Minnesota Tree Care Advocate's

Minnesota Citizen Pruner

– : City of Maple Grove : –

Cooperative University of Minnesota and City of Maple Grove program

Amended by Ashley Reichard, Volunteer Programs Coordinator

University of Minnesota

Department of Forest Resources Urban & Community Forestry

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PROGRAM OVERVIEW

Minnesota Citizen Pruner Program Introduction

Citizen Pruner is a pilot program to increase local capacity by working with municipalities and engaging citizens in community forestry. Citizen Pruner volunteers are trained in tree identification, biology, and pruning techniques to help maintain tree health and public safety. If this pilot program is successful, Citizen Pruner certification will be valid for three years.

Renewal competency assessments will be available online or through postal mail at no cost. Recertification is issued at the end of each calendar year.

Citizen Pruners are needed now more than ever. As municipal budgets continue to be cut, the aid from citizens becomes increasingly more important to communities. Citizen Pruners are able to manage small branches near the ground while tree care professionals can focus on larger branches higher in the tree canopies. Completing this ground work is vital for clearing sight lines and blocked sidewalks.

Citizen Pruner Code of Conduct

Citizen Pruner volunteers serve at the discretion of the Citizen Pruner program. Just as it is a privilege for the Citizen Pruner program to work with volunteers who offer their time and talent, volunteer involvement in the program is a privilege and responsibility, not a right.

The purpose of the standards of behavior is to ensure the safety and well-being of all Citizen Pruner participants (i.e. target audiences, staff, other professionals, volunteers) and to ensure a positive, enjoyable experience for volunteers.

Citizen Pruners will:

- uphold volunteerism as a way to meet the urban forest needs of Minnesota
- represent the program with dignity and respect by being a positive spokesperson for the program and the city
- be courteous, civil, and respectful.

Failure to honor these standards can result in Citizen Pruner status removal. Not honoring these standards must be confirmed. The program director must authorize any termination.

Resolution of the conflict may lead to reinstatement, reinstatement with limitations, reassignment of volunteer duties, or removal from the program.

Program Staffing

- Gary Johnson - Director: directs and administers the program; oversees development and delivery of education and program operations. Contact: johns054@umn.edu
- Ashley Reichard - Volunteer Program Coordinator: organizes and relays program information to volunteers from the University of Minnesota. Contact: reich343@umn.edu or 612-625-2361
- Joe Bennett - Street Department Supervisor: determines volunteer events within the city of Maple Grove. Contact jbennett@maplegrovemn.gov or 763-494-6365

Communications

- MN Tree Source Website - additional information and resources (www.mntreesource.com)
- Tree Care Advocate Website - additional MN tree volunteer programs (www.mntca.umn.edu)
- UMN Headquarters - 115 Green Hall, 1530 Cleveland Avenue North, St. Paul, MN 55108-6112

Programs Guidelines, Policies, and Procedures

Minimum Age Requirement

Participants in the Citizen Pruner program must be 18 years or older, confirmed with a valid photo I.D. or have signed parental consent.

Certification and Recertification

Core Course

New volunteers must complete Core Course education and pass the initial competency assessment by answering 75% of the questions correctly to be a certified Citizen Pruner in active status, and will receive a certificate and membership card. Certification is valid for three years. Please contact citizenpruner@mntca.org if you are interested in recertifying after the initial three year period as an active Citizen Pruner.

Data Collection

Data collection by Citizen Pruners is crucial. Data is used to generate reports that are given to stakeholders and municipalities. Citizen Pruners are expected to take data on each tree pruned, noting location of each tree pruned, and all aspects of pruning that took place on each tree.

Forms are given to each group of Citizen Pruners at the start of a volunteer event. One volunteer from each group collects data. The data collector should have legible handwriting, and must be accurate and concise.

Once data is collected in the field, one volunteer from each group submits the data online at http://www.mntreesource.com/report-your-hours.html. The original paper form is given to the city contact. See the data collection form in Appendix A. To print more data collection forms, go to http://www.mntreesource.com/cp-additional-resources.html.

Public versus Private Property

Only trees will be pruned on public property such as parks, rights-of-way, and boulevards. Public property boulevards can vary greatly but, are typically within 10-15 feet of the curb, but this can vary from street to street. If it's questionable whether a tree is on public or private property, ask city staff. Otherwise, do not prune the tree.

How to Work with the Public

The public is interested in what volunteers are doing. Provide a courteous explanation about the Citizen Pruner program, and the partnership between the city and the University of Minnesota. Many people are concerned and care deeply about trees, especially if it is right in front of their home. Most people are positive, a few may be negative. It is important to remember that you are an ambassador on behalf of the city and the Minnesota Citizen Pruner program, and you may be able to recruit new volunteers to help care for your public trees.

Show your Citizen Pruner ID to anyone who questions what you are doing and explain that you have taken a course and a competency assessment for certification. Inform them that what you are doing is helping the trees. Emphasize that you have been authorized by your city to prune these tree. Thank them for their concern, as we need more people who are concerned about their street trees. If a citizen exhibits resistance to your pruning activities, discontinue pruning, and move to another location if possible. Note the location you discontinued work and inform your city contact of the interaction.

As the public sees you work, they will see you as a source of knowledge and may ask you to look at their own tree. Do not answer questions about private trees because it could be a liability to volunteers and the program, and can infringe on private industry. In a courteous manner explain to them the Citizen Pruner program, and the partnership between the city and the University of Minnesota. Recommend they contact a Certified Arborist and provide them with the Tree Owner's Manual card (see Appendix B).

All questions involving public property, including trees and infrastructure, should be directed to the city. If possible, provide the citizen with the appropriate city contact information.

General city questions should be directed to: City of Maple Grove at 763-494-6000

Any questions about public trees should be directed to: City Contact Kelly Matzke at kmatzke@maplegrovemn.gov or 763-494-6370

Safety

There are a number of safety regulations in place for the safety of volunteers, citizens, and the protection of surrounding infrastructure. Volunteers are expected to follow all of the regulations set by the Citizen Pruner program and by the city. If the Citizen Pruner program discovers that safety precautions are being disregarded by any volunteer, the Citizen Pruner status will be suspended. The volunteer will be immediately placed on temporary inactive status and may be placed on inactive status following decisions made by the city contact and the program director.

Citizen Pruner safety regulations include:

- Only branches within arms reach, while both feet are firm on the ground may be pruned. Pruning anything above that is prohibited. Any low hanging branches that require the attention of the city should be reported to Kelly Matzke.
- Anything removed from the tree should be around 2 inches in diameter at the branch collar ridge or smaller. A good way to approximate this size is by wrapping a hand around the branch; it is the right size to remove if thumb and fingers touch.
- Electricity can flow through branches, so never prune trees/branches that are within 10 feet of utility lines.
- Never get on a ladder., so if pruning can't be done with both feet on the ground, do not do it.
- Be aware of your surroundings.
  - Sometimes you won't be able to prune things you want to without stepping into the street. If you are on a street that is not busy, you may have a group member watch for cars while you make a good cut.
  - When you are pruning, or others are pruning around you, make sure that you or others stand clear of the branch drop zone. Even seemingly small branches can injure a person.
- Dress code:
  - wear city supplied safety equipment at all times, this includes but is not limited to protective eyewear, helmet, high visibility safety vests, etc.
  - no open toe shoes
  - no offensive clothing, e.g., too revealing, offensive graphics or words

Managing Brush

Manage brush so it is safe for citizens and convenient for the city. Keep brush cleared from all sidewalks, out of the street, and at least 10 feet away from any fire hydrant. Maintaining brush in a courteous and safe manner is crucial.

Following a volunteer event, the city will haul the brush away. If you are pruning independently, make sure to alert the city immediately of the location of the brush so they can pick it up as soon as possible.

Make as few piles of brush as possible on each boulevard. For ease of handling brush, stack the brush with the pruned end of the material facing the street. If brush is too large to fit with the pruned end of the branch out in the boulevard space provided, cut the brush into smaller pieces or, turn the brush pile parallel with the street while keeping the cut ends together.

SCIENCE AND ART OF PRUNING

Tools of the Trade

Tools

Tools will be provided to you at each volunteer event, or you may bring pruning shears and handsaws from home. Please check with your city contact before bringing your own tools or if interested in using larger equipment.

Types of Tools

Different tools are used for different types of pruning. Tools are usually differentiated by the size of what will be pruned.

Bypass pruners

Bypass pruners have curved blades that act like a scissor as they overlap. Properly sharpened bypass pruners leave a smooth, well-defined cut and do not crush plant material. Bypass pruners typically have up to a 1-inch diameter cutting capacity.

Handsaw

Pruning saws come in many shapes and sizes. The blade may be curved or straight, and have either fine or coarse teeth. Pruning saws should be used to remove 1-inch to 2-inch diameter branches.

Pole Pruners

Pole pruners are very similar to the bypass pruner, in that they act like a scissor to make a cut. Properly sharper pole pruners to make a smooth, well-defined cut that does not crush plant material. Pole pruners typically have up to a 1-inch diameter cutting capacity.

Image: Pole Pruner

Image: Bypass pruners

Image: Handsaw

Tool Cleaning Procedure

Clean tools of all debris and dirt with soap and water after a volunteer shift. Disinfect tools with rubbing alcohol. Dry pruning tools and/or spray the blades with WD-40 before putting them away to prevent rusting. Note: tools need to be cleaned and disinfected before pruning some tree species (See Tree Identification and Pruning Restrictions).

Tree Identification and Pruning Restrictions

Correctly identifying the type of tree about to be pruned is the first crucial step in pruning trees. Different species of trees are susceptible to diseases at different times of year. Pruning trees at the wrong time can lead to infection.

Linden

Lindens, also known as basswoods, are a species that commonly produce sprouts and suckers.

Photos: Dave Hanson

Leaves: alternate, simple, 4”-8” long, coarsely serrate edges; heart-shaped, unequal base.

Twigs: slender, round 2-scaled, reddish bud. **Fruit**: ¼-⅜”, round, under leaf like bract, no ridges.

Bark: light gray when young, darkens with age, narrow/shallow flat topped ridges.

Oaks

Pruning oaks at the wrong time of year can lead to infection by oak wilt, which can result in the tree's death. The safe period for pruning oaks is typically November through March.

Visit www.myminnesotawoods.umn.edu/2010/03/oak-wilt-risk-status-in-minnesota for the current oak wilt infection status. Do not prune oaks from April through October. If pruning is necessary, spray with shellac.

Photos: Dave Hanson

Leaves: alternate, simple, 4-7" long, 5-12 shallow rounded lobes, shiny green top, whitish below.

Fruit: ¾" to 1¼" paired acorns, 1"-4" stalk. Acorns mature in the autumn.

Bark: light brown, papery, scales become blocky and deeply fissured with age.

Photos: Dave Hanson

Leaves: alternate, simple, 4-9" long, 7-11 bristle-tipped lobes, sinuses cut ½ way to midrib.

Fruit: ⅝" to 1⅛" acorn, shallow cap, scales pubescent, acorns mature autumn of second season.

Bark: gray to red-brown, smooth, shiny, becoming grayish flat-topped ridges, deeply furrowed.

Bur Oak

Code: QUMA

Family: Fagaceae

Quercus macrocarpa

Photos: Dave Hanson

Leaves: alternate, simple, 4-12" long, 5-9 rounded lobes, center sinuses cut to mid-rib.

Fruit: acorn, fringed (bur) cap covers ½ or more of ¾" to 2" acorn, acorns attached direct to twig.

Bark: grayish with vertical ridges, deeply furrowed. Bur oak can have corky twigs.

White Oak

Code: QUAL

Family: Fagaceae

Quercus alba

Photos: Dave Hanson

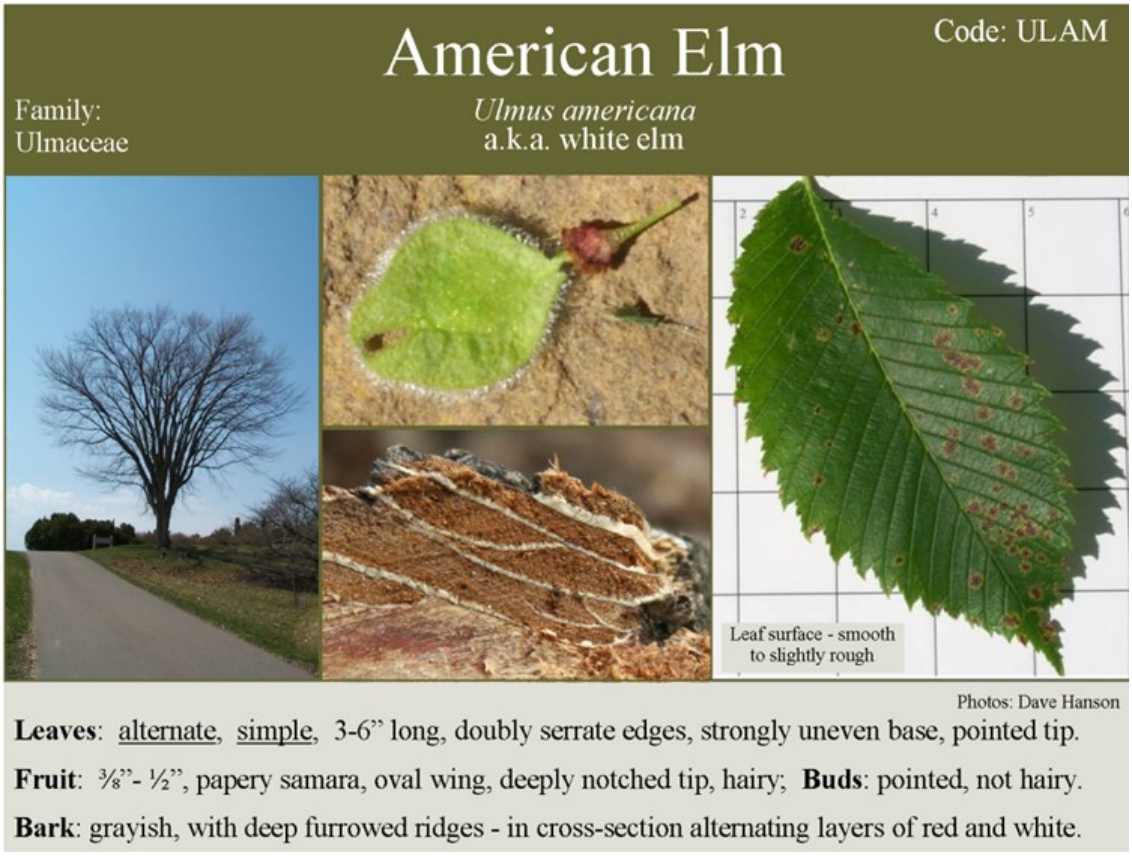
Leaves: alternate, simple, 4-9" long, 5-9 rounded lobes, sinuses nearly uniform in depth.

Fruit: acorn, ⅜" to 1¼" acorns, cap covers top ¼-⅓, acorn is attached via a ¼" stalk.

Bark: Light ashy-gray, narrow vertical ridges, with age breaks into blocky, irregular shapes.

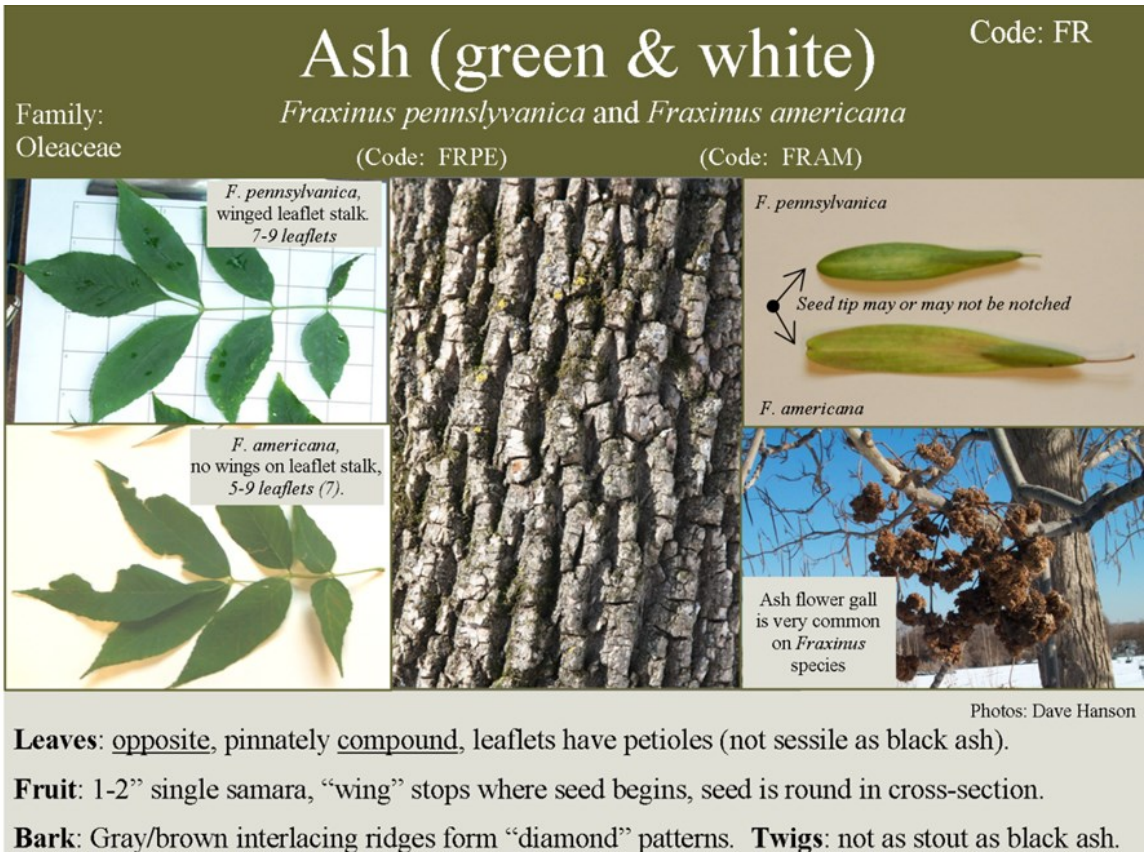
Elms

There are a variety of diseases that can affect elm. Whenever possible, elms are best pruned during the dormant season (November to March). If necessary to prune during the growing season, spray wound with shellac.



Ash

Ash trees infested with Emerald Ash Borers (EAB) shouldn't be pruned during their flight season (beginning of May through end of August). Flight seasons can change depending on spring and fall temperatures. Cold springs delay flight season and warm falls extend flight season. Pruning ash trees during the flight season of the adult insect encourages their movement to other healthy trees nearby.



Honeylocust

Nectria canker is a disease that spreads when the weather is wet, so pruning Honeylocust in the spring to fall should be avoided. Pruning in the heat of the summer or from the late autumn to late winter is most desirable to avoid spreading diseases. It is also important to thoroughly clean and disinfect tools before pruning a Honeylocust. Spray or dip the saw or pruners blade in rubbing alcohol and "flame" with a match or lighter.

Crabapple and Mountain Ash

These trees are all susceptible to fireblight, which can be spread through pruning wounds during spring and early summer. This means crabapples and mountain ashes should be pruned during the late fall or late winter (October through November, and February through early April, respectively).

Photos: Dave Hanson

Leaves: alternate, simple, 1-3" long, elliptical-ovate, finely serrated, showy white to red flowers.

Fruit: small apple or pome (< 2"), variety of colors, some persist into late winter.

Bark: gray/pink thin, scaly/flaky. **Twigs**: moderately thick, foliage/fruit on spur shoots.

Photos: Dave Hanson

Leaves: alternate, pinnately compound, 6-10" long, 11-17 sharp, finely-toothed leaflets.

Twigs: twig, stout gray-reddish. **Buds**: dark, pointed, resinous, hairy. **Fruit**: small red-orange "berries" in a cluster. **Bark**: grayish, smooth, lenticels in youth - ages to splitting, peeling, rough.

Birches

There are a variety of problems that can affect birches...none of which are related to pruning. People fear pruning in the spring causes them to bleed and causes problems. Trees don't bleed, the y exude sap. No harm done.

Paper Birch

Code: BEPA

Family: Betulaceae

Betula papyrifera

Photos: Dave Hanson

Leaves: alternate, simple, coarse doubly toothed margins, leaf base - symmetrical, rounded.

Twigs: reddish-brown with prominent lenticels. Male catkins are often present at twig ends.

Bark: young reddish bark, lenticels - matures to white peeling bark, at tree base dark and fissured.

Maples

Again, there are a variety of problems that can affect maples...none of which are related to pruning. People are even more fearful of pruning maples in the spring that results in "bleeding." Maples don't bleed, they exude sap. Note that people aren't squeamish about pouring maple "blood" on their pancakes.

Sugar Maple

Code: ACSA2

Family: Aceraceae

Acer saccharum

Autumn maturing double samara

Photos: Dave Hanson

Leaves: opposite, simple, 3-6" long, 3-5 pointed lobes; "U" sinuses, coarsely toothed margins.

Twigs: brown, pointed buds. **Fruit**: 1-1¼" long, paired; horseshoe shape, green turning brown.

Bark: Young gray/brown and smooth; Becomes dark and deeply furrowed when older.

Types of Removals from Trees

Citizen Pruner volunteers are tasked with removing sprouts, suckers, deadwood, and leftover tree stem protection systems. It's not only important to correctly identify and remove them, but also know why they form and are used.

Tree Stem Protection Systems

Tree stem protection systems are used to protect the tree's stem from physical damage. Weed whips, lawnmowers, animals, and herbicides commonly cause physical damage to tree stems.

Even though the intent of tree stem protection systems is to protect the tree, they can be damaging if secured incorrectly or left on too long. Stem protection applied to tightly or left on too long can compress the stem. This can restrict water and nutrient uptake, and constrain normal flow through the stem.

Stem protection systems should be removed when they are tight to the stem. When removing any stem protection systems, keep them separate from the pruning debris.

Remaining string/rope ties and ID tags should be identified and removed within a timely manner. Be sure to check with the city first to ensure that they have recorded the species into their inventory data before continuing.

Mulch Volcanoes

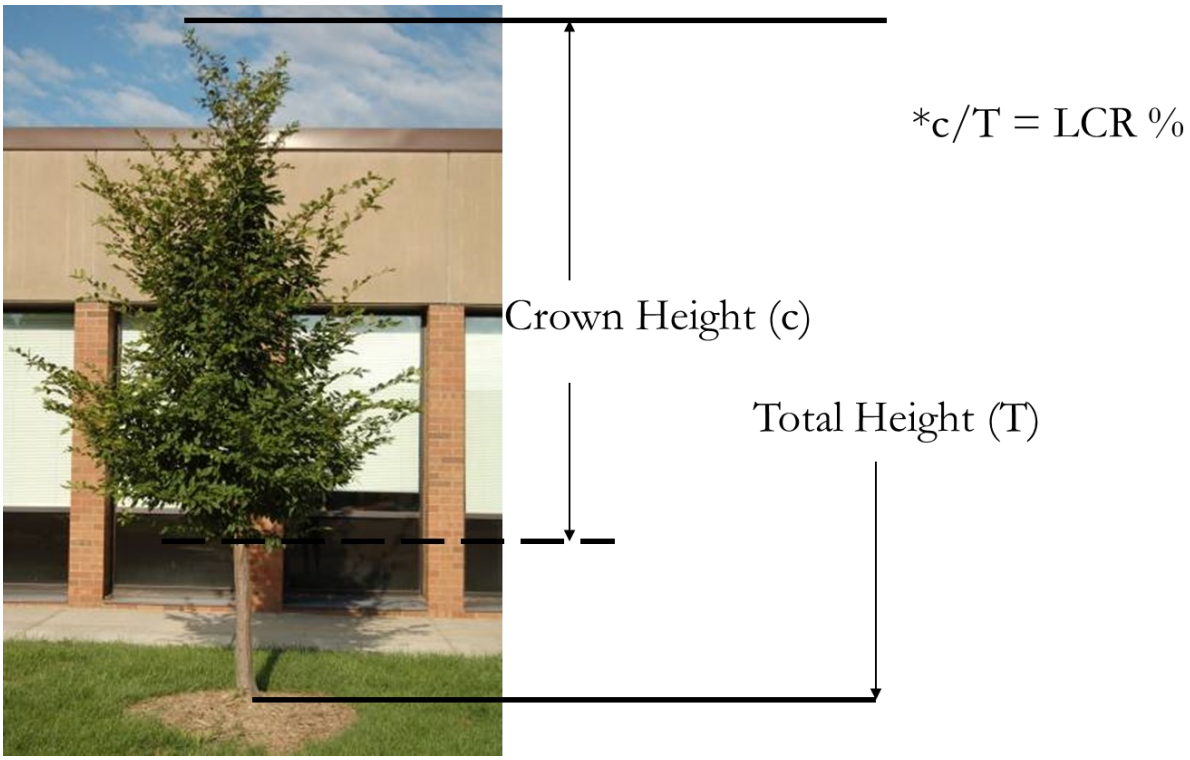
Mulch volcanoes happen when mulch is piled too close to the stem of the tree to the point where it looks like a volcano. This is not healthy for the tree and can create an environment that promotes stem girdling roots, insects, and diseases.

Mulch should be moved away from the stem so that the mulch is no longer touching the stem. Use your hands to move the mulch so that it creates a ring around the stem like doughnut.

Before starting to prune keep these two rules in mind:

1. Always keep a good Live Crown Ratio. This means that for deciduous trees 60% of the tree should contain a living crown, and for coniferous trees this means 75% should be in Live Crown

2. Never remove more than 25% of the trees Live Crown in one pruning season.



Suckers

Suckers are sprouts that develop at the base of the trunk or off the tree's root system. Suckering may occur when trees are planted too deeply, or because of stem girdling roots. Some tree species such as apples and lindens are naturally prone to suckering.

Why suckers become a problem:

Suckers become a problem when they block sight lines, sidewalks, and streets.

Image: Sucker on Tilia (Linden)

Image: Sucker on Tilia (Linden)

Sprouts

A sprout (or watersprout) is a fast-growing, often very upright branch that emerges from the tree trunk.

Why sprouts become a problem:

Not only can sprouts block site lines, creating safety issues for drivers or pedestrians, they can also be a disadvantage to the tree. Sprouts form weak branch unions because they are more shallowly attached than branches at a normal branch union. Large sprouts have a greater potential to fail because of their weak branch union attachment.

Image: Sprouts on Tilia (Linden)

Included bark

Included bark is when bark grows in between a branch union which prevents the branch from attaching correctly to the trunk or another branch.

Why included bark is a problem:

Since bark is growing between the union, woody material is unable to attach the branch correctly. This creates a weak union which is more likely to fail, causing it to fall.

Image: Included bark on Malus (Apple)

Co-dominant leaders

The term co-dominant leader is used to describe two or more main stems that are about the same diameter and emerge from approximately from the same location on the trunk.

Why co-dominant leaders are a problem:

The closer in size a branch is to the main stem, the more likely it is to fail. Co-dominant leaders are similar in size and competing for dominance, they are all closer in size to the main stem and are thus more likely to fail.

Choosing a leader:

First you must choose which leader to keep. Look for leaders that are central to the stem, and straight in nature. Also be aware of leaders that have the best structure with good branch attachments. Once you've chosen the leader, you do not need to completely remove all of the competing leaders, but the ones you do not remove you should suppress using a reduction cut (see page 23).

Image: Co-dominant leader on Acer (Maple)

Crossing or rubbing branches

Crossing or rubbing branches occur when two separate branches begin to collide with one another.

Why crossing or rubbing branches are problems:

Crossing or rubbing branches can injure bark and other living tissue on the branch, which makes the branch more prone to decay or disease.

Image: Rubbing branch on Malus (Apple)

Good spacing between branches

The vertical space between branches should eventually be 12 inches for fruit or small stature trees, and 18 inches or more for medium and large stature deciduous trees (this spacing does not apply to coniferous trees).

Why good branch spacing is important:

Good branch spacing is important for future growth of the tree. As branches increase in size, it's more likely they will grow into each other if not properly spaced. Without proper spacing, it's more likely that branches will begin to cross or rub.

Image: Poor spacing on Malus (Apple)

Deadwood

Deadwood occurs for a number of reasons and is easily identified during leaf out. Use either a bypass pruner or pruning saw to remove deadwood at the branch collar. Use the three-cut method if the branch is large.

Before

After

When pruning branches with deadwood and live wood, prune only deadwood and save as much of the live wood as possible. The deadwood on a live branch should always be pruned back to a node.

Temporary branches

Trees grow outwards, not upwards, so branches that you see now will remain at the same height until you or a storm remove them. Trees need to be pruned up to clear space for cars and trucks to drive through. Different streets vary in their requirement of clearance levels, but the average is 14.5 feet in height. Temporary branches can be removed at any point in a trees life. Use your collective group judgment to decide whether temporary branch removal is necessary at this time.

Image: Temporary branch on Malus (Apple)

Pruning

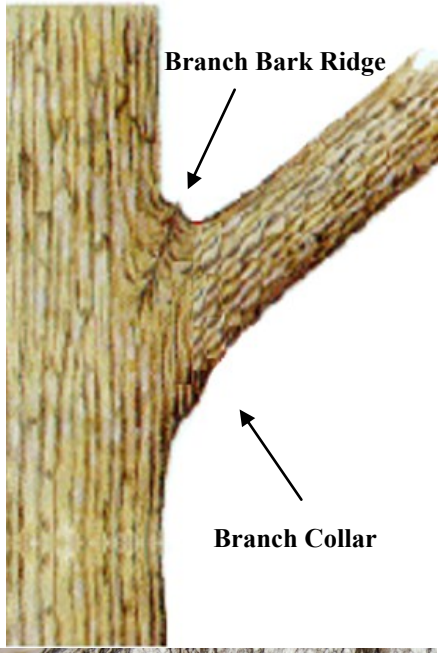
How to prune suckers:

Suckers that form below the soils surface should be pruned as close to and as parallel with the ground as possible. Suckers that form on the base of the trunk should be pruned similarly to sprouts.

Prune small suckers growing out of the trunk's base with bypass pruners just outside the branch collar or area of swelling. If the sucker is large and is growing out of the base of the trunk, use the three-cut method to prevent bark ripping. There is no need to use the three cut method on suckers growing out of the ground because there is no risk of bark ripping. Whenever possible, saw away from the trunk to lower the risk of injuring the stem.

If you come across a pruning cut done improperly and the tree collar has grown along a branch stub, remove only the dead stub that extends beyond the collar.

Pruning branch material



First identify the branch collar, the area of swelling. This may be hard to find with sprouts as they will often swell where there are several small sprouts in one area. The branch collar is more noticeable on a larger branches. Prune sprouts and branches just beyond the branch collar because it makes a smaller, more sealable wound that does not injure the main stems cambium.

Sharp tools make the best pruning cut on a tree. Prune small sprouts and branches with a pruning shear. If the sprout or branch is too large for bypass pruners, use the three-cut method with a pruning saw to prevent bark ripping.

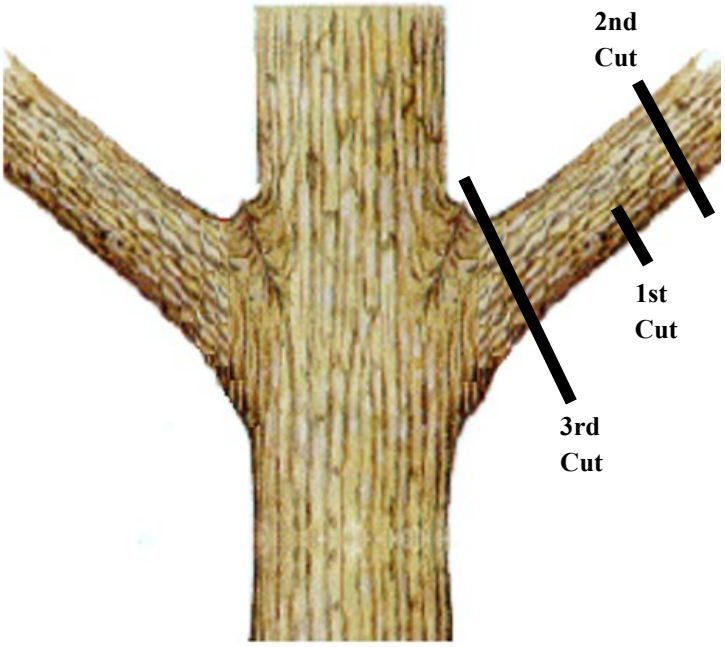
How to prune branch material (sprouts, included bark, etc.) that is less than 1 inch in diameter:

Image: Sprouts on Ulmus (Elm)

- ◊ Hand support the end of branch away from the tree stem to stabilize the branch as you make your cuts
- ◊ Identify branch collar.
- ◊ Place pruning shears just outside of branch collar with the sharp end of the blade on the underside of the branch material..
- ◊ Apply pressure through squeezing handles.
- ◊ Once blades cut all the way through, place branch material in pile facing pruned ends in the same direction.

Image: Sprouts on Tilia (Linden)

How to prune branch material (sprouts, included bark, etc.) that is 1 to 2 inches in diameter:



- ◊ Hand support the end of branch away from the tree stem to stabilize the branch as you make your cuts.
- ◊ Identify branch collar.
- ◊ Proceed using the Three-cut method.

Three-cut method:

1. With your handsaw make a shallow cut on the underside of the branch 1 or 2 feet out from the branch union.
2. Make a top cut all the way through the branch slightly farther out than the first cut to leave a short stub.
3. Remove the stub by cutting just outside the branch collar, perpendicular to the direction the branch is growing

How to prune branch material (sprouts, included bark, etc.) with a pole pruner:

- ◊ Identify the branch you want to prune, making sure it is not too large for the pole pruner. Do not cut anything too large, as doing so may break the pole pruners.
- ◊ Identify the branch collar.
- ◊ Do not stand directly below the branch that you are cutting. Make sure that you stand off to the side of where you are cutting so the branch doesn't fall on you.
- ◊ Place the branch between each shear of the pole pruner.
- ◊ Make sure that your placement of the shears will make an appropriate cut for the branch.

Image: Pole pruning of a co-dominant leader on Acer (Maple)

- ◊ Pull sliding handle or rope towards you to make the cut.
- ◊ Review the cut made and amend if needed.

Reduction cut

Pruning to a node is used when pruning out deadwood or when making a suppression cut, also known as a reduction cut. A reduction cut shortens the stem back to a lateral branch or to a node. Future growth is forced into the unpruned branches.

Pruning back to a node

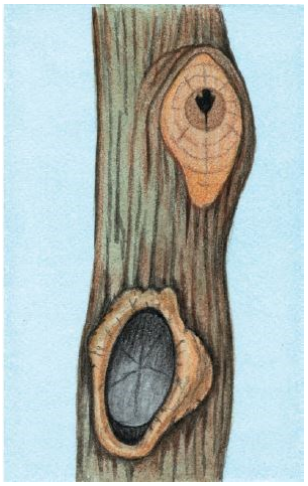
Poor Pruning

Bark ripping can occur when the three-cut method is not used to remove large branches. This often happens when the pruning cut is made by starting the cut on the top side of the branch. The branch fails because it doesn't have enough support, causing the bark at the base of the branch to tear.

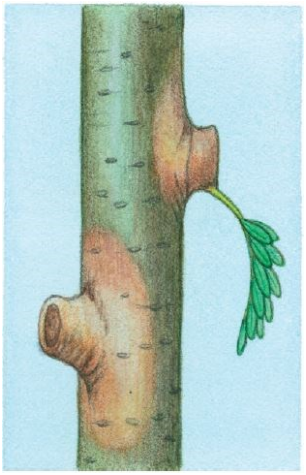
Flush cutting occurs when a pruning cut is made close to the stem and removes part of the stem's living tissue. This inhibits the flow of water and nutrients up the stem, and can affect branch development in the canopy and will lead to decay.

Stub cutting occurs when a branch is pruned too far outside the branch collar. It takes longer for the tree to grow new wood and bark over the wound.

Bark Ripping



Flush Cutting



Stub Cutting

Compartmentalization of Decay in Trees

Compartmentalization of Decay in Trees (CODIT) is a complex tree process to prevent the spread of decay and disease. Trees do not heal like humans. Instead of healing an injury, a tree will compartmentalize it. Even though pruning is beneficial to the tree, pruning is still considered an injury.

Compartmentalization is a unique way trees plug up their vascular system to prevent the transport of diseases and decay in the stem. This plugging also prevents the transport of water and nutrients. Some trees species are better at compartmentalizing than others.

Pruning a tree leaves an open wound. If pruned correctly, the wound will compartmentalize and new growth will form over the wound quickly.

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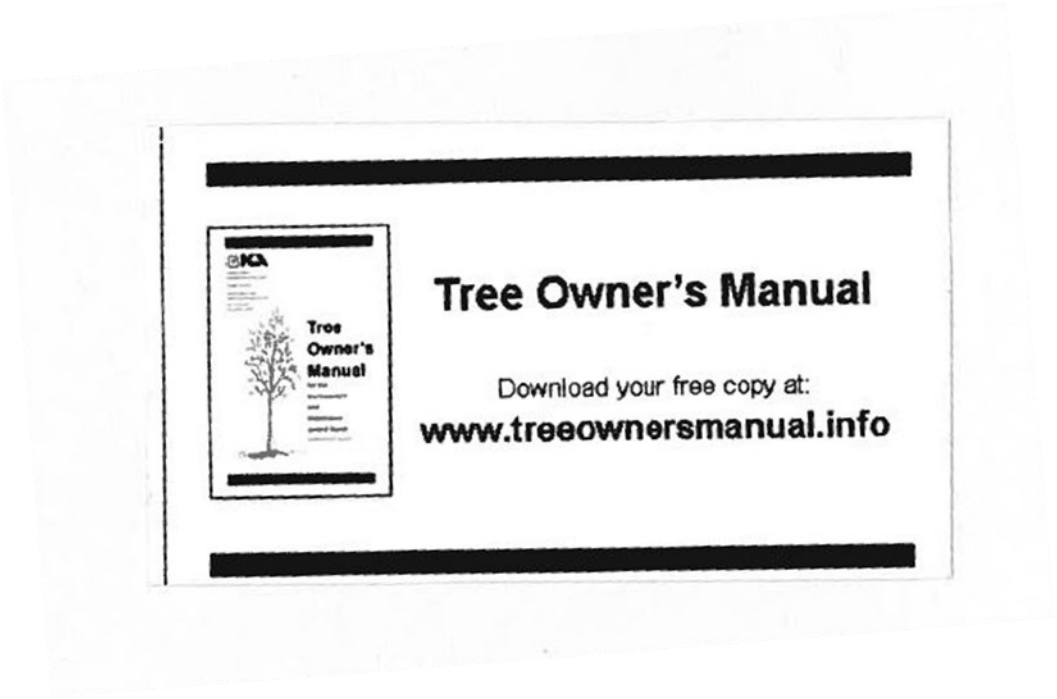
Appendix A

Citizen Pruner Field Form

Community Name:						Start Time:	
Group Member Names:						End Time:	
						Date:	
				Please check off if you conducted an of the following removals:			
Tree #	Street Address	Species	Location Description (Boulevard, park, etc.)	Suckers/Sprouts	Light Pruning (broken/damaged/low branches/deadwood	Developmental Pruning	Materials (wraps, tags, string, etc.)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

Appendix B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