

= *Acer rubrum* =

Acer rubrum (red maple , also known as swamp , water or soft maple) is one of the most common and widespread deciduous trees of eastern and central North America . The U.S. Forest service recognizes it as the most common species of tree in America . The red maple ranges from southeastern Manitoba around the Lake of the Woods on the border with Ontario and Minnesota , east to Newfoundland , south to Florida , and southwest to eastern Texas . Many of its features , especially its leaves , are quite variable in form . At maturity it often attains a height of around 15 m (49 ft) . Its flowers , petioles , twigs and seeds are all red to varying degrees . Among these features , however , it is best known for its brilliant deep scarlet foliage in autumn .

Over most of its range , red maple is adaptable to a very wide range of site conditions , perhaps more so than any other tree in eastern North America . It can be found growing in swamps , on poor dry soils , and most anywhere in between . It grows well from sea level to about 900 m (3 @ , @ 000 ft) . Due to its attractive fall foliage and pleasing form , it is often used as a shade tree for landscapes . It is used commercially on a small scale for maple syrup production as well as for its medium to high quality lumber . It is also the State Tree of Rhode Island . The red maple can be considered weedy or invasive . It is taking over forests in the eastern US , replacing traditional mainstays like oaks , as well as hickories and pines .

= = Description = =

Though *A. rubrum* is usually easy to identify , it is highly changeable in morphological characteristics . It is a medium to large sized tree , reaching heights of 18 to 27 metres (59 to 89 ft) and exceptionally over 35 metres (115 feet) . The leaves are usually 9 to 11 centimetres (3 @ . @ 5 to 4 @ . @ 3 in) long on a full grown tree . The trunk diameter can range from 46 to 76 cm (18 to 30 in) , depending on the growing conditions . Its spread is about 12 m (39 ft) . A 10 @ - @ year @ - @ old sapling will stand about 6 m (20 ft) tall . In forests , the bark will remain free of branches until some distance up the tree . Individuals grown in the open are shorter and thicker with a more rounded crown . Generally speaking , however , the crown is irregularly ovoid with ascending whip @ - @ like curved shoots . The bark is a pale grey and smooth when the individual is young . As the tree grows the bark becomes darker and cracks into slightly raised long plates . The largest known living red maple is located near Armada , Michigan , at a height of 38 @ . @ 1 m (125 ft) and a bole circumference , at breast height , of 4 @ . @ 95 m (16 @ . @ 2 ft) .

The leaves of the red maple offer the easiest way to distinguish it from its relatives . As with nearly all North American maple trees , they are deciduous and arranged oppositely on the twig . They are typically 5 ? 10 cm (2 @ . @ 0 ? 3 @ . @ 9 in) long and wide with 3 @ - @ 5 palmate lobes with a serrated margin . The sinuses are typically narrow , but the leaves can exhibit considerable variation . When 5 lobes are present , the three at the terminal end are larger than the other two near the base . In contrast , the leaves of the related silver maple , *A. saccharinum* , are much more deeply lobed , more sharply toothed and characteristically have 5 lobes . The upper side of *A. rubrum* 's leaf is light green and the underside is whitish and can be either glaucous or hairy . The leaf stalks are usually red and are up to 10 cm (3 @ . @ 9 in) long . Furthermore , the leaves can turn a brilliant red in autumn , but can also become yellow or orange on some individuals .

The twigs of the red maple are reddish in color and somewhat shiny with small lenticels . Dwarf shoots are present on many branches . The buds are usually blunt and greenish to reddish in color , generally with several loose scales . The lateral buds are slightly stalked , and in addition there may be collateral buds present as well . The buds form in fall and winter and are often visible from a distance due to their reddish tint . The leaf scars on the twig are V @ - @ shaped and contain 3 bundle scars .

The flowers are generally unisexual , with male and female flowers appearing in separate sessile clusters , though they are sometimes also bisexual . They appear in spring from April to May (though as early as late January in the southern part of its range) , usually coming before the leaves . The tree itself is considered Polygamodioecious , meaning some individuals are male , some

female , and some monoecious . The red maple will begin blooming when it is about 8 years old , but it significantly varies between tree to tree : some trees may begin flowering when they are 4 years old . The flowers are red with 5 small petals and a 5 @-@ lobed calyx borne in hanging clusters , usually at the twig tips . They are lineal to oblong in shape and are pubescent . The pistillate flowers have one pistil formed from two fused carpels with a glabrous superior ovary and two long styles that protrude beyond the perianth . The staminate flowers contain between 4 and 12 stamens , often with 8 .

The fruit is a 15 to 25 millimeter (.5 to .75 inch) long double samara with somewhat divergent wings at an angle of 50 to 60 degrees . They are borne on long slender stems and are variable in color from light brown to reddish . They ripen from April through early June , before even the leaf development is altogether complete . After they reach maturity , the seeds are dispersed for a 1 to 2 week period from April through July .

= = Distribution and habitat = =

A. rubrum is one of the most abundant and widespread trees in eastern North America . It can be found from the south of Newfoundland , Nova Scotia and southern Quebec to the south west of Ontario , extreme southeastern Manitoba and northern Minnesota ; south to Wisconsin , Illinois , Missouri , eastern Oklahoma , and eastern Texas in its western range ; and east to Florida . It has the largest continuous range along the North American Atlantic Coast of any tree that occurs in Florida . In total it ranges 2 @,@ 600 km (1 @,@ 600 mi) from north to south . The species is native to all regions of the United States east of the 95th meridian west , with only three exceptions , namely the Prairie Peninsula of the Midwest , the coastal prairie in southern Louisiana and southeastern Texas and the swamp prairie of the Florida Everglades . In several other locations , the tree is absent from large areas but still present in a few specific habitats . An example is the Bluegrass region of Kentucky , where it is not found in the dominant open plains , but is present along streams . Here the red maple is not present in the bottom land forests of the Grain Belt , despite the fact it is common in similar habitats and species associations both to the north and south of this area .

The tree 's range ends where the ? 40 ° C (? 40 ° F) mean minimum isotherm begins , namely in southeastern Canada . On the other hand , the western range is limited by the much drier climate of the Great Plains . Nonetheless , it has the widest tolerance to climatic conditions of all the North American species of maple . The absence of red maple in the Prairie Peninsula is due to the species ' intolerance of fire .

A. rubrum does very well in a wide range of soil types , with varying textures , moisture , pH , and elevation , probably more so than any other forest tree in North America . It grows on glaciated as well as nonglaciated soils derived from the following rocks : granite , gneiss , schist , sandstone , shale , slate , conglomerate , quartzite , and limestone . Chlorosis can occur on very alkaline soils , though otherwise its pH tolerance is quite high . As concerns levels of moisture , the red maple grows everywhere from dry ridges and southwest facing slopes to peat bogs and swamps . It occurs commonly in rather extreme moisture conditions , both very wet and quite dry . While many types of tree prefer a south or north facing aspect , the red maple does not appear to have a preference . Its ideal conditions are in moderately well @-@ drained , moist sites at low or intermediate elevations . However , it is nonetheless common in mountainous areas on relatively dry ridges , as well as on both the south and west sides of upper slopes . Furthermore , it is common in swampy areas , along the banks of slow moving streams , as well as on poorly drained flats and depressions . In northern Michigan and New England , the tree is found on the tops of ridges , sandy or rocky upland and otherwise dry soils , as well as in nearly pure stands on moist soils and the edges of swamps . In the far south of its range , it is almost exclusively associated with swamps .

Red Maple is far more abundant today than when Europeans first arrived in North America , where along with its cousin Silver Maple , it may have comprised a mere 5 % of forest area and was confined mostly to riparian zones . The density of the tree in many of these areas has increased 6 to 7 fold and this trend seems to be continuing , much of it due to human factors , especially

suppression of wildfires which would kill shallow @-@ rooted pioneer species like red maple , but leave mainline forest trees like oaks and hickories untouched . In addition , conservation efforts have caused a major increase in the population of white @-@ tailed deer since the mid @-@ 20th century . Deer will readily consume acorns , but leave maple seeds untouched , thus reducing the ability of oaks to regenerate . Concern has been expressed , as the ongoing spread of the red maple is changing the nature of eastern forests by reducing the number of oaks , hickorys and pines that would otherwise dominate . Extensive use of red maple in landscaping has also contributed to the surge in the species ' numbers as volunteer seedlings proliferate . Finally , disease epidemics have greatly reduced the population of elms and chestnuts in the forests of the US . While mainline forest trees continue to dominate mesic sites with rich soil , more marginal areas are increasingly being dominated by red maple .

= = Ecology = =

Red maple seldom lives longer than 150 years , making it short to medium lived . It reaches maturity in 70 to 80 years . Its ability to thrive in a large number of habitats is largely due to its ability to produce roots to suit its site from a young age . In wet locations , red maple seedlings produce short taproots with long and developed lateral roots , while on dry sites , they develop long taproots with significantly shorter laterals . The roots are primarily horizontal , however , forming in the upper 25 cm (9 @. @ 8 in) of the ground . Mature trees have woody roots up to 25 m (82 ft) long . They are very tolerant of flooding , with one study showing that 60 days of flooding caused no leaf damage . At the same time , they are tolerant of drought due to their ability to stop growing under dry conditions by then producing a second growth flush when conditions later improve , even if growth has stopped for 2 weeks . Red maple is one of the most drought @-@ tolerant species of maple in the Carolinas .

A. rubrum is one of the first plants to flower in spring . A crop of seeds is generally produced every year with a bumper crop often occurring every second year . A single tree between 5 and 20 cm (2 @. @ 0 and 7 @. @ 9 in) in diameter can produce between 12 @, @ 000 and 91 @, @ 000 seeds in a season . A tree 30 cm (0 @. @ 98 ft) in diameter was shown to produce nearly a million seeds . Red maple produces one of the smallest seeds of any of the maples . Fertilization has also been shown to significantly increase the seed yield for up to two years after application . The seeds are epigeal and tend to germinate in early summer soon after they are released , assuming a small amount of light , moisture , and sufficient temperatures are present . If the seeds are densely shaded , then germination commonly does not occur until the next spring . Most seedlings do not survive in closed forest canopy situations . However , one- to four @-@ year @-@ old seedlings are common under dense canopy and though they eventually die if no light reaches them , they serve as a reservoir , waiting to fill any open area of the canopy above . Trees growing in a Zone 9 or 10 area such as Florida will usually die from cold damage if transferred up north , Canada , Maine , Vermont , New Hampshire and New York , even if the southern trees were planted with northern red maples . Due to their wide range , genetically the trees have adapted to the climatic differences .

Red maple is able to increase its numbers significantly when associate trees are damaged by disease , cutting , or fire . One study found that 6 years after clearcutting a 3 @. @ 4 hectares (8 @. @ 4 acres) Oak @-@ Hickory forest containing no red maples , the plot contained more than 2 @, @ 200 red maple seedlings per hectare (900 per acre) taller than 1 @. @ 4 m (4 @. @ 6 ft) . One of its associates , the black cherry (*Prunus serotina*) , contains benzoic acid , which has been shown to be a potential allelopathic inhibitor of red maple growth . Red maple is one of the first species to start stem elongation . In one study , stem elongation was one @-@ half completed in 1 week , after which growth slowed and was 90 % completed within only 54 days . In good light and moisture conditions , the seedlings can grow 30 cm (0 @. @ 98 ft) in their first year and up to 60 cm (2 @. @ 0 ft) each year for the next few years making it a fast grower .

The red maple is a used as a food source by several forms of wildlife . Elk and white @-@ tailed deer in particular use the current season 's growth of red maple as an important source of winter food . Several Lepidoptera (butterflies and moths) utilize the leaves as food ; see List of

Lepidoptera that feed on maples .

Due to *A. rubrum* 's very wide range , there is significant variation in hardiness , size , form , time of flushing , onset of dormancy , and other traits . Generally speaking , individuals from the north flush the earliest , have the most reddish fall color , set their buds the earliest and take the least winter injury . Seedlings are tallest in the north @-@ central and east @-@ central part of the range . In Florida , at the extreme south of the red maple 's range , it is limited exclusively to swamplands . The fruits also vary geographically with northern individuals in areas with brief frost free periods producing fruits that are shorter and heavier than their southern counterparts . As a result of the variation there is much genetic potential for breeding programs with a goal of producing red maples for cultivation . This is especially useful for making urban cultivars that require resistance from verticillium wilt , air pollution , and drought .

Red maple frequently hybridizes with Silver Maple ; the hybrid , known as Freeman 's Maple *Acer x freemanii* , is intermediate between the parents .

= = = Allergenic potential = = =

The allergenic potential of red maples varies widely based on the cultivar .

The following cultivars are completely male and are highly allergenic , with an OPALS allergy scale rating of 8 or higher :

'Autumn Flame ' (' Flame ')
'Autumn Spire'
'Columnare ' (' Pyramidale ')
'Firedance ' (' Landsburg ')
'Karpick'
'Northwood'
'October Brilliance'
'Sun Valley'
'Tiliford'

The following cultivars have an OPALS allergy scale rating of 3 or lower ; they are completely female trees , and have low potential for causing allergies :

'Autumn Glory'
'Bowhall'
'Davey Red'
'Doric'
'Embers'
'Festival'
'October Glory'
'Red Skin'
'Red Sunset ' (' Franksred ')

= = = Toxicity = = =

The leaves of red maple , especially when dead or wilted , are extremely toxic to horses . The toxin is unknown , but believed to be an oxidant because it damages red blood cells , causing acute oxidative hemolysis that inhibits the transport of oxygen . This not only decreases oxygen delivery to all tissues , but also leads to the production of methemoglobin , which can further damage the kidneys . The ingestion of 700 grams (1 @.@ 5 pounds) of leaves is considered toxic and 1 @.@ 4 kilograms (3 pounds) is lethal . Symptoms occur within one or two days after ingestion and can include depression , lethargy , increased rate and depth of breathing , increased heart rate , jaundice , dark brown urine , colic , laminitis , coma , and death . Treatment is limited and can include the use of methylene blue or mineral oil and activated carbon in order to stop further absorption of the toxin into the stomach , as well as blood transfusions , fluid support , diuretics , and anti @-@ oxidants such as Vitamin C . About 50 % to 75 % of affected horses die or are

euthanized as a result .

== Cultivation ==

Red maple 's rapid growth , ease of transplanting , attractive form , and value for wildlife (in the eastern US) has made it one of the most extensively planted trees . In parts of the Pacific Northwest , it is one of the most common introduced trees . Its popularity in cultivation stems from its vigorous habit , its attractive and early red flowers , and most importantly , its flaming red fall foliage . The tree was introduced into the United Kingdom in 1656 and shortly thereafter entered cultivation . There it is frequently found in many parks and gardens , as well as occasionally in churchyards .

Red maple is a good choice of a tree for urban areas when there is ample room for its root system . It is more tolerant of pollution and road salt than Sugar Maples , although the tree 's fall foliage is not as vibrant in this environment . Like several other maples , its low root system can be invasive and it makes a poor choice for plantings near paving . It attracts squirrels , who eat its buds in the early spring , although squirrels prefer the larger buds of the silver maple .

Red Maple make vibrant and colorful bonsai , and have year around attractive features for display .

== Cultivars ==

Numerous cultivars have been selected , often for intensity of fall color , with ' October Glory ' and ' Red Sunset ' among the most popular . Toward its southern limit , ' Fireburst ' , ' Florida Flame ' , and ' Gulf Ember ' are preferred . Many cultivars of the Freeman maple are also grown widely . Below is a partial list of cultivars :

- 'Armstrong ' - Columnar to fastigate in shape with silvery bark and modest orange to red fall foliage
- 'Autumn Blaze ' - Rounded oval form with leaves that resemble the silver maple . The fall color is orange red and persists longer than usual
- 'Autumn Flame ' - A fast grower with exceptional bright red fall color developing early . The leaves are also smaller than the species .
- 'Autumn Radiance ' - Dense oval crown with an orange @-@ red fall color
- 'Autumn Spire ' - Broad columnar crown ; red fall color ; very hardy
- 'Bowhall ' - Conical to upright in form with a yellow @-@ red fall color
- 'Burgundy Bell ' - Compact rounded uniform shape with long lasting , burgundy fall leaves
- 'Columnare ' - An old cultivar growing to 20 metres (66 feet) with a narrow columnar to pyramidal form with dark green leaves turning orange and deep red in fall
- 'Gerling ' - A compact , slow growing selection , this individual only reaches 10 metres (33 feet) and has orange @-@ red fall foliage
- 'Northwood ' - Branches are at a 45 degree angle to the trunk , forming a rounded oval crown . Though the foliage is deep green in summer , its orange @-@ red fall color is not as impressive as other cultivars .
- 'October Brilliance ' - This selection is slow to leaf in spring , but has a tight crown and deep red fall color
- 'October Glory ' - Has a rounded oval crown with late developing intense red fall foliage . Along with ' Red Sunset ' , it is the most popular selection due to the dependable fall color and vigorous growth . This cultivar has gained the Royal Horticultural Society 's Award of Garden Merit .
- 'Redpointe ' - Superior in alkaline soil , strong central leader , red fall color
- 'Red Sunset ' - The other very popular choice , this selection does well in heat due to its drought tolerance and has an upright habit . It has very attractive orange @-@ red fall color and is also a rapid and vigorous grower .
- 'Scarlet Sentinel ' - A columnar to oval selection with 5 @-@ lobed leaves resembling the silver maple . The fall color is yellow @-@ orange to orange @-@ red and the tree is a fast grower .
- 'Schlesingeri ' - A tree with a broad crown and early , long lasting fall color that a deep red to reddish purple . Growth is also quite rapid .
- 'Shade King ' - This fast growing cultivar has an upright @-@ oval form with deep green summer

leaves that turn red to orange in fall .

'V.J. Drake ' - This selection is notable because the edges of the leaves first turn a deep red before the color progresses into the center .

= = Other uses = =

In the lumber industry *Acer rubrum* is considered a soft maple . The wood is close grained and as such it is similar to that of *A. saccharum* , but its texture is softer , less dense , and has a poorer figure and machining qualities . High grades of wood from the red maple can nonetheless be substituted for hard maple , particularly when it comes to making furniture . As a soft maple , the wood tends to shrink more during the drying process than with the hard maples .

Red maple is also used for the production of maple syrup , though the hard maples *Acer saccharum* (sugar maple) and *Acer nigrum* (black maple) are more commonly utilized . One study compared the sap and syrup from the sugar maple with those of the red maple , as well as those of the *Acer saccharinum* (silver maple) , *Acer negundo* (boxelder) , and *Acer platanoides* (Norway maple) , and all were found to be equal in sweetness , flavor , and quality . However , the buds of red maple and other soft maples emerge much earlier in the spring than the sugar maple , and after sprouting chemical makeup of the sap changes , imparting an undesirable flavor to the syrup . This being the case , red maple can only be tapped for syrup before the buds emerge , making the season very short .

Red maple is a medium quality firewood , possessing high heat energy , nominally 5 @. @ 4 MJ / m³ (18 @. @ 7 million BTU (mbtu) per cord) , than other hardwoods such as Ash : 7 MJ / m³ (24 mbtu / cord) , Oak : 7 MJ / m³ (24 mbtu / cord) , or Birch : 5 @. @ 8 MJ / m³ (20 mbtu / cord) .