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EVERGREENS

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J. A. Lofgren, H. G. Johnson,
M. C. Eisel, M. E. Smith,
and J. P. McKinr



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M. C. Eisel and J. P. McKinnon are extension horticulturists
M. E. Smith is an associate professor and extension forester
J. A. Lofgren is a professor and extension entomologist
H. G. Johnson is a professor and extension plant pathologist

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M. C. Eisel, M. E. Smith, J. A. Lofgren, H. G. Johnson, and J. P. McKinnon

Evergreen trees and shrubs contribute to the beauty of the Minnesota landscape. Without spruce, pine, and other cone-bearing trees, our state would be almost leafless 6 months of the year. Our evergreen forests and landscape plantings shelter people and wildlife through the northern winters, and the fruit of evergreens—the blue-gray berries of juniper, the red fruits of yew, and the bright brown cones of pine—provide food for winter creatures. Viewing Minnesota's dark coniferous trees beside new leaves in spring and seeing the flaming foliage of autumn provide two high points for landscape lovers. Between these exciting seasons, the expanse and serenity of evergreen forests delight the traveler, who may not realize that the same qualities can be achieved in manmade landscapes.

The few broadleaf evergreens that grow in Minnesota are not discussed in detail in this bulletin. Bearberry, wintergreen, and other small native plants, as well as rhododendrons, Korean boxwood, pachistima, and mahonia are grown to some extent in various parts of the state. Of these, Korean boxwood has the greatest winter hardiness and potential for landscape use.



Arborvitae used in a screen planting.

Choosing Evergreens

You'll get the most pleasing results with evergreens if you choose varieties for qualities that contribute to the use and beauty of the overall design. Low growing juniper or dwarf yew, for instance, can provide year-round color and mass as entrance plantings for a home or public building. Shrubby upright junipers or Mugho pine can be planted as backgrounds for flowering plants, while a group of well-spaced spruce can provide the focal point for a very large area. Large evergreen trees can be planted to shelter or screen property throughout the year. A single fir may mature to a magnificent specimen in a park-like setting.

Choice of evergreen plant materials depends on aesthetic and horticultural considerations. The colors, foliage textures, and shapes of maturing plants are equally important. Site considerations—light, moisture, soil, and exposure—are crucial in the plant's development, so you should select a site carefully. When selecting landscape materials, appearance cannot be separated from cultural needs. For example, using a handsome Rocky Mountain juniper to complement a massive stone wall facing north under

a 6-foot overhang is futile. The tree's foliage will soon deteriorate and its shape will become distorted in such an impossible environment.

Three mistakes are common in the landscape use of evergreens:

- Using too many varieties in a single design.
- Using varieties that grow too large for the average home site.
- Planting groups of evergreens that grow into heavy masses and overpower the rest of the composition.

Usually, evergreens should be combined with deciduous (leaf-losing) plants to provide changing interest throughout the seasons. Such light and airy plants lend variety to a landscape that might seem monotonous if it consisted entirely of conifers. Furthermore, healthy evergreens grow, and planning must anticipate their mature size.

Uses of plant materials in landscape design have changed as architectural styles and living patterns have changed. Neighborhoods built 15-20 years ago and "landscaped" with foundation plantings around four

sides of each house and specimen evergreens on almost every lawn seem hopelessly overplanted today. Narrow upright junipers or arborvitae used against house walls have grown to touch the eaves and must either be removed or headed back severely. The familiar group of three Colorado spruce or worse, three different pines and spruces, on a 75-foot lot can take up 30-40 feet as well as create the problem of tops growing into shade trees.

The solution to overplanting is a careful study of the mature size of each evergreen you want to use and an effort toward logical thought about landscape design trends. Buttressing each wall of a simple house with a solid mass of various evergreen shrubs is neither necessary nor fashionable. Such plants could be better used at the boundaries of the property to define the space belonging to the house or to give a four season division between areas open to public view and areas where you want seclusion.

Large plants growing against a building wall have a short life expectancy and an unnatural growth habit. Potentially large evergreens give greatest satisfaction when they have room to develop to their full size without severe shearing or pruning.

Most evergreen trees and shrubs develop attractively when they are allowed to grow in natural form. Pruning evergreens will be discussed in a later section, but special mention must be made of using evergreens for hedges, shelterbelts, and windbreaks. The planting and training of evergreens used for these purposes are different from the culture of those used in other ways.

Evergreen hedges can be made from varieties that can be sheared without damage. In Minnesota, arborvitae is used most often. For a compact hedge, plant evergreens about 2 feet apart. Shear them each year to keep the hedge dense from the ground up.

Evergreens are now being used throughout Minnesota for field windbreaks and farmstead shelterbelts. Besides adding beauty, they provide year-round wind protection. At least two rows of evergreens are needed, but use them in combination with deciduous trees and shrubs. Colorado, white, and Black Hills spruce; Ponderosa and red pine; and redcedar are recommended for shelterbelt and windbreak plantings where they are adapted. (See University of Minnesota Ext. Bull. 196, *Planting Trees For Farmstead Shelter*.)

Spruces provide an impenetrable barrier and year-round protection in the farmstead shelterbelt.



At one time in Minnesota, almost all evergreens cut for Christmas trees were taken from native forests of spruce and fir. Today thousands of landowners are systematically plant-

ing, culturing, and harvesting pine, spruce, and fir for the Christmas tree market. Many of these manmade forests were established on idle land or land unsuitable for agriculture.

Planting and Care

Soil-Moisture Requirements

Most evergreens are not particular about soil type. Rich, coarse-textured soils, sandy loam in nature, are best for most varieties. But you can successfully grow evergreens on sandy or clay soils if you incorporate organic matter into the soil.

Many of our commonly grown conifers need a well drained soil. Even the arborvitae and tamarack, which are found native in poorly drained soils, grow better on well drained sites if rainfall is sufficient.

Many people have difficulty with foundation plantings of evergreens because the subsoil from the basement and building refuse was filled in around the house. In such a case, you can achieve success only by digging a sufficiently large hole and refilling it with good soil.

Remember that many evergreens grown for landscape purposes are native in other regions. You are planting them under unnatural conditions, so they are apt to be short-lived and must be replaced occasionally.

Shade Tolerance

Evergreens vary in their tolerance of shade. Some kinds, especially pines, cedars, and spruces, may become deformed and stunted when planted under large deciduous trees.

The arborvitae tolerate some shade; yews and hemlocks usually do better in shade than in full sunlight. Because of differences in shade tolerance, you

must select evergreens for varying conditions when you use them in foundation plantings.

Planting

Except when planting evergreen seedlings and transplants, plant evergreens with a ball of soil attached. When an evergreen arrives from the nursery, a strip of burlap is secured around the ball of soil to hold it in place. Dig a hole slightly larger than the ball of soil; carefully place the tree into the hole so that it is 1 inch deeper than it was in the nursery. Fill in around the base of the ball with good soil. Tamp the soil around the base to prevent undue settling of the plant.

Repeat this process until the hole is a little more than half full. Loosen and fold back the burlap from around the top of the ball. Then fill the hole with water; allow the water and soil to settle. Finish filling the hole with loose soil and leave a depression around the tree's base to facilitate later watering. For the first season, keep the ground soaked periodically during dry periods, especially if you plant trees near the house foundation where the soil frequently becomes dry. Temporarily stake larger trees to prevent tipping while the ground is wet.

Small evergreens, either seedlings or transplants, are generally planted barerooted during the spring before new growth begins. Seedlings that have been in the seedbed for 2 years

are designated as 2-0 stock; seedlings that have been moved to transplant beds for 1 or 2 years are known as 2-1 or 2-2 transplants. When the trees are out of the ground, keep roots moist at all times; exposure to the drying effects of wind and sun kills them.

One recommended way of planting seedlings or transplants is the hole method. Dig the hole large enough to permit placing the tree roots in their natural position without crowding. Work good soil around the roots a little at a time; firm this with your hands. The root collar or soil line on the stem should be at the soil surface or slightly lower when the hole is completely filled. Planting small evergreens too shallow or too deep often results in retarded growth or death of the tree. After the hole is filled, tamp the soil.

The slit method is rapid and efficient on sandy soils. Open a slit with a spade, insert the seedling into the slit, and remove the spade. Then firm the soil by tamping.

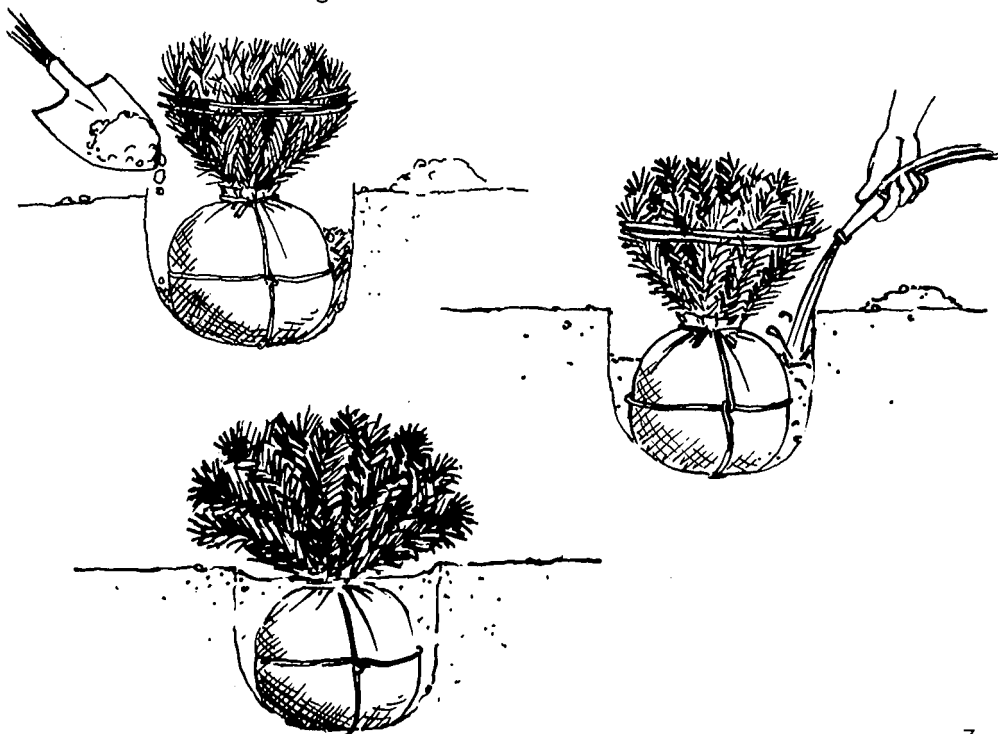
Mechanical planting with specially designed equipment is recommended when many trees are involved.

Never mix fertilizer with the soil that you put around evergreen roots when planting; evergreen roots are sensitive to contact with commercial fertilizers. Instead, plant a new tree in a good grade of topsoil containing plenty of organic matter. After the tree has exhausted the food supply, you may have to add fertilizer.

Cultivation

Cultivate evergreens for several years until they become well established. This is necessary for shelter-

Top, left: Dig a generous hole. Root collar should be at soil line. Right: Water after filling hole half way with good soil. Bottom, left: Finished hole is firmly tamped and has shallow saucer for watering.



belt, windbreak, and ornamental plantings. For individual trees, keep the soil cultivated about a foot beyond the branch spread. In the foundation planting, cultivate the entire area from the house foundation out to the lawn's edge. Keep the cultivation shallow to prevent root injury.

Remember, you have a large investment in your plantings—they deserve the best care.

Fertilizer

Like other green plants, evergreens remove nutrients from the soil. But unlike other green plants, evergreens are not especially demanding on the mineral elements necessary for growth.

In the forest, needles and twigs accumulate on the ground and return fertilizing elements to the soil. But under cultivation, evergreens usually do not receive plant nutrients from this source because the needle and twig litter is raked and burned. Grass clippings also are removed, further impoverishing the soil. Under these unnatural conditions, you may find it necessary to fertilize.

The tree itself indicates when it needs a fertilizer. If growth rate and needle color are normal for a particular variety, fertilization is unnecessary. But if growth is sharply reduced and the color is not a bright healthy green, you should add fertilizer.

Of the 12 or more elements needed for plant growth, only 3 are likely to be lacking in most soils. These are nitrogen, phosphorus, and potassium. A complete fertilizer relatively high in nitrogen, such as 10-8-6, is suggested. You may vary this formula slightly, but usually the nitrogen content (the first figure in the formula) should be higher than the phosphorus and po-

tassium (the last two figures).

You may apply fertilizer from early spring until midsummer. Applications beyond this period are apt to stimulate growth late in the season; this allows insufficient time for plant tissue to harden up to withstand early frosts and winter cold.

The amount and method of fertilizer application are important. As a general rule, one-half pound of a 10-8-6 or similar fertilizer for each foot of tree height is recommended.

In foundation plantings and places where the soil around the tree is cultivated, apply fertilizer in a shallow trench in a circle under outer branch tips. Scatter the fertilizer in the bottom of this trench and cover with soil. Rain or artificial watering carries fertilizer down to feeding roots.

When large lawn trees appear to be growing poorly, place fertilizer in ground holes made with a crowbar or soil auger. Make the holes 6-18 inches deep and 2 feet apart under the outer branches. Thoroughly soak the soil around the tree the day before fertilizing. This makes it easier to drive an iron rod or other 1- to 1½-inch punch far enough into the ground. Place a handful of fertilizer in each hole and add water to help dissolve it. You do not have to plug holes afterwards—in fact, leaving them open helps get air and water to roots.

Well rotted manure is an excellent fertilizer for evergreens. Annual applications provide a good mulch that helps conserve moisture and furnish necessary nutrients. Apply manure in a layer 2-3 inches thick over an area equal to the branch spread. Besides supplying needed minerals, manure and compost improve the soil's physical texture and waterholding capacity.

Additional Water

Evergreens growing in our native forests reach enormous sizes with moisture from natural rainfall only. From this fact you might conclude that evergreens need no additional water; this is not the case.

If you could examine the soil under evergreens in a natural forest, you would find several inches of leaves and leaf mold. This material keeps the ground cool and moist and reduces evaporation from the forest floor.

Contrast this condition with what exists in the average yard where the ground has no natural mulch to protect it from drying out. Many trees are planted under eaves where they get little rainfall. Often young trees must compete for moisture with garden flowers and the adjoining lawn. For the first few years, roots do not extend much beyond the original ball of soil, so each tree's feeding area is limited. For these reasons, you should water regularly for the first few years, at least until the tree becomes well established.

When watering, remove the hose nozzle and let the water soak into the soil until it absorbs no more. During dry weather, one thorough watering every 10 days or 2 weeks should be sufficient. A light sprinkling at frequent intervals often is harmful because the water does not reach the main mass of roots and shallow surface roots are encouraged.

Pruning Requirements

There are three reasons for pruning an evergreen:

- To keep the tree within certain limits of size and form.
- To remove any diseased or injured parts.

- To train the tree into some special shape.

Evergreens may be divided into two groups: (1) those that open dormant buds and make their annual growth within a few weeks in the spring—pines, firs, spruces, and Douglas-fir and (2) those whose growth is not limited to early spring but is more or less continuous throughout the growing season—junipers, arborvitae, yews, and hemlock.

Pruning evergreens in the first group generally is limited to the removal of dead or injured branches. Remove such branches close to the main trunk or just beyond a strong lateral branch. Occasionally you may find it desirable to shape one of these evergreens for a particular purpose such as a clipped hedge or when you desire a globe-shaped Mugho pine.

To obtain a desirable form, prune evergreens annually in the spring, just as the buds open and before new needles unfold. Pruning is merely cutting off tips of new growth with a sharp knife or hedge shears. You can regulate the rate of annual growth by the amount of new growth you remove. Wherever you make the cut, several adventitious buds develop; consequently the tree becomes compact and dense.

Since trees of this class are most attractive when allowed to grow naturally, do not plant them where their growth must be restricted by heavy pruning. Use them instead for lawn specimens or background groups. Pruning heavily into hard wood makes an unsightly plant; new shoots do not develop to cover large stubs.

Pruning evergreens in group two is quite different. These evergreens are commonly used where their growth must be limited such as in foundation plantings, rock gardens,

formal gardens, and hedges. Corrective pruning generally starts in the nursery; by the time you purchase the specimens they are well shaped according to their natural form. After you plant them in their permanent locations, you must prune annually. Otherwise these evergreens do not retain their compact shapes.

You can prune at any time during the late spring or early summer. Although you can use a hedge shears, a sharp knife gives a more natural appearance to the pruned plant. Cut tips of new growth back with a sharp pruning knife, using an upward free-hand movement. This annual pruning keeps the plant compact and restricts growth rate. It may, for instance, greatly increase the length of time you can use an evergreen shrub in a given space in a foundation or entrance planting.

Low growing or spreading evergreens require little pruning. If they spread too widely, remove some of the outer branches by cutting back to a vigorous side shoot.

Special mention must be made of pruning semi-upright informally shaped evergreen shrubs. Two such shrubs commonly grown in Minnesota are Maney juniper and the spreading form of Japanese yew. Maney juniper is valuable in landscape design particularly because of its shaggy texture and informal upright habit. It affords evergreen foliage that can withstand sunlight, wind, and dry conditions as well as any of the junipers. Since it is a shrub and not a juniper tree (with a potential height of about 20 feet), Maney can be used where an ultimate height of 4-5 feet is desired. Note, however, that shearing and severe shaping of this plant destroy the characteristics that make it desirable.

Japanese yews are grown in their

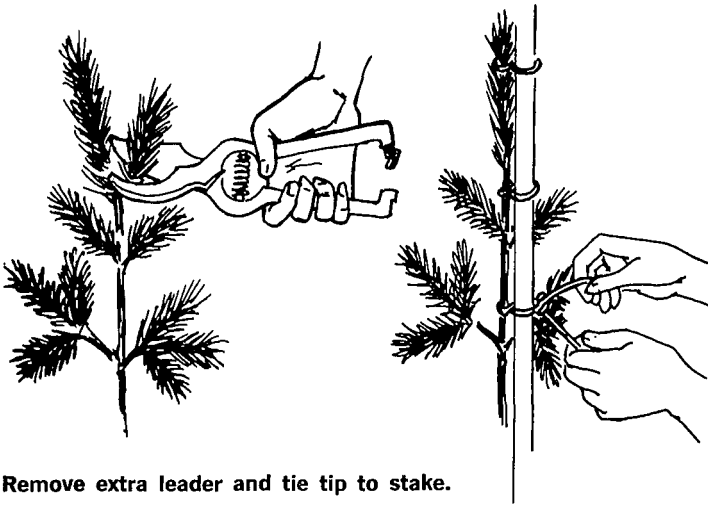
spreading form to give a horizontal effect without extreme height, particularly in shaded or protected places where other shrubby evergreens such as Mugho pine or Maney juniper do not thrive. Unless a plant is being sheared for hedge or topiary work, the graceful tips of yew are pruned mainly to keep the plant full at the center and well branched along the side shoots.

Evergreens that grow with a single stem sometimes are injured by the breaking or loss of the leader. Birds swinging on the soft tips of a spruce or pine in early summer may be responsible for this breakage. Frost and insect damage, as well as mechanical injuries, also can cause the loss of the leader. To correct this condition, tie up a side branch in the upper whorl and securely fasten it to a stake anchored below to the main trunk. The side branch, trained to grow upward, soon will replace the lost leader. Unless you do this, the tree will grow without a top or several side branches will grow to form a tree with several leaders.

Winter Protection

Many newly planted evergreens suffer from winter drought, especially if the ground is dry when it freezes. To overcome this difficulty, soak the ground thoroughly and mulch heavily with leaves or peat moss just before the ground freezes. Taking these precautions reduces the depth of freezing and shortens the period the plant is deprived of soil moisture because of a frozen root zone.

Some evergreens, such as yews and arborvitae, brown or show burning during late February or March. If these evergreens are grown in full sun, you may have to shade them during this period. Place a burlap shade,



Remove extra leader and tie tip to stake.



Left: Snip soft candles of Mugho pine to reduce height. Right: Use sharp knife to shorten stringy tips of junipers.

mounted between upright stakes, on the south and west sides of the plants.

Evergreen branches may be broken by heavy snows and ice storms. Shake

snow from branches after each heavy snowfall. After an ice storm, you can save unbroken branches by placing props under them.

Health of Evergreens

Individual spruce, fir, pine, and other kinds of evergreens vary greatly in size, vigor, growth habit, and length of life. One tree may be broad and low; another of the same species may be narrow and high. One pine may grow at only half the rate of another pine. Some never do well. Be-

cause this variability among individuals is inherent and unavoidable, every tree you buy will not be of equal quality with the choicest plants.

Evergreen needles, although green throughout the year, do not live forever. Each year a healthy, vigorous evergreen puts out a new crop of

twigs and needles at the ends of twigs only. So needles that have been destroyed on the old growth by insect defoliation, fire, dogs, etc., normally are not replaced. Each year the oldest needles die, turn brown, and drop; this occurs in August and September. Therefore, older parts of all branches are naturally bare of needles. Furthermore, lower branches shaded by those above may have needles only on their outer portions.

Many evergreens planted as ornamentals in this region have a maximum life expectancy of 50-60 years; often they begin to deteriorate when only 25-40 years of age.

Even with the best care and most expert handling, some risk is involved in transplanting evergreens. The older and larger the tree, the greater is the risk. Because of the inevitable loss of a substantial portion of the root system in transplanting, some trees fail to survive even when roots are properly balled and burlapped. With small trees this loss will not be great. But with large trees, especially those that have not been root pruned, the loss may be considerable.

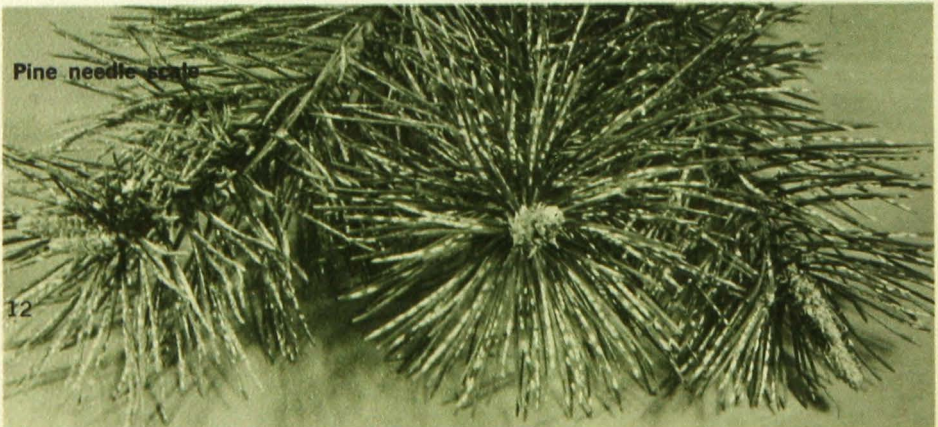
Large trees or those that are not properly transplanted may have to redevelop much of their root systems. In such cases the tree may be stunted for a year or more. Extra watering after transplanting helps the tree recover from this loss of roots. Experts with special equipment should transplant large trees.

You can send specimens from unhealthy trees to the University for examination. Be sure to include:

1. As large a sample as reasonable, preferably several branches from the tree or the trees affected. Include branches in which symptoms are first beginning to appear. Little information is obtainable from material that has been dead for some time.
2. Information on when the trouble first appeared and the course it took.
3. The number and kinds of trees affected.
4. Ages and sizes of trees affected and their location as to kind of soil, exposure, slope, shade, etc.
5. Previous known history of the trees: when transplanted, whether sprayed, and other treatments given.

Place specimens of insects in a small box or mailing tube with some of the foliage on which you've found them feeding. Do not send soft-bodied insects in an envelope. Send such specimens to the Plant Disease Clinic or the Department of Entomology, Fisheries, and Wildlife, University of Minnesota, Institute of Agriculture, St. Paul, Minnesota 55101.

Common and injurious insects and diseases of ornamental evergreens are described in tables 1 and 2. Injuries from other causes are listed in table 3.



Pine needle scale

White pine blister
rust



Cedar-apple gall rust



Roots of red pine
chewed by pocket
gophers.

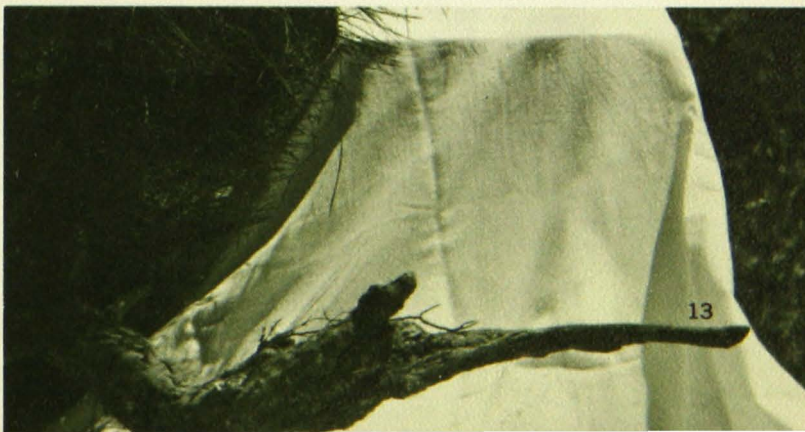


Table 1. Injuries caused by diseases

Description	Cause	Treatment	Remarks
Branches die on spruce, usually beginning at base of tree and progressing upward. As the disease progresses, resin is exuded and accumulates on the dead and dying branches. This disease is commonly known as <i>Cytospora</i> canker or spruce canker.	The <i>Cytospora</i> fungus attacks spruce trees that have become weakened in any way.	Plant susceptible trees such as spruce in protected sites where soil is reasonably good. Avoid southwest-facing slopes and light gravelly soils. Fertilizing and watering help.	Treatment is not a positive control. Remove badly affected trees.
Brown galls, up to an inch or more in diameter, appear on twigs of eastern redcedar and related species and varieties. In warm rainy weather in May and June, orange-colored gelatinous tendrils protrude from galls. This disease is cedar-apple rust.	A rust fungus that lives part of its life on the cedar and part on various kinds of apple causes this disease.	Cedar trees generally are not injured sufficiently to warrant control measures. Control disease on valuable apple trees (see Plant Pathology Fact Sheet 4, Cedar-Apple Rust).	You can remove infected cedar trees to prevent infection of apple trees. Remove cedars within a 1/4-mile radius of apple trees.
Yellow to orange blisters, about one-fourth inch across, erupt from outer bark or white pine stems and branches in May. Part above cankered area dies. Disease is white pine blister rust.	A rust fungus that lives part of its life on white pine and part on currants and gooseberries causes this disease.	Remove all wild and cultivated currant and gooseberry bushes within a 1/4-mile radius of white pines. Remove infected branches; cut 6-8 inches below canker if possible.	Disease does not spread from one pine to another. It spreads to currant and gooseberry bushes and then back to white pines.
Small yellow to orange blisters appear on old needles of pine during April or May and on new needles of spruce in June and July. Infected needles may turn yellow and drop. Disease is needle rust.	A rust fungus that lives part of its life on pines and spruces and part on other hosts causes this disease.	Remove goldenrods from vicinity of pines; remove leatherleaf from vicinity of spruce.	Damage to pine and spruce usually does not justify control.
Redcedar turns brown in mid-summer. Browning may affect twigs or branches, gradually spreading to kill tree in a year or two. Disease is phomopsis blight.	Disease is caused by a fungus.	Remove and burn infected seedlings as they appear. Spray trees with bordeaux mixture every 10 days during growing season.	Control measures are only partially effective.

Table 2. Injuries caused by insects

Description	Cause	Treatment	Remarks
Needles are eaten by greenish, yellowish, varicolored, or spotted worms, usually feeding in clusters.	Larvae of several species of sawflies.	Spray with 2 tablespoons 50-percent wetttable DDT or methoxychlor to 1 gallon water.	Observe trees periodically because control measures are most effective when applied while larvae are small.
Buds of spruce are destroyed by reddish-brown larvae in webs formed among new needles.	Spruce budworm.	Use materials given above. Apply with strong spray just as buds break and again about 10 days later.	Injury to the buds usually precedes foliage feeding.
Ugly nests are formed of needles and excrement webbed together, usually on inner branches.	Spruce tortrix.	Use materials above. Apply with strong spray in the spring and again after the first of August. Nests may be removed and burned.	Loss of old needles seldom causes serious injury unless repeated often.
Small, white cottony masses appear on trunk and branches of white pine and occasionally other pines.	Pine bark aphid.	Spray thoroughly in late May with 50-percent malathion applied at the rate of 2 teaspoons to 1 gallon of water.	Trees weakened by winter injury or excessive shade are most seriously affected.
Foliage is off color—dull gray or turning brown—particularly on lower branches; very fine webbing is on twigs and needles.	Spider mite (to see mites, strike branch sharply over white paper).	Spray with Kelthane or Ovex.	Spruce, arborvitae, and junipers are most commonly affected.
White, elongated small objects appear on needles, particularly on spruce and white and Mugho pine.	Pine needle scale.	Spray with malathion, 2 teaspoons to 1 gallon water, in late May when young purple scales appear.	Hatching usually occurs when lilacs are coming into full bloom. Make two applications 10 days apart.
Conelike galls are at base of terminal growth of spruce. They are green when fresh, brown when old. Twigs often are dying beyond galls.	Spruce gall aphid.	Spray in late April or May when terminal buds are beginning to swell. Use lindane at the rate of 1 teaspoon to 1 gallon of water.	You can remove and destroy galls from ornamental trees.
Upon examination, dying young conifers show that small roots have been eaten.	White grubs or strawberry root weevil.	Treat soil with chlordane, 10 pounds of actual chlordane per acre (5 pounds in sandy soil).	Avoid planting conifers in sod land infested with white grubs.
Fine brown dust or shredded wood particles are forced from holes in bark. Tree appears to be dying.	Bark beetles or wood borers.	None.	These insects usually attack dead or dying trees. Cut and burn trees.

Table 3. Injuries from other causes

Description	Cause	Treatment	Remarks
Needles turn brown in spring. Often needles die on parts exposed to winter sun; sometimes entire tree dies. Condition known as winter drying—one kind of winter injury.	Not entirely understood. Seems to be associated with temperature fluctuation and dry soil conditions.	None. Plant susceptible species in locations that are at least partially protected from direct sunshine during winter. Late fall watering is a helpful preventive measure.	Arborvitae, all yews, and many pines are most affected; spruce is affected occasionally.
New growth dies or curls downward in late spring after cold spell. This is frost injury.	Late frost in spring after new growth starts causes this condition.	None.	Trees will recover unless injury is very severe.
Stunting of needles or gradual death occurs within a year or two after transplanting. Sometimes older needles fall off.	Transplanting injury can cause this condition.	Transplant trees when small or have expert transplant trees with special equipment. Give newly transplanted trees extra water. Water at frequent intervals for a year or two.	If trees have been planted in summer or fall, injury is most likely to show up after new growth appears in the spring.
Lower branches die, foliage becomes thin, and growth rate declines from year to year.	Old age or poor vigor in trees not native to this region causes this condition.	Remove trees when they become unsightly and replace with younger and more vigorous stock.	It is best to plant species that are native to the area. Use a local seed source.
Fall yellowing of older needles occurs back from growing tips. This is especially apparent in white pine in late autumn.	This condition is perfectly natural; pine needles live only 1½ years; spruce needles live 3-5 years.	None.	It is natural for older branches to be bare of needles except at their growing tips.
Patches die on trees and shrubs near ground, usually during early spring. Injury is most common on exposed outer parts. Affected areas are often black.	Urine from dogs causes this condition.	Protect trees with fencing.	This condition is most common on cedars and arborvitae.
Nearly square holes occur evenly spaced in horizontal rows in bark.	A bird—yellow-bellied sapsucker—causes this condition.	There is no practical control other than driving birds away.	Wrapping affected areas may prevent further injury.

Major Groups of Evergreens

The major groups of evergreens are: pines, spruces, arborvitae, junipers, yews, hemlock, true firs, and Douglas-fir. The tamarack and European larch drop their needles in the fall but are closely related to the narrow-leaved evergreens.

All evergreens do shed needles; the individual leaf or needle does not remain throughout the tree's life. Needle loss is a slow, gradual process that normally occurs from the interior part of the tree. Some needles, such as on the arborvitae, persist for 2 years. On spruce, the needles live for 3-10 years if they are healthy. Any excessive browning and dropping of needles, especially from branch tips, could mean insect damage, disease, or other injury.

Each evergreen group has certain characteristics that make identification easy:

- Pines have long, slender needles borne in clusters of from two to five.
- Spruces, firs, Douglas-fir, yews, and hemlock have needle-shaped leaves scattered along the stem.
- Spruces have sharp pointed needles that are usually square in cross sec-

tion. When the needles drop, the leaf base persists.

- In true firs the needles are flat and blunt; when they fall they leave a smooth, circular scar on the twig.
- Douglas-fir needles resemble those of firs. But sharp pointed buds and three-lobed bracts that come out from between cone scales are distinguishing characteristics.
- Yews have dark-green needles and green twigs. Fruit on the female tree resembles a fleshy red berry.

The hemlock is the only conifer that bears its needles on petioles. The linear needles are flat, pointed, and generally one-fourth to two-thirds inch long. They drop during their 3rd year, leaving a prominent leaf scar on the twig. Leaves are whitish underneath.

The arborvitae have scale or awl-shaped leaves. These are borne in pairs, closely crowded on flattened twigs. Arborvitae fruits are small, dry cones.

Juniper leaves are either small and scalelike or short and pointed. The characteristic leaf arrangement is in whorls of three. Juniper berries are hard, round, and usually bluish green.

Juniper group in a landscape planting.





Eastern hemlock



Colorado spruce



Balsam fir



Douglas-fir

Each evergreen group has certain characteristics that make identification easy.



American arborvitae



Eastern redcedar



Eastern white pine



Japanese yew

Size, shape, and arrangement of leaves are important identifying characteristics.



Globe arborvitae

In the following list we do not attempt to give a complete botanical description of species and varieties. But we hope a brief general description of trees and their uses will be helpful to you.

ARBORVITAE (*Thuja*)

Eastern or American Arborvitae (*Thuja occidentalis*), 15-20 feet.* The arborvitae are characterized by flattened branches and twigs that resemble fronds of certain ferns. The frondlike twigs are made up of small, scalelike, flattened leaves that are attached closely in pairs. In the common forms, these branches are arranged horizontally. In some globe and pyramidal forms the arrangement is nearly vertical. They have small cones.

Although native in northern and eastern Minnesota, the arborvitae tend to brown during the winter and in dry summers, especially if planted in light soils or on exposed sites. For this reason, arborvitae often do best in protected spots. Avoid planting arborvitae in light soils unless rainfall is ample or additional water can be supplied.

Arborvitae are widely used for hedges, screens, and locations where it may be necessary to control size by shearing. The following varieties are commonly grown:

Golden Arborvitae (*T.o.* 'Aurea'), 12-15 feet,* is a bushy pyramidal tree that has bronze yellow foliage in the spring.

Hetz Midget Arborvitae (*T.o.* 'Hetz Midget'), 1-2 feet,* is a very dwarf,

* Heights indicate approximate growth for landscape grade material after 10 years under normal conditions.

globular, slow growing selection. The foliage is dark green.

Pyramidal Arborvitae (*T.o.* 'Pyramidalis'), is a narrow form that slowly reaches a height of 20 feet. The foliage is dense with small fronds that are dark glossy green.

Siberian Arborvitae (*T.o.* 'Robusta'), 10-12 feet,* is one of the hardiest arborvitae. This form is typically pyramidal and compact, although it can be pruned into a globe. It has gray-green foliage during the growing season. (Formerly listed as *T.o.* 'Wareana'.)

Woodward Globe Arborvitae (*T.o.* 'Woodwardii'), 5 feet,* is one of the best globe forms for Minnesota conditions. Its branches tend to grow upward, producing a well rounded form rather than an upright tree. Plant in a location protected from winter sun.

'Jewell Globe,' 'Dark Green,' and 'Techny' are other varieties of arborvitae often planted in Minnesota.

Oriental Arborvitae (*Thuja orientalis*) is not recommended for Minnesota at the present time because of lack of winter hardiness.

DOUGLAS-FIR (*Pseudotsuga*)

Douglas-fir (*Pseudotsuga menziesii glauca*), 12-15 feet.* The Douglas-fir, a beautiful evergreen, deserves to be more widely grown. The species ranges throughout the Rocky Mountains and Pacific Coast area. Plant only trees grown from seeds from the northern Rocky Mountains, as strains from the West Coast are not hardy in this area.

The tree is difficult to shape in the nursery. But as it gets older it forms

a symmetrical, pyramidal tree that bears its branches well down to the ground when grown in the open. The normally dark-green needles are flat like those of the true fir. Bluish forms are known. The peculiar three-lobed appendages that grow out between cone scales and the long, pointed, red buds make the Douglas-fir easy to recognize.

When grown from hardy seed stocks, the Douglas-fir grows well in most sections of Minnesota. It is good for specimen and group plantings. If you carefully select the seed source, it could prove valuable for windbreak and plantation Christmas tree production.

P. M. 'Fastigiata,' Fastigiata Douglas-fir, 15-18 feet.* This selection has a narrow, columnar growth habit.

FIRS (*Abies*)

The firs are among the most beautiful of our evergreens. Many fir species are native in mountainous regions of the West and are not adapted to Minnesota conditions. Only two species are considered here, but several others are being evaluated at the Minnesota Landscape Arboretum.

Balsam Fir (*Abies balsamea*), 12-15 feet,* is native in northern and eastern Minnesota. This fir is distinguished by short, blunt, flat, and flexible needles $\frac{1}{2}$ to 1 inch long, blunt buds that are coated with sticky resin, and cones that stand upright on the branches. These cones disintegrate before falling. The smooth gray bark is covered with many small blisters containing resin. The tree is pleasantly aromatic.

* Heights indicate approximate growth for landscape grade material after 10 years under normal conditions.

Balsam fir does not tolerate droughty conditions. For this reason it should not be planted on coarse sandy soils. It grows well on moist sites and should be planted where it can be protected from northwest winds. Winter browning may occur in dry exposed locations.

The particular site requirements of balsam fir have limited its planting for Christmas tree production. However, it is one of the major Christmas tree species harvested from native forests. Trees and cut boughs retain needles better than most other evergreen species, and their fragrance makes balsam firs particularly valued for holiday decorations.

White Fir (*Abies concolor*), 12-15 feet,* is the best fir to plant in southern Minnesota. The 2- to 3-inch long flat leaves curl upward. Their color varies from light green to deep bluish green.

When young, the tree is wide and pyramidal, and its lower branches touch the ground. As it becomes older the plant grows mostly upward into a narrow, pyramidal, beautiful tree 50 or more feet tall. Because of its large size it is best suited for parks and large home grounds. Avoid dry, wind-swept sites for white fir.

HEMLOCK (*Tsuga*)

Canada or Eastern Hemlock (*Tsuga canadensis*), 12-15 feet,* is one of the most beautiful upright evergreens. Its leaves are narrow, flat, and about three-fourths inch long, with a white line on the undersurface. Branch tips are drooping and graceful. Unfortunately the hemlock, whose natural range just touches Minnesota near Duluth, cannot survive open exposed

sites. It must be protected from wind and winter sun. Its shade tolerance, however, makes hemlock valuable for planting in wooded areas where evergreens will be partly shaded by deciduous trees. It also can be grown on the northern or eastern exposures of buildings where a large evergreen is desired. The tree can be lightly trimmed without destroying its beauty.

Hemlock hedges, common in the northeastern part of the United States, are not recommended for Minnesota unless the site is moist, shaded, and protected from wind.

JUNIPERS (*Juniperus*)

The large juniper group contains some of the most useful evergreens for landscape purposes. Forms vary from low creeping types to tall upright trees. Because of this diversity, junipers can be selected for almost any landscape use where site conditions are suitable.

Junipers grow best in full sun. A few varieties will tolerate some shade. They do best in soils that are well drained, and they will tolerate more drought than other evergreens grown in Minnesota.

Chinese Juniper (*Juniperus chinensis*). Varieties of Chinese juniper differ greatly in form and size. The typical mature form is pyramidal and about 12 feet high. Leaves are awl-shaped, at least one-half inch long, and very sharp. The leaves have two indistinct white lines on the upper surface that give the plant a bluish appearance. The tree is not entirely hardy and frequently loses many needles by browning during the winter. It must

* Heights indicate approximate growth for landscape grade material after 10 years under normal conditions.

Upright and spreading junipers used in a landscape planting.



be planted in a protected spot, preferably on the east side of a building.

Varieties of Chinese juniper described below are more commonly used in Minnesota than the species. These varieties appear to be fully hardy. (Other selections such as I-o-Ace, Mint Julip, Mountbatten, and San Jose, now being sold in the nursery trade, are being evaluated at the Minnesota Landscape Arboretum.)

Ames Juniper (*Juniperus chinensis* 'Ames'), 7-9 feet,^o is a dense, compact, broadly based, pyramidal juniper selected by Iowa State University. It is not a perfectly formed, geometrical cone and should not be sheared. Its habit is irregular and rugged, lending itself well to informal design. The foliage is a bright blue-green color and remains almost unchanged through the winter. Some years this juniper produces an abundance of blue-gray berries.

Blaauw Juniper (*Juniperus chinensis* 'Blaauw'), 2 feet.^o This plant has an irregular, spreading, low, vase-shaped habit. Its informal shape makes it useful in contemporary landscape design where a tight geometric form is inap-

propriate. The woody structure of the shrub often is visible beneath the foliage, which has a heavy texture and is a dark green throughout the year.

Hetz Juniper (*Juniperus chinensis* 'Hetz'), 8 feet.^o This juniper is vigorous and widespreading and is characterized by oblique, ascending branches. The foliage is blue-green. Hetz juniper grows rapidly and may become too open if not tip pruned as it develops. It grows best in full sun.

Iowa Juniper (*Juniperus chinensis* 'Iowa'), 9-10 feet,^o is dense, compact, and broadly pyramidal. Its growth habit is slightly irregular, and its bluish-green foliage color persists through the winter. Heavy pruning will destroy the characteristic shape. Iowa resembles Ames juniper but may be expected to grow a little more rapidly and be less compact. It also may produce an abundance of blue-gray berries.

Maney Juniper (*Juniperus chinensis* 'Maney'), 4-5 feet.^o This juniper is another of the informally shaped, semi-erect bushy types. It is a wide spreading shrub with a shaggy, distinctive foliage. The blue-green color

^o Heights indicate approximate growth for landscape grade material after 10 years under normal conditions.



Hetz juniper



Maney juniper

is exceptionally resistant to winter bronzing. Berries appear some years.

Maney is one of the most handsome and useful junipers for landscape purposes in Minnesota. It needs very little trimming; a little tipping will keep it from being too open in habit. It does best in full sunlight, but will tolerate light shade with a shorter use expectancy. Any juniper will gradually deteriorate in partly shaded lo-

cations. Maney juniper appears to be adapted to all parts of the state.

Pfitzer Juniper (*Juniperus chinensis* 'Pfitzeriana'), 5-6 feet.^o The plant has a semi-erect spreading habit with horizontal branching. It is normally hardy and has medium-green foliage. Young plants are very vigorous. As plants mature, growth is less rapid and the shrub becomes more dense. It needs full sun.

^o Heights indicate approximate growth for landscape grade material after 10 years under normal conditions.

Golden Pfitzer Juniper (*Juniperus chinensis* 'Pfitzeriana Aurea'), 5 feet.* The growth habit of this plant is similar to Pfitzer juniper. The growing tips are a bright golden yellow in spring and early summer. During fall and winter this color changes to a greenish yellow. Older foliage is medium green.

Sargent's Juniper (*Juniperus chinensis* 'Sargentii'), 3 feet.* This juniper is low growing and has a spreading habit and short upright branches. It is one of the best of the low growing junipers because of its ability to resist winter discoloration. The foliage is either green or blue green throughout the year. Sargent's juniper combines well with other junipers in planting composition.

Common Juniper (*Juniperus communis*). The common juniper is quite variable in form, ranging from a tree 20-30 feet high to a low, prostrate shrub. The hardiness of this species varies considerably, and only the following prostrate forms are recommended for Minnesota.

Prostrate or Oldfield Common Juniper (*Juniperus communis depressa*), 2-3 feet,* is native to the timbered sections of northeastern and eastern Minnesota. It is suitable for planting throughout the state and does well in sandy soil. Its distinguishing features are the numerous buds that occur in leaf axils and a white line down the upper sides of leaves. It turns a bright brown in fall and retains this color until the growing season begins in spring. The plant reaches a height of about 3 feet and has a spreading habit. It may be used in naturalistic landscaping where a

low, irregular mass of foliage is needed as a ground or bank cover. Centers of older plants often become open.

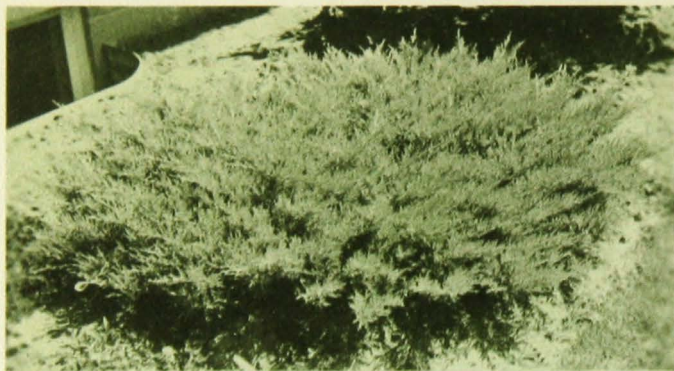
Golden Prostrate Juniper (*J. communis depressa* 'Aurea'), 2-3 feet,* is similar to prostrate juniper but has golden-yellow needles on the growing tips in spring and summer. These tips become light brown as the rest of the shrub turns to the characteristic bronze-brown winter color. Golden prostrate juniper is more often sold in nurseries in Minnesota than prostrate juniper.

Creeping Juniper (*Juniperus horizontalis*), 1 foot.* This juniper spreads close to the ground. It is an attractive bank or slope cover and is sometimes used in rock gardens. The prostrate branches often take root where they come in contact with the soil. Creeping juniper is native in northern and southeastern Minnesota and is adapted to most of the state.

Many varieties of creeping juniper have been selected because of differences in color and form. Not all of these varieties have been adequately tested in Minnesota. The following are commonly planted:

Andorra Juniper (*Juniperus horizontalis* 'Plumosa'), 1 foot.* This juniper is sold as a compact mound since it is trimmed in the nursery, but it spreads widely and may become quite open. It can be planted in an evergreen grouping as the lowest specimen or as a ground cover in a rock garden or along the steps of a terrace. Its summer color is bluish-green; in winter it has a purplish hue. Plants in exposed locations may suffer winter injury that results in browned branch tips.

* Heights indicate approximate growth for landscape grade material after 10 years under normal conditions.



Andorra juniper

Bar Harbor Juniper (*Juniperus horizontalis* 'Bar Harbor'), 1 foot,* is a spreading form that is useful as a low shrub or as a ground cover. Its foliage turns a silvery purple in winter.

Hughes Spreading Juniper (*Juniperus horizontalis* 'Hughes'), 1 foot,* is characterized by a distinctly radiating branching habit. It is a low growing, dense plant, but it grows rapidly in width. The fine textured foliage is silvery blue in summer and changes to a purplish color in winter. This juniper is a vigorous selection.

Waukegan Juniper (*Juniperus horizontalis* 'Douglas'), 1 foot,* has a soft bluish-green foliage in summer that turns reddish purple in winter. It is used mostly in rock gardens and entrance plantings. Its branches take root easily, so one plant may cover a large area.

Eastern Redcedar (*Juniperus virginiana*), 12-15 feet.* This species is native in practically every state east of the Rocky Mountains. The numerous forms include plants tall and narrow, low and bushy, and all shapes and sizes in between.

In Minnesota the typical form is upright with a broad, conical top. The color, generally green, usually turns a reddish brown in the fall and blends with the autumn landscape. Bluish-green forms also are common; some green forms that hold their color all winter have been selected. Because of this species' extreme variability, numerous named varieties have been selected and propagated.

The eastern redcedar is the alternate host for cedar-apple rust. Do not plant redcedar within one-half mile of a commercial apple orchard.

Eastern redcedar is used widely for windbreak, shelterbelt, and wildlife plantings. It often produces an abundance of berries relished by many birds during the winter. Grafted varieties most often are used in ornamental plantings. However, many of these varieties become straggly and ragged and are very susceptible to cedar-apple rust.

Silver Redcedar (*Juniperus virginiana* 'Glauca') is the best selection of redcedar in Minnesota. It is fast growing and forms a rather loose, pyramidal tree. Its silver-blue color is brightest in the spring.

* Heights indicate approximate growth for landscape grade material after 10 years under normal conditions.

Japgarden Juniper (*Juniperus procumbens*), 1 foot.* This low, wide-spreading form has grayish-green, dense, somewhat tufted foliage, giving it an oriental appearance. A dwarf form, *J. Procumbens* 'Nana,' is being sold. This form grows more slowly.

Meyer Juniper (*Juniperus squamata* 'Meyeri'). This juniper has not proved dependably hardy in Minnesota.

Rocky Mountain Juniper (*Juniperus scopulorum*), 12-15 feet.* This evergreen is similar to eastern redcedar in general appearance. However, it requires 2 years to mature its seeds, while eastern redcedar requires 1. It is used extensively in farmstead shelterbelts and field windbreak plantings. Like redcedar, many selections of Rocky Mountain juniper are susceptible to cedar-apple rust and should not be planted near apple trees. The following horticultural varieties are used more commonly in landscaping than the above species:

Blue Heaven Juniper (*Juniperus scopulorum* 'Blue Heaven'). This selection often is sold as Blue Haven. It has a neat, pyramidal form. The foliage is intensely blue throughout the year.

Cologreen Juniper (*J.s.* 'Cologreen'). This dense, columnar juniper keeps its green color through the winter.

Dewdrop Juniper (*J.s.* 'Dewdrop'). This dense, compact, broadly pyramidal juniper is a light blue-green.

March Frost Juniper (*J.s.* 'March Frost'). This juniper has silver-blue foliage and an upright habit. The growth is more irregular than most selections of Rocky Mountain juniper.

Medora Juniper (*J.s.* 'Medora'). This tall growing selection has a very narrow or columnar habit. The dense foliage is green. Its greatest potential is for screening where a tall, narrow evergreen screen is needed.

Moffet Juniper (*J.s.* 'Moffet'). This juniper is a very dense and symmetrical tree with a blue-green color.

Pathfinder Juniper (*J.s.* 'Pathfinder'). This juniper is distinctly bluish-gray. It matures to a broad, open pyramid. Pathfinder juniper is susceptible to cedar-apple rust.

Platinum Juniper (*J.s.* 'Platinum'). This juniper tree is intensely blue and pyramidal in shape.

Welch Juniper (*J.s.* 'Welchi'). This juniper is a narrow pyramidal tree with bluish-green foliage.

Many other horticultural varieties of Rocky Mountain juniper are offered for sale in Minnesota. Most are pyramidal upright trees with height potentials of 20 feet or more. However, other shapes such as Table Top juniper (a spreading form), Globe juniper, and Lakewood juniper also are available.

Savin Juniper (*Juniperus sabina*), 3-5 feet.* This shrubby evergreen has slender, arching branches that rise gracefully 3 or more feet. The needles are short and soft, giving the shrub a fine texture. It is dark green all year round. Savin juniper and its selections need full sun and protection from spider mites for best development.

Arcadia Juniper (*Juniperus sabina* 'Arcadia'), 1-2 feet.* This dense, low growing, spreading variety has light-green foliage. It retains its color throughout the year. Older plants

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have an undesirable tendency to develop open centers.

Skandia Juniper (*Juniperus sabina* 'Skandia'), 1-2 feet.* This low growing, spreading selection is a very desirable ground cover plant. It is quite dense and reaches a height of about 18 inches. The foliage is dark green through the entire year.

Tamarisk Juniper (*Juniperus sabina* 'Tamariscifolia'), 2-3 feet,* is a low spreading selection of Savin juniper. Its general effect is that of a feathery mound 12-15 inches high and 3 feet or more wide. The color is an attractive light green. Tamarisk juniper is apparently hardy in a protected spot, but it suffers from drought in dry locations.

Von Ehron Juniper (*Juniperus sabina* 'Von Ehron'), 3-5 feet.* An extremely vigorous spreading juniper, this tree has a heavy, oblique branching habit. It is dark green all year.

LARCHES (*Larix*)

Although they shed their needles in the fall, larches generally are considered along with evergreens because of their needle-shaped leaves and cones. These characteristics make them more similar to coniferous evergreens than to broad-leaved deciduous trees. Larch leaves are soft to the touch and are clustered on short, spurlike branches. The immature cones are reddish-purple in the spring and turn brown as they mature in the fall. The larch is a tree of delicate beauty when the pale green foliage appears in the spring and again when the tree turns golden yellow in autumn before the needles fall.

Eastern Larch or Tamarack (*Larix laricina*), 15-20 feet.* The tamarack is native in swampy areas over much of the state. When planted on upland soils, it grows more rapidly than it does in swamps or bogs.

European Larch (*Larix decidua*), 15-20 feet.* This species seems well adapted for planting in most sections of Minnesota. The mature tree reaches a height of 60 feet or more and has wide spreading branches. One old specimen in Goodhue County has a branch spread of over 50 feet.

This species is used chiefly for planting in parks and as lawn specimens on large home grounds. It may have a place in shelterbelt planting.

Japanese Larch (*Larix leptolepis*), 12-15 feet.* This Japanese native larch is similar to tamarack. The foliage turns golden yellow in the autumn before dropping. The brown rosette-like cones are about an inch long.

PINES (*Pinus*)

Pines can be readily distinguished from other evergreens by their long needle-shaped leaves. These leaves usually are borne in bundles of from two to five bound together at the base by a light-brown membranous sheath. The following species are commonly planted in Minnesota.

Austrian Pine (*Pinus nigra*), 12-15 feet.* This species is a two-needled pine with needles 3-5 inches long that are very stiff and sharp and dark green. The color gives the entire tree a dark appearance. Aside from the Mugho, the Austrian pine is the most symmetrical pine. It forms a broad pyramidal tree of slow growth that

* Heights indicate approximate growth for landscape grade material after 10 years under normal conditions.

Tamarack



may ultimately reach a height of 50 feet or more. It should be planted in full sun.

The Austrian pine is used for lawn specimens on large grounds and for background groupings. It also may be used in windbreak and shelterbelt plantings and grown for Christmas tree purposes.

Eastern White Pine (*Pinus strobus*), 15-18 feet.* This species is native in northern, eastern, and scattered points in southeastern Minnesota. Its needles are bluish-green, soft in texture, 3-5 inches long, and grow in bundles of five. When young the tree is pyramidal in form, but it becomes more open and picturesque as it grows older.

White pine grows extremely fast in favorable locations. For best development the species requires an acid, moist soil and protection from dry winds; it is not recommended for planting in western Minnesota. It is adapted to Christmas tree culture and is useful in windbreak and shelterbelt plantings in sections where the species thrives. Avoid planting in regions where the risk of blister rust disease is high. It can be used on home grounds where its large size can be accommodated.

White pine is susceptible to blister rust disease. To protect the tree from blister rust, remove the alternate hosts—currants and gooseberries.

* Heights indicate approximate growth for landscape grade material after 10 years under normal conditions.



Norway pine



Mugho pine

Jack Pine (*Pinus banksiana*), 12-15 feet.* This pine is native in north-eastern Minnesota. The tree is characterized by its short needles that are shiny dark green, 1-2 inches long, and grow in bundles of two. Small, recurved cones remain on the tree several years; other pine species shed cones as soon as they are ripe.

Jack pine is somewhat irregular in growth habit and has a yellowish winter color that has restricted its use in home landscaping. However, with continuing interest in irregular plant forms and smaller scale plants for small properties, selected jack pines may have a future in planting composition. Jack pine grows rapidly on poor, sandy soils and is well suited for field windbreaks and farm shelter-belt plantings in sandy areas of northern Minnesota.

Mugho Pine (*Pinus mugho mughus*), 8-10 feet.* The species from which this variety was selected is native to the mountainous regions of northern Europe. Both the species and Mugho pine are extremely variable in size and form. The plant is a shrub with several stems. Needles are borne in 2-inch clusters and are 2-3 inches long.

Mugho pine is extremely hardy and retains a good winter color better than most other shrubby evergreens. It should be planted in full sun. It develops to its full beauty when allowed to grow naturally without extreme pruning. In this form, Mugho pine makes a beautiful background plant or handsome screening material. It can be used as a large specimen plant in a suitable space. New growth can be pinched back each spring to slow its growth and retain a compact form

where such retardation is necessary. The plant is susceptible to pine needle scale, but few other pests and diseases affect it in Minnesota.

Norway or Red Pine (*Pinus resinosa*), 15-18 feet,* is native and grows commonly in northern Minnesota. It is widely known in the lake states as Norway pine. In 1953 the Minnesota legislature recognized it as the state tree. It grows rapidly when young and attains considerable size when mature.

This pine can be distinguished from other two-needle pines by the softness of its 4-6 inch long needles. The bark is reddish, and older branches and the trunk have broad, flat scales.

Because of its rapid growth and large size, red pine is not desirable for landscape purposes on small grounds. However, it is useful for large scale screens, windbreak, shelterbelt, and Christmas tree purposes. It also is valuable for park and roadside plantings. In western regions of the state, winter injury may deform the tree or kill it.

Ponderosa Pine (*Pinus ponderosa scopulorum*), 12-15 feet.* Ponderosa pine is native from the Missouri River westward to the Pacific Coast. The variety scopulorum, from the Black Hills in South Dakota and northern Rocky Mountain regions, is best adapted to Minnesota conditions.

The tree is fast growing and ultimately reaches a height of 50 feet or more. Needles are 4-6 inches long, rather coarse and twisted, and grow in bundles of two or three on the same tree. They make this tree easy to distinguish.

* Heights indicate approximate growth for landscape grade material after 10 years under normal conditions.

Ponderosa pine is most suited for landscaping large grounds. It may be planted in background groups or as a specimen for parks, public building sites, or on large suburban or country properties. It is one of the best pines for windbreaks and shelterbelts, particularly in western Minnesota.

Scotch Pine (*Pinus sylvestris*), 15-18 feet,* is a European native that has been widely planted in Minnesota. It is a fast growing tree that is pyramidal when young, but it becomes open and picturesque as it matures. Needles grow in bundles of two, are bluish-green, 2-3 inches long, and slightly twisted. Bark on older branches is quite smooth and cinnamon brown or reddish.

Because of its rapid growth, Scotch pine is adapted to large mass plantings or for use as specimen trees in parks or on large grounds. This pine cannot endure long dry periods because of its shallow root system. The tree is not well suited for planting in western Minnesota.

Northern seed sources such as the Riga strain develop a better upright form at maturity, but the needles turn pale green or yellow in the dormant season. Certain other strains from central and southern Europe are preferred by Christmas tree growers because they retain a more normal green or blue-green color in the fall. Scotch pine is presently the favored species for Christmas tree plantings in Minnesota.

Fastigiate Scotch Pine (*Pinus sylvestris* 'Fastigiata') is a compact, upright form of Scotch pine. It is a handsome accent plant and can be used in smaller spaces than the species.

SPRUCES (*Picea*)

Spruces are important evergreens for windbreak and ornamental planting throughout Minnesota. Their distinguishing characteristic is sharp pointed needles that are squarish in cross section. When the needles drop, they leave a jagged leaf base that helps distinguish spruces from firs. With a few exceptions, spruces are large trees and should be planted where their size is an advantage rather than a problem.

Black Spruce (*Picea mariana*), 12-15 feet.* This spruce is a fast growing tree native to Minnesota swampland. It can be used for naturalistic lakeside plantings, but it is not recommended for drained sites. The native white spruce is a more handsome, long-lasting landscape choice.

Colorado Spruce (*Picea pungens*), 12-15 feet.* This popular evergreen is grown throughout Minnesota because of its striking appearance. It has a nearly perfect pyramidal outline, with horizontally spreading branches that grow in close whorls. This growth habit produces a layered appearance.

Colorado spruce varies from green to bluish green in seedling lots. Bluish forms are usually sold as Colorado blue spruce, while green forms are sold as Colorado spruce. The needles are stiff and sharp, coming out at right angles to the stem. The year-old twigs are a bright brown and the cones are 3-5 inches long.

Colorado spruce is better adapted to western parts of Minnesota than other spruces. It is favored by the heavier, richer soils of those regions and can tolerate a higher pH than many other species. However, it is

* Heights indicate approximate growth for landscape grade material after 10 years under normal conditions.

Colorado spruce



not native to the state and may be more subject to diseases than the native white spruce. Because it is susceptible to a fungus canker disease (see table 1, page 14), Colorado spruce may be relatively short-lived. It also seems to be more subject to needle browning following a severe winter than the native spruce or Black Hills spruce.

The Colorado spruce and its selected forms are used for lawn specimens, group plantings, windbreaks, and shelterbelts. The large size of the mature tree should be carefully considered when planting it on small properties or in restricted spaces.

Koster Blue Spruce (*Picea pungens* 'Pendens,' formerly 'Kosteriana') is a grafted form with an intense bluish-green color. This evergreen is narrow and upright with rather irregular, pendulous branches.

Several other blue-green selections are being sold by nurseries in the state.

Norway Spruce (*Picea abies*). The Norway spruce and its numerous varieties have been extensively planted in the eastern United States. In Minnesota this species seems adapted only to a limited southeastern area where it is grown chiefly for shelterbelt and ornamental purposes.



White spruce

As northern Scandinavian seed sources are selected more carefully, the Norway spruce could be planted in more northern Minnesota areas. A few Minnesota Christmas tree growers are now growing and marketing Norway spruce in increasing numbers.

The tree grows rapidly when young and eventually reaches a height of 70

or more feet. The main branches are more or less horizontal, and the tips turn downward slightly. The secondary branches and twigs tend to droop as the tree gets older. Except in favored sites with adequate moisture supplies, the needles shed prematurely, often giving the mature tree a bare, shaggy appearance.

Dwarf forms occasionally are offered for specimen purposes.

White Spruce (*Picea glauca*) 12-15 feet.* This tree, native to northern Minnesota, grows rapidly to form a fairly compact, spire-shaped tree 50 or more feet tall. Its needles are not as long or as sharply pointed as those of Colorado spruce. The color varies from green to bluish green. The cones are about 2 inches long.

The white spruce is used for windbreak and shelterbelt plantings and for specimen and background plantings throughout Minnesota except on the dry, high lime soils of the western area. It is not a popular species for Christmas tree purposes because of its poor needle retention, but it continues to be planted and cultured for this purpose. The tree does best in rich, moist soil.

Black Hills Spruce (*Picea glauca densata*), 10-12 feet,* is a geographical variety of white spruce. It differs from the species in that it has a more compact habit and slower growth. Like the species, the color ranges from green to bluish green. Black Hills spruce is a good lawn specimen in spaces large enough for it. Since it is more drought resistant than the native form, it is especially useful in windbreaks and shelterbelts.

Dwarf Alberta Spruce (*Picea glauca* 'Albertiana'), 2-3 feet,* is a dwarf form of white spruce that grows only about one-half inch in height each year. A mature specimen does not exceed 6 feet, while a 10-year-old specimen may not be over 2 feet tall. The form is compact and upright.

Because of its dwarf nature, this evergreen is useful in rock gardens

and for accent in formal gardens. It must be grown in a shaded place to prevent winter burn. It can be protected with a burlap screen. Mount the burlap on a frame so it doesn't touch the plant.

YEWS (*Taxus*)

Yews differ from all other evergreens in that they produce bright red fleshy fruits. These fruits are produced on female plants.

Other distinguishing features of yews are the shiny dark-green flat needles and the green color of young twigs. Yews tolerate considerable pruning, so they can be kept in bounds in small spaces for a longer period than most evergreens. Regular tip pruning, about twice a season, produces a more dwarfed, compact specimen.

Canada Yew (*Taxus canadensis*), 2-3 feet,* is native in moist, shaded spots in Minnesota. It is a low spreading plant that often roots where branches touch the ground. It is best grown in a shaded natural garden where it will receive little exposure to winter sun.

Japanese Yew (*Taxus cuspidata*), 3-5 feet,* is far better than the native form for landscape purposes. When grown from seed the typical form is a small upright tree. Spreading forms have been selected and introduced into the nursery trade. Japanese yew is useful for planting on northern sites and in shaded areas elsewhere in a landscape design. If a yew must be grown in the open, it should be protected from the sun in winter to prevent browning.

* Heights indicate approximate growth for landscape grade material after 10 years under normal conditions.

Japanese yew



Dwarf Japanese Yew (*Taxus cuspidata* 'Nana'), 3 feet,^o is a dwarf form that is much more compact and slow growing than the species. It has an interesting tufted habit and can be easily trained into a globe or other geometric shape. Dwarf Japanese yew is more resistant to winter browning than the species.

Upright Japanese Yew, 6-8 feet,^o refers to forms selected in the nursery trade for their upright habit—broad at the base and rapidly tapering to a

point. These forms usually are pruned regularly to retain the pyramidal shape. Plants that are not trimmed may produce a wide spreading upright tree.

Anglojap Yew (*Taxus X media*). Several named varieties of this species have been selected by eastern nurserymen. They are under test at the Minnesota Landscape Arboretum. Reports will be made as information becomes available. Interested persons can check the yew collection each season.

^o Heights indicate approximate growth for landscape grade material after 10 years under normal conditions.

Mention of commercial names does not imply endorsement nor does failure to mention a name imply criticism.

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