	35-50	High	Yes
Ohio buckeye	Intermediate	Intermediate	6.1-6.5	30-50	30-40	Medium	Yes
Butternut	Sensitive	Intermediate	6.6-8.0	40-60	50-60	Medium	No
Catalpa	Intermediate	Tolerant	6.1-8.0	50-80	30-50	Medium	No
Black cherry	Intermediate	Sensitive	6.0-7.5	50-70	40-50	Low	No
Kentucky coffeetree	Intermediate	Intermediate	6.5-7.5	50-80	40-50	Low	No
Eastern cottonwood	Tolerant	Tolerant	5.5-8.0	80-100	80-100	High	Yes
Red-osier dogwood	Tolerant	Intermediate	6.1-8.5	8-10	10-12	Low	No



SPECIES	ROOT SEVERENCE	SOIL COMPACTION & FLOODING	SOIL pH PREFERENCE	MATURE TREE HEIGHT (feet)	MATURE CROWN SPRED (feet)	HAZARD TREE RATING*	DAMAGE CAUSING ROOTS
American elm	Tolerant	Intermediate	5.5-8.0	70-100	70-150	Medium	Yes
Slippery elm	Tolerant	Intermediate	6.6-8.0	60-70	40-60	Medium	Yes
Hackberry	Tolerant	Intermediate	6.6-8.0	30-130	50+	Low	No
Hawthorn	Intermediate	Intermediate	6.0-7.5	20-40	20-30	Low	No
Bitternut hickory	Intermediate	Intermediate	6.0-6.5	40-75	30+	Medium	No
Honeylocust	Tolerant	Intermediate	6.0-8.0	50-75	50-75	Medium	Yes
Ironwood	Sensitive	Sensitive	6.1-8.0	25-50	20-30	Low	No
Basswood	Intermediate	Sensitive	5.5-7.3	70-100	50-75	High	No
Black locust	Tolerant	Sensitive	4.6-8.2	30-60	20-50	Medium	No
Red maple	Tolerant	Tolerant	4.5-7.5	50-70	40-60	Medium	Yes
Silver maple	Tolerant	Tolerant	5.5-6.5	60-90	75-100	High	Yes
Sugar maple	Intermediate	Sensitive	5.5-7.3	60-80	60-80	Medium	Yes
Mountain-ash	Tolerant	Intermediate	4.0-7.0	15-25	15-25	Medium	No
Black oak	Sensitive	Sensitive	6.0-6.5	50-80	50-70	Medium	No
Bur oak	Tolerant	Intermediate	4.0-8.0	70-80	40-80	Low	No
Pin oak	Sensitive	Sensitive	5.5-7.5	50-75	30-50	Medium	No
Red oak	Tolerant	Sensitive	5.5-7.5	50-75	30-50	Medium	No
Swamp white oak	Intermediate	Tolerant	6.0-6.5	60-70	40-50	Low	No
White oak	Sensitive	Sensitive	6.5-7.5	60-100	50-90	Low	No
Plum	Tolerant	Sensitive	6.5-6.6	20-25	15-25	Low	No
Serviceberry	Intermediate	Sensitive	6.5-6.6	20-25	15-25	Low	No
Black walnut	Sensitive	Intermediate	6.6-8.0	70-100	60-100	Medium	No
Black willow	Tolerant	Tolerant	6.5-8.0	30-60	20-40	High	Yes

Table 9.1:

\* **Hazard tree rating:** refers to the relative potential for a tree to become hazardous. For a tree to be considered hazardous, a potential "target" (e.g., a house, a sidewalk, pedestrians) must be present. A high hazard tree rating does not imply that the tree will always fail.

1, *Protecting Trees from Construction Damage- A Homeowners Guide*, Gary R. Johnson, University Of Minnesota Extension Service, Saint Paul, MN, 1999.