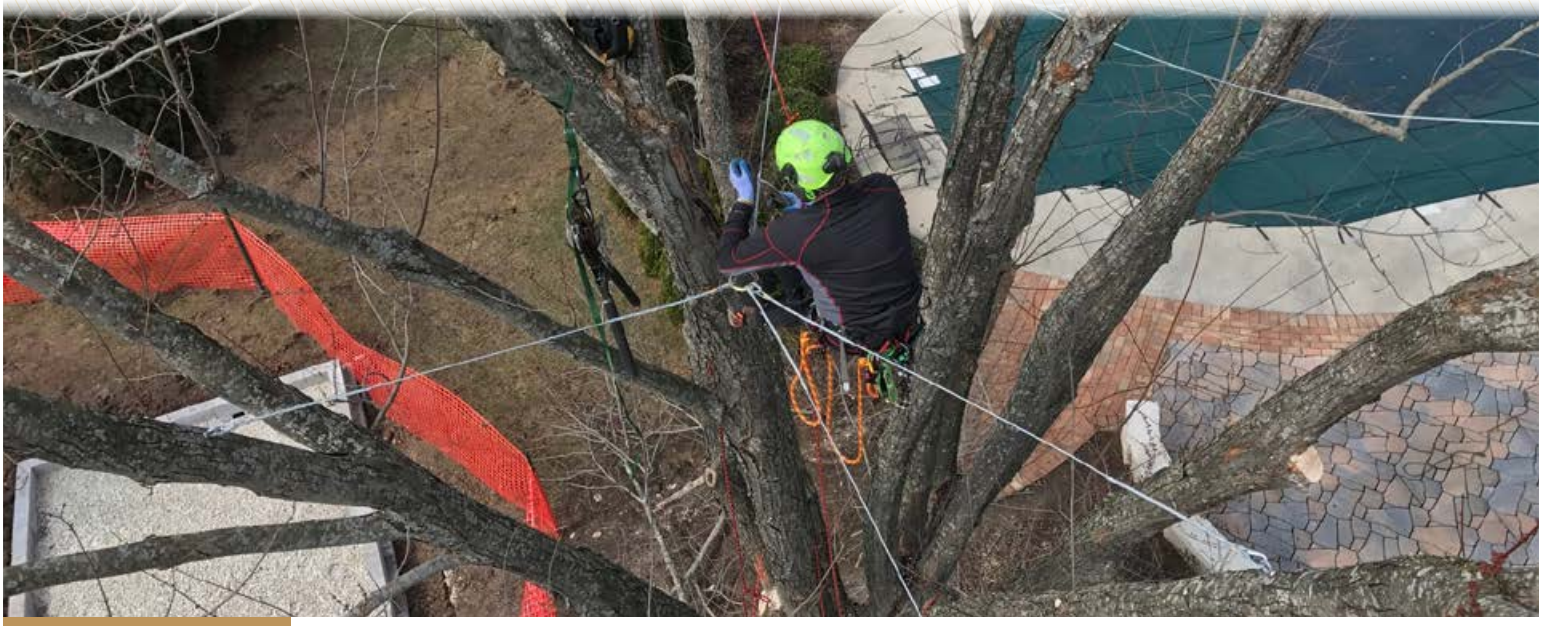
PURDUE EXTENSION

FNR-550-W

EXPERT REVIEWED



Large Tree Cabling and Bracing

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Trees can grow in ways that aren't always the safest or most sustainable for long-term health and safety. This can happen for many reasons: species characteristics, growing location, or lack of proper pruning in early life stages. When this results in poor branch structure, branches are less likely to break if they have reinforcement or corrective pruning.

Cabling, bracing, guying, or props may help prevent branch or whole-tree failure. These tree support systems reinforce critical areas of the tree by limiting the movement of branches or leaders. They help reduce the risk of injury to humans and damage to property by providing supplemental support for structurally weak areas of the tree. However, it is important to understand that not all risk can be mitigated by tree support installations. Also, not all trees can be reinforced with supplemental support. A qualified arborist (e.g., an International Society of Arboriculture Certified Arborist) should be consulted to determine a tree's eligibility for a support system.

Common Structural Deficiencies in Trees

The most common risk of tree failure is the presence of one or more codominant stems. **Codominant stems** or "V-crotch" branch unions are structurally weak compared to a single stem or those with proper

This codominant oak tree is predisposed to failure and would benefit from cabling and/or bracing.

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branch aspect ratios and spacing. The weakness is due to lack of connective tissue anchoring a stem to the tree trunk and the presence of included bark between the stems. The longer the codominant stems, the greater the likelihood of failure, especially on larger trees. The best solution for problems associated with codominant stems is to avoid them altogether by selecting plants with good branch structure. For a tree with poor branch structure, an alternative is to remove or subordinate prune one of the codominant stems as early as possible in its life, allowing for the development of a dominant leader. (See Purdue publications *Tree Pruning Essentials,* FNR-506-W and *Tree Pruning: What Do Trees Think?* FNR-534-W) For older trees with poor branch structure, bracing or cabling may be the only option for strengthening the weak area of the tree.

Overextension often results in structural problems. This is the presence of unusually long, heavy, or far-outstretched limbs where most foliage is concentrated toward the end of the branch. Overextended limbs often break at the junction of the branch and stem. Alternatively, a branch may crack due to tension and compression. These failures usually occur when a branch is under a heavy load of wind, snow, or ice. Installation of cables or propping may be used to avoid making large pruning cuts; however, early corrective pruning is the best course of action to prevent this condition.

This overextended limb may have an increased risk for failure. Cabling or props could help support the limb.

Tree Support Devices

Cables and brace rods are supplemental structural supports intended to reduce the risk of failure of weak stems, branch unions, and multiple leaders. A **cabling system** consists of flexible, extra-high-strength steel strand cables attached to bolts installed in the upper crown of a tree by drilling through the wood. Cabling may reduce stress damage from high wind or the weight of ice or snow. Essentially, cabling strengthens weak branch unions or limbs so that they can better withstand severe weather conditions and survive longer. The system transfers weight from a weak branch union to a stronger one, prevents breakage, and restricts the distance that a branch can move in relation to the rest of the tree. Cables are also installed on overextended branches to support those branches.

Cabling helps limit the movement of limbs to reduce the likelihood of failure.

Alternative **dynamic**, or **soft cabling systems**, use a synthetic rope attached to the tree without invasive drilling. These systems can be less damaging to the tree and can be used where hardware installation isn't possible. All cabling systems are intended to limit the movement of the supported branches so they are less likely to fail during storms.

Dynamic cabling systems are less invasive options for tree support systems.

Braces are threaded rods that are installed through unions of weak branches and multiple stems by drilling through the tree to provide more rigid support. Brace rods are used when trees have codominant or multiple leaders. These rods reduce the risk of the stems spreading apart or moving sideways in relation to each other. In many instances, bracing can be used to repair a crotch or branch union that has split. Often a combination of cabling and bracing is implemented to obtain the safest and most stable support for the defective tree parts.

Brace rods may be used alone or in combination with cabling to help reduce splitting of codominant leaders on trees.

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Cable and bracing installation is a complicated process best completed by qualified arborists. Before installing any system, the first step is contacting a qualified professional such as an International Society of Arboriculture Certified Arborist. The tree should be reviewed carefully and objectives of the installation should be clearly defined. Pruning is often an integral part of the process and should be completed prior to any installation. Maintenance following tree support installation is minimal, but also important. Ground inspections should be conducted annually for loose hardware or adjustments. Usually, every three years the support system should be inspected by an arborist who ascends the tree for a closer look.

Using Tree Supports

Installing tree support systems can help reinforce weak branches, repair split trunks, and reduce the possibility of failure. Often, significant branches and even entire trees are needlessly removed when supplemental support systems may mitigate the defect and reduce the risk.

Typically, support systems are used to reduce the risk of tree failure, such as when cables and/or braces are utilized to strengthen structural weaknesses (e.g., codominant trunks) on an otherwise healthy tree. However, restoration is another application for supplemental reinforcement. For example, a large tree may have been damaged in a storm and lost a major leader. This loss exposes other branches to the likelihood of further damage—and supports may mitigate the increased risk. An overextended branch that threatens a pedestrian walkway may be another candidate for supplemental support.

Not all trees are candidates for support systems, nor should all trees be saved. Some trees cannot be cabled or braced due to poor health, decayed wood, or lack of value due to the species or location. The primary question to ask is, "Can the risk be reduced to an acceptable level for the tree manager or owner through support installation?"

Additional important considerations and questions to ask as you decide if you should save a tree include:

- Is this a reasonable treatment for the tree, or am I just trying to preserve a tree which should be removed?
- Is this expenditure reasonable, or is a new tree a better long-term investment?
- Is the tree healthy enough to allow support equipment to be installed?
- Do I understand that support systems are no guarantee against failure?
- Am I prepared to have the system inspected regularly, then perhaps replaced after 7–10 years?

Cabling and bracing do not eliminate risk of tree failure, but when done correctly by a certified arborist, they can extend the life of a tree or make it safer. Done incorrectly, they can create an even greater hazard. Be sure to consult an ISA Certified Arborist or other qualified tree care professional to help determine if your tree can benefit from a support system.

Resources

Tree Support Systems: Cabling, Bracing and Guying. Best Management Practices Series, International Society of Arboriculture, Champaign, IL.

Some images courtesy of Bartlett Tree Experts, Wachtel Tree Science and Cobra Systems.

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