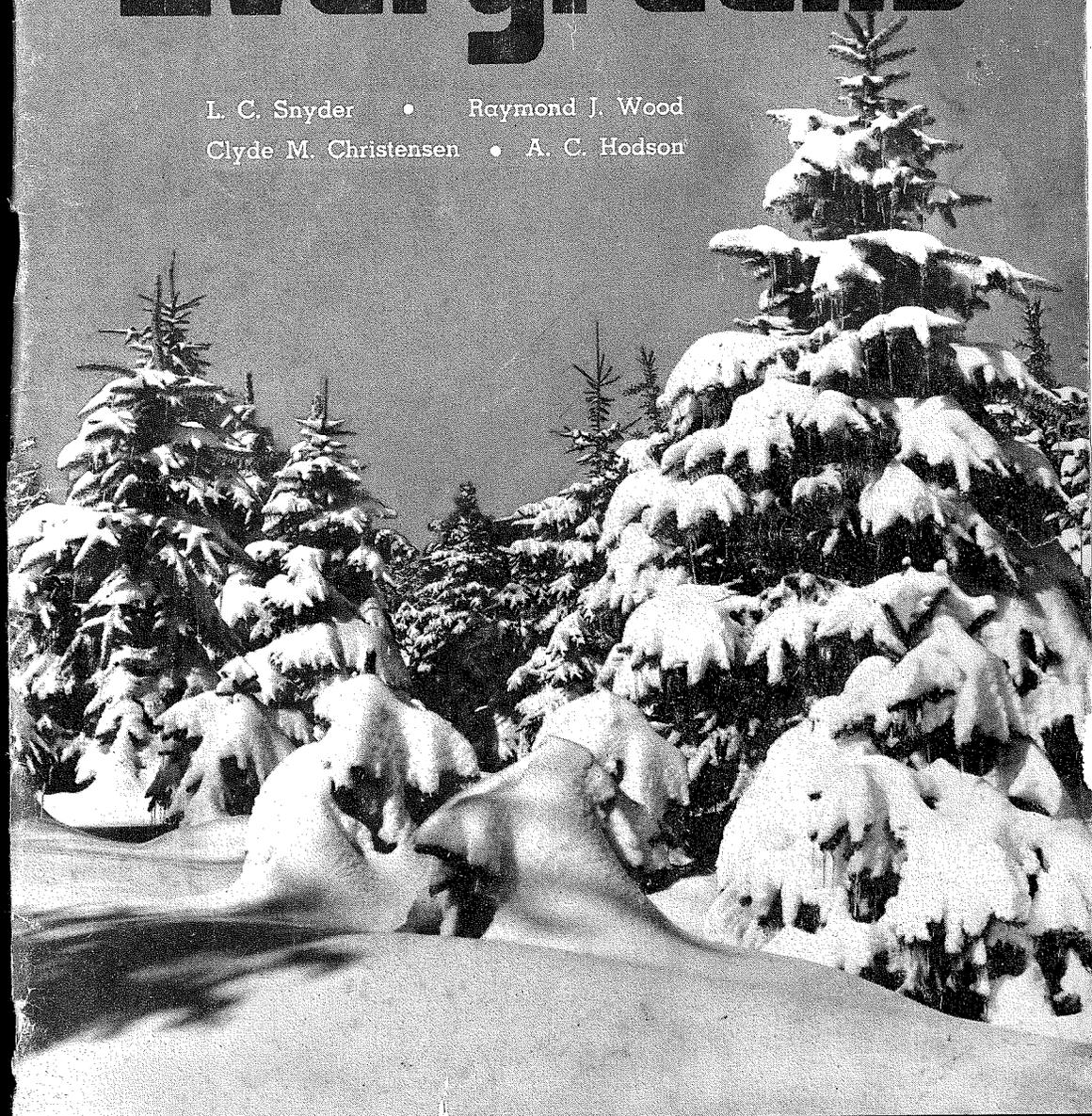


Evergreens

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Evergreens

L. C. Snyder, Raymond Wood,
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EVERGREENS are widely used in landscape and shelterbelt plantings. Although they are greatly appreciated, their identity and cultural requirements are familiar to very few individuals. This bulletin, therefore, was prepared to enable people to become better acquainted with evergreens and the problems connected with their culture.

No attempt is made in this bulletin to give a technical description of species and varieties of evergreens or to provide an identification key. A brief general description of the tree and its uses, however, will be helpful.

Evergreens are distinguished from deciduous trees and shrubs by the green leaves that persist over winter. For the most part the evergreens which grow in Minnesota have needle- or scale-like leaves. A few of the broad-leaved evergreens, such as the Oregon grape, bearberry, and wintergreen, also occur in Minnesota, but these are not considered in this bulletin.



FIG. 1. Mass plantings of evergreens are adaptable to large grounds.

Major Groups of Evergreens

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

Each of the evergreen groups has certain characteristics that make identification easy. The pines have long, slender needles that are borne in clusters of from two to five. The spruces, firs, Douglas fir, yews, and hemlock have needle-shaped leaves that are scattered along the stem. The spruces have sharp-pointed needles that are square in cross section. When the needles drop the leaf base persists. In the true firs the needles are blunt, and when they fall they leave a smooth, circular scar on the stem. The Douglas fir needles resemble those of the fir, but the sharp-pointed buds and 3-lobed bracts that come out from between the cone scales are characteristics that readily distinguish this tree. The yews have dark green needles and green twigs. The fruit on the female tree resembles a fleshy, red berry, thus making the yew easy to distinguish when in fruit. The hemlock has fewer distinguishing characteristics. The needles are flat, pointed, and, when they drop, leave a persistent base on the twig. They are also whitish underneath.

The arborvitae and the junipers have scale or awl-shaped leaves. In the arborvitae these scale-like leaves are borne in pairs, closely crowded on flattened twigs. The fruits of the arborvitae are small, dry cones. In the junipers the leaves are either small and scale-like or short and pointed. The characteristic arrangement of these leaves is in whorls of three. The juniper berries are hard and round and generally take on a bluish-green color.

The Firs (*Abies* spp.)

The firs are among the most beautiful of our evergreens. Most of the fir species are native in the mountainous regions of the West, and hence are not adapted to Minnesota conditions. Only two species will be considered.

Balsam Fir (*Abies balsamea*). The balsam fir can be distinguished by the short, blunt, flat, and flexible needles $\frac{1}{2}$ to 1 inch long, and the blunt buds that are always covered with a heavy layer of sticky pitch. The smooth, gray bark is covered with many small blisters containing pitch. Although the tree is native in northern and eastern Minnesota, it does poorly outside of its natural range. Its use should therefore be limited to the northern, forested sections and to parts of southeastern Minnesota with heavy soil and ample rainfall. The chief uses for the balsam fir are for Christmas trees and Christmas decorations, and paper pulp.

White Fir (*Abies concolor*). The white fir is the best fir to plant in Minnesota. The leaves are flat, about 2 to 3 inches long, and curve upward. The color varies from light green to a deep bluish-green. When young, the tree is wide and pyramidal, the lower branches touching the ground. As it grows older, the plant grows mostly upward and becomes a narrow, pyramidal tree 50 or more feet tall and of great beauty. The white fir is very good as a specimen tree in parks and on large home grounds and blends well with other evergreens in group plantings. These should be limited to the southern parts of the state. After severe winters the needles often turn brown.

The Junipers (*Juniperus* spp.)

The junipers are a very large group and contain some of our very best ever-

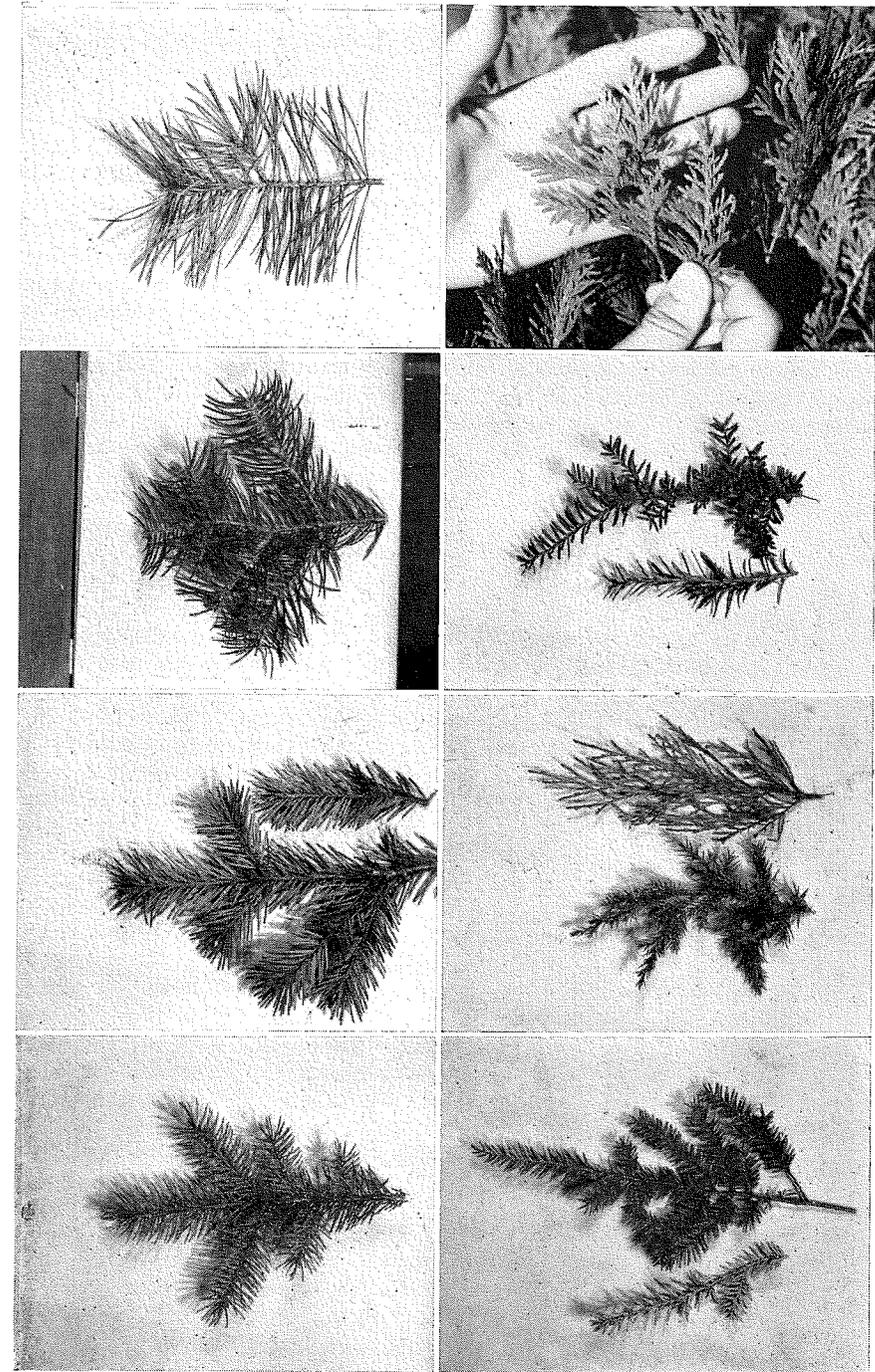


FIG. 2. Size, shape, and arrangement of the evergreens' leaves are their most important identifying characters. Examples are shown above. Upper left to right: Spruce, Douglas fir, Fir, and Pine. Lower left to right: Hemlock, Juniper, Yew, and Arborvitae.

greens for landscape purposes. The forms vary from low, creeping types to tall, upright trees. Because of this diversity of form, junipers can be selected for almost any landscape use.

Chinese Juniper (*Juniperus chinensis*). The Chinese juniper varies greatly in form and size. The typical form of the species is pyramidal in shape and grows about 12 feet high. The leaves are awl-shaped, one-half inch long or longer, and very sharp to the touch. They have two indistinct white lines on the upper surface that give the plant a bluish appearance.

The tree is not too hardy, and frequently loses many of its needles by browning during the winter. If used, plant in a protected spot, preferably on the east side of the house. The following varieties are used far more commonly than the species.

Variety pfitzeriana (Pfitzer Juniper). This is one of the hardiest and most widely used of the low evergreens throughout the entire state. An untrained specimen is quite low and spreading, seldom exceeding 3 feet in height. The practice of staking the



FIG. 3. Chinese Junipers

young plants in the nursery results in a taller, spreading shrub that may reach a height of 5 feet. This variety is commonly used under windows in the foundation planting and in the shrub border. Browning of the needles may follow a severe winter.

Variety pfitzeriana aurea (Golden Pfitzer Juniper). This resembles the Pfitzer except that the new growth is golden yellow in color. It is not as desirable as the common Pfitzer.

Variety japonica (Japanese Juniper). This form is low and spreading, and is bluish-green. It is not widely used.

Common Juniper (*Juniperus communis*). The common juniper is very variable in form, ranging from a tree 20 to 30 feet high, to a low prostrate shrub. The following variety is grown in Minnesota.

Variety depressa (Oldfield Common Juniper). This prostrate juniper is native in the timbered sections of northern and eastern Minnesota, and is suitable for planting in all parts of the state. The distinguishing features of this evergreen are the numerous buds that occur in the axils of the leaves and the white line down the upper side of the leaves. The plant grows to a height of about 3 feet and has a spreading habit of growth. This evergreen is very good where a low, irregular mass of foliage is desired.

Creeping Juniper (*Juniperus horizontalis*). The creeping juniper spreads close to the ground and gives an attractive appearance when used for covering sandy banks and slopes, or in the rock garden. It is native in northern and southeastern Minnesota, and appears to be adapted to most of the state. The following varieties have been selected because of their color variations or form.

Variety douglasi (Waukegan Juniper). This variety has soft bluish-green foliage in summer that turns a reddish-purple in winter. It is used mostly in rock gardens and foundation plantings.

Variety plumosa (Andorra Juniper). This variety is not quite as spreading as the creeping juniper but forms a compact mound a foot or so high and about 3 feet in diameter. It can be included in an evergreen grouping as the lowest plant, or planted in the rock garden or alongside the steps of a terrace.

Savin Juniper (*Juniperus sabina*). This is one of the best of the low evergreens for foundation plantings or at the edge of evergreen groups. The form is graceful with slender, arching branches that rise 3 or more feet. The needles are all short and soft, giving the shrub a very fine texture. Browning of the needles may follow a severe winter.

Variety tamariscifolia (Tamarisk Juniper). This beautiful evergreen is more of a low, spreading shrub than the Savin juniper. The general effect is that of a feathery mound, 12 to 15 inches in height and 3 or more feet in diameter. The color is an attractive bluish-green. It is especially good in the rock garden or as a low element in an evergreen grouping. Though apparently hardy in a protected spot, it suffers from drouth in a dry location.

Rocky Mountain Juniper (*Juniperus scopulorum*). The Rocky Mountain juniper is very similar to the eastern red cedar in general appearance, differing chiefly in the fact that it requires two years to mature its seeds while the eastern red cedar requires one. It is used extensively in farmstead shelterbelts and field windbreak plantings. The following horticultural varieties are used more commonly in landscaping than the species.

Varieties Welchi and Moffeti are narrow and pyramidal in form, and useful where narrow forms are desired.

Varieties Chandleri and Pathfinder are a little broader and find more general use in landscaping.

Eastern Red Cedar (*Juniperus virginiana*). The eastern red cedar is na-

tive in practically every state east of the Rocky Mountains. Over this wide range, the numerous forms include plants tall and narrow, low and bushy, and all shapes and sizes in between. In Minnesota, the typical form is a narrow, compact tree. The color, which is typically green, usually turns a reddish-brown in the fall, thus blending with the autumn landscape. Bluish-green forms are also common and some of the green forms have been selected that hold their green color all winter. Because of the extreme variability of this species, it is only natural that numerous named varieties should have been selected and propagated.

The eastern red cedar is the alternate host for the cedar-apple rust and should not be planted within a half mile of apple or crab apple trees. It should not be planted in areas where apple production is important.

The eastern red cedar is widely used for windbreak, shelterbelt, and roadside plantings. The species is also used for hedges and foundation plantings.



FIG. 4. An Eastern Red Cedar

For most landscape purposes, however, one of the following grafted varieties is more often used.

Variety pyramidiformia hillii (Hill Dundee Juniper). This is a compact, pyramidal form that is bluish-green in the spring and summer and turns to a purplish-plum color in the fall and winter. It is useful for foundation plantings where upright specimens are desired.

Variety glauca (Silver Red Cedar). The silver red cedar is fast-growing and, unless sheared regularly, forms a rather loose, pyramidal tree. Its outstanding feature is its attractive silver-blue color, which is brightest in the spring.

Variety canaerti (Canaert Red Cedar). This is a popular deep green form with all of the needles short and twigs rather slender. The habit of growth is pyramidal, and if properly sheared it makes an attractive upright specimen in the foundation planting.

Variety kosteri (Koster Red Cedar). Unlike most of the other red cedars, the Koster is a low, semi-dwarf shrub 2 to 3 feet high, with horizontally spreading branches and irregular habit. It is useful in small gardens, rock gardens, and foundation plantings.

The Larches (*Larix* spp.)

The larches, although they shed their needles in the fall, are generally considered among the evergreens because of their needle-shaped leaves and cone-bearing habit. The needle-like leaves are soft to the touch and clustered on short spur-like branches. Only two species will be considered, the European larch (*Larix decidua*) and the Eastern larch or tamarack (*Larix laricina*).

European Larch (*Larix decidua*). The European larch seems to be well adapted for planting in most sections of Minnesota. The mature tree reaches a height of 60 or more feet and has wide-

spreading branches. One old specimen in Goodhue County has a branch spread of over 50 feet. The needle-shaped leaves are borne in whorls and are bright green in color. The chief attraction of the larch is the delicate beauty of the new spring growth and the yellow color of the needles just before they drop in the fall. It is used chiefly for planting in parks and as lawn specimens on large home grounds. It is possible that this species may have a place in shelterbelt plantings.

Eastern Larch or Tamarack (*Larix laricina*). The eastern tamarack is native in swampy areas over much of the state. In the spring of the year when the new growth comes out, the native tamarack is a tree of great beauty. Although native in swampy areas, the tree does surprisingly well under cultivation and may find a wider use.

The Spruces (*Picea* spp.)

The spruces are one of the most important evergreen groups for windbreak and ornamental plantings in Minnesota, having been found useful in all parts of the state. The distinguishing characteristics of the spruces are their sharp-pointed needles that are squarish in cross section. When the needles drop, they leave a jagged leaf base. This characteristic helps to distinguish the spruces from the firs.

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 to be adapted to only a limited area in the southern part where the soil is deep and the moisture supply is more stable, and is grown chiefly for windbreak and shelterbelt purposes. The tree grows rapidly when young and eventually reaches a height of 70 feet or more. The main branches are more or less horizontal with the tips turning slightly downward, but the

secondary branches and twigs tend to droop, giving a pendulous appearance as the tree gets older. Except in favored sites, the needles shed prematurely, giving the mature trees a bare, shaggy appearance.

White Spruce (*Picea glauca*). This tree, native in northern Minnesota, grows rapidly to form a fairly compact, spire-shaped tree 50 feet or more in height. The needles are not quite so long nor so sharp-pointed as those of the Colorado spruce. The color varies from green to bluish-green. The cones are about 2 inches long.

The white spruce is one of our most valuable evergreens for windbreak and shelterbelt plantings, and for specimen and background plantings in all parts of the state except the drier sections of the western part. The tree does best in rich, moist soil.

Variety densata (Black Hills Spruce). The Black Hills spruce is a geographical variety of the native white spruce, differing from the species in its more compact habit and slower growth. Like the species, the color ranges from green to bluish-green. It is excellent as a lawn specimen and, since it is more drouth-resistant than the native form, can be used in windbreak and shelterbelt plantings in western Minnesota.

Variety conica (Dwarf Alberta Spruce). This 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 in height, while a 10-year-old specimen may not be over about 2 feet in height. The form is very compact and upright. Because of its dwarf nature, this evergreen is useful in rock gardens and for accent in the formal garden. The cost, however, is very high, since the tree must be propagated by grafting and it grows very slowly in the nursery. This of course, limits its use.

Colorado Spruce (*Picea pungens*). The Colorado spruce is one of the most

widely grown evergreens. It thrives on most soil types and withstands drouth better than many of the other spruces. The tree is striking in appearance—it has a nearly perfect pyramidal outline and horizontally spreading branches that occur in close whorls, giving the tree a layered appearance. Its color varies from green to bluish-green in seedling lots. The bluish forms are generally sold as Colorado blue spruce, while the green forms are sold as Colorado spruce. The needles are stiff and very sharp, coming out at right angles to the stem. The year-old twigs are a bright brown color and the cones are 3 to 5 inches long.

The Colorado spruce and its selected forms are very valuable for lawn specimens and group plantings, and for windbreaks and shelterbelts. Although frequently used in foundation plantings, its use for this purpose should be discouraged because of its large size at maturity. Since Colorado spruce is not native in this state it may be more subject to insects and diseases than the

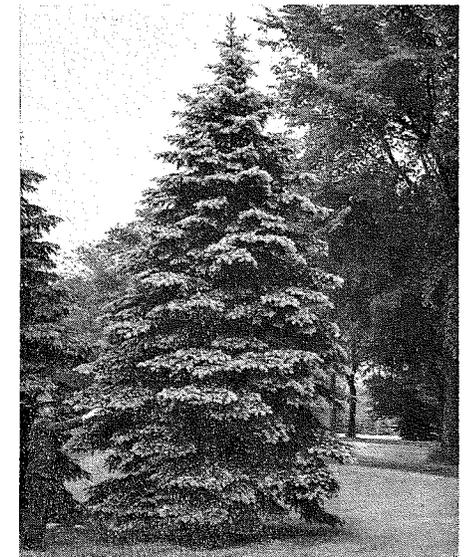


FIG. 5. A Colorado Blue Spruce

white spruce. For this reason it may be relatively short-lived. This spruce seems to be more subject to browning of the needles following a severe winter than the native white spruce or Black Hills spruce.

Variety kosteri (Koster Blue Spruce). This is a grafted form with an intense bluish-green color. The form is narrow and upright, with rather irregular and pendulous branches.

The Pines (*Pinus* spp.)

The pines are readily distinguished from other evergreens by the long needle-shaped leaves that are always borne in bundles of from 2 to 5 bound together at the base by a light-brown membranous sheath. The needles of most of the pine species may show a browning following a severe winter. The following species are commonly planted in Minnesota.

Jack Pine (*Pinus banksiana*). The jack pine is native in northern Minnesota. The tree is characterized by its short needles that are dark, shiny green, 1 to 2 inches long, and in bundles of two. The small, recurved cones remain on the tree for several years, thus distinguishing this species from other pines that shed their cones as soon as ripe.

The growth is very irregular and the tree is not too attractive. Because of its

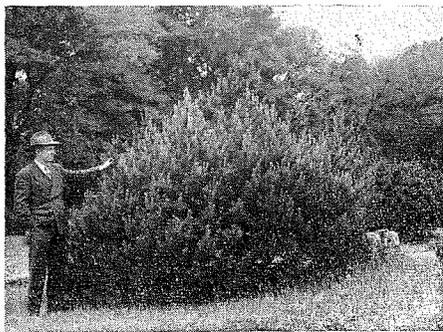


FIG. 6. A Mugho Pine

rapid growth and ability to grow on poor, sandy soils, this tree is best adapted for windbreaks and shelterbelt plantings in sandy areas of north-eastern Minnesota.

Swiss Mountain Pine (*Pinus mugho*). The Swiss Mountain pine is native in the mountainous regions of northern Europe and shows many variations in size and form, from a low-spreading shrub to an upright tree 20 feet or more high. The typical form is a large, pyramidal bush nearly as broad as it is high. The needles are born 2 in a cluster and are 2 to 3 inches long. The species is used for specimen plantings on the lawn or for group plantings in parks and around public buildings. The following variety is widely used in foundation plantings and in formal gardens.

Variety mughus (Mugho Pine). The mugho pine is a compact, dwarf variety that is widely grown in Minnesota for use in foundation plantings and for accents in formal gardens. By pinching back the new growth in the spring, this plant can be shaped to almost any form desired.

Austrian Pine (*Pinus nigra*). The Austrian pine is one of the two-needled pines with needles 3 to 5 inches long, very stiff and sharp, and of a dark green color that gives the entire tree a dark appearance. Aside from the mugho, the Austrian pine is the most symmetrical of the pines, forming a broad pyramidal tree of slow growth that may ultimately reach a height of 50 feet or more.

The Austrian pine is used for lawn specimens on large grounds and for background groupings. It might also be used in windbreak and shelterbelt plantings.

Rocky Mountain Ponderosa Pine (*Pinus ponderosa scopulorum*). The Ponderosa pine is native from the Missouri River westward to the Pacific coast. The variety *scopulorum* from the Black Hills of South Dakota and north-

ern Rocky Mountain regions seems to be best adapted to Minnesota conditions.

The tree is fast-growing and ultimately reaches a height of 50 feet or more. The needles are 4 to 6 inches long, are rather coarse and twisted, and occur in bundles of two or three on the same tree, thus making this pine easy to distinguish from other pines.

Because of its large size, this variety of Ponderosa pine should not be used for landscaping except on large grounds or in parks where large background groups are desired. In western Minnesota, it is one of the best pines for windbreaks and shelterbelts.

Red Pine (*Pinus resinosa*). The red pine is one of our native evergreens that is well adapted to the timbered sections of Minnesota. It is large and fast-growing, and can be distinguished from other two-needled pines by the 4-to-6-inch long needles that are soft and dark green. The bark is also reddish in color and forms large, flat plates.

Because of its rapid growth and large size, this pine should not be used for landscape purposes on small grounds. It is, however, very valuable for windbreak and shelterbelt plantings on the sandier soils of eastern and northern Minnesota. It is also valuable for parks and roadside plantings. Because of the soft nature of the foliage and its dark green color, the branches make fine Christmas decorations. The young trees may also be used as Christmas trees.

Eastern White Pine (*Pinus strobus*). The eastern white pine is native in northern and eastern Minnesota. The needles are bluish-green, soft in texture, 3 to 5 inches long, and occur in bundles of five. When young, the trees are pyramidal in form, but they become more or less open and picturesque as they grow older.

Because of its rapid growth, the white pine is not recommended for use as lawn specimens on small grounds. However, where a group of trees or a

windbreak and shelterbelt planting is desired, the white pine is hard to equal in those sections of Minnesota where this species thrives. White pines are the alternate host for the white pine blister rust disease and it is not advisable to plant it within a quarter of a mile of currant or gooseberry bushes. For best development, the species requires a rich, moist soil and a high air humidity. For this reason the white pine is not recommended for western Minnesota.

Scotch Pine (*Pinus sylvestris*). The Scotch pine, a native of Europe, is fast-growing and forms a pyramidal tree when young, but becomes open and very picturesque as it matures. The needles are in bundles of two, bluish-green in color, 2 to 3 inches long, and twisted. The bark on the older branches is quite smooth and cinnamon brown or reddish in color.

Because of its rapid growth it is best used where large mass plantings or specimen trees in parks or large grounds are desired. Because of its shallow root system, this pine cannot

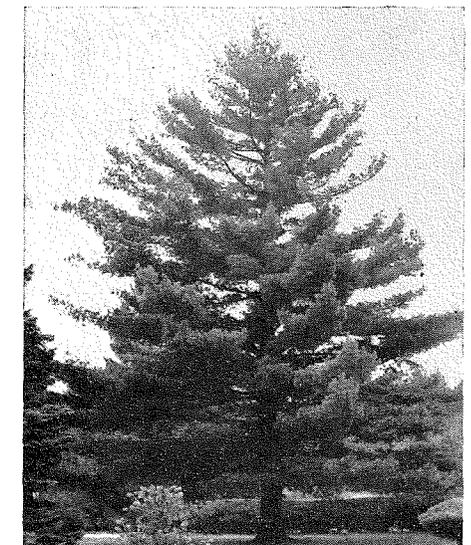


FIG. 7. A White Pine

endure long dry periods and is not well suited for planting in western Minnesota.

Douglas Fir (*Pseudotsuga* spp.)

Common Douglas Fir (*Pseudotsuga taxifolia*). The Douglas fir is a beautiful evergreen and deserves to be more widely grown than it is. The species ranges throughout the Rocky Mountains and the Pacific Coast area. Only plants grown from seeds from the northern Rocky Mountains should be planted here, since 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 bearing its branches well down to the ground when grown in the open. The needles are flattened like those of the true fir and are normally dark green in color, although bluish forms are known. The peculiar three-lobed appendages that grow out between the cone scales and



FIG. 8. A Pyramidal Arborvitae

the long, pointed buds make the Douglas fir easy to recognize.

The Douglas fir, when grown from hardy seed stocks, grows well in most sections of Minnesota. It is good for specimen and group plantings and may prove valuable for windbreak and shelterbelt purposes.

The Yews (*Taxus* spp.)

The yews differ from all other evergreens in their method of seed production. The male flowers are produced on one tree while the female flowers are produced on another. The fruits form a soft, pulpy, red, cup-shaped berry. Other distinguishing features of the yews are the dark green color of the flat needles and the green color of the young twigs.

Canada Yew (*Taxus canadensis*). The Canada yew is native in moist, shaded spots in Minnesota. It is a low, spreading plant, often rooting where the branches touch the ground. It can be grown only where it is moist and protected, since it will not endure overexposure to the winter sun.

Japanese Yew (*Taxus cuspidata*). The Japanese yew is far better than the native form for landscape purposes. When grown from seed, the typical form is a small, upright tree. Spreading forms are propagated from cuttings. It is useful in the foundation planting on the north or east sides of the house and in semishade elsewhere in the yard. When it is grown in the open, protection from the sun should be provided in late winter.

Variety nana (Dwarf Japanese Yew). This is a dwarf form which, with a little shearing, can be trained into a globe and kept under 3 feet for years. It endures more sun than the species.

Variety capitata (Upright Japanese Yew). This upright form is useful where an upright evergreen is desired on the north side of the house.

Arborvitae (*Thuja* spp.)

Eastern Arborvitae (*Thuja occidentalis*). The arborvitae are characterized by the flattened branches and twigs that resemble the fronds of certain types of ferns. The frond-like twigs are made up of small, scale-like, flattened leaves that are attached closely in pairs. In the common form these branches are arranged horizontally, while in some globe and pyramidal forms the arrangement is nearly vertical.

Although native in northern and eastern Minnesota, the arborvitae have a tendency to brown-up during the winter time and during dry summers, especially when planted in light soils or in exposed sites. For this reason the arborvitae should be used sparingly out of its natural range except in protected spots, such as the north or east sides of the house. Avoid planting the arborvitae in light soils unless the rainfall is ample or additional water can be supplied. It is widely used for hedges, screens, and foundation plantings. The following varieties are commonly grown.

Variety pyramidalis (Pyramidal Arborvitae). This pyramidal arborvitae is of columnar habit with dark green foliage which reaches a height of 15 to 20 feet. It is useful for foundation plantings where an upright specimen is needed.

Variety Douglasi pyramidalis (Douglas Pyramidal Arborvitae). This is a narrow form which slowly reaches a height of 20 feet. The foliage is dense with small fronds that are a dark, glossy green.

Variety Douglasi aurea (Douglas Golden Arborvitae). This is a bushy pyramidal tree with bronzy-yellow foliage in the spring.

Variety wareana (Ware or Siberian Arborvitae). One of the hardiest of all the arborvitae, this form is typically



FIG. 9. A Globe Arborvitae

pyramidal and compact, although it can be pruned into a globe.

Variety Woodwardi (Woodward Globe Arborvitae). The branches of the globe arborvitae tend to grow upward, producing a globe form rather than an upright tree. Of all the globe forms, the Woodward Globe is one of the best for Minnesota conditions.

The *Jewel Globe* and the *Dark Green* are other varieties of arborvitae often planted in Minnesota.

Hemlock (*Tsuga* spp.)

Northern Hemlock (*Tsuga canadensis*). This is one of the most beautiful of all evergreens of upright habit. The leaves are narrow, flat, and about three-fourths of an inch long, with a white line on the undersurface. The tips of the branches are drooping and very graceful, especially after a heavy snowfall. Unfortunately, the hemlock, whose natural range just touches the state near Duluth, is not too hardy in most parts of the state except in protected and shaded locations. Since it will tolerate more shade than most evergreens, it can be grown on the north side of the house where an upright specimen is desired. This tree is worth growing where conditions are favorable.

Uses for Evergreens

EVERGREENS lend themselves to landscape planting because of their interesting forms and year-round color. Perhaps the widest use for evergreens is in foundation plantings. Here a selection may be used alone or in combination with deciduous shrubs. Narrow or broad pyramidal forms may be chosen for corner groupings or to frame the doorway. Global forms may be selected for planting under the windows or in front of the upright specimens; if less formal specimens are desired, the half-erect or creeping forms can be used.

Evergreens may also be used for background plantings to enclose the outdoor living room or to screen some unsightly view. Groups of the taller forms should be used in back, with lower forms in front. Evergreens make excellent backgrounds for flower borders and pools.

On large grounds or in parks the taller evergreens, such as the Colorado blue spruce and white fir, are excellent. Always locate these trees where they will have ample room to develop naturally. It is best not to plant specimen trees in front of the house but rather out at an angle from the front corners so that they will frame the house as they grow up. Never plant them in the shade of large deciduous trees.

Some of the evergreens make very compact and beautiful hedges when kept regularly sheared. The arborvitae and cedars are especially good. For a compact hedge, evergreens should be planted about 18 inches apart and sheared each year to keep the hedge dense from the ground up.

Evergreens are being used more and more for field windbreaks and farmstead shelterbelts in all parts of Minnesota. In addition to adding beauty, they add year-round wind protection for the farmstead. In setting aside land for the shelterbelt, ample space should be provided so that the inner rows of evergreens will be at least 100 feet from the main farm buildings. It will also be well to plan to enclose a sufficiently large area for garden and fruit plantings. Ideally, the shelterbelt should extend along the west and north sides of the farmstead to furnish maximum wind protection to all parts of the farmstead area during the winter months. Evergreens should be used in combination with deciduous trees and shrubs. At least two rows of evergreens are needed. Colorado, white, and Black Hills spruces, Ponderosa and red pines, and the cedars are recommended species for shelterbelt and windbreak plantings in those sections of Minnesota where they are adapted.

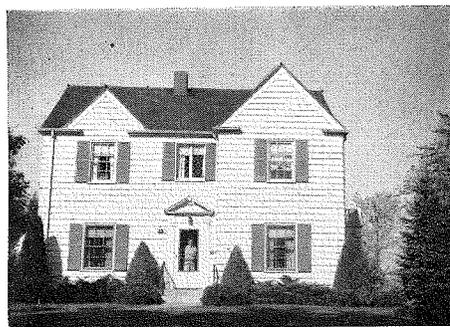


FIG. 10. Evergreens used in a Foundation Planting

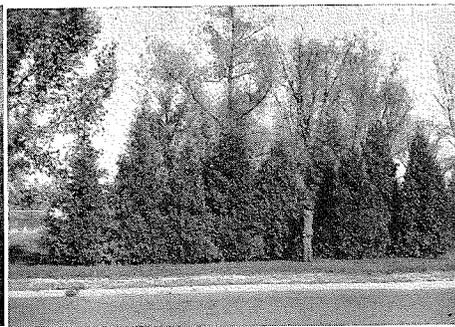


FIG. 11. Evergreens used in a Screen Planting

Planting and Care

Soil and Moisture Requirements

Evergreens, for the most part, are not fussy about the soil type on which they are grown. A rich, sandy loam is best for most varieties. However, evergreens can be grown successfully on sandy or clay soils if sufficient organic matter is first incorporated with the soil.

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

Perhaps the greatest difficulty comes from planting the evergreens in foundation plantings where the subsoil from the basement and other building refuse has been filled in around the house. Under such conditions, success can be achieved only by digging a sufficiently large hole and refilling with good soil.

It is well to remember that many of the evergreens grown for landscape purposes are native in other regions and that they are being planted under unnatural conditions. Under such situations they are apt to be short-lived and will therefore need to be replaced occasionally.

Shade Tolerance

Evergreens vary in their tolerance of shade. Some kinds, when planted under large deciduous trees, fail to make a normal growth. As a result, they are apt to be deformed and stunted in appearance. This is especially true of the pines, spruces, and cedars. The arborvitae will tolerate some shade and the yews and hemlock seem to do better in shade than in full sunlight. The differences in shade tolerance make it very necessary to select evergreens for each exposure when they are being used for foundation plantings.

Planting Evergreens

Except when planting seedling evergreens, it is necessary to plant them with a ball of dirt attached. When the evergreen arrives from the nursery a strip of burlap will be tightly fastened around the ball of dirt to hold it in place. Dig a hole slightly larger than the ball of dirt and place the tree carefully in the hole so that the tree will be perhaps an inch deeper than it was in the nursery. Fill in around the base of the ball with good soil. Firmly tamp the soil around the base of the ball to exclude air. Repeat until the hole is a little more than half full. Loosen the burlap from around the top of the ball and fold back. Next, fill the hole with water and allow it to sink in. Finish filling the hole with loose soil and leave a depression around the base of the tree to facilitate later watering. Keep the ground soaked periodically during dry periods for the first season. This is especially advisable if trees are planted near the house foundation where the soil frequently becomes very dry. Larger trees should be temporarily staked to prevent tipping while the ground is wet.

Small evergreens, either seedlings or transplants, are generally planted bare-rooted during the spring before the new growth has begun. Seedlings which have remained in the seedbed for two years are designated as 2-0 stock, while transplants which were grown for two years in the seedbed and one or two years in the transplant bed are known as 2-1 or 2-2 transplants. The same care should be used with small evergreens as with balled stock. It is very important that the roots be kept moist at all times; exposure to the drying effects of the wind will cause their death. Because of the care necessary, seedlings or transplants are best planted by the hole method. The hole should be dug large enough to permit placing the tree

roots in their natural position without crowding. Good soil should be worked around the roots a little at a time and firmed with the hand. It is very important that the root collar or dirt line be right at the surface of the soil, when the hole is completely filled. Planting small evergreens too shallow or too deep will often result in retarded growth and death. After the hole is filled the soil should be tamped with the feet. Another method that has proved successful when the soil is in good, mellow condition is the slit method. A slit is opened with a spade, the seedling inserted in the slit, and the spade removed. The soil is then firmed by tamping with the feet.

Cultivation

Evergreens should be kept cultivated for several years until they have become well established. This is as true for shelterbelts and windbreaks as for ornamental plantings. For individual trees, it will be necessary to keep the soil worked out about a foot beyond

the spread of the branches. In the foundation planting the entire area should be cultivated from the house foundation out to the edge of the lawn. Cultivation should be shallow to prevent injury to the roots.

Remember that you have a large investment in your plantings and that they demand the best of care.

Fertilizers for Evergreens

Evergreens, like all other green plants, remove fertilizer elements from the soil. Unless the soil has an abundant natural supply of these elements, evergreens will grow better when fertilizers are supplied.

Of the 12 or more elements known to be necessary for plant growth, only three are apt to be lacking in most soils. These are nitrogen, phosphorous, and potassium. The correct ratio between these elements is also important. A complete fertilizer relatively high in nitrogen, such as a 10-8-6, is best. This formula might be varied slightly but, in general, the nitrogen content (the

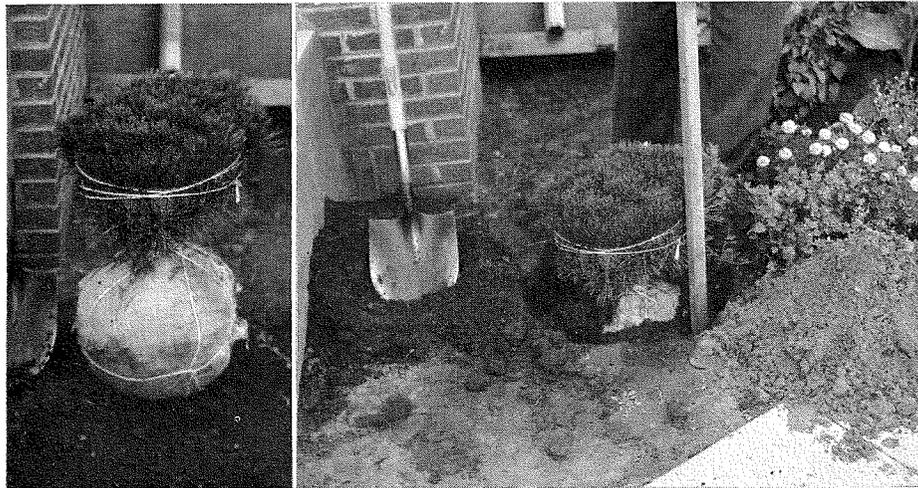


FIG. 12. Steps to follow in planting balled evergreens: (1) Balled Mugho Pine as received from nursery. (2) Hole dug amply large, tree in place, and top soil being tamped around the roots. (Steps 3 and 4 follow on page 17.)

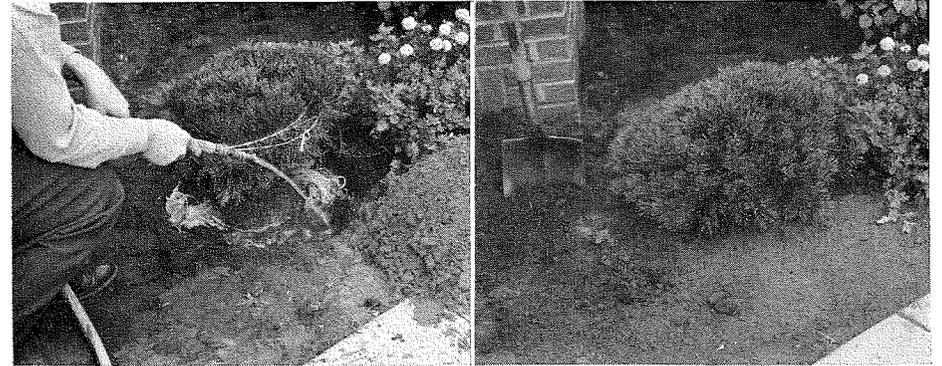


FIG. 13. Steps in planting balled evergreens (cont.). (3) Burlap folded back and water being applied to settle soil. (4) Loose soil added to fill hole and surface evened, leaving a shallow depression for watering.

first figure in the formula) should be higher than the phosphorus and potassium (the last two figures).

The amount and the method of application are also very important. For soil of average fertility, one-half pound of a 10-8-6 or similar fertilizer for each one foot in height of the tree should be about right. Make a shallow trench in a circle under the tips of the branches. Scatter the fertilizer in the bottom of this trench and cover with soil. Rain will carry the fertilizer down to the feeding roots. The best time to apply this fertilizer is in **early spring**.

If mature trees seem to be growing poorly, they can be fertilized by making holes with a crowbar or soil auger from 6 to 18 inches deep and 2 feet apart under the tips of the branches. Place a handful of fertilizer in each hole and fill with dirt. This should be repeated each year if the trees are not making satisfactory growth.

In addition to the commercial fertilizers, organic fertilizers such as manure and compost may be supplied. Manure should be **well rotted** and should be applied as a top dressing. Manure and compost, in addition to supplying needed minerals, improve the physical texture and water-holding capacity of the soil.

The tree itself will serve as an indicator of whether a fertilizer is needed. If the growth is satisfactory and the color good, the addition of fertilizer is not necessary. On the other hand, if growth is slow and the color poor, it will be best to fertilize. **Never mix fertilizer with the soil that is put around the evergreen roots when planting, since evergreen roots are sensitive to contact with commercial fertilizers.**

Watering Evergreens

Evergreens growing in our native forests reach enormous sizes with only the moisture they receive from natural rainfall. From this we might conclude that evergreens need no additional water. This, however, is not the case. If we were to examine the soil under evergreens in a natural forest, we would find an accumulation of leaves and leaf mold to a depth of several inches. This keeps the ground cool and moist and reduces evaporation from the forest floor. Contrast this with the conditions that exist in the average yard. Here the ground has no natural mulch to protect it from drying out. Trees are often planted under the eaves where they get little rainfall and often the young trees must compete with garden

flowers and the adjoining lawn. For the first few years, the roots will not extend much beyond the original ball of dirt so the feeding area for each tree is limited. For these reasons it is advisable to water regularly for the first few years at least, until the tree has become well established.

In watering it is best to remove the hose nozzle and let the water soak into the soil until the soil will absorb no more water. The new canvas hose soakers will be found ideal for this purpose. This may take several hours during dry periods. After these periodic soakings it will be well to work the surface of the soil to form a dust mulch. Even during dry weather one thorough watering every 10 days or two weeks should be sufficient. A light sprinkling at frequent intervals often does more harm than good, since the water does not reach the main mass of roots and shallow surface roots are encouraged.

Pruning Evergreens

The pruning of evergreens is little understood by the average home owner. There are only about three reasons for pruning an evergreen. These are:

1. To keep the tree within certain limits of size.
2. To remove any diseased or injured part of the tree.
3. To shape the tree into some special form.

Evergreens may be divided into two groups. The first group is the evergreens that open their dormant buds and make the most of their season's growth within a few weeks in the spring. This group includes the pines, firs, spruces, and Douglas fir. In the second group the growth is not limited to early spring, but is more or less continuous throughout the growing season. This includes the junipers, arborvitaes, yews, and hemlock.

Pruning of the first group of evergreens is generally limited to the removal of dead or injured branches.

These should be removed close to the main trunk or just beyond a strong lateral branch. Occasionally it may be desirable to shape one of these evergreens for a particular purpose. This is true of the mugho pine when a globe-shaped specimen is desired in the foundation planting. It is also true when these evergreens are grown for clipped hedges. In pruning evergreens of this group to obtain a desired form, the pruning must be done in the spring just as the buds are opening and before the new growth spreads out. The pruning is merely cutting off the tips of the new growth. This can be done either with a sharp knife or with a pair of hedge shears. The rate of annual growth can be regulated by the amount of new growth removed. Wherever the cut is made, several adventitious buds develop and the tree becomes very compact and dense.

Since trees of this class are most attractive when allowed to grow naturally, they should not be planted where their growth must be restricted by pruning. For this reason we would not advise the planting of spruces and pines in the foundation planting, but rather use them for lawn specimens or background groups where they can develop naturally.

The pruning of junipers, arborvitaes, etc., is quite different. These evergreens are commonly used where their growth must be limited, as in foundation plantings, rock gardens, formal gardens, and hedges. Corrective pruning generally starts in the nursery, and by the time the specimens are purchased they are well shaped according to the natural form. After they are planted in their permanent locations, this pruning will need to be continued if their compact form is to be retained.

The pruning can be done at any time during the late spring or early part of the summer. A pair of hedge shears might be used, but a sharp knife will give a more natural appearance to the



FIG. 14. Upper left: A Colorado Spruce that has developed a double leader. Upper right: One leader removed and the other tied in an upright position. Lower left: Pruning shears can be used in maintaining the formal ball shape of a Mugho Pine. Lower right: The most natural shape of an upright Red Cedar or Juniper can be kept with a sharp, short-bladed knife.

pruned specimen. The tips of the new growth are cut back with a sharp pruning knife, using an upward, free-hand movement. This annual pruning will keep the tree compact and restrict the rate of growth, and will greatly increase the time that these evergreens can be left in the foundation planting.

For low-growing or spreading specimens, little pruning will be necessary. If the specimens spread too widely, some of the outer branches can be removed by cutting back to a vigorous side shoot.

Evergreens which grow with a single stem are sometimes injured by the breaking or loss of the leader. Frost and insect damage as well as mechanical injuries may result in this loss. To correct this condition, one of the side branches in the upper whorl should be tied up and securely fastened to a stake anchored below to the main trunk. The side branch thus trained to grow upward will soon replace the lost leader. Unless this is done, the tree will either grow up without a top, or several of the side branches will grow up to form a tree with several leaders.

Winter Protection

Many newly planted evergreens suffer from winter drouth. This is especially true if the ground is dry when it freezes. To overcome this difficulty, soak the ground thoroughly and mulch heavily, using leaves or peat moss, just before the ground freezes. This will reduce the depth of freezing and help to conserve moisture. Since evergreens retain their leaves, they use some water all winter, and unless this water is available the trees will suffer.

Some evergreens, such as the yews and arborvitae, will brown or show burning during late February or March from too much sun. Where these evergreens are grown in full sun, it may be necessary to shade them during this period by placing a burlap shade mounted between upright stakes on the south and west sides of the specimens.

Evergreen branches may be broken by heavy snows and ice storms. It is desirable to shake the snow from the branches after each heavy snowfall. After an ice storm, branches may be saved by placing props under them.



Health of Evergreens

THE COMMON and injurious insects and diseases of ornamental evergreens are described in tables 1, 2, and 3. Factors other than specific insects, diseases, and bird or animal injury may influence the appearance, vigor, and length of life of these trees.

Individual trees of spruce, fir, pine, or other evergreen trees will vary greatly in size, vigor, growth habit, and length of life. One individual tree may be broad and squat and another of the same species narrow and high. One individual pine may grow at only half the rate of another. There are, occasionally, runts that never do well. Because this variability among individuals is inherent and unavoidable, every one of the trees you buy will not equal the choicest individuals in quality.

Evergreen leaves, although green throughout the year, do not live for-

ever. Each year a healthy, vigorous evergreen puts out a new crop of twigs and leaves at the outer ends of the twigs only. This means that needles destroyed by insect defoliation, fire, dogs, etc., are not replaced. Each year leaves will die, turn brown, and drop. Spruces retain their leaves for 2 to 5 years, pines from 1½ to 2½ years only. Thus it is natural for the older parts of all the twigs to be bare of foliage. Furthermore, the lower branches, shaded by those above, may have leaves only at the outer ends.

Most of the evergreens planted as ornamentals in this region have a life expectancy of 50 to 60 years at most, and often they will begin to deteriorate when only 25 to 40 years of age. A tree 4 feet high may be as much as 10 years old, and if trees this age and size are planted they can be expected



FIG. 15. White Pine Blister Rust

FIG. 16. Sawfly

to remain attractive for an additional 15 to 30 years.

Even with the best of care and the most expert workmanship there is some risk involved in transplanting evergreens. The older and larger the tree, the greater the risk. Because of the inevitable loss of some of the root system in transplanting, some of the transplanted trees will fail to survive even when the roots are balled and burlapped. With trees only a foot high, this loss may be only 5 to 10 per cent, but with trees three to four feet high the loss may be up to 20 per cent. That is, of trees more than 3 feet high when transplanted, one out of five or ten will normally die within the next year or two, and of those that survive the majority may be stunted for a year or two. Heavy watering after transplanting helps reduce this injury.

Specimens from unhealthy trees may be sent to the University for examination. Be sure to include the following:

1. As large a sample as possible, preferably several branches from the tree or trees affected. These should

include some in which the symptoms are just beginning to appear, because usually little information is obtainable from material that has been dead for some time.

2. Information on when the trouble first appeared and the course which it has taken.
3. The number and kind of trees affected.
4. Age and size of trees affected and their location as to kind of soil, exposure, slope, shade, and so on.
5. The previous history of the trees in so far as this is known: when transplanted, whether sprayed or given other treatments.
6. Specimens of insects should be placed in a small box or mailing tube with some of the foliage on which they are found feeding. Do not send soft-bodied insects in an envelope.

Such specimens should be sent to the Agricultural Extension Service, University of Minnesota, Institute of Agriculture, St. Paul 1, Minnesota.

The tables referred to in this section follow on pages 23 through 25.



Table 1. Injuries Caused by Diseases

Description	Cause	Treatment	Remarks
1. Red cedar turns brown in mid-summer. Browning may affect twigs or branches, gradually spreads to kill tree in year or two.	Twig blight, a fungus disease.	Cut off and burn dead branches promptly; spray tree with Bordeaux mixture every 10 days during growing season.	These controls are not very effective but non better are known at present.
2. Brown galls up to inch in diameter on twigs of Eastern red cedar; in rainy weather orange-colored gelatinous tendrils protrude from galls.	Cedar apple rust, a fungus disease which spends part of its life on apple trees.	State laws specify that Eastern red cedar trees constituting a menace to nearby apple orchards may be eradicated.	Eastern red cedars are not injured enough to justify protection, but there may be heavy loss of nearby apple crop.
3. Branches die on Colorado blue spruce, usually beginning at base of tree and progressing upward. As branches die, resin is exuded from bark, hardens in white masses, and drips.	Blue spruce trees deteriorate at an early age in Minnesota. Weakened trees may become infected with a canker-causing fungus.	No effective control is known at present. Cutting out infected branches and fertilizing trees to improve vigor has been recommended.	Value doubtful of cutting out infected branches and fertilizing trees.
4. Yellow blisters about 1/4 inch across erupt from outer bark of stems and branches of white pine in April or May; part above cankered area dies.	White pine blister rust which spends part of its life on currants.	Eradication of all wild and cultivated currant bushes (except Alpine currant) from vicinity of white pine plantings.	Does not spread from one pine to another; only to currants and gooseberries, then back to pines.
5. Small yellow blisters on old needles of pine during April or May, on new needles of spruce in July and August. Infected needles may turn brown and fall off.	Leaf rust, caused by fungi which spend only part of their life on pines and spruces.	Pine leaf rust can be controlled only by eradicating goldenrod in vicinity; spruce needle rust only by eradicating leatherleaf.	Damage too slight to justify expense of control.

Table 2. Injuries Caused by Insects

Description	Cause	Treatment	Remarks
1. Needles eaten by greenish, yellowish, varicolored, or spotted worms, usually feeding in clusters.	Larvae of several species of sawflies.	Spray with lead arsenate, 3 tablespoons to gallon water, or 2 tablespoons 50 per cent wettable DDT to gallon water.	Trees should be observed periodically because control measures are most effective when applied while larvae are small.
2. Buds of spruce destroyed by reddish-brown larvae in webs formed among new needles.	Spruce budworm.	Use materials given in No. 1. Apply with strong spray just as buds break and again about 10 days later.	Injury to the buds usually precedes foliage feeding.
3. Ugly nests formed of needles and excrement webbed together, usually on inner branches.	Spruce tortrix.	Use materials in No. 1. Apply with strong spray about middle of August, or remove nests in early spring and burn.	Loss of old needles will seldom cause serious injury unless repeated often.
4. Small, white cottony masses on trunk and branches of white pine, occasionally other pines.	White pine aphid.	Spray thoroughly in late May with liquid lime sulfur, 1 part to 25 parts water, or dry lime sulfur, 6 tablespoons to 1 gallon water.	Trees weakened by winter injury or excessive shade are most seriously affected. Do not apply lime sulfur on a hot, muggy day.
5. Foliage off color, dull grayish, or turning brown, particularly on lower branches; very fine webbing on twigs and needles.	Spruce spider mite (to see mites, strike branch sharply over white paper).	Spray with Ovotran or Aramite	Spruce and junipers are most commonly attacked.
6. White objects on needles, small, elongated, particularly on spruce and white and Mugho pine.	Pine-needle scale.	Spray with dry lime sulfur, 1 pound to 12 gallons of water in late May or early June when purple young scales appear.	
7. Cone-like galls at base of terminal growth of spruce, green when fresh, brown when old, twigs often dying beyond galls.	Spruce gall aphid.	Spray in April before buds start to break; use liquid lime sulfur 1 part to 8 parts water, or dry lime sulfur according to directions on package.	Dormant-strength lime sulfur or oil should never be used after growth starts in the spring.
8. Dying young conifers show on examination that small roots have been eaten.	White grubs.	Treat soil with chlordane, 10 pounds of actual chlordane per acre.	Avoid planting conifers in sod land infested with white grubs.
9. Fine brown dust or shredded wood particles 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.

Table 3. Injuries from Other Causes

Description	Cause	Treatment	Remarks
1. Trees turn brown in May or early June. Often leaves die on part exposed to winter sun; sometimes whole tree dies.	Winter injury caused by warm weather, especially on warm, sunny days in January and March.	None. Trees will recover from moderate injury.	White and red cedars, western yellow pine, Austrian, Scotch, and white pines are most affected, spruces occasionally.
2. New growth dies or curls downward in late spring after cold spell.	Heavy frost in late spring.	None. Unless injury is very severe, trees will recover.	
3. Stunting of needles or gradual death occurs within year or two after transplanting. Sometimes older needles fall off.	Transplanting injury.	Trees should be transplanted as small as practicable and watered heavily at transplanting and 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 spring.
4. 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.	Remove trees when they become unsightly and replace with younger and more vigorous stock.	Many evergreens that are not native decline in vigor after 20 or 30 years.
5. Fall yellowing of older needles occurs back from growing tips, especially apparent in white pine in late autumn.	Perfectly natural; pine needles live only 1½ years, spruce needles, 3 to 5 years.	None.	It is natural for older branches to be bare of needles except at their growing tips.
6. Patches die on trees and shrubs near ground, usually during early spring. Injury is most common on exposed outer parts.	Urine from dogs.	Protect trees with fencing.	
7. Nearly square holes occur evenly spaced in horizontal rows in bark.	A bird — yellow-bellied sapsucker.	There is no practical control other than driving birds away.	Smearing bark with tanglefoot has been suggested.
8. Needles turn brown beginning with new growth. Tree dies and may bend over.	Pocket gophers eat off the roots.	Poison bait.	Damage generally occurs in sandy soils where gophers are prevalent.

List of Evergreens

See general description for adaptability in your area and special requirements

Evergreens for Shelterbelts

Rocky Mountain Juniper
Eastern Red Cedar
European Larch
Tamarack
Norway Spruce
White Spruce
Black Hills Spruce
Colorado Spruce
Jack Pine
Ponderosa Pine
Red Pine
White Pine
Arborvitae

Evergreens for Foundation Plantings

Pfitzer Juniper
Common Juniper
Creeping Juniper and varieties
Savin Juniper
Rocky Mountain Juniper and varieties
Eastern Red Cedar and varieties
Mugho Pine
Japanese Yew
Arborvitae and varieties

Evergreens for Lawn Specimens

White Fir
Balsam Fir
European Larch
Tamarack
Norway Spruce

White Spruce
Black Hills Spruce
Colorado Blue Spruce
Austrian Pine
Red Pine
White Pine
Scotch Pine
Douglas Fir

Evergreens for Hedges

Rocky Mountain Juniper and varieties
Eastern Red Cedar and varieties
Arborvitae
White Pine
White Spruce
Black Hills Spruce
Colorado Spruce

Evergreens for Screens

Concolor Fir
Rocky Mountain Juniper and varieties
Eastern Red Cedar and varieties
Norway Spruce
White Spruce
Black Hills Spruce
Colorado Spruce
Ponderosa Pine
Red Pine
White Pine
Scotch Pine
Douglas Fir
Arborvitae



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