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Wisconsin Rest Area Maintenance (RAM) Program

Lawn Mowing Guidelines

A. STATEMENT

Mowing is a very important part of lawn maintenance. It is often performed as a task to control lawn height, but proper mowing can add to the health, vigor and over-all appearance of the lawn. Mowing involves supervisors, trained operators, and well-maintained equipment. The regular mowing season is defined as starting in mid-May and ending in mid-October – approximately 20 lawn maintenance cycles. The lawn maintenance cycle includes: grass mowing, trimming and edging, proper removal/disposal of lawn litter and trash, and landscape debris.

B. MOWING SAFETY

The Contractor shall use discretion when mowing near the public. The lawn maintenance cycle shall begin on vacated grounds first, and then continue so as not to inconvenience the visitors. The safety of visitors shall not be jeopardized in order to complete the work.

1. Proper attire:
 - a) Safety shoes, safety glasses, heavy gloves, and personal hearing protection should be used as necessary.
2. Equipment:
 - a) Lawn mowing and maintenance shall be accomplished through the use of carefully selected equipment designed and operated to perform all work as economically and efficiently as possible. This equipment could include large mowers/tractors, push mowers, weed trimmers, motorized edgers, and rakes.
 - b) The blades of the mowing equipment should be sharpened to ensure a clean cut, healthy grass, and minimal wear and tear on the equipment.

C. GENERAL PROCEDURES

1. Mowing Lines: Abrupt changes in mowing lines should be avoided. When mowing up to and away from stationary objects or approved weed control areas, do so with smooth, curved and gradual transitions so as not to produce a chopped or ragged look. At all year-round sites **please consult your site-mowing plan for specific areas requiring lawn maintenance. Contact the DSPN office if you require a copy of current mowing plans for your site.**
2. In general, a lawn maintenance cycle shall be completed approximately once per week with all lawn maintenance activities completed by Friday at 3:00 p.m. Mowing activities shall plan to commence weekly so as to achieve the desired outcome of appropriate height grass for the weekend. All elements of the lawn maintenance cycle shall be continued until completed. No partial mowing will be allowed unless the weather forces delays. If rain or wet turf conditions exist, the Contractor shall finish the cycle as soon as favorable conditions exist.
3. During the mowing season, lawn within the site proper shall be maintained to a maximum height of 5 inches, minimum height of 3 inches. Review the mowing plans annually. Adjust areas to be mowed in the spring if necessary. Mowing season shall end when grass stops growing.

4. Raking: All grass areas shall be raked once in early spring, before the mowing season begins, to remove leaves, branches and other debris that may have accumulated on the premises during the winter. Grass areas shall be raked in the fall as needed to maintain the area in a proper and professional manner.
5. Grass areas shall be edged along all walks and curb areas with a motorized edger to maintain a neat and professional appearance. Edging shall be no wider than 1/2 inch from edge of sidewalk/curb to lawn surface. All edging debris shall be removed from the site.
6. Shredded bark material shall be kept confined to the original mulch areas.
7. All clippings shall be removed from sidewalks, concrete picnic table pads, parking areas, and flower and shrub beds.
8. Grass shall be trimmed around all fixed objects at every mowing. Extreme care shall be used to prevent injury to fixed objects and trees.

David R. Keger

Developed or Revised by Disability Service Provider Network

10/25/06

Date

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Approved on behalf of WisDOT by the Bureau of Highway Maintenance

10/25/06

Date

Wisconsin Rest Area Maintenance (RAM) Program

Basic Lawn Care Guidelines

A. INTRODUCTION

Most lawns in Wisconsin are made up of a mixture of several grasses. The basic lawn grasses are Kentucky bluegrass and red fescue. Grass seed purchased to repair or rejuvenate a lawn should consist primarily of these grasses.

The following lawn maintenance schedules and procedures are based on general guidelines and recommendations for development and care of bluegrass/fescue lawns in Wisconsin. The objective is to provide optimum growing conditions for bluegrass and fescue and thereby produce a strong, healthy, deep-rooted turf. This is accomplished primarily by providing adequate moisture, maintaining fertility and mowing properly.

Lawn weeds consisting of grasses and broadleaf plants which interrupt the uniform texture of the lawn are usually considered, undesirable and should be eliminated. The first and most important part of a weed control or elimination program is to provide the best possible growing conditions for the desirable grasses. Weeds which persist or invade the lawn can usually be controlled or removed with properly selected and applied herbicides. A flexible program to control weeds should be based on the type of weed, the seriousness of the problem, the desired results and possible adverse side effects.

B. FERTILIZING

As a rule, unless a problem exists, fertilizer for lawns should have approximately a 2:1:1 ratio of Nitrogen(N), Phosphorus(P) and Potassium(K). A common recommendation for bluegrass/fescue lawns in Wisconsin is 3 pounds actual Nitrogen per 1,000 square feet per season. For best results, divide this amount so as to apply one third in early May, one third in mid June and one third in late August. (See schedule in Section 7.1 of this manual)

Examples of 2:1:1 or approximately that ratio fertilizer are 16-8-8 and 10-6-4. The numbers 16-8-8 and 10-6-4 represent the percent of the total weight of material that is actual Nitrogen, Phosphorus and Potassium available in the product. Thus, in a fertilizer with a 16-8-8 formulation, 16 percent is actual available nitrogen. Since recommendations are based on pounds of actual nitrogen per area (3 pounds actual nitrogen per 1,000 square feet as stated above), the question is how much of a particular formulation should be applied to provide the 3 pounds of nitrogen per 1,000 square feet.

The following formula provides a simple method for determining the amount of a particular formulation to apply:

$$\frac{\text{_____}}{\% \text{ of N in fertilizer}} \times 3 \text{ lbs.} = \text{amount of fertilizer to use per } 1,000 \text{ sq. ft. to provide 3 lbs. N}$$

Substituting for the 16-8-8 formulation:

$$\frac{100}{16} \times 3 = 18.7 \text{ lbs. of 16-8-8 fertilizer per 1,000 sq. ft.}$$

or for the 10-6-4 formulation:

$$\frac{100}{10} \times 3 = 30 \text{ lbs. of 10-6-4 fertilizer per 1,000 sq. ft.}$$

Done in three applications, the 16-8-8 would, therefore, be applied at one third of the 18.7 pounds, or about 6 pounds per 1,000 square feet in early May, about 6 pounds in mid June and about 6 or 7 pounds in late August. The 10-6-4 would similarly be applied at one third of 30, or 10 pounds per 1,000 square feet in each application.

It is best to make the application in two directions by applying on half the amount to be applied in one direction and on half in the perpendicular direction. If, as in the first example above, 6 pounds are to be applied in early May, apply 3 pounds in one direction and 3 pounds in the perpendicular direction.

Lawn fertilizers are available with nitrogen in soluble or insoluble form. Nitrogen in soluble form dissolves readily in water and is, therefore, quickly available to plants, while insoluble nitrogen becomes available over a period of time. Fertilizer having only soluble nitrogen will cause a flush of growth and be gone in a short time, while insoluble or slow release nitrogen will be available for a longer time at a more uniform rate. A complete fertilizer with a combination of soluble and insoluble nitrogen is recommended.

If this fertilizer program (supplying 3 pounds of nitrogen per 1,000 square feet per year in two or three applications) does not provide the anticipated results, a soil test or soil tests should be made. Based on test results, a fertilizer program more specific to the site could be developed.

1. Fertilizer for Turf Areas:

The following recommendations are based on general recommendations for bluegrass/fescue lawns in Wisconsin. Plan to apply 3 pounds of actual nitrogen in 2 or more applications per season. General recommendations suggest using a fertilizer having a 2:1:1 ratio of major ingredients. Many commercially available lawn fertilizers, however, have a much higher proportion of nitrogen. Examples are 24-4-8, 20-10-5, 20-5-10, 26-33, etc. Even though the ratio of nitrogen is higher than the 2:1:1, it is suggested that the amount of fertilizer be based on the amount of actual nitrogen applied. If possible, divide the fertilizer application such that about 1 pound of actual nitrogen is applied in early-May, one pound in mid-June and one pound in late-August. If two applications are more practical, apply 1 ½ pounds in early-May and 1 ½ pounds in late-August. In any one application, it is best to apply one half the amount in one direction and the other half in a perpendicular direction to assure even coverage over the area.

- a. Note: If a combination fertilizer and herbicide is to be used in addition to the complete fertilizer described above, be sure to consider the amount of fertilizer thus applied when figuring the amount of complete fertilizer required.

2. Fertilizing Trees and Shrubs:

At planting time the trees and shrubs were fertilized with controlled release fertilizer packets which should supply the nutrient requirements for about three years. When the three year period is up or when plants indicate a need for nutrients, fertilizer packets or spikes can be dug in around the periphery of the plants.

Commercial fertilizer such as 16-8-8 or 12-6-4 can also be used for trees and shrubs. For large deciduous trees, use about 2 pounds per inch of trunk diameter, for evergreen trees, ½ pound per foot of height and for shrubs, ½ cup per foot of height.

For the trees, divide total amount between holes spaced about 2 feet apart in concentric rings radiating from the center of the tree to about 2 feet past the drip line. Concentric rings should be 1 or 2 feet apart and no closer to the tree trunk than twice the diameter of the trunk. For shrubs, the fertilizer can be worked into the area around the plant.

Accuracy in rate of material and method of application is very important in using herbicides. Broadleaf weed killers are broadleaf plant killers which do not differentiate between desirable and undesirable plants. Herbicide spray drift may be carried by wind to areas where broadleaf ornamentals could be damaged. Do not spray on windy days or when temperature exceeds 80 degrees.

Some broadleaf herbicides, such as Dicamba, are taken up by broadleaf plant roots and have been known to damage woody ornamentals. Care should be exercised in using these herbicides around trees and shrubs.

C. SEEDING

The best times for seeding lawn grasses are late summer and early spring. In spring, when snow has gone and soil has drained and firmed sufficiently to walk on the lawn without damaging it, remove debris and do a general overall clean-up. Inspect the lawn for winter kill, bare spots and damaged areas. Rake areas to be seeded to provide a good seed bed. If settling has occurred or if an area has been damaged or torn up by snow removal equipment, restore the area by adding topsoil if necessary and reshaping before seeding.

Seed the prepared areas at the rate of about 2 pounds of seed per 1,000 square feet and rake lightly to barely cover the seed. If material is available, mulch seeded areas with straw or grass clippings, especially when spring seeding is done later or if regular watering is not practical.

If lawn seed is required for the repair of lawn areas, use a seed mix which contains approximately 65% Kentucky bluegrass and 35% creeping red fescue. Sew at the rate of 1 pound per 1,000 square feet.

D. WATERING

For newly seeded lawns, watering should be at frequent intervals so that, once grass begins to germinate, it stays moist. As the grass grows and roots develop, intervals between waterings should be lengthened and the amount of water per watering should be increased.

For established lawns, watering should be done as necessary and practical, depending on the water supply, to provide a healthy, deep-rooted turf. Intervals between waterings should vary depending on rainfall, soil type and the condition of the grass. When watering is necessary, apply enough water to wet the soil 6 inches or more deep. Avoid watering lightly at frequent intervals as this causes shallow root growth and stimulates weed seed germination and growth.

Water established lawn with an oscillating sprinkler or soaker as need dictates. Water thoroughly at each watering but do not water more often than is dictated by the condition of the lawn.

E. INSECT AND DISEASE CONTROL

A regular spraying program for insects and disease is not recommended as insecticides control beneficial insects as well as harmful pests. Rather it is recommended that plants be inspected regularly and problems treated specifically as and if they arise.

Dormant oil helps to control aphids, mites and scale insects. Spray infected plants and nearby plants in early spring before spring growth starts. Spraying should be done when a 24 hour period of above-freezing temperature is expected after treatment. Use a fine spray to get complete-coverage of plant parts.

F. RODENT CONTROL

The most serious and extensive rodent damage to plantings in recent years has been caused by rabbits and meadow mice. Rabbits work on top of snow so, as snow depth increases, damage moves up the tree. Quite often the snow raises the rabbit above screen or plastic guards. Mice usually work under the snow and often do severe damage on the stem and upper roots of the plant while the snow protects them from predators. Recommendations suggest being vigilant and include the following:

1. Keep the area around plants free of weeds and long grass.
2. Place guards.
3. Apply repellent. Recommended as most effective are products containing "Thiram". The following mixture is suggested:

Thylate	65% 1 ½ pound
Water	4 gallons
Plyac	1 pint

4. Mix and spray on areas to be protected in November and again in winter if thaw occurs.
5. Place baits: Baits are used to reduce the population. Use baits which are generally safe to humans and larger animals, place them in stations, and maintain surveillance. There are no guaranteed remedies for the rodent problem but the combination suggested above may work.

G. WEED CONTROL

Weed control should not be thought of as an isolated activity but as part of a turf management program. Weeds are more likely to invade a poor, weak, sparse lawn than a strong, thick, healthy one, indicating that following recommended cultural practices should be thought of as the primary form of weed control. Herbicides are most often used in lawn care to control two general types of plants, annual grasses (crabgrass) and broadleaf's (dandelions). The most effective crabgrass control herbicide is a type which prevents seed germination and, therefore, must be applied in the spring before seeds germinate. Broadleaf weed control herbicides selectively control broadleaf plants but not grasses. These will be described below.

1. Crabgrass Control:
Crabgrass is a warm season annual grass which grows best during the heat of summer when desirable lawn grasses are often dormant. Crabgrass overwinters as seed which begins to germinate about mid-May. The most effective chemical control is by a selective pre-emergence herbicide. Those recommended for

crabgrass actually prevent seed germination and therefore do not harm established perennial grasses. To be effective, the pre-emergence herbicide must be applied uniformly, at the proper rate and before seed germination.

Be aware of several side effects of pre-emergence crabgrass control herbicides. New grass seeding in treated areas would be prohibited along with weed seed germination, therefore, seeding should not be done during the effective period of the herbicide. The herbicide is likely to control plants which would arise from seed around trees and in mulched areas by preventing seed germination. If crabgrass is a problem, the most effective chemical treatment is made prior to seed germination. Apply a pre-emergence herbicide such as Balan, Dacthal or Prowl in April, using properly calibrated application equipment.

2. **Combination Crabgrass Control Plus Fertilizer:**
Most garden supply stores carry crabgrass control herbicide/fertilizer combination products. Many of these contain Balan, Dacthal, or Prowl as the crabgrass control plus fertilizer. Many of these are combined to provide the crabgrass control while supplying approximately 1 pound of actual nitrogen per 1,000 square feet. The product thus provides for the early season lawn fertilizing while controlling crabgrass. Note that timing should be based on the necessity of applying the crabgrass control herbicide prior to seed germination. **Read and follow the label carefully.**

3. **Broadleaf Weed (Plant) Control:**
Broadleaf weeds such as dandelions and thistles may be selectively controlled through the use of selective herbicides which, if used properly, will not harm the desirable lawn grasses.

For overall control of broadleaf weeds in a turf area, the herbicide should be applied uniformly at the prescribed rate to the entire lawn area. For best or most complete control, the applications should be made in May and September. If broadleaf weeds are not a serious problem, spot treatment of individual weeds throughout the summer will give satisfactory control.

4. **Broadleaf Weed Control in Turf:**
If broadleaf weeds in turf are a problem, apply an herbicide which is selective for broadleaf plants. For best results with least possibility of damage to other plants, apply in May and/or September. Herbicides are most effective when weeds are in an active stage of growth.

The herbicide may be broadcast over an entire lawn area or used as a spot treatment, spraying individual weeds. Unless otherwise directed, if broadleaf weeds are wide spread, treat with a broadcast spray once in May or September. For weeds which escape the treatment and for other areas, spot treat several times per season as weeds appear.

For spot treating, use a two or three gallon plastic sprayer. Lay out a 1,000 square foot area on the parking lot and determine how much water is required to cover the area. Mix this with the required amount of herbicide and spot spray individual weeds. Spray for coverage of leaf surfaces. For broadcast spraying, use a siphon type sprayer connected to a hose. Calculate to apply the amount required as described above. Keep spray down, avoid spraying on windy days and when temperature exceeds 80 degrees.

5. **Combination Broadleaf Control Plus Fertilizer:**
Most garden supply stores carry combination "weed and feed" type products for broadleaf weeds. Many of these are combined to control broadleaf weeds while

supplying about 1 pound of nitrogen per 1,000 square feet. These products are usually applied to damp or moist grass to activate the herbicide. Note that timing should be based on applying the herbicide in spring when weeds have emerged and are in a stage of active growth. Read and follow the label carefully. If a combination product is used as a broadcast area treatment, an herbicide should be available for spot treatment of weeds which escape and for the areas outside the broadcast treatment area.

All herbicides should be applied early or late in the day during the time when there is the least amount of visitors. These are also the times when temperatures and wind velocity are most conducive to safe application. It is best to use herbicides which do not have an odor. Consider posting small signs at regular intervals around the perimeter of the treated area for 24 hours after the application has been completed. These signs should simply say that the area has been treated with an herbicide.

6. Weed Control for Mulched Areas Around Trees and Shrubs:
 - a. Pre-emergence: In April, before seeds begin to germinate, apply a pre-emergence herbicide to mulched areas. Examples of pre-emergence herbicides that may be used are Surflan and Treflan. **Read and follow the label carefully.**
 - b. Post emergence: This provides a means for controlling weeds which appear during the growing season in mulched areas. Applying Roundup in accordance with manufacturer's directions is recommended. **Read and follow the label carefully.**

7. Weed Control Other:

As a rule, crabgrass and broad leaf weeds are the principal targets of a weed control program. However, weed problems which are not controlled by the methods described may arise and need attention.

An example of a difficult-to-control plant would be a perennial grass such as quack grass. If this type of plant becomes a problem in a bluegrass/fescue lawn, it may become necessary to completely eradicate all plants and start over. This can be done with good success by treating with a systemic foliar herbicide which has no soil residual. When the plants are completely dead the area is worked up and reseeded.

H. POSTING OF AREAS TREATED WITH PESTICIDES

Herbicides must be used properly and safely. They are the priority method of choice for control of noxious weeds and may be used to treat nuisance weeds. Herbicides shall be applied only on a spot treatment basis to dense patches of the target weed. Care shall be taken to preclude damage to desirable plants and off-target vegetation. **In all cases, the directions on the label shall be read and followed carefully.**

1. Registration:

Herbicides must be registered by the Environmental Protection Agency for the intended use and must be used in accordance with the requirements and regulations of the Department of Agriculture, Trade and Consumer Protection Chapter ATCP 29 on "Pesticide Use and Control" and the Department of Natural Resources Chapter NR80 on "Use of Pesticides on Land and Water Areas of the State of Wisconsin". Please contact DSPN if you are interested in a copy of these regulations or if you have any questions concerning the application of herbicides.

2. **Application:**
Herbicides must be applied by certified and licensed applicators only. Herbicides classified as “Restricted-use” must only be applied by certified and licensed pesticide applicators. A daily record of all herbicide applications must be kept for 2 years from the date of application.

3. **Posting:**
While not legally required to do so, the Wisconsin Department of Transportation recommends posting areas that have been treated with pesticides. This applies to lawn areas at rest areas and waysides treated for dandelions. Signs should be posted about every 300 feet around the perimeter of the treated area. Place the signs in places the public is most likely to enter.

If the herbicide application is done by a commercial applicator, the applicator should be able to supply the appropriate signs. DSPN also has “Lawn Application” signs available. The signs should include a date on which the signs can be removed (72 hours after application). The date may be handwritten on the sign.

Wisconsin Rest Area Maintenance (RAM) Program

Snow And Ice Control Guidelines

A. STATEMENT

It is necessary to make all Wisconsin Department of Transportation year-round rest area facilities safe and accessible during the winter season. As part of the custodial care and landscape maintenance services, snow and ice control should receive first priority. This guideline applies to the developed portion within the rest area site which includes sidewalks, handicap accessible ramps, curb cuts, curbs and gutters, and in some instances car parking stalls directly in front of and leading to the main building doors.

B. RESPONSIBILITIES

The supervision of winter maintenance should be a cooperative effort between the Wisconsin Department of Transportation, Disability Service Provider Network, and the Community Rehabilitation Programs providing custodial care and landscape maintenance at highway rest area sites.

1. Wisconsin Department of Transportation (WisDOT) – Provide roadside facilities to enhance the safety, comfort, convenience and enjoyment of the traveling public. WisDOT will insure that the roadside facilities are adequately maintained so that they may serve their intended function. This includes establishing priorities, approving policies, and providing general guidance and control of winter maintenance activities.
2. Disability Service Provider Network (DSPN) – Develop and administer the RAM Program which includes winter maintenance activities within the developed portion of the year-round rest area facilities. Monitor services provided as listed in the contract work specifications. Assist CRPs in planning for effective snow and ice control services including determining equipment and manpower requirements.
3. Community Rehabilitation Programs (CRPs) – Develop and implement a plan for effective snow and ice control according to the requirements of the WisDOT/CRP contract and this guideline. The size, layout, and site use patterns of each site should be taken into consideration in the snow and ice control plan. Provide adequate supervision of personnel, adequately trained personnel, necessary equipment, supplies and other resources to effectively control snow and ice according to contract standards and requirements.

C. WEATHER MONITORING

A key element in implementing an efficient snow and ice control plan is receiving timely weather information. Accurate weather forecasting is necessary in deciding which operational procedure to follow. The following are potential sources for weather information:

1. Local weather stations, radio, and TV
2. Weather channel – cable TV, internet
3. National weather service
4. Weather service monitors installed at most rest areas
5. County Highway Department
6. County Sheriff's Department

D. GENERAL PROCEDURES

Such things as the rate and accumulation of snowfall, moisture content, temperature, time of day or night, wind direction and velocity, and duration are all factors that need to be considered for each snow and ice condition.

1. When snow and/or freezing rain occurs, arrange for the staff to arrive at the site a minimum of one hour earlier than scheduled to clear Priority 1 areas.
2. On days when it is snowing, snow removal is the first priority. Additional people may need to be assigned to RAM operations for the purpose of snow removal.
3. Snow removal will remain a priority until all standards have been met.
4. All shifts will participate in snow removal until standards have been met.

E. SNOW AND ICE CONTROL PRIORITIES

NOTE: While the staff is on site during and after a storm, snow and ice removal is the main priority. Building cleaning efforts should be confined to toilets, urinals, sinks, and any obvious floor and wall needs until the snow and ice removal is complete.

PRIORITY 1 (See snow/ice removal diagram. Priority 1 areas are to be maintained free of snow and ice continually while the staff is on site. Salt and/or other snow and ice control chemicals should be used as necessary to keep walkways clear throughout the storm.)

⇒ **PATH (FOUR FEET WIDE) FROM THE MAIN DOORS TO CAR AND TRUCK LOTS.**

⇒ **SIDEWALKS (IN FRONT OF THE PARKING LOTS), CURBS, AND GUTTERS FOR FIFTY FEET IN EACH DIRECTION FROM THE CENTER OF THE CLEARED PATH. HANDICAP PARKING AND UNLOADING SPACES AND HANDICAP RAMPS WITHIN 100 FEET OF THE WALKWAY.**

PRIORITY 2 (Priority 2 areas are to be cleared as soon as possible following clearing of Priority 1 areas and must be cleaned IN TOTAL within 48 hours after the end of the storm).

⇒ **PLAZA AND ALL REMAINING SIDEWALKS (EDGE TO EDGE) INCLUDING THE ADJACENT CURB, GUTTER AND RAMPS AND CONCRETE SLAB AREAS SERVING REAR EXIT DOORS WITH NO WALKS OR PLAZAS.**

⇒ **BENCHES, TRASH/RECYCLING BINS, AND TELEPHONE.**

⇒ **ATTENTION: SOME OUTER WALKWAYS MAY NOT RECEIVE SNOW REMOVAL SERVICE BY THE SITE CREW. THESE AREAS ARE IDENTIFIED AND AGREED UPON BY THE SITE MANAGER AND DSPN PRIOR TO THE SNOW SEASON.**

F. FREEZE/THAW AREAS

Site managers should identify all probable freeze/thaw affected sidewalk and plaza areas and assure that de-icing materials be applied appropriately to keep the areas as safe as possible at all times both while the crew is on and off site. If sanding is warranted, it should also be done.

G. LEAVING THE WORK SITE DUE TO SEVERE WEATHER

At minimum, a path from the parking lots to the building should be maintained during a snowstorm. When the site maintenance crew's safety is at risk because of a storm's intensity, supervisory personnel will determine if the crew should leave the work site. Anytime the staff leaves the site, appropriate amounts of salt or ice melt chemical must be applied to maintain Priority 1 areas as clear as possible throughout the storm. If the work crew leaves the work site prior to the end of the work shift, DSPN must be notified as soon as possible.

H. EQUIPMENT

The control of snow and ice shall be accomplished through the use of carefully selected equipment designed and operated to perform all work as economically and efficiently as possible. Snow/ice removal equipment shall be checked each fall to ensure that equipment and safety features are in good working order.

I. CHEMICALS

Chemicals should be applied with the appropriate equipment to provide the most effective benefit from the material. The material should be spread only to the width and amount necessary to achieve the service expectation.

Dry sodium chloride (salt) may be the most effective chemical during and after the storm when the sidewalk temperature is 23°F or higher.

Alternative synthetic ice melting products (see Table 1, page 4) can be used to effectively control snow and ice below 23°F. Again, material should be used as sparingly as possible.



Developed or Revised by Disability Service Providers Network,

3/08/10

Date























Approved on behalf of WisDOT by the Bureau of Highway Maintenance

3/08/10

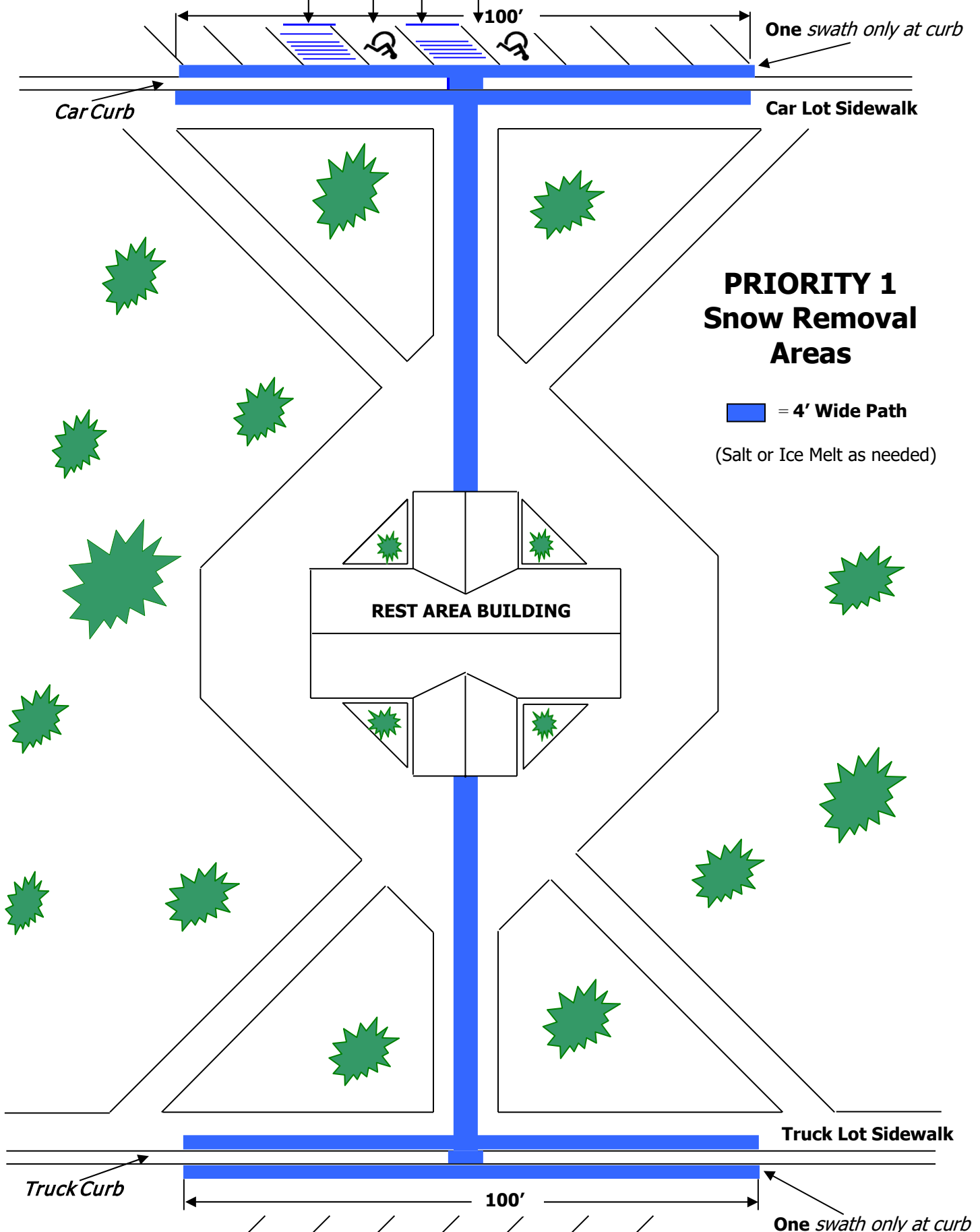
Date

Table 1. Alternative products for ice control

Product	Advantages	Disadvantages
Calcium Chloride	<ul style="list-style-type: none">  Effective to -59° F  No visible residue when dry  Will not damage soil structure 	<ul style="list-style-type: none">  Costs twice as much as rock salt  Injures plants
Magnesium Chloride	<ul style="list-style-type: none">  Effective to -25° F  Melts ice faster than calcium chloride  Less corrosive than calcium chloride and sodium chloride 	<ul style="list-style-type: none">  Costs twice as much as rock salt  May cause chloride toxicity  Absorbs moisture readily; must be stored in dry area.
Calcium Magnesium Acetate (pelleted deicer made from dolomitic limestone and acetic acid)	<ul style="list-style-type: none">  Biodegradable; not harmful to the environment  Less corrosive than sodium chloride  Can increase soil permeability 	<ul style="list-style-type: none">  Expensive--costs 15 times as much as rock salt
Abrasive Materials (sand, ash, or cinders)	<ul style="list-style-type: none">  Inexpensive  Not harmful to trees and shrubs 	<ul style="list-style-type: none">  Will not melt ice  Not as effective as other products at preventing skids  Bulky; must be removed from gutters each spring

SNOW/ICE REMOVAL DIAGRAM

H/C Access Area, Parking Spaces, and Loading Zone (If vehicle with snow plow is available)

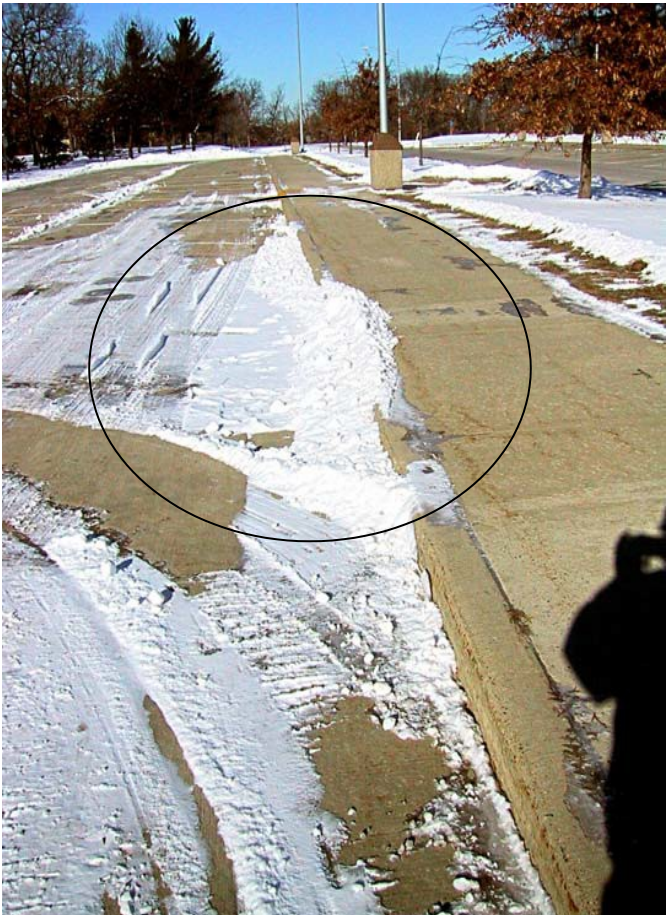


CURBS:

Priority 1: Handicap Ramps and curbs



Does Not Meet Standards



Does Not Meet Standards



Meets Standards!

SIDEWALKS

Priority 1: Path from main doors to car and truck lots.

Priority 1: Walks in front of the parking lots curbs, and gutters (approximately 50 feet in both directions from center.)



Meets Standards



Meets Standards

Wisconsin Rest Area Maintenance (RAM) Program

Suggested Schedule of Principal Activities for Maintenance of Grounds

January

- If thaw occurs, check for rodent activity and retreat plant with repellents, if possible.

February

- Plan to do pruning in February or March, depending on weather.
- During this period, removal of large limbs can be done with little or no damage to turf. Selection of limbs or branches to be removed is made easier by the absence of leaves. Thus, pruning to improve branching structure can be accomplished more easily at this time.
- Multi-stemmed shrubs should be pruned annually during the dormant period. This pruning should consist of completely removing one or several of the older stems, depending on the size of the plant. This type of pruning thins and continually renews the shrub in its natural form.

March

- Pruning as above if not done in February.
- If insects were a problem the previous year, spray with dormant oil to reduce overwintering populations. Do only when indications are that 24 hours of above freezing temperature will follow spraying.
- Check equipment and supplies to insure that work will be done properly and at the optimum time.

April

- Begin spring cleanup. As soon as soil is drained sufficiently to allow working on turf, do general cleanup of litter, rake matted areas, remove leaves and debris and repair damaged areas.
- Transplant or plant trees, shrubs and evergreens if this is to be done.
- Remove wrappings and rodent guards from all trees.
- Check plants to insure that wires, ropes, tags, etc. are removed. If braces or guys are on plants, be sure they are properly in place so as not to damage the plant. Remove all braces and guys as soon as possible.
- Shape the edge of mulched beds and areas around trees.
- Replenish mulch and shape or rake as necessary.
- Apply pre-emergence herbicides to mulched areas.
- Apply pre-emergence crabgrass control herbicides. If seeding is to be done, avoid treating seeded areas or areas to be seeded. (If the need for reseeding is not serious, postpone until late summer.)
- Apply fertilizer. Apply lawn fertilizer in late April or early May. Apply to dry turf unless otherwise directed by the manufacturer. (If a combination fertilizer/pre-emergence crabgrass control herbicide is used, apply early to insure effectiveness of crabgrass control.)
- Begin mowing as necessary according to grass height.

May

- Mow lawn and trim as necessary.
- Water lawn and woody plants as necessary.
- Apply broadleaf herbicide to lawn.
- If the herbicide is a liquid, apply several days after mowing so that leaf surface has developed sufficiently to obtain an effective amount of coverage. Allow several days after treatment so that the herbicide will take effect before mowing. Apply when temperature is 80 degrees or less.
- If a broadleaf herbicide in combination with fertilizer is used, follow the manufacturer's instructions. (These are usually applied to damp turf.)
- Spot treat broadleaf weeds in unmowed grass areas. Do not broadcast spray as this area may contain native wild flowers and woody plants.
- Inspect for early stages of insect and disease problems.
- Control weeds in mulched areas by hand weeding or cultivation. If weeds are quite prolific, treat with a post-emergence foliar herbicide.
- Fertilize woody plants.
- Prune evergreens. Prune spruce, pine and fir if necessary or desirable by removing part of the new growth while it is tender and soft. Prune junipers and arborvitae as necessary to shape or control in May or early June.
- If annuals are to be planted, set out bedding plants after May 15 or when danger of frost is past.

June

- Mow as necessary or as per schedule.
- Spot treat any broadleaf weeds in turf which might have escaped earlier treatment.
- Weed mulched areas or spot treat any weeds which may have appeared since last treatment or weeding.
- Continue to check for insects and disease on plants.
- Water turf as necessary, based on rainfall and soil moisture.
- Water woody plants based on rainfall and soil moisture.
- Water with soil probe or root feeder.
- Fertilize lawn if recommended fertilizer amount has been divided into three applications.

July

- Mow lawn as necessary.
- Anticipate water requirements. Factors such as heavy foliage, lack of rain and hot, windy days combine to increase the plant's need for water
- Prune deciduous plants if necessary. Minor heading back and shaping of spring flowering plants may be done at this time.

August

- Mow and trim as necessary.
- Water lawn and plantings as necessary.
- Check for insects and disease.
- After mid-month, prepare areas and seed any bare, weak or damaged turf areas. Mulch and water as necessary for new seeding.
- Fertilize lawn.
- Spot treat broadleaf weeds in the lawn areas

September

- Mow as necessary.
- Water if necessary.
- Transplant or plant evergreens.
- Shape and re-mulch all shrub beds and mulched areas around trees.

October

- Mow if necessary.
- Mulch leaves and rake if necessary to remove heavy leaf deposits which might compact and damage lawn grasses.
- Water evergreens.

November

- Mulch leaves or remove heavy leaf deposits from the lawn.
- Wrap thin-barked small trees, place rodent guards and apply rodent repellent.
- Water evergreens.
- Drain hoses and protect any equipment or materials which would be damaged by freezing. Usually it is advisable to store liquid pesticides in an area which will not freeze.

December

- Check for rodent activity. Place bait if necessary.
- Check equipment, make repairs or note repairs to be made by others, store materials and equipment, prepare list of material and equipment needs.

Wisconsin Rest Area Maintenance (RAM) Program

Landscaping Resources and Links

If you would like further information about landscaping issues, you may want to visit some of the links below. If you have specific landscaping questions, please contact the DSPN office.

A. TREE, PLANT & SHRUB CARE

1. International Society of Arboriculture:

This webpage is an excellent source to attain information on specific topics, to answer questions, and to locate an ISA Certified Arborist near you. Topics include tree or plant buying, planting, pruning and other general care information. Tree hazard and treatment suggestions are also included.

Visit: <http://www.treesaregood.com/>

2. Wisconsin Department of Natural Resources:

This webpage includes a variety of areas with tree and plant information including the following:

a. Tree & Shrub Identification: Includes a simple key for you to use to identify many of Wisconsin's forest trees. If you know the name of the species in which you are interested, you may look for information on it using an index. The State Nursery web site contains information on some of the common Wisconsin shrubs. The shrubs listed are also available for purchase from the nursery.

Visit: <http://dnr.wi.gov/topic/urbanforests/treecenter.html>

b. Wisconsin Urban & Community Forests Newsletter: The newsletter contains technical articles, profiles of urban forestry activities in Wisconsin, resources, coming events, Wisconsin Urban Forestry Council actions and news items to help educate, train, exchange information and improve awareness of urban forestry in Wisconsin.

Visit: <http://dnr.wi.gov/topic/urbanforests/newsletters.html>

B. INVASIVE INSECTS

1. Wisconsin 's Emerald Ash Borer Resource:

This webpage is an excellent source to obtain information regarding the Emerald Ash Borer. This site offers links to University of Wisconsin – Madison, Wisconsin Department of Resources and Wisconsin Department of Agriculture, Trade and Consumer Protection for more information on this invasive insect.

Visit: <http://emeraldashborer.wi.gov/>

2. Gypsy Moth

This webpage is updated on a regular basis and is an excellent resource for information regarding Gypsy Moths in Wisconsin.

Visit: <http://gvpsymoth.wi.gov/>

Wisconsin Rest Area Maintenance (RAM) Program *Tree Care Information*

Tree Care Information pamphlet.

Tree Care Information



Why Topping Hurts Trees
Pruning Young Trees
Pruning Mature Trees
Proper Pruning Cuts
How to Properly Prune Deciduous
Shrubs
Technical References

Why Topping Hurts Trees

Topping is perhaps the most harmful tree pruning practice known. Yet despite more than 25 years of literature and seminars explaining its harmful effects, topping remains a common practice. This brochure explains why topping is not an acceptable pruning technique and offers some better alternatives.

■ What is topping?

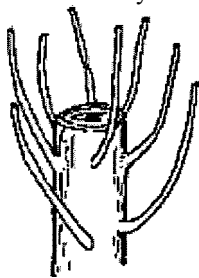
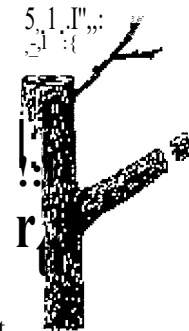
Topping is the indiscriminate cutting back of tree branches to stubs or lateral branches that are not large enough to assume the terminal role. Other names for topping include "heading," "tipping," "hat-racking," and "rounding over."

The most common reason given for topping is to reduce the size of a tree. Often homeowners feel that their trees have become too large for their property. People fear that tall trees may pose a hazard. Topping, however, is not a viable method of height reduction, and certainly does not reduce the hazard. In fact, topping will make a tree more hazardous in the long term.

■ Topping stresses trees

Topping often removes 50-100% of the leaf-bearing crown of a tree. Since the leaves are the "food factories" of a tree, this can temporarily "starve" a tree. The severity of the pruning triggers a sort of survival mechanism. The tree activates latent buds, forcing the rapid growth of multiple shoots below each cut. The tree needs to put out a new crop of leaves as soon as possible. If a tree does not have the stored energy reserves to do this, it will be seriously weakened and may die.

Topping is cutting branches back to stubs, or lateral branches.

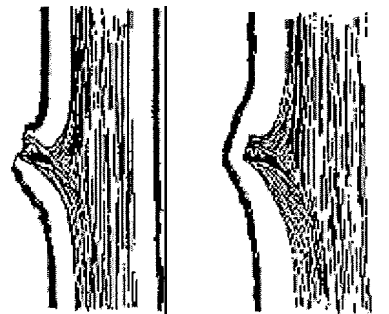


New shoots develop profusely below a topping cut.

A stressed tree is more vulnerable to insect and disease infestations. Large, open pruning wounds expose the sapwood and heartwood to attack. The tree may lack sufficient energy to chemically "defend" the wounds against invasion. Some insects are actually attracted to stressed trees by chemical signals.

■ Topping Causes Decay

The preferred location to make a pruning cut is just beyond the branch collar at the branch's point of attachment. The tree is biologically equipped to close such a wound provided the tree is healthy enough and the wound is not too large. Cuts made along a limb, between lateral branches, create stubs with wounds that the tree may not be able to close. The exposed wood tissues begin to decay. Normally a tree will "wall off" or compartmentalize the decaying tissues. But few trees can defend the multiple severe wounds caused by topping. The decay organisms are given a free path to move down through the branches.



The tree will close a well-positioned cut as new wood is produced. Normally it will compartmentalize any internal decay;

|| ijl || ■ Topping Can Lead to

Sunburn

Branches within a tree's crown produce thousands of leaves to absorb sunlight. When the leaves are removed, the remaining branches and trunk are suddenly exposed to high levels of light and heat. The result may be sunburn of the tissues beneath the bark. This can lead to cankers, bark splitting and death of some branches.

■ Topping Creates Hazards

The survival mechanism that causes a tree to produce multiple shoots below each topping cut comes at great expense to the tree. These shoots develop from buds near the surface of the old branches. Unlike normal branches that develop in a "socket" of overlapping wood tissues, these new shoots are only anchored in the outermost layers of the parent branches.

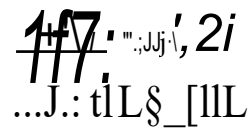
The new shoots grow very quickly, as much as 20 feet in one year, in some species. Unfortunately, the shoots are very prone to breaking, especially during windy conditions. The irony is that while the goal was to reduce the tree's height to make it safer, it has been made more hazardous than before.



Stubs left from topping usually decay. The shoots that are produced below are often weakly attached.

■ Topping Makes Trees Ugly

The natural branching structure of a tree is a biological phenomenon. Trees form a variety of shapes and growth habits,



all the branches are of roughly equal length. Topping destroys the natural form of a tree's crown.

Without the leaves (up to six months of the year in temperate climates) a topped tree appears disfigured and mutilated. With the leaves, it is a dense ball of foliage, lacking its simple grace. A tree that has been topped can never fully regain its natural form.



Trees that have been topped may become hazardous and are unsightly.

■ Topping is Expensive

The cost of topping a tree is not limited to what the perpetrator is paid. If the tree survives, it will require pruning again within a few years. It will either need to be reduced again, or storm damage will have to be cleaned up. If the tree dies it will have to be removed. Topping is a high maintenance pruning practice.

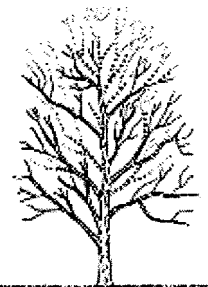
There are some hidden costs of topping. One is the reduction in property value. Healthy, well maintained trees can add 10-20% to the value of a property. Disfigured, topped trees are considered an impending expense.

Another potential cost of topped trees is the potential liability. Topped trees are prone to breaking and can be hazardous. Since topping is considered to be an unacceptable pruning practice, any damage caused by branch failure of a topped tree may lead to a finding of negligence in a court of law.

■ Alternatives to Topping

There are times when a tree must be reduced in height or spread. Providing clearance for utility lines is an example. There are recommended techniques for doing this. If practical, branches should be removed back to their point of origin. If a branch must be shortened, it should be cut back to a lateral that is large enough to assume the terminal role. A rule of thumb for this is to cut back to a lateral that is at least 1/3 the diameter of the limb being removed.

This method of branch reduction helps to preserve the natural form of the tree. However, if large cuts are involved, the tree may not be able to close over and compartmentalize the wounds. Sometimes the best solution is to remove the tree and replace it with a species that is more appropriate for the site.



If the height of a tree must be reduced, all cuts should be made to strong laterals or to the parent limb. Do not cut limbs back to stubs.

■ Hiring an Arborist

Pruning large trees can be dangerous. If pruning involves working above the ground, or using power equipment, it is best to hire a professional arborist. An arborist can determine what type of pruning is necessary to improve the health, appearance and safety of your trees. A professional arborist can provide the services of a trained crew, with all of the required safety equipment and liability insurance.

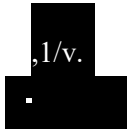
- There are a variety of things to consider when selecting an arborist:
- Membership in professional organizations such the International Society of Arboriculture (ISA), the National Arborist Association (NAA) or the American Society of Consulting Arborists (ASCA)
- Certification through the ISA Certified Arborist program
- Proof of insurance
- A list of references (don't hesitate to check.)
- A void using the services of any tree company that:
 - Advertises topping as a service provided. Knowledgeable arborists know that topping is harmful to trees and is not an accepted practice.
 - Uses tree climbing spikes to climb trees that are being pruned. Climbing spikes can damage trees, and their use should be limited to trees that are being removed.

Professional arborists can determine what type of pruning is necessary to improve the health, appearance and safety of your trees.

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 UPDATED FEBRUARY 2000



Pruning Young Trees



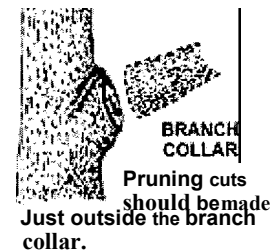
Proper pruning is essential in developing a tree with a strong structure and desirable form. Trees that receive the appropriate pruning measures while they are young will require little corrective pruning when they mature.

There are a few simple principles that everybody should understand before they set out to prune a tree.

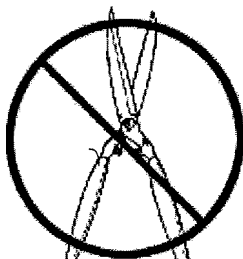
- Each cut has the potential to change the growth of the tree. Always have a purpose in mind before a cut is made.
- Proper technique is essential. Poor pruning can cause damage that lasts for the life of the tree. Learn where and how to make the cuts before picking up the pruning shears.
- Trees do not "heal" the way people do. When a tree is wounded it must grow over and "compartmentalize" the wound. In effect, the wound is contained within the tree forever.
- A rule, small cuts do less damage to the tree than large cuts. This is why proper pruning (training) of young trees is critical. Waiting to prune a tree when it is mature can create the need for large cuts that the tree cannot easily close.

■ Making the cut

Where you make a pruning cut is critical to a tree's response in growth and wound closure. Pruning cuts should be made just outside the branch collar. Since the branch collar contains trunk or parent branch tissues, the tree will be damaged unnecessarily if you remove or damage it. In fact, if the cut is large, the tree may suffer permanent internal decay from an improper pruning cut.



If a permanent branch is to be shortened, cut it back to a lateral branch or bud. Internodal cuts, or cuts made between buds or branches, may lead to stem decay, sprout production and misdirected growth.



Never use hedge shears to prune your tree!;

■ Pruning tools

When pruning trees, it is important to have the right tool for the job. For small trees, most of the cuts can be made with hand pruning shears (secateurs). The scissor type, or by-pass blade hand pruners are preferred over the anvil type. They make cleaner, more accurate cuts. Cuts larger than 1/2 inch in diameter should be made with lopping shears or a pruning saw.

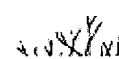
Never use hedge shears to prune a tree. Whatever tool you use, make sure it is kept clean and sharp.

■ Establishing a strong scaffold structure

A good structure of primary, scaffold branches should be established while the tree is young. The scaffold branches provide the framework of the mature tree. Properly trained young trees will develop a strong structure that will require less corrective pruning as they mature.



The goal in training young trees is to establish a strong



trunk with sturdy, well-spaced branches. The strength of the branch structure depends on the relative sizes of the branches, the branch angles and the spacing of the limbs. Naturally, this will vary with the growth habit of the tree. Pin oaks and sweetgums, for example, have a conical shape with a central leader. Elms and live oaks are often wide-spreading without a central leader. Other trees, such as lindens and Bradford pears, are densely branched. Good pruning techniques remove structurally weak branches while maintaining the natural form of the tree.

■ Trunk development

For most young trees, maintain a single, dominant leader. Do not prune back the tip of this leader. Do not allow secondary branches to outgrow the leader. Sometimes a tree will develop double leaders known as codominant stems. These can lead to structural weaknesses, so it is best to remove one while the tree is young.

The lateral branches contribute to the development of a sturdy, well-tapered trunk. It is important to leave some of these lateral branches in place, even though they may be pruned out later. These branches, known as temporary branches, also help protect the trunk from sun and mechanical injury. Temporary branches should be kept short enough not to be an obstruction or compete with selected permanent branches.



When codominant stems develop, they may become "codominant" if the trunk is not pruned out of the stems while the tree is young.

■ Permanent branch selection

Nursery trees often have low branches that may make the tree appear well-proportioned when young, but low branches are seldom appropriate for large growing trees in an urban environment. How a young tree is trained depends on its primary function in the landscape. For example, street trees must be pruned so that they allow at least 16 feet of clearance for traffic. Most landscape trees only require about eight feet of clearance.

The height of the lowest permanent branch is determined by the tree's intended function and location in the landscape. Trees that are used to screen an unsightly view or provide a wind break may be allowed to branch low to the ground. Most large growing trees in the landscape must eventually be pruned to allow head clearance.

The spacing of branches, both vertically and radially in the tree is very important. Branches selected as permanent, scaffold branches must be well-spaced along the trunk. Maintain radial balance with branches growing outward in each direction.

A good rule of thumb for the vertical spacing of permanent branches is to maintain a distance equal to 3% of the tree's eventual height. Thus a tree that will be 50 feet tall should have permanent scaffold branches spaced about 18 inches apart along the trunk. Avoid allowing two scaffold branches to arise one above the other on the same side of the tree.

Some trees have a tendency to develop branches with narrow angles of attachment and tight crotches. As the tree grows, bark can become enclosed deep within the crotch between the branch and the trunk. This is called included bark. Included bark weakens the attachment of the branch to the trunk and can lead to branch failure when the tree matures. You should prune branches with weak attachments while they are young.

Avoid over-thinning the interior of the tree. The leaves of each branch must manufacture enough food to keep that branch alive and growing. In addition, each branch must contribute food to grow and feed the trunk and roots. Removal of too many leaves can "starve" the tree, reduce growth and make the tree unhealthy. A good rule of thumb is to maintain at least half the foliage on branches arising in the lower 2/3 of the tree.

■ Newly planted trees

Pruning of newly planted trees should be limited to corrective pruning. Remove torn or broken branches. Save other pruning measures for the second or third year.

The belief that trees should be pruned when planted to compensate for root loss is misguided. Trees need their leaves and shoot tips to provide food and the substances which stimulate new root production. Unpruned trees establish faster, with a stronger root system than trees pruned at the time of planting.

■ Wound dressings

Wound dressings were once thought to accelerate wound closure, protect against insects and diseases, and reduce decay.

However, research has shown that dressings do not reduce decay or speed closure, and rarely prevent insect or disease infestations. Most experts recommend that wound dressing not be used. If a dressing must be used for cosmetic purposes, use a thin coating of a material that is not toxic to the plant.

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Pruning is the most common tree maintenance procedure. Although forest trees grow quite well with only nature's pruning, landscape trees require a higher level of care to maintain their safety and aesthetics. Pruning should be done with an understanding of how the tree responds to each cut. Improper pruning can cause damage that will last for the life of the tree, or worse, shorten the tree's life.

■ Reasons for Pruning

Since each cut has the potential to change the growth of the tree, no branch should be removed without a reason. Common reasons for pruning are to remove dead branches, to remove crowded or rubbing limbs, and to eliminate hazards. Trees may also be pruned to increase light and air penetration to the inside of the tree's crown or to the landscape below. In most cases, mature trees are pruned as a corrective or preventative measure.

Routine thinning does not necessarily improve the health of a tree. Trees produce a dense crown of leaves to manufacture the sugar used as energy for growth and development. Removal of foliage through pruning can reduce growth and stored energy reserves. Heavy pruning can be a significant health stress for the tree.

Yet if people and trees are to coexist in an urban or suburban environment, then we sometimes have to modify the trees. City environments do not mimic natural forest conditions. Safety is a major concern. Also we want trees to complement other landscape plantings and lawns. Proper pruning, with an understanding of tree biology, can maintain good tree health and structure while enhancing the aesthetic and economic values of our landscapes.

■ When to Prune

Most routine pruning to remove weak, diseased or dead limbs can be accomplished at any time during the year with little effect on the tree. As a rule, growth is maximized and wound closure is fastest if pruning takes place before the spring growth flush. Some trees, such as maples and birches, tend to "bleed" if pruned early in the spring. This may be unsightly, but is of little consequence to the tree.

A few tree diseases, such as oak wilt, can be spread when pruning wounds allow spores access into the tree. Susceptible trees should not be pruned during active transmission periods.

Heavy pruning just after the spring growth flush should be avoided. This is when trees have just expended a great deal of energy to produce foliage and early shoot growth. Removal of a large percentage of foliage at this time can stress the tree.



On a dead branch that has a collar of live wood, the final cut should be just beyond the outer edge of the collar.

■ Making Proper Pruning Cuts

Pruning cuts should be made just outside the branch collar. The branch collar contains trunk or parent branch tissue and should not be damaged or removed. If trunk collar has grown out on a dead limb to be removed, make the cut just beyond the collar. Do not cut the collar.

If a large limb is to be removed, its weight should first be reduced. This is done by making an undercut about 12-18 inches from the limb's point of attachment. A second cut is made from the top,



Use the 3-cut method to remove a large limb.

directly above or a few inches further out on the limb. This removes the limb leaving the 12-18 inch stub. The stub is removed by cutting back to the branch collar. This technique reduces the possibility of tearing the bark.

■ Pruning Techniques

Specific types of pruning may be necessary to maintain a mature tree in a healthy, safe and attractive condition.

Crown cleaning

is the removal of dead, dying, diseased, crowded, weakly attached and low-vigor branches from the crown of a tree.

Crown thinning

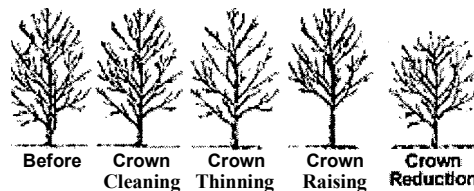
is the selective removal of branches to increase light penetration and air movement through the crown. Thinning opens the foliage of a tree, reduces weight on heavy limbs, and helps retain the tree's natural shape.

Crown raising

removes the lower branches from a tree in order to provide clearance for buildings, vehicles, pedestrians and vistas.

Crown reduction

reduces the size of a tree, often for clearance for utility lines. Reducing the height or spread of a tree is best accomplished by pruning back the leaders and branch terminals to lateral branches that are large enough to assume the terminal roles (at least one-third the diameter of the cut stem). Compared to topping, this helps maintain the form and structural integrity of the tree.



■ How much should be pruned?

The amount of live tissue that should be removed depends on the tree size, species, and age, as well as the pruning objectives. Younger trees will tolerate the removal of a higher percentage of living tissue than mature trees. An important principle to remember is that a tree can recover from several small pruning wounds faster than from one large wound.

A common mistake is to remove too much inner foliage and small branches. It is important to maintain an even distribution of foliage along large limbs and in the lower portion of the crown. Over-thinning reduces the tree's sugar production capacity and can create tip-heavy limbs that are prone to failure.

Mature trees should require little routine pruning. A widely accepted rule of thumb is never to remove more than one fourth of a tree's leaf bearing crown. In a mature tree, pruning even that much could have negative effects. Removing even a single, large-diameter limb can create a wound that the tree may not be able to close. The older and larger a tree becomes, the less energy it has in reserve to close wounds and defend against decay or insect attack. The pruning of large, mature trees is usually limited to the removal of dead or potentially hazardous limbs.

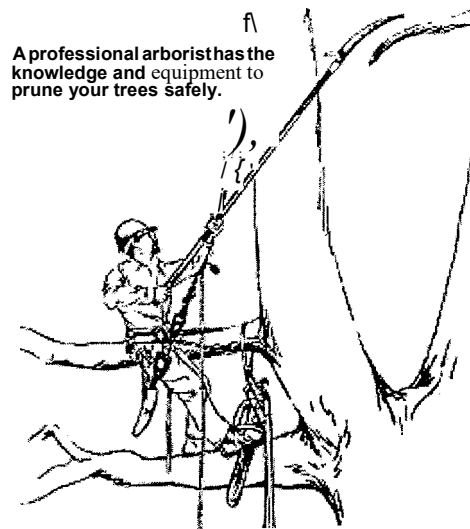
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must be used for cosmetic purposes, then only a thin coating of a non-toxic material should be applied.

■ Hiring an Arborist

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 - o Uses tree climbing spikes to climb trees that are being pruned. Climbing spikes can damage trees, and their use should be limited to trees that are being removed.

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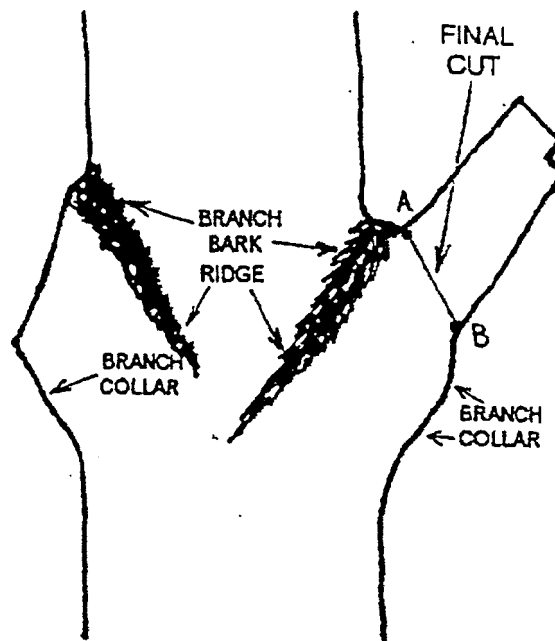
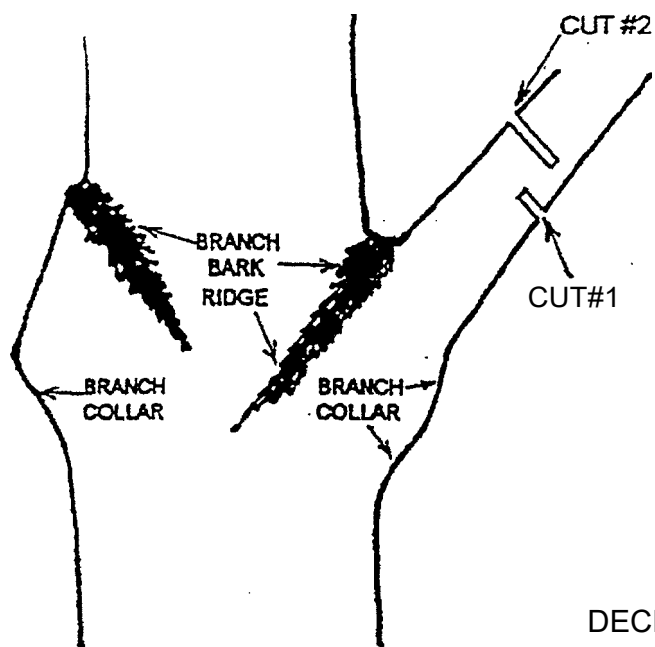
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 UPDATED FEBRUARY 2000

PROPER PRUNING CUTS

STEP #1

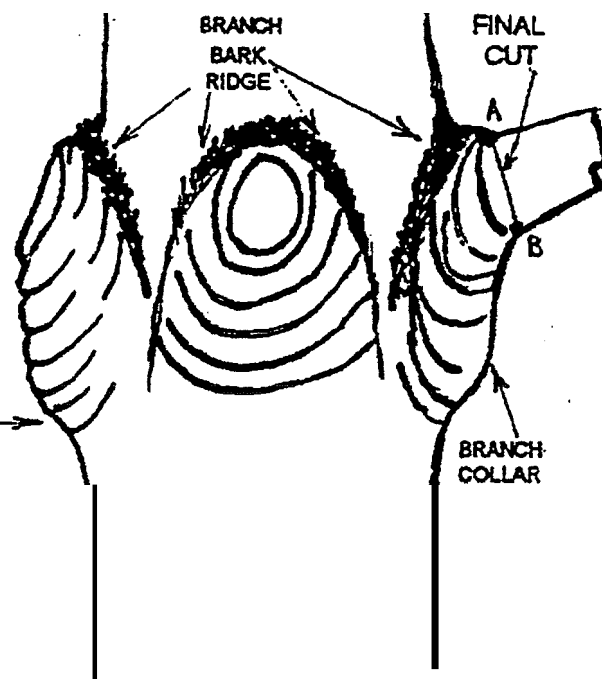
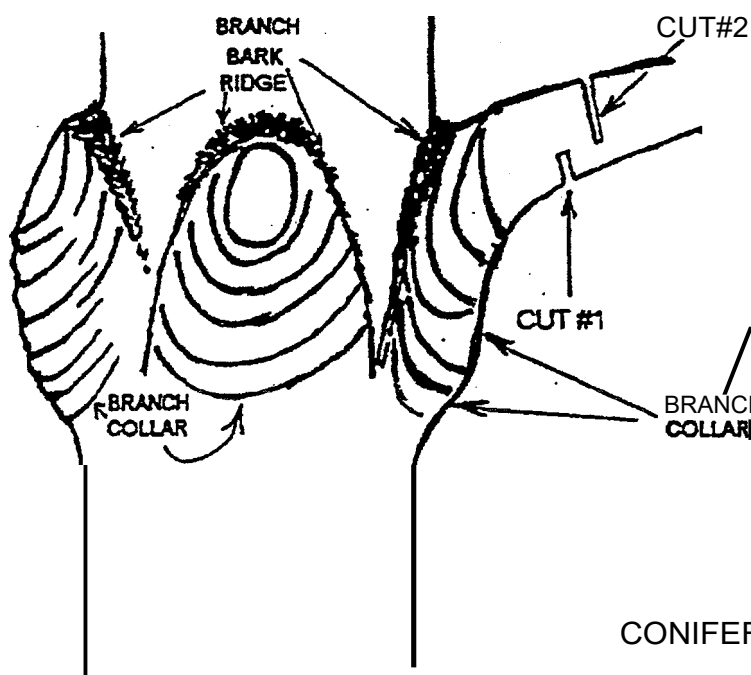
STEP #2



DECIDUOUS

STEP #1

STEP #2



CONIFERS

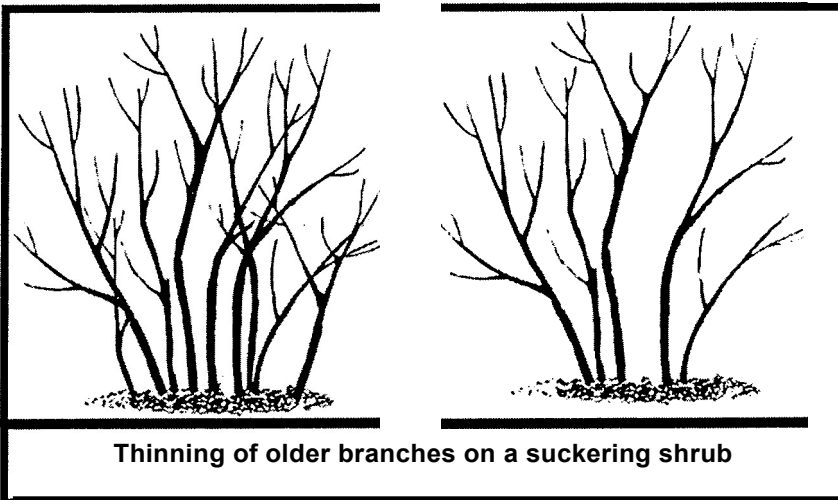
1. STEP #1- This 2 cut process reduces the likelihood that the limb will peel and cause additional unwanted tissue damage.
2. STEP #2-Your finish or final cut should be made from point A to point B:
DO NOT LEAVE STUBS & DO NOT FLUSH CUT

NOTE: DO NOT CUT INTO THE BRANCH BARK RIDGE
DO NOT REMOVE THE BRANCH COLLAR

How to Properly Prune Deciduous Shrubs

Laura Jull, UW-Madison Horticulture

Why prune shrubs? Pruning is important for a variety of reasons. Pruning can help control the size of a shrub, direct growth, influence flowering or fruiting, rejuvenate old, overgrown plants, or maintain plant health and appearance. Pruning also encourages growth below the pruning cut. In addition to pruning, selecting shrubs that are suited to your environment and location are very important. The ultimate height, spread, and growth rate should be taken into account when selecting shrubs for landscaping.



Thinning of older branches on a suckering shrub

Types of pruning cuts:

Thinning: This technique is the most common and best way to renew a shrub. Thinning preserves the overall plant shape and is particularly useful for shrubs that sucker from its base (see diagram.) Remove interior branches with loppers or a pruning saw back to the base of the plant or the point of origin. Remove only 1/3 of the largest branches at one time.

Heading back: Heading back can be used to reduce

the height of most types of shrubs. This technique entails removing each branch back to a larger branch or bud. When pruning back to a bud, cut the branch on a slight angle to within 1/4" above the bud. DO NOT leave a stub. Disinfect your pruning tools with alcohol or a 10% bleach solution after each cut to avoid spreading diseases. Wound treatments are not recommended and can actually slow down wound closure.

Rejuvenation: Use this technique for shrubs that are overgrown or leggy, and for shrubs that sucker readily from the base. Cut the entire shrub back to a height of 4-10" from the ground when the shrubs are dormant. Shrubs that can tolerate rejuvenation pruning are butterfly bush, Annabelle hydrangea, potentilla, and Japanese spirea.

Shearing: This technique involves the removal of new shoots using hedge shears. Shearing should be used only on formal hedges. Examples of shrubs that can be sheared into formal hedges are yews, boxwood, hemlock, and arborvitae. Maintain the base of formal hedges wider than the top to insure adequate light penetration to the bottom of the hedge. Each time you shear a hedge, leave 1" of previous growth to allow for the plant to regrow. Most shrubs should NOT be pruned with hedge shears. For most shrubs, shearing will eliminate the shrub's natural form, will reduce the amount of foliage and flowers in the shrub's interior, and will cause a proliferation of shoots that will make the shrub unsightly.

Pinching: This technique involves the removal of shoot tips allowing for additional side branching. Pinching increases the bushiness of a shrub. This type of pruning can be done on smaller shrubs in spring or on certain evergreens.

Deadheading: This technique involves the removal of spent flowers by hand. For some shrubs such as Japanese spirea, deadheading can encourage a second flush of flowers.

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University of Wisconsin-Extension

When should I prune my shrubs?

Broad-leaved evergreens: Broad-leaved evergreens require little pruning. Most grow very slowly. If pruning does become necessary, selectively prune branches back to a side branch so that the foliage hides the pruning cuts. Broad-leaved evergreens should not be sheared or cut back into older, non-leafy areas as these plants lack latent buds. New growth is initiated from terminal buds. Examples of broad-leaved evergreens are rhododendrons, evergreen hollies, and Oregon grapeholly.

Spring-flowering shrubs: Spring-flowering shrubs produce flower buds on one-year-old wood (wood produced the preceding summer). Therefore, you should prune these shrubs AFTER they have flowered in spring, but before the next year's flower buds are set. If you prune these shrubs in winter or early spring, you will remove many of the flower buds. Spring-flowering shrubs that sucker readily from the base benefit from thinning (see above). Examples of spring-flowering shrubs are lilacs, forsythia, viburnums, honeysuckle, chokeberry, mockorange, and weigela.

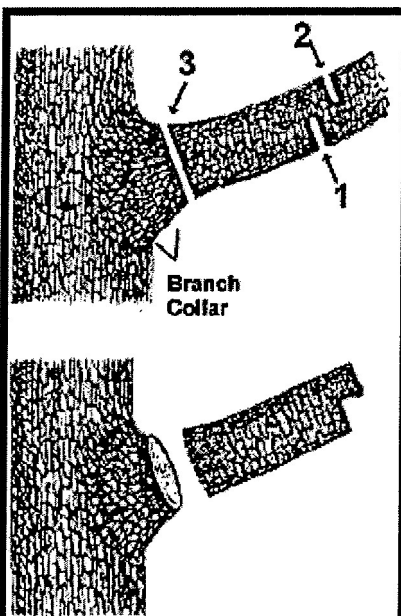
Summer-flowering shrubs: Summer-flowering shrubs produce flower buds on new growth in the spring. Prune these shrubs when they are dormant or in early spring before budbreak. If you postpone pruning until late spring or early summer, you will remove many flower buds. Examples of summer-flowering shrubs are hydrangeas, roses, Japanese spirea, rose-of-Sharon, potentilla, and smokebush.

For more information on pruning: See UW-Extension Bulletins A1817, A1771, A1730 and Extension Fact Sheets X1013, X1014, X1016, or contact your County Extension Agent.

How to Properly Prune Deciduous Trees

Laura Jull, UW-Madison Horticulture

Why prune trees? Pruning is important for a variety of reasons. Pruning can help control the size of a tree, direct growth, influence flowering or fruiting, or maintain plant health and appearance. Pruning can also increase the safety of a tree by removing broken, diseased, dead, or dying branches. In addition to pruning, selecting plants that are suited to your environment and location are very important. The ultimate height and spread, in addition to location of overhead powerlines, should be taken into account when selecting trees for landscaping.



Three step method of pruning large limbs

What should be pruned?

Newly planted trees: Newly planted trees should not be pruned unless a branch is broken, diseased or dead. These trees need foliage to produce carbohydrates (sugars), which are then transported to the root system for initiation of new roots.

Young trees: After a young tree is established for 2-5 years, the tree can be pruned to encourage a well-branched canopy. Lower branches can be removed to raise the canopy, if desired. *Scaffold branches* to be maintained in the tree should be selected that are 12-18" apart, evenly distributed around the trunk with wide crotch angles. Remove no more than 1/3 of the total crown of a tree at one time. Young trees also need corrective pruning to remove crossing branches, *double leaders*, *watersprouts*, and *root suckers*.

Older trees: Older, established trees, if properly trained when young, require little pruning. These trees should never be *topped* as this leads to poor branch structure and increased limb breakage. Use the three-point method of limb removal for pruning large branches (see diagram at left and description below). This method ensures proper pruning and closure of wounds. Contact a certified arborist to prune larger limbs and remove trees, particularly if the tree is close to powerlines or buildings.

The 3-point method of proper pruning of large limbs

When doing any type of pruning, always use a sharp pruning saw for making pruning cuts. Also, be sure to disinfect your pruning tools with alcohol or a 10% bleach solution after each pruning cut to avoid spreading diseases.

Step one: Select the branch that you want to remove. On large limbs, the first cut should be 12-18" from the limb's point of attachment. The pruning cut should be an undercut made 1/2 way through the branch (see diagram). This pruning cut is very important because it relieves weight from the branch collar and prevents accidental tearing of bark from the tree's trunk when the limb is removed.

Step two: The second pruning cut should be made on the outside of the first cut (i.e., farther from the trunk). Cut all the way through the limb from the top down, thus removing the weight of the branch.

Step three: The final cut should be made next to the tree's trunk outside the *branch collar*. Cut from the top down and cut all the way through the remaining branch stub. The branch collar should be left intact. DO NOT cut the branch flush with the tree's trunk. A proper cut avoids large wounds, and allows the tree's wound to close quickly.



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Should I use wound treatments? In general, wound treatments, such as tree paint or wound dressing, are not recommended. These compounds slow down wound closure and promote decay. One exception when wound treatments are recommended, is the case of oak trees that are pruned during the growing season. Using wound treatments on oaks is important to keep out insects that transmit the oak wilt fungus.

When should I prune trees? Most deciduous trees should be pruned in late fall to winter. At this time of year, you can see the overall branch structure easily, and most insects and disease causing organisms are not active. Late fall/winter pruning is especially important for oak trees to help prevent spread of the fungus that causes oak wilt. Late spring and summer are usually not good times of year to prune because disease pathogens are present and wound closure is slower. If you prune in late winter, some trees may bleed or ooze sap excessively in the early spring. The bleeding may be unsightly, but does not harm the tree. Examples of trees that bleed excessively are maple, willow, birch, walnut, beech, hornbeam, elm, and yellowwood.

Definitions:

Branch collar: the ring of trunk tissue that surrounds a lateral branch at the point of attachment to the stem.

Double leaders: two major, terminal growing points located at the top of the tree.

Root suckers: vigorous, upright, adventitious shoot that arises from latent buds below the graft union or at the base of the tree.

Scaffold branches: the large branches that form the main structure of the crown of a tree.

Topping: improper pruning technique to reduce height of a tree by removal of large branches back to larger primary branches. This technique is not recommended.

Watersprouts: vigorous, vertical, adventitious shoot that arises from latent buds above the ground or graft union on older wood.

For more information on pruning: See UW-Extension Bulletins A1817, A1771, A1730 and Extension Fact Sheets X1013, X1015, or contact your County Extension Agent.

Revised
Oct. 10, 1999

University of Wisconsin Garden Facts



Mulches are materials placed over the soil surface to maintain moisture and improve soil conditions. Mulching is one of the most beneficial things a home owner can do for the health of a tree. Mulch can reduce water loss from the soil, minimize weed competition, and improve soil structure. Properly applied, mulch can give landscapes a handsome, well-groomed appearance. Mulch must be applied properly; if it is too deep, or if the wrong material is used, it can actually cause significant harm to trees and other landscape plants.

• The Benefits of Proper Mulching

- Helps maintain soil moisture. Evaporation is reduced, and the need for watering can be minimized.
- Helps control weeds. A 2 to 4 inch layer of mulch will reduce the germination and growth of weeds.
- Mulch serves as nature's insulating blanket. Mulch keeps soils warmer in the winter and cooler in the summer.
- Many types of mulch can improve soil aeration, structure (aggregation of soil particles), and drainage over time.
- Some mulches can improve soil fertility
- A layer of mulch can inhibit certain plant diseases.
- Mulching around trees helps facilitate maintenance, and can reduce the likelihood of damage from "weed whackers," or the dreaded "lawnmower blight."
- Mulch can give planting beds a uniform, well-cared-for look.

Trees growing in a natural forest environment have their roots anchored in a rich, well-aerated soil full of essential nutrients. The soil is blanketed by leaves and organic materials that replenish nutrients and provide an optimal environment for root growth and mineral uptake. Urban landscapes, however, are typically a much harsher environment with poor soils, little organic matter, and big fluctuations in temperature and moisture. Applying a 2- to 4-inch layer of organic mulch can mimic a more natural environment and improve plant health.

The root system of a tree is not a mirror image of the top. The roots of most trees can extend out a significant distance from the tree trunk. Although the guideline for many maintenance practices is the drip line--the outermost extension of the canopy--the roots can grow many times that distance. In addition, most of the fine, absorbing roots are located within inches of the soil surface. These roots, which are essential for taking up water and minerals, require oxygen to survive. A thin layer of mulch, applied as broadly as practical, can improve the soil structure, oxygen levels, temperature, and moisture availability where these roots grow.

fl Types of Mulch

Mulches are available commercially in many forms. The two major types of mulch are inorganic and organic. Inorganic mulches include various types of stone, lava rock, pulverized rubber, geotextile fabrics, and other materials. Inorganic mulches do not decompose and do not need to be replenished often. On the other hand, they do not improve soil structure, add organic materials, or provide nutrients. For these reasons, most horticulturists and arborists prefer organic mulches.

Organic mulches include wood chips, pine needles, hardwood and softwood bark, cocoa hulls, leaves, compost mixes, and a variety of other products usually derived from plants. Organic mulches decompose in the landscape at different rates depending on the material. Those that decompose faster must be replenished more often. Because the decomposition process improves soil quality and fertility, many arborists and other landscape professionals consider this a positive characteristic, despite the added maintenance.

ff Not Too Much!

As beneficial as mulch is, too much can be harmful. The generally recommended mulching depth is 2 to 4 inches. Unfortunately, North American landscapes are falling victim to a plague of overmulching. A new term, "mulch volcanoes," has emerged to describe mulch that has been piled up around the base of trees. Most organic mulches must be replenished, but the rate of decomposition varies. Some mulches, such as cypress mulch, remain intact for many years. Top dressing with new mulch annually (often for the sake of refreshing the color) creates a build-up to depths that can be unhealthy. Deep mulch can be effective in suppressing weeds and reducing maintenance, but it often causes additional problems.



"Mulch volcanoes" can cause many problems for trees.

4f Problems Associated with Improper Mulching

- Deep mulch can lead to excess moisture in the root zone, which can stress the plant and cause root rot.
- Piling mulch against the trunk or stems of plants can stress stem tissues, and may lead to insect and disease problems.
- Some mulches, especially those containing cut grass, can affect soil pH. Continued use of certain mulches over long periods can lead to micronutrient deficiencies or toxicities.
- Mulch piled high against the trunks of young trees may create habitats for rodents that chew the bark_ and can girdle the trees.
- Thick blankets of fine mulch can become matted, and may prevent the penetration of water and air. In addition, a thick layer of fine mulch can become like potting soil and may support weed growth.
- Anaerobic "sour" mulch may give off pungent odors, and the alcohols and organic acids that build up may be toxic to young plants.

41 Proper Mulching

It is clear that the choice of mulch and the method of application can be important to the health of landscape plants. The following are some guidelines to use when applying mulch.



Mulch wide not deep.

- Inspect plants and soil in the area to be mulched. Determine whether drainage is adequate. Determine whether there are plants that may be affected by the choice of mulch. Most commonly available mulches work well in most landscapes. Some plants may benefit from the use of a slightly acidifying mulch such as pine bark.
- If mulch is already present, check the depth. Do not add mulch if there is a sufficient layer in place. Rake the old mulch to break up any matted layers and to refresh the appearance. Some landscape maintenance companies spray mulch with a water soluble, vegetable-based dye to improve the appearance.
- If mulch is piled against the stems or tree trunks, pull it back several inches so that the base of the trunk and the root crown is exposed.
- Organic mulches are usually preferred to inorganic materials due to their soil-enhancing properties. If organic mulch is used, it should be well aerated and, preferably, composted. Avoid sour-smelling mulch.
- Composted wood chips can make good mulch, especially when they contain a blend of leaves, bark, and wood. Fresh wood chips may also be used around established trees and shrubs. Avoid using uncomposted wood chips that have been piled deeply without exposure to oxygen.
- For well-drained sites, apply a 2- to 4-inch layer. If there are drainage problems, a thinner layer should be used. Avoid placing mulch against the tree trunks. Mulch out to the tree's drip line or beyond.

Remember: if the tree had a say in the matter, its entire root system (which usually extends well beyond the drip line) would be mulched.



International Society of Arboriculture

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DIAGNOSING TREE HEALTH PROBLEMS

by Cindy Casey
DNR West Central Region

note: Definitions for italicized words are given at the end of the article.

Diagnosing tree health problems is an important aspect of community tree management. Unhealthy trees are not simply an aesthetic problem, but a functional one as well. Trees must be kept healthy to perform in the landscape and avoid becoming liabilities. While preventive measures can minimize the stress that predisposes trees to many problems, it is not possible to entirely avoid the wide array of potential plant health problems.

Accurate diagnosis requires broad technical knowledge, practical experience and good sleuthing skills. Pinpointing the cause of damage can be complicated because different problems can have similar *symptoms*, a given problem does not always exhibit identical symptoms, and visible *signs* are often attributable to secondary rather than causative factors. Nevertheless, a systematic approach can help even those without specialized training zero in on the likely cause of many landscape tree problems.

Know your plants.

Tree managers must develop basic knowledge of the plant materials they work with. Different tree species have different requirements and susceptibilities. What is normal for one plant may be abnormal for another. Brown leaves clinging to the branches of an oak tree in winter is not cause for concern. A similarly clad maple is declining or dead. Many species have hallmark problems, e.g., Norway maple and stem-girdling roots. Proper plant identification helps to quickly focus on-or rule out-commonly associated problems. Knowing the site requirements of different plants is also necessary for proper diagnosis. A red pine on a poorly drained clay soil will very quickly develop off-color needles, turn brown and die, while a silver maple on the same site can thrive for decades.

Learn the profiles of common tree health problems.

Some health problems have such distinctive signs and symptoms that near-certain field diagnosis is possible. Yellow leaves throughout a selected elm branch in early July probably indicate Dutch elm disease. Some disorders become common only under certain environmental conditions. The fungal leaf disease anthracnose is generally confined to cool, damp weather. Certain cultural problems like severed or suffocated roots are so common on construction sites that they are automatically suspected when tree decline occurs in the years following construction activity.

Assess signs and symptoms.

Most disorders exhibit a set of characteristic symptoms. Failure to evaluate the full range of symptoms can result in misdiagnosis or to treatment of symptoms rather than causes. Wilting leaves on a maple can be from moisture stress, root injury, soil contamination, insect feeding or fungal pathogens. While diagnosis cannot be made from the wilted leaves alone, additional symptoms such as reduced twig growth, branch die back, yellowing foliage, and green streaking under the bark put *Verticillium* wilt at the top of the list of suspected causes. Patterns of injury are also important. By noting patterns from tree to tree, within a tree and within affected plant parts, the field of suspected causes is easily narrowed. A northern pin oak, whose leaves suddenly turn brown in August could be suffering from a variety of problems. Observing an adjacent pin oak with identical symptoms and noting that another adjacent pin oak died the previous year after showing the same symptoms would quickly point to oak wilt as the suspected cause.

A checklist approach to diagnosis helps ensure thorough assessment of signs and symptoms. Detailed answers to the following questions will help you or a specialist arrive at a diagnosis. Be sure to note the date of your inspection.

* **site history & use** - How is the site used? Have there been previous uses that might diminish site quality, such as a landfill or old roadbed? Does the site contain buried tanks or building rubble? Are there factories or other potential sources of pollution nearby? Has any recent disturbance occurred, such as construction, grade change, utility installation, changes in groundwater flow? Have amendments or other treatments been made to the soil? Have pesticides been applied to the soil, adjacent lawns or nearby plants?

* **weather history** - Have noteworthy weather conditions occurred recently, such as high or low temperature extremes, early or late frosts, drought or prolonged rainy spells, flooding, hail, ice storms, high wind, lightning?

* **site & landscape features** - Is the tree in sun or shade, protected or exposed? Is there significant topography, such as frost pockets, swales or ridges? What is the soil texture, drainage, pH, density, fertility? What surfaces surround the plant, e.g., pavement, grass, other groundcovers, mulch? Are there physical constraints to tree growth? Are there downspouts, exhaust vents or similar features that might affect microsite? What other plants are close by?

"" **plant data** - What is the plant species and cultivar, age and size? When was the tree planted? What cultural work, e.g., pruning, fertilizing, pesticide application, supplemental watering, cabling or bracing has been performed and when? Has the tree shown similar damage in the past? Is the problem getting better, worse, or staying the same?

"" **signs & symptoms** - Do leaves or branches at the top of the tree show the same damage as leaves or branches at the bottom? Do exterior plant parts show the same damage as interior? Is damage confined to one side or portion of the tree? Is the damage consistent from tree to tree? When were symptoms first noticed? Are insects, eggs or webs present? If so, what plant parts are involved?

Leaves: Are they ragged or full of holes? Covered with spots, bumps or other growths? Are there transparent sections? Are they twisted, curled, misshapen or undersized? Are leaves wilted or drooping? Did they turn brown or black suddenly? If there is brown or off-color tissue, what is the pattern of discoloration? Did fall coloration appear prematurely? Did leaves fall off prematurely or suddenly?

Trunk and Branches: Are dead, dying or sparsely foliated branches present? Has annual shoot growth been consistent or declining gradually or suddenly? Are there holes, cracks, *cankers*, discolored or sunken areas in the trunk or branches? Are there mechanical injuries such as tearing, scraping, gouging or girdling? Are fungal fruiting bodies ("mushrooms") or other abnormal growths present? Is sap or other material oozing from the tree? If any bark is loose, carefully remove a section and look at its underside and the wood underneath. Are insect galleries, sawdust, shoestring-like strands, discolored wood or unusual odors present? Cutting or scraping off the bark from a branch with wilted or scorched-looking leaves, is there discolored streaking of the wood underneath? Is there sawdust or sap at the base of the tree? Is mulching material in direct contact with the trunk? Are any roots pressing against the base of the tree? Can you see the flare of buttress roots?

Look at any flowers or fruit: Is production abnormally heavy or light? Are flowers or fruit rotting, shriveling or aborting? Are there abnormal growths or spots?

Keep things in perspective . . .

Some tree health problems are easy to diagnose, some are difficult. Sometimes the cause cannot be determined, even by a specialist. Diagnosis is frequently a matter of educated guesswork based on the process of elimination. Although biotic agents can often be positively identified, the majority of health problems are cultural or site related, causes for which symptoms are usually nonspecific. Problems stemming from the root-soil relationship are among the leading causes of urban tree decline and death, yet such causes are easily overlooked because roots are generally hidden, and above ground symptoms can take years to develop.

Just because a pest or disease is present does not mean the organism is significant to tree health or the direct cause of the health problem. Some insects are beneficial, preying upon others that are damaging. Many pests and diseases, particularly those confined to leaf tissue, are aesthetic problems and do not, by themselves, compromise tree health. Many other pests and diseases are opportunistic, primarily affecting stressed trees. While these agents may damage or **kill** trees, the underlying health problem may well be a consequence of site or cultural factors such as poor drainage, soil compaction, grade change, improper planting or pruning, excessive fertilization, string trimmer damage or simply having chosen the wrong species for the site. It is important to discern the cause of the underlying health problem to avoid superficial treatment or repeated problems in the future.

Even with proper diagnosis treatment is often unavailable, impractical or inopportune. By selecting species that are relatively pest- and disease-free, matching species to the site, planting and maintaining trees correctly and protecting trees from damage, many disorders can be avoided. When problems do arise, early detection, diagnosis and treatment, if warranted, can often minimize the effects.

Resources, Support and Training Opportunities.

Assistance is available from many sources. Consulting arborists or, in some counties, extension horticulturists can help with diagnosis and treatment recommendations. Laboratory analysis of plant and soil samples is also available. Various institutions and agencies occasionally offer workshops, field days and accredited courses on plant health topics. The *Wisconsin Urban and Community Forests* newsletter posts notices of upcoming training opportunities, some of which may be related to woody plant problems. Also, check with your county extension office for any plant health clinics or field days to be offered in or near your area.

definitions:

symptom - the external and internal reactions or alterations of a plant as a result of the disease or parasite (e.g., premature leaf drop)
sign - the pathogen or parasite, its parts or products, seen on a host plant (e.g., fruiting body of a fungus or an empty insect pupal case)
canker- a localized lesion on the bark containing dead tissue

Diagnosing Tree Health Problems Diagnostic Tools & Laboratory Analysis

*by Kim Sebastian
DNR Southeast Region*

Armed with knowledge, experience and powers of observation, you can diagnose most plant problems. But sometimes, to adequately examine a plant, it may be necessary to use one or more tools. (See table). If you take a survey of people and their "tools," some prefer the Tim the Toolman approach, where bigger and more is better. Others feel that a good, locking-blade pocket knife is all they need. Most of us fall somewhere in between. So, here's a short list of tools, and what you might use them for in the field for diagnosis.

Diagnostic Tools

A clipboard, paper and pen are tools that obviously help you to record information. There are several diagnostic forms available, or you can make one up of your own. By taking the time to jot some things down, those little details that you gather just may tell a different story.

Probably one of the most useful tools is a sturdy, locking-blade pocket knife. It can be used to slice through shoots and small branches, and examine young wood and bark. You also can explore decayed areas, cankers and insect holes. And, if you absolutely had to, you could use it as a digging implement. You'd probably be better off with a shovel to look at the soil, and to check the amount of compaction, texture and moisture. You can sample the soil horizon with a soil probe, and check out the roots with a small sturdy trowel.

Pruning shears will help in collecting samples, and in checking the internal condition of small branches. A saw might be needed for larger branches, and a pole saw to get samples that are out of reach.

If you feel that internal decay might be a problem, a drill with a long bit is an excellent tool to help determine problems in the trunk. If you don't have a drill, a wood chisel and hammer also can cut through thick bark and probe for decay. You also can use these tools to tap the bark to determine if wood is sound.

A hand lens can assist in looking at insects, disease problems or symptoms, and plant tissues. Binoculars work well to examine specimens that are out of reach. It is said that a picture is worth a thousand words, so think of all the time that you can save yourself if you snap a few photos. A camera can record and document various information for future reference or evidence.

A variety of measuring tapes to measure shoot growth, trunk diameter, distances and other sizes should also be thrown in your tool kit. And, last but not least, bags and labels are a necessity. After you collect all of your samples, bags then help to keep the specimens from drying out and in good condition (as long as you keep them out of the heat and don't crush them). Vials for holding insects in one piece are also a good idea. Once you've collected these samples, what do you do with them?

Collecting and Sending Plant Samples

After making a preliminary diagnosis, call a local expert for confirmation or for recommendations on appropriate control measures. It still may be necessary to send a sample of the problem to a laboratory for analysis. When sending a sample, follow the lab's suggestions, or use these guidelines from the University of Wisconsin-Extension (UWEX) to receive the best possible diagnosis:

1. Send an adequate representative of the problem. If possible, collect several samples that show a continuum of symptoms.
2. Submit a **fresh** sample. Package and mail it immediately. If the sample is collected during a field visit, place it in a cooler, rather than on the car or truck dashboard, until you get ready to mail it.
3. Package the sample properly so the soil doesn't dirty the foliage. Wash roots unless it is a sample for nematode analysis or you are submitting potted samples.

4. Package different species with different problems separately.
5. Use packing material around the sample so it isn't crushed during shipping.
6. Mail the sample early in the week so it doesn't sit in the post office over the weekend.
7. Fill in as many blanks as you can on the submittal form. Since the diagnosis process often involves piecing together various clues, background information is crucial.

Note: Keep the submittal form legible by placing it in a separate plastic bag. *Do not* wrap your specimen with the submittal form.

Laboratory Analysis

University of Wisconsin-Extension Plant Disease Diagnostics Clinic

Before you submit samples, consult with your local Extension agent. Some extension offices have Horticulture Agents, and he or she may be able to identify the plant disease or insect. If you still need diagnostic help with a plant problem, ask your agent for a Plant Disease and Insect Identification Form, and for a brochure entitled UW Madison/UW-E., Extension Plant Disease Diagnostics Clinic. This brochure illustrates packaging guidelines for potted plants, seedlings, leaves, branches, insects and turf. Since several plant parts can be submitted for diagnosis, it is important to properly handle each of them.

The charge for this diagnostic laboratory service varies, but usually is \$10. Call the Clinic at 608/262-2863 or check out their website www.plantpath.wisc.edu/pddc for details. The laboratory also accepts digital samples for review. To use UWEX's diagnostic service, submit the completed Plant Disease and Insect Identification Form, the specimen, and the required fee to: Plant Disease Diagnostics Clinic, Department of Plant Pathology, University of Wisconsin-Madison, Russell Laboratories, 1630 Linden Drive, Madison, WI 53706-1598. You should receive your results in approximately one to two weeks.

Tools and equipment recommended by the Council of Tree and Landscape Appraisers for diagnosis

<i>Recording</i>	Mallet*
Clipboard*	Pole pruner*
Compass*	Pruning knife*
Distance meter*	Pruning shears*
Engineer's pocket scale	Shigometer, PIRM
Photography equipment*	Shovel, spade*
Pocket calculator	Small saw
Report forms	Trowel
Tape recorder	
	<i>Collecting & Examining Specimens</i>
<i>Size of Plant</i>	Disinfectant
Diameter tape measure*	Labels*
Height meter*	Microscope
Trunk calipers	Plastic, glassine bags*
	Vials for insects*
<i>Tree Problem Diagnosis</i>	
Battery-operated drill	<i>Diagnosing Soil Problems</i>
Binoculars*	Gas detector
Chisel gouge*	pH meter
Entrenching tool*	Soil auger, profile tube*
Hand lens*	Soil moisture meter
Ice pick*	
Increment borer	

* Denotes equipment most critically needed

Diagnosing Tree & Shrub Disorders September 2002

Insect

<http://www.entomology.wisc.edu/entodiag.html>

Insect Diagnostic Lab
UW-Madison Dept. of Entomology

<http://www.entomology.umn.edu/cues/index.html>

Center for Urban Ecology and Sustainability
Ornamentals and Turf Entomology
University of Minnesota

<http://www.fs.fed.us/na/morgantown/fhp/natural/nat.htm>

Natural Enemies - Tools for Integrated Pest Management
United States Dept. of Agriculture
Forest Service Northeastern Area

<http://www.na.fs.fed.us/spfo/albpestartert/index.htm>

Asian Long-horned Beetle Pest Alert
Animal and Plant Health Inspection Service
Forest Service - United States Dept. of Agriculture

<http://www.na.fs.fed.us/spfo/eab/index.html>

Emerald Ash Borer Pest Alert
Forest Service - United States Dept. of Agriculture

Insects That Feed on Trees and Shrubs, Second Edition

1991. by Warren T. Johnson and Howard H. Lyon of Cornell University. This is perhaps the most useful reference manual on diagnostic entomology yet produced. It contains 240 multi-picture composite color plates providing easy identification. Over 950 species of insects, mites, and other animals that injure woody plants in the United States.

Essential diagnostic aid for anyone working with woody ornamentals. 556 pages.

Price: \$69.50
Contact: Cornell University Press
124 Roberts Place
P.O. Box 6525
Ithaca, New York 14851

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Disease

<http://www.plantpath.wisc.edu/pddc>

University Wisconsin Plant Disease Diagnostic Lab Clinic

<http://www.forestpathology.org>

Forest and Shade Tree Pathology
College of Environmental Science & Forestry State Univ. of New York

<http://forestry.about.com/bldisex.htm>

An Index of Major Tree Diseases
USDA Forest Service
Disease Leaflet Series

<http://www.ext.nodak.edu/extpubs/plantsci/hor>

Deciduous Tree Diseases

North Dakota state University & NDSU Extension Service

Diseases of Trees and Shrubs

1987. by Wayne Sinclair, Warren T. Johnson and Howard H. Lyon of Cornell University. A comprehensive pictorial survey of the disorders of forest and shade trees and woody ornamental plants of the United States and Canada. Authoritative and reliable, it simplifies diagnosis of specific plant diseases by focusing on signs and symptoms that can be seen with the unaided eye or with a hand lens. Over 1700 illustrations within the 247 color plates. An essential diagnostic tool.

Price: \$69.50

Contact: Cornell University Press
124 Roberts Place
P.O. Box 6525
Ithaca, New York 14851

Insect & Disease

<http://datcp.state.wi.us/arm/environment/insects/pest-bulletin/>

Wisconsin Cooperative Pest Survey Bulletin

Wisconsin Department of Agriculture, Trade and Consumer Protection

<http://www.uwex.edu/ces/wihort>

Urban Horticulture

University of Wisconsin-Extension

<http://www2.champaign.isa-arbor.com/consumer/disease.html>

Insect & Disease Problems

International Society of Arboriculture

<http://www.ipm.uiuc.edu/urban/index.html>

University of Illinois Extension - Urban Pest Management

<http://www.cnr.umn.edu/FR/extension/foresthealth/forestandshadetreehealthpage.htm>

University of Minnesota Extension - Forest Resources, Forest and Shade Tree Health

Woody Ornamentals Pest Management in Wisconsin. 2002 -2003.

University of Wisconsin Extension bulletin A3597, 40 pages. \$4.00

AP ARTIAL LIST OF
LANDSCAPETREEPRUNINGTECHNICALREFERENCES

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- WILSON, C.L., S.S. MILLER, B.E. OTTO and B.1. ELDRIDGE. 1984. Pruning technique affects dieback and *Cytospora* infection in peach trees. *Hort. Science.* 19:251-253.

TEXTBOOKS

- GILMAN, E.F. 1997. Trees for Urban and Suburban Landscapes: An Illustrated Guide to Pruning. Delmar Publishers, Albany, NY. 178 p.
- HARRIS, R.W., J.R. CLARK and N.P. MATHENY. 1998. Arboriculture: Integrated Management of Landscape Trees, Shrubs and Vines, 3rd edition. International Society of Arboriculture, Savoy, IL. 687 p.
- PIRONE, P.P. 1978. Tree Maintenance. Oxford Univ. Press, New York. 587 p.
- SHIGO, A.L. 1991. Modern Arboriculture: A Systems Approach to the Care of Trees and Their Associates. Shigo and Trees, Associates, Durham, NH. 424p.



Wisconsin Rest Area Maintenance (RAM) Program

Appropriate Rest Area Perennial Plant Species

If you would like further information about landscaping issues, you may want to visit some of the links below. If you have specific landscaping questions, please contact the DSPN office.

In all Wisconsin WisDOT rest areas, “annual” plant species such as pansies, petunias, marigolds, etc, should only be considered for planting in very finite areas such as standing or hanging planter pots or a small border of a larger planting area. Only a “splash” of color should be considered necessary from annual plant species to enhance curb appeal during the growing season. Service providers are encouraged to be conservative in the use of annual species.

In larger planting areas, whenever it is deemed necessary to add or replace plantings, service providers should look to plant “perennial” species that re-bloom yearly and need not be replaced annually, saving labor and plant cost impacts on tight budgets.

Following are a list of perennial species to consider whenever the need for new plantings arises. These are listed by their common name in no particular order.

AJUGA	HARDY PRIMROSE
AMSONIA	HELLEBORE
ASTER	HIBISCUS
ASTILBE	HOSTA
BEE BALM	HYDRANGEA
BELLADONNA DEPHINIUM	KOREAN FIR
BELLFLOWER	LUNGWORT
BLACK-EYED SUSAN	MAIDEN GRASS
BLUE SEA HOLLY	MINATURE HOLLYHOCK
CATMINT	NORTHERN LIGHTS GRASS
CLEMATIS	PLOX
COLUMBINE	PURPLE BLAZINGSTAR
CONEFLOWER	RUSSIAN SAGE
COREOPSIS	SEDUM
CORNFLOWER	SELECT BLUE FESTUCA
DELPHINIUM	GRASS
DIAMOND GRASS	SWITCH GRASS
EGRET FLOWER	TRADESCANTIA
ERAGROSTIS GRASS	YELLOW VIOLA
FERNS	YUCCA
FLAME GRASS	ZEBRA GRASS
GAILLARDIA	

Other perennials (evergreens such as arbor vitae, yew, juniper, dwarf pine, etc.) may be selected as well. Those listed will perform throughout our growing season and many change coloration from spring to summer to autumn.

Whenever selecting species to plant, carefully consider the size of the area to plant, exposure to sun and shade and necessary watering. Is it attractive and prudent to plant just one species or is it better to plant a mix of species? Consider the adult size of the plant itself. Will it fill in the area to be planted appropriately? Will it create interest and attraction in the planted area as opposed to be incongruous with its surroundings? Take measure of all of these aspects in selecting the plant species for the specific area to be planted.

NOTE: Prior to ordering, purchasing and planting any new species, contact DSPN to review plantings and areas to be planted. DSPN and/or WisDOT must approve new species plantings prior to their installation.

Plant species may be viewed and researched at the following company websites:

| Springhill Nursery <http://springhillnursery.com/>
Nature Hills Nursery <http://www.naturehills.com/>
Greenwood Nursery <http://www.greenwoodnursery.com/>
Burpee Seed Co. <http://www.burpee.com/home.do>
Gurney's Seed and Nursery Co. <http://gurneys.com/Default.asp?>

You may find information on other nursery and seed company websites as well.

Good luck. May all your thumbs be green.

Wisconsin Rest Area Maintenance (RAM) Program

Tree Removal

Tree removal at RAM sites should only be done when a tree has died or a tree is badly damaged from storms, etc. Only dead or damaged trees that threaten a possibility to injure the public or staff should be removed. This means any tree on grounds where the public may be present or a tree that may fall into a public area or parking area.

When a dead or damaged tree has been identified as a possible safety threat to the public or site property, it should be identified by painting a large, easily visible orange "X" on the tree trunk. Once painted, the local county highway maintenance department should be called and the necessary tree removal reported.

If the tree in question threatens imminent danger, the county should be clearly informed of that status. If it does not appear that the county will quickly remove the threatening tree, contact DSPN to determine whether a tree removal company should be contacted to address the situation.

Normally, if the tree in question is not an imminent threat, many counties will wait until late autumn or winter to respond to the felling request.

Again, if it appears that the county is not going to respond and remove necessary trees, contact DSPN and an alternate plan will be considered.

Those Service Providers who have the experienced personnel and appropriate equipment and safety apparel to safely fell and remove trees may do so, but only after contacting DSPN and informing DSPN of the felling and removal about to take place.

All stumps left in the public use grounds area must be ground down below grade, then dirt filled and seeded. Not all counties have stump removal equipment, so inquire of the county highway department if stump removal can be done by the county. If not, contact a local stump removal professional and contract to have the stump ground down.