

Planting Guidance for the Revegetation of Riparian Areas in Vermont



The active revegetation of riparian areas through plantings can greatly accelerate the natural recovery process and restoration of important riparian functions. The following guidance is not meant to be a comprehensive resource on riparian restoration, but does provide basic information and resources regarding planting densities, techniques and species for riparian revegetation projects in Vermont.

General:

Species selection will vary based upon biophysical region, soils, topography, existing vegetation and other factors. Assessment of the project area and adjacent riparian lands, including an inventory of established trees and shrubs, will provide a good indication of which species are suited for the site.

When available, information on the known or potential natural community type of the site can further inform planting efforts. Vermont has five distinct floodplain forest natural communities, as well as many other shrub and wetland communities, that occur along shorelines. Each natural community is characterized by certain soils, flood regimes, and other conditions that will favor a certain suite of trees and shrubs. Selecting species appropriate to a site's natural community will enhance long-term restoration. Detailed information on Vermont's natural communities and their associated species can be found in *Wetland, Woodland, Wildland* (Thompson and Sorenson 2000).

Native species should be used. There are limited exceptions where naturalized, non-native species can be considered in areas where they are already well established and/or do not pose a threat to riparian ecosystems (e.g. boxelder). **When developing planting plans and ordering or purchasing plant material, it is important to provide complete scientific names (including subspecies if appropriate) of plant species to insure non-native and invasive species are not inadvertently introduced.** Plant a variety of suitable tree and shrub species to insure structural and ecological diversity and long term viability of the riparian area.

It is also important to consider the successional status of the plant species and the target riparian environment. For example, it is not advisable to plant all late successional trees in an open agricultural field as it disregards site conditions and normal ecological processes. Under natural conditions, early successional (shade intolerant) trees and shrubs such as chokecherry, white pine, shrub willows, dogwoods, and viburnums would be some of the first species to colonize the site. Riparian projects which account for natural succession processes, while also incorporating late successional trees, can improve long-term project success.

Strive for a total stem density of 400 stems/acre with at least 50% comprised of tree species. Assume a 20-25% loss following planting. Survivorship can be increased by selecting appropriate species, proper handling and planting techniques, watering, and implementing follow-up maintenance activities.

Maximize the use of large trees when possible. Large trees have greater survival and will provide important riparian function, such as shading, much sooner than seedlings. Trees < 4 feet tall are more likely to be outcompeted by grasses and are more subject to damage by deer. To accelerate the development of riparian shading, concentrate larger trees in a minimum of two staggered rows along the waterbody.

Planting Techniques:

Large Trees (8-15' tall stock, ~ 1-2" caliper)

- Obtain trees in early spring and plant them before they begin to leaf out (usually need to be in the ground by mid-May at the latest, can be planted as soon as the ground has thawed and snow is melted at planting site). Field-dug trees usually come with a small root ball wrapped in burlap and will be root-pruned and top-pruned to help the tree survive transplanting. Balled and burlaped or trees grown in containers come with larger root balls and are comparably more expensive than field dug stock. Inspect root balls to insure adequacy and proper condition. Trees can also be planted in fall after they have entered dormancy.
- Space large trees 15' to 20' apart.
- Dig hole large enough to fit root ball and to spread out the roots, and deep enough to cover up to the root swell (area on the trunk just above topmost emerging roots where trunk begins to narrow-up). It is not necessary to completely remove the burlap from the root ball, but it is important to loosen the strings around the root ball and spread out the burlap and roots to help the tree sit down into the hole and insure soil is able to completely surround the roots.
- Spread a thin layer of soil over roots, and then water-in roots. Cover with more soil and water again, filling hole with soil. Pack soil firmly around tree to eliminate air spaces next to the roots and to put the roots in contact with soil. Watering as you fill the hole with soil also helps to do this.
- Large trees require more maintenance to insure survival. Water trees several days a week for the first few weeks if no substantial rain falls. Also water during dry spells for the first summer to help insure survival. If careful attention to watering is unlikely to happen, consider planting extra stock to account for some mortality.

Seedlings & Bare-root Trees (minimum 36" tall stock)

- Use the same planting techniques as above, but space trees 8 to 10' apart. Expect a higher percent of mortalities with smaller stock.

Shrubs & Willows

- Shrubs material should be no less than 36" tall.
- Willows and other shrubs should be planted 3-5 feet apart. Consider clustering shrubs in groups 4' apart to mimic natural succession and provide valuable cover habitats.

Willow Stakes

- Cut stems of shrub willow species when plant is dormant (early spring before leaf out or fall after leaf drop). Cut stems into 1.5 to 2 foot long "stakes". Minimum caliper is .75 inches, maximum caliper is 2 inches.
- Pound stakes into streambank until only 1 to 2 inches, or 25% of stake is showing above ground. A rubber mallet works well for this.
- Livestakes and fascines can be used on bank faces and on low banks where the willow can root into fairly moist soils. High banks that are dry do not usually support willows well.

Protection of Plantings

- Protect trees from rodent damage with tree tubes or tree wraps – either heavy duty plastic wraps or wraps fabricated on site from hardware cloth. These can be purchased for a few dollars each and take only a few minutes to install. As trees grow, these will need to be loosened or removed.
- Biodegradable tree mats can also be installed to retard weed growth and reduce moisture loss.
- Latex paint mixed with sand applied to the lower 3' of tree trunks has been effective in Vermont in reducing beaver and vole damage for 2-inch caliper and larger trees. *Avoid using this technique on smaller trees as it can cause plant mortality.*
- Consider developing a monitoring and stewardship plan to provide necessary plant care, address unexpected plant losses and/or damage, control competing species, etc.

Technical Assistance:

US Fish and Wildlife Service, Partners for Fish and Wildlife Program

<http://www.fws.gov/lcfrwro/habitat.html>

US Natural Resource Conservation Service

<http://www.nrcs.usda.gov/wps/portal/nrcs/site/vt/home/>

Vermont Department of Environmental Conservation, Watershed Coordinators

<http://dec.vermont.gov/watershed/contacts>

Vermont Fish and Wildlife Department, Fisheries Biologists

<http://www.vtfishandwildlife.com/common/pages/DisplayFile.aspx?itemId=247326>

Watersheds United Vermont – for a listing of local watershed organizations which often have experience in riparian restoration approaches for local conditions.

<http://www.watershedsunitedvt.org/home>

References & Additional Resources:

Alaska Fish and Game. 2005. Streambank Revegetation and Protection: A Guide for Alaska. <http://www.adfg.alaska.gov/index.cfm?adfg=streambankprotection.main>

Connecticut River Joint Commission. 1998. Buffers for Habitat - Riparian Buffers for the Connecticut River Watershed. <http://www.crjc.org/riparianbuffers.htm>

Natural Resources Conservation Service. Plants Materials Program: Riparian and Bioengineering. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/plantmaterials/technical/publications/?cid=stelprdb1043002>

New Hampshire Department of Environmental Services. Native Shoreland*/Riparian Buffer Plantings for New Hampshire. http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/vrap_native_plantings.pdf

Thompson, E.H. and E.R. Sorenson. 2000. Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont. Vermont Department of Fish and Wildlife and The Nature Conservancy. 456 p. University Press.

U.S. Forest Service. 2004. Riparian Restoration. <http://www.fs.fed.us/t-d/pubs/html/04231201/toc.htm>

Vermont Agency of Natural Resources. 1994. Native Vegetation for Lakeshores, Streambanks and Wetland Buffers. https://anrweb.vt.gov/PubDocs/DEC/WSMD/mapp/docs/mp_native-veg.buffer-manual.1994.pdf

Vermont Natural Resources Conservation Service. Specification Guide Sheet for Riparian Forest Buffer (391): <https://efotg.sc.egov.usda.gov/references/public/VT/VTSpec391-0109.pdf>

Vermont Natural Resources Conservation Service. Specification Guide Sheet for Tree/Shrub Establishment (612): <https://efotg.sc.egov.usda.gov/references/public/VT/VTSpec612-0109.pdf>

Vermont Natural Resources Conservation Service. Forestry Technical Note #2: Trees and Shrubs for Conservation: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_010205.xls

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Tree and Shrub Species:

The following is a list of common tree and shrub species used in riparian restoration projects in Vermont. See the Vermont Agency of Natural Resources 1994 publication *Native Vegetation for Lakeshores, Streamsides and Wetland Buffers* for a more complete and detailed list as well as plant descriptions and appropriate site conditions.

TREES			
Common Name	Scientific Name	Planting Location ¹	Distribution ² & Comments
American Elm	<i>Ulmus americana</i>	R	Statewide; Often killed by Dutch Elm Disease within 30 years.
American Sycamore	<i>Platanus occidentalis</i>	R	South ½ Champlain Valley, South 1/3 CT River Valley
Atlantic White Cedar	<i>Thuja occidentalis</i>	B	North 2/3 of VT
Balsam Fir	<i>Abies balsamea</i>	B	Statewide
Balsam Poplar	<i>Populus balsamifera</i>	B	North 2/3 of VT
Black Cherry	<i>Prunus serotina</i>	B	statewide
Black Willow	<i>Salix nigra</i>	R	statewide
Boxelder	<i>Acer negundo</i>	R	Non-native, use only where already well established.
Common Hackberry	<i>Celtis occidentalis</i>	R	South ½ Champlain Valley, South 1/3 CT River Valley
Eastern Cottonwood	<i>Populus deltoides</i>	R	Champlain Valley, South 1/3 CT River Valley
Gray Birch	<i>Betula populifolia</i>	B	Statewide
Paper Birch	<i>Betula papyrifera</i>	U	Statewide
Ironwood (American hornbeam)	<i>Carpinus caroliniana</i>	B	Statewide except far North East VT; Most appropriate in backswamps & low gradient floodplains
Quaking Aspen	<i>Populus tremuloides</i>	U	Statewide; highly preferred by beaver – protection required.
Red Maple	<i>Acer rubrum</i>	B	Statewide
Silver Maple	<i>Acer saccharinum</i>	R	Statewide; excellent for floodplain stabilization, shade, wood and leaf litter input.
Sugar Maple	<i>Acer saccharum</i>	U	Statewide
White Ash	<i>Fraxinus americana</i>	B	Statewide; Consider potential threat of Emerald ash borer.
White Pine	<i>Pinus strobus</i>	U	Statewide
Yellow Birch	<i>Betula alleghaniensis</i>	B	Statewide

SHRUBS			
Common Name	Scientific Name	Planting Location ¹	Distribution ² & Comments
Arrow-wood	<i>Viburnum dentatum var. lucidum</i>	B	Southern Vermont
Elderberry	<i>Sambucus canadensis</i>	B	Statewide
Gray Dogwood	<i>Cornus racemosa (C. foemina)</i>	B	Champlain Valley & south ½ VT
Chokecherry	<i>Prunus virginiana</i>	B	Statewide
Highbush Cranberry	<i>Viburnum trilobum (V. opulus var americanum)</i>	B	Statewide; Most HB cranberry in nurseries is <i>var.opulus</i> which is non-native, but not known to be invasive. Differs mostly in minor leaf characters & fruit is more tart than native var.
Red Elderberry	<i>Sambucus racemosa (S. pubens)</i>	B	Statewide
Red Osier Dogwood	<i>Cornus sericea</i>	R	Statewide
Serviceberry	<i>Amelanchier arborea and A. laevis</i>	B	Statewide
Silky Dogwood	<i>Cornus amomum</i>	B	Not found in northern Green Mountains or Essex Co.
Speckled Alder	<i>Alnus incana spp. rugosa</i>	R	Exercise extreme caution in planting leafless alders! Some nurseries may provide the invasive <i>Alnus glutinosa</i> and other species/subspecies which are difficult to distinguish w/o leaves.
Wild Raisin / Witherod	<i>Viburnum nudum var cassinoides</i>	R	Statewide
Winterberry	<i>Ilex verticillata</i>	R	Statewide
Common pussy willow Silky willow Bebb's willow Shining willow Sandbar willow Wooly headed willow	<i>Salix discolor spp.</i> <i>Salix sericea</i> <i>Salix bebbiana</i> <i>Salix lucida</i> <i>Salix interior</i> <i>Salix eriocephala</i>	R	Beware of planting leafless individuals. The non-native Streamco, Purple, or Basket Willow (<i>Salix purpurea</i>) has opposite leaves & should be avoided; all native willows are alternate.

¹ R = Riparian floodplain - species suited to moist soils and periodic inundation.

U = Upland – species best suited to drier, upland side slopes and terrace locations.

B = Both – species suited to a wide range of riparian floodplain and upland conditions.

² Range interpreted from: <http://esp.cr.usgs.gov/data/little/> and <https://gobotany.newenglandwild.org/simple/>

Riparian Planting Sources: (should not be considered a complete listing or an indication of endorsement)

Nursery	Website	Address	Phone
<i>New England Wetland Plants</i>	http://www.newp.com	820 West St. Amherst, MA, 01002	(413) 548-8000
<i>Intervale Conservation Nursery</i>	http://www.intervale.org/what-we-do/intervale-conservation-nursery/	180 Intervale Rd. Burlington, VT 05401	(802) 660-0440 x 114
<i>Drinkwater Nursery</i>		564 Lawrence Rd. Waterford, VT 05819	(802) 535-9748
<i>Champlain Valley Native Plant Restoration Nursery</i>	http://www.pmnrcd.org	Green Mountain College Poultney, VT 05764	(802) 287-8396
<i>Vermont Wetland Plant Supply</i>	www.vermontwetlandplants.com	P.O. Box 153 Orwell, VT	(802) 948-2553
<i>NH State Forest Nursery</i>	http://www.nhnursery.com	405 Daniel Webster Highway Boscawen, NH 03303	(603) 796-2323 (nursery) (603) 271-2214 (admin)
<i>New York State Tree Nursery</i>	http://www.dec.ny.gov/animals/7127.html	2369 Rte. 50 Saratoga Springs, NY 12866	(518) 587-1120
<i>Cold Stream Farm</i>	www.coldstreamfarm.net	8585 North Stephens Rd. Free Soil, MI 49411	(231) 464-5809
<i>Fiddlehead Creek Nursery</i>	www.FiddleheadCreek.com	7381 State Route 40 Hartford, NY 12838	(518) 632-5505
<i>Vermont Willow Nursery</i>	willowmanvt@me.com	1943 Ridge Road North, Fairfield VT 05455-5631	