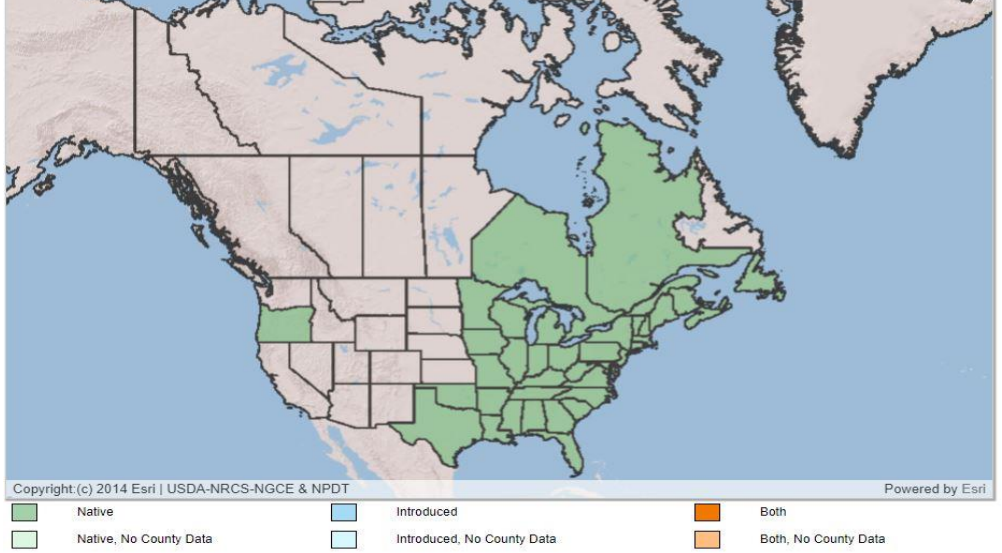


Plant Propagation Protocol for *Acer rubrum* (Red Maple)

ESRM 412 – Native Plant Production

URL: <https://courses.washington.edu/esrm412/protocols/2021/ACRU>

TAXONOMY	
Plant Family	
Scientific Name	Aceraceae
Common Name	Maple
Species Scientific Name	
Scientific Name	<i>Acer rubrum</i> L.
Varieties	<ul style="list-style-type: none">• <i>Acer rubrum</i> L. (Red Maple)• <i>Acer rubrum</i> L. var. <i>drummondii</i> (Hook. & Arn. ex Nutt.) Sarg. (Drummond's Maple)• <i>Acer rubrum</i> L. var. <i>rubrum</i> (Red Maple)• <i>Acer rubrum</i> L. var. <i>trilobum</i> Torr. & A. Gray ex K. Koch (Red Maple)
Sub-species	<ul style="list-style-type: none">• <i>Acer rubrum</i> L. ssp. <i>drummondii</i> (Hook. & Arn. ex Nutt.) A.E. Murray• <i>Acer rubrum</i> L. var. <i>tomentosum</i> Tausch• <i>Rufacer rubrum</i> (L.) Small• <i>Acer rubrum</i> L. var. <i>tridens</i> Alph. Wood
Cultivar	
Common Synonym(s)	ACBA2 <i>Acer barbatum</i> Michx. p.p.
Common Name(s)	
Species Code (as per USDA Plants database)	ACRU
GENERAL INFORMATION	

Geographical range	 <p>https://plants.sc.egov.usda.gov/home/plantProfile?symbol=ACRU</p> <p>Largest distribution on the east coast and the eastern Midwest in the USA. Also found in parts of the southeast, including Florida and Texas^[3]. Found north of the USA in places such as Ontario, Quebec, Newfoundland, and Nova Scotia. Native to the Pacific Northwest, specifically Lane County Oregon^[3].</p>
Ecological distribution	<p>Adapted to wet ecosystem and occurs frequently in forested wetlands, while also known to exist in upland sites with good drainage^[5]. It tolerates a wide range of soils of varying pH, water content, and texture^[5]. <i>Acer rubrum</i> can occupy a multitude of sites including dry ridges, sunny slopes, bogs, and swamps^[5]. Ideal soil conditions for the red maple are a moderately well drained at lower elevations^[5].</p>
Climate and elevation range	<p><i>Acer rubrum</i> can occupy elevations from sea level to 3000ft and is extremely tolerant compared to other Maples^[5]. The Maples found in their northern range tolerate a mean minimum isotherm of -40 degrees Celsius, while the western range is dictated by the dry prairie climates^[5]. It is also found as far south as Florida.</p>
Local habitat and abundance	<p>Red maple occupies North American temperate deciduous forests and is extremely widespread on the eastern part of the continent. In upland sites, <i>Acer rubrum</i> usually accompanies sugar maple, beech, black cherry and the birches^[4]. In wetlands, it accompanies black ash, cottonwood, and black gum^[4]. Red Maple can occupy hardiness zones 3-9^[8]</p>
Plant strategy type / successional stage	<p><i>Acer</i> is a subclimax tree/ pioneer species that can occupy the overstory^[5]. It is a dicot perennial tree^[3]. Some seeds will germinate the same spring that they are dispersed, while others will stay dormant for the next season (if conditions are unfavorable)^[1]. This type of seed banking is likely a helpful strategy for increasing recruitment^[1]. Red maple is known to be shade tolerant as well as moderately stress tolerant and has a growth rate of about 13"-24" per year^{[4] [5] [8]}. Additionally, it can act as a somewhat weedy/ invasive tree in certain habitats^[7].</p>

Plant characteristics	Red maples are deciduous trees with a light grey bark that grow up to 50-60 ft tall when mature ^[7] . The green leaves turn a characteristic red in the fall and each leaf has five pointed lobes that extend from the middle ^[7] . Red maples produce winged seeds called samaras which fall from the tree in spring prior to full development of the leaves ^[7] . The trees can have both male and female flowers, which form in little red clusters in the springtime ^[7] .
PROPAGATION DETAILS	
Ecotype	As the eastern regions of North America hold the largest concentration of Red Maples, seeds are often sourced from areas such as Tennessee, Virginia, and Maryland (often bordering the Appalachian Mountain Range) ^[2] .
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Plug + (container-field grown hybrids)
Stock Type	Bare root and container
Time to Grow	2-5 years
Target Specifications	For bare root seedlings, the desired height is between 4-24", while the desired height for container saplings is 72" ^[2] . However, the desired maturity can be dependent on the outplanting site and the individual performing the propagation. Generally, larger saplings will be hardier when outplanted and they will compete easier with other species for establishment and growth. Smaller trees will have a more difficult time competing in a crowded outplanting site, but will require less time, money, and effort to grow.
Propagule Collection Instructions	Seeds should be collected in spring, soon after they have fallen from the tree. The easily identifiable wing seeds fall before the leaves are fully developed ^[7] . Seeds can be handpicked, due to their large size and easily sorted.
Propagule Processing/Propagule Characteristics	Red maple seeds have a density of roughly 15,400 -19,000 seeds/kg and are easy to process as chaff and other inert matter can be removed by hand ^[2] . They can be stored dormant in a cool dry place for a year (possibly more) ^[1] ^[6] .
Pre-Planting Propagule Treatments	<p>Although stratification is not necessary and seeds can germinate without dormancy, some studies show that seeds exhibit physiological dormancy and stratification is used to prepare these seeds for germination^[6].</p> <p>One way of stratifying the seeds is to perform a 90-day cold stratification, after which the seeds will germinate in an environment of 5-15 degrees Celsius^[6].</p> <p>The other stratification method is to place the seeds in cold stratification for only 42-56 days. The seeds germinate at a temperature of 20-30 degrees Celsius^[6].</p> <p>Store seeds in a cool, dry environment. Remove the chaff and germinate using mist bench on blotter paper^[2].</p>

Growing Area Preparation / Annual Practices for Perennial Crops	<p>Seeds can be germinated prior to sowing in a growing media. However, direct sowing into small containers is also a viable strategy^[2]. If germinating prior to planting into a container, seeds should be placed on blotter paper and a mist bench should be used to keep the seeds moist while they imbibe water^[2].</p> <p>Once the seeds have germinated, they are planted into a propagation media (at a depth less than $\frac{3}{4}$") and provided slow release fertilizer with an N-P-K concentration of 18-6-8^[2]. There should be about 0.15 lbs. of fertilizer per ft³ of mix^[2].</p> <p>Larger plants should be planted in a woody mix with roughly equal parts growing mix and pine bark mulch, with long release (270 day) fertilizer and endo-mycorrhizae^[2].</p> <p>Smaller seedlings can start off in small plastic plugs or quart sized pots and as the individual grows, it should be planted in larger pots to prevent it from becoming root bound^[2].</p>
Establishment Phase Details	Sown in late spring/ early summer after the seeds have fallen to the ground. Geminates on blotting paper in the mist bench or sow directly into media ^[2] . Seeds must be sown no deeper than $\frac{3}{4}$ ' deep in the seeding mix ^[2] .
Length of Establishment Phase	Two months ^[2]
Active Growth Phase	About 60 days after germination, the plants are moved from containers to beds with nutrient rich, moist, loamy soil ^[2] ^[5] . The desired growing conditions can also be met by using woody beds and providing fertilizer throughout the spring and summer ^[2] .
Length of Active Growth Phase	45 days
Hardening Phase	Seedlings are moved outdoors to undergo hardening before they are moved to the growing beds where they will mature ^[2] .
Length of Hardening Phase	2 weeks
Harvesting, Storage and Shipping	To harvest bare root seedlings, it takes two years. For the trees to reach the size requiring three-gallon containers, it will take 5 years before they can be harvested. The bare root plants are harvested in early December ^[2] .
Length of Storage	Bare root plants are stored in a cold storage room where the roots are trimmed down a bit and covered in sawdust before the plants are placed in containers ^[2] . They receive some water throughout the winter as needed ^[2] . Larger container plants are stored outside and covered in a blanket for insulation ^[2] .
Guidelines for Outplanting / Performance on Typical Sites	Red Maple grows rapidly early in life- first it will grow in height in spring/ early summer before growing radially ^[5] . Radial growth finishes after about 80 days ^[5] . Thinning actually can work better than applying fertilizer for stimulating growth in some cases ^[5] . They have roots that acclimate well to almost any environment ^[5] .
Other Comments	N/A

INFORMATION SOURCES

References	<p>[1]Janneke Hille, R. L., & Clark, J. S. (2005). The benefits of seed banking for red maple (<i>acer rubrum</i>): Maximizing seedling recruitment. <i>Canadian Journal of Forest Research</i>, 35(4), 806-813. Retrieved from https://search.proquest.com/scholarly-journals/benefits-seed-banking-red-maple-acer-rubrum/docview/230539725/se-2?accountid=14784</p> <p>[2]Davis, Kathy M.; Kujawski, Jennifer. 2001. Propagation protocol for production of Plug + (container-field grown hybrids) <i>Acer rubrum</i> plants USDA NRCS - Norman A. Berg National Plant Materials Center Beltsville, Maryland. In: Native Plant Network. URL: http://NativePlantNetwork.org (accessed 2021/05/05). US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources.</p> <p>[3]Plants 3, United States Department of Agriculture Natural Resources Conservation Service, plants.sc.egov.usda.gov/home/basicSearchResults?resultId=cc13ee12-a7ea-4464-8ccc-d1972652e3d3. Date Accessed 5/4/2021</p> <p>[4]Dickerson, John. "Red Maple Acer Rubrum." Plant Fact Sheet, USDA NRCS New York State Office, 31 Jan. 2002, plants.usda.gov/DocumentLibrary/factsheet/pdf/fs_acru.pdf. Date Accessed 5/4/2021</p> <p>[5]Burns, Russell M., and Barbara H. Honkala. <i>Silvics of North America</i>. U.S. Dept. of Agriculture, Forest Service U.a, 1990.</p> <p>[6]Baskin, Carol, and Jerry Baskin. "Native Plant Network." Reforestation, Nurseries and Genetics Resources, Southern Regional Extension Forestry and USDA Forest Service, nnp.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=aceraceae-acer-1998. Accessed 5/4/2021</p> <p>[7] "Red Maple (<i>Acer Rubrum</i>) Fact Sheet - Signs of the Seasons: A New England Phenology Program - University of Maine Cooperative Extension." Signs of the Seasons: A New England Phenology Program, University of Maine, extension.umaine.edu/signs-of-the-seasons/indicator-species/red-maple-fact-sheet/. Accessed 5/5/2021</p> <p>[8] "Red MapleAcer Rubrum." <i>Red Maple Tree on the Tree Guide at Arborday.org</i>, Arbor Day Foundation, www.arborday.org/trees/treeguide/treedetail.cfm?itemID=867. Accessed 5/5/2021</p>
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