

Final Report:
Vermont Agroforestry Species
Research Project

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Deliverables

- Research future climate projections for Vermont
- Develop spreadsheet format
- Prepare farmer survey, analyze and include results
- Conduct interviews with experts identified by VTFTP
- Conduct research
- Produce final spreadsheet
- Produce quick reference list
- Present virtually to VTFTP

Interviews

10 Expert Interviews

- Interviewees selected by VTFTP staff

Expert Interviews

Noah Simon, Breadtree

Meghan Giroux, Interlace Commons

Kristin Jovanelly, Dartmouth

Elodie Eid, farmer-to-farmer agroforestry

Mandy St. Hilaire, Propagate

Eli Roberts, Interlace Commons

Jesse Marksohn, Yellowbud Nursery

Jacob Holzberg-Pill, Forestry and Natural Resources vocational program

Juan Alvez, UVM Agroforestry

Eric Antosh, Big Flats Plant Materials Center

Expert Interview Top Species

# of expert recommendations (of 10)	species
8	White mulberry
6	Chinese chestnut, American persimmon
5	Hybrid hazel
4	Hybrid poplar, black locust, hybrid willow, elderberry, honey locust
3	River locust, yellowbud hickory, hybrid hickory, seaberry, black walnut, apple, pussy willow
2	Shagbark hickory, heartnut, butternut, Carpathian walnut, honeyberry, red mulberry, peach, black currant, red currant, goat willow, highbush blueberry
1	Saskatoon, pawpaw, hackberry redbud, autumn olive, ash, larch, white spruce, black spruce, white pine, cottonwood, aspen, American plum, sour cherry, plum, flowering cherry, Nanking cherry, bristly locust, arrowwood, nannyberry, highbush cranberry

Other issues from interviews

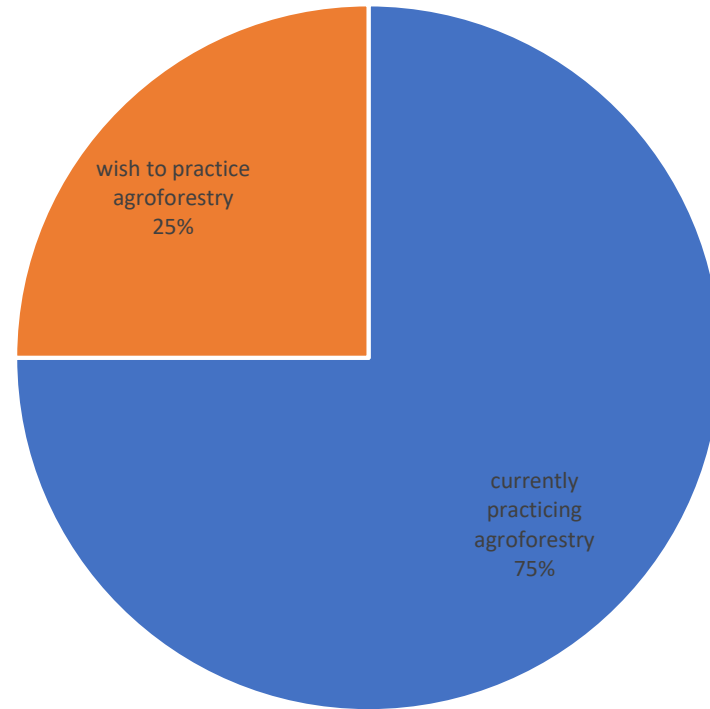
- Many promoting native species
- Some want no invasives, others recommending them
 - You may wish to cull some species before publishing: like autumn olive
- Some concerned about warming and trialing marginal warmer species

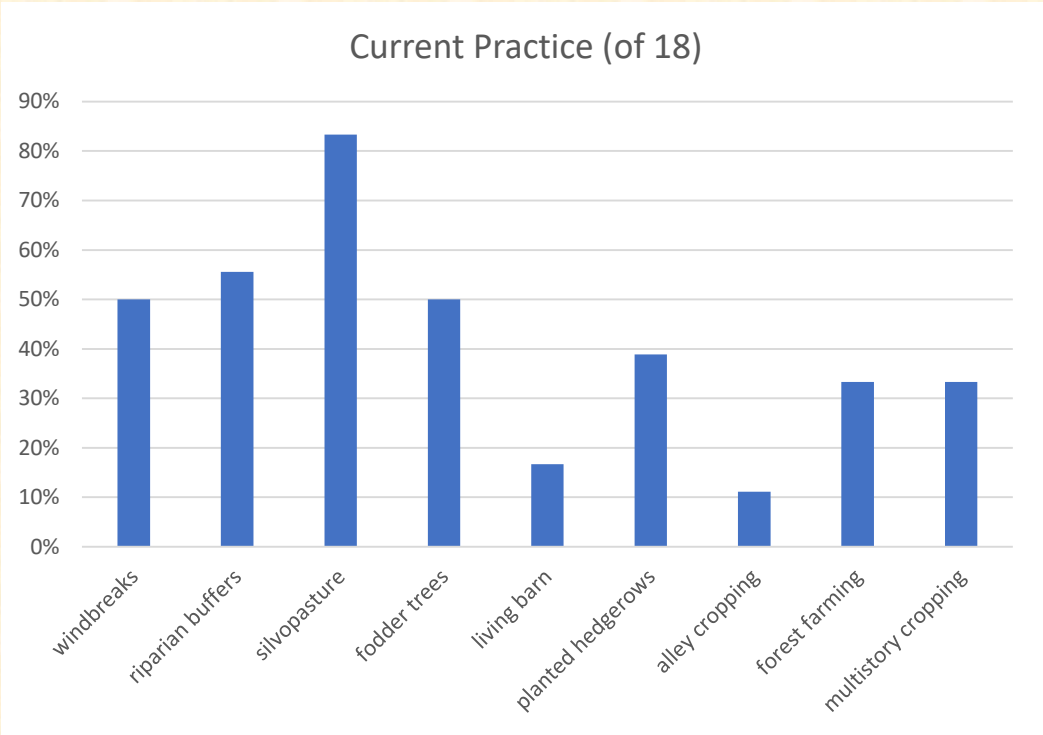
Survey

Survey Results

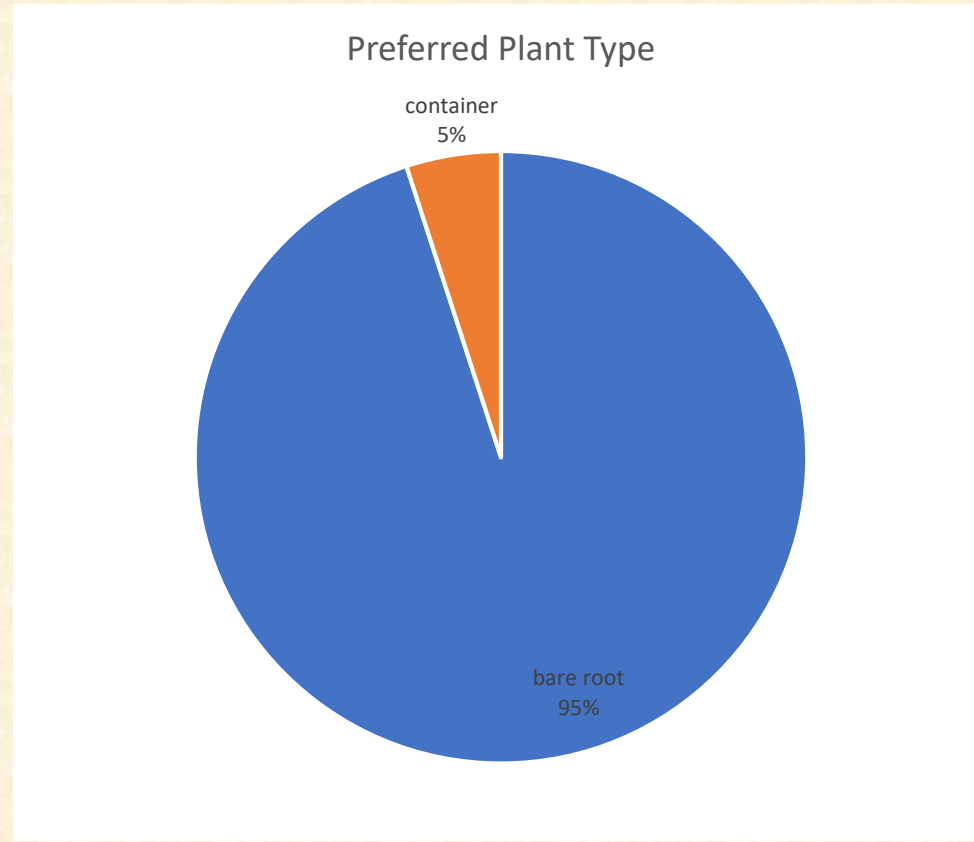
24 farmers

Agroforestry Status (of 24)





Farmer Preferred Plant Type



Farmer Survey Top Species

# of farmer recommendations (of 18)	species
6	Elderberry
5	Hickory, apple, willow, hazelnut, white oak, red oak, silver maple
4	Hazelnut, black walnut, mulberry*, swamp white oak*, oaks
3	Maples, aronia, Chinese chestnut, ashes, heartnut, pear, black currant, black locust*
2	Serviceberries, sweet birch, pagoda dogwood, red osier dogwood, honey locust, seaberry, butternut, hybrid poplar*, American plum, beach plum, Nanking cherry, Asian pear, red currant, arborvitae, highbush cranberry
1	Birches, pawpaw*, buttonbush, redbud, other shrub dogwoods, American hazel, hawthorns, American persimmon, eastern red cedar, black gum, white pine, aspen, sour cherry, plum, peach, sassafras, highbush blueberry, viburnums
negative	Carpathian walnut, tulip tree, honeyberry, elm

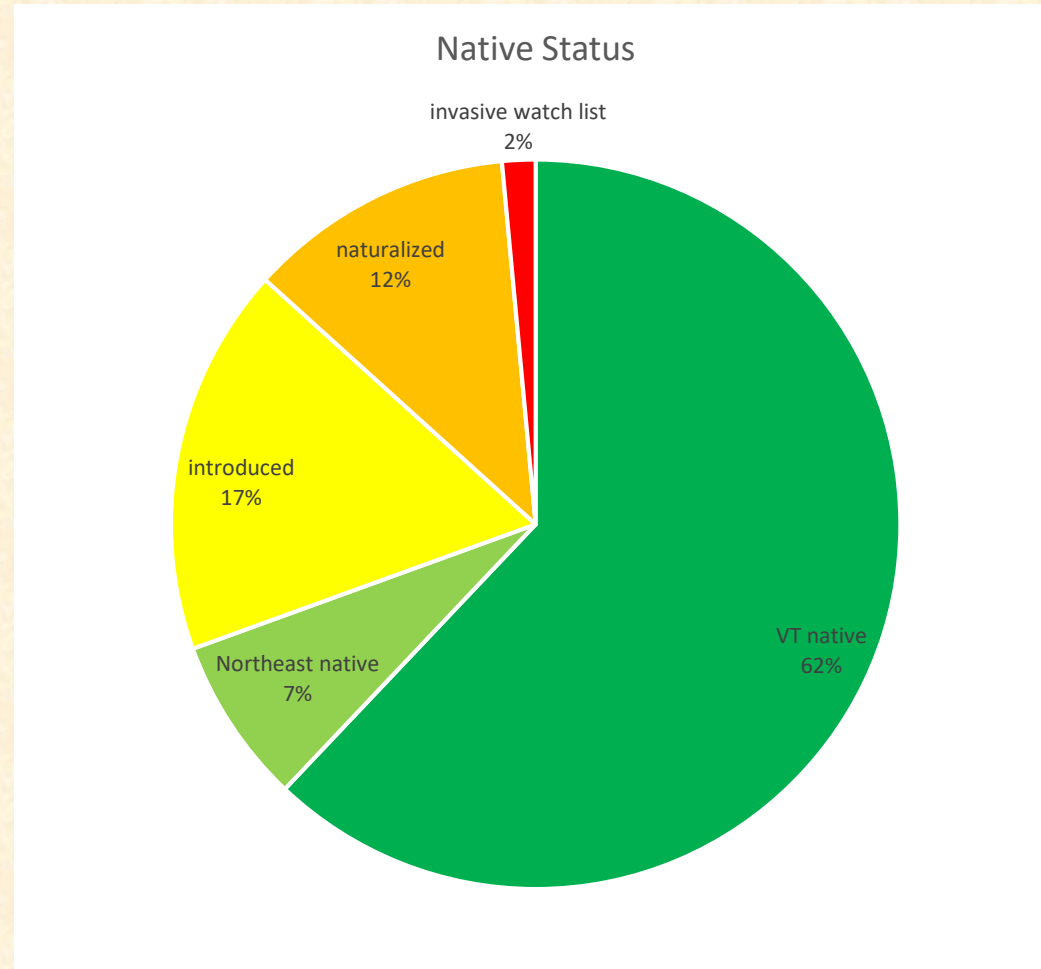
*Also one negative rating

Other issues from survey and interviews

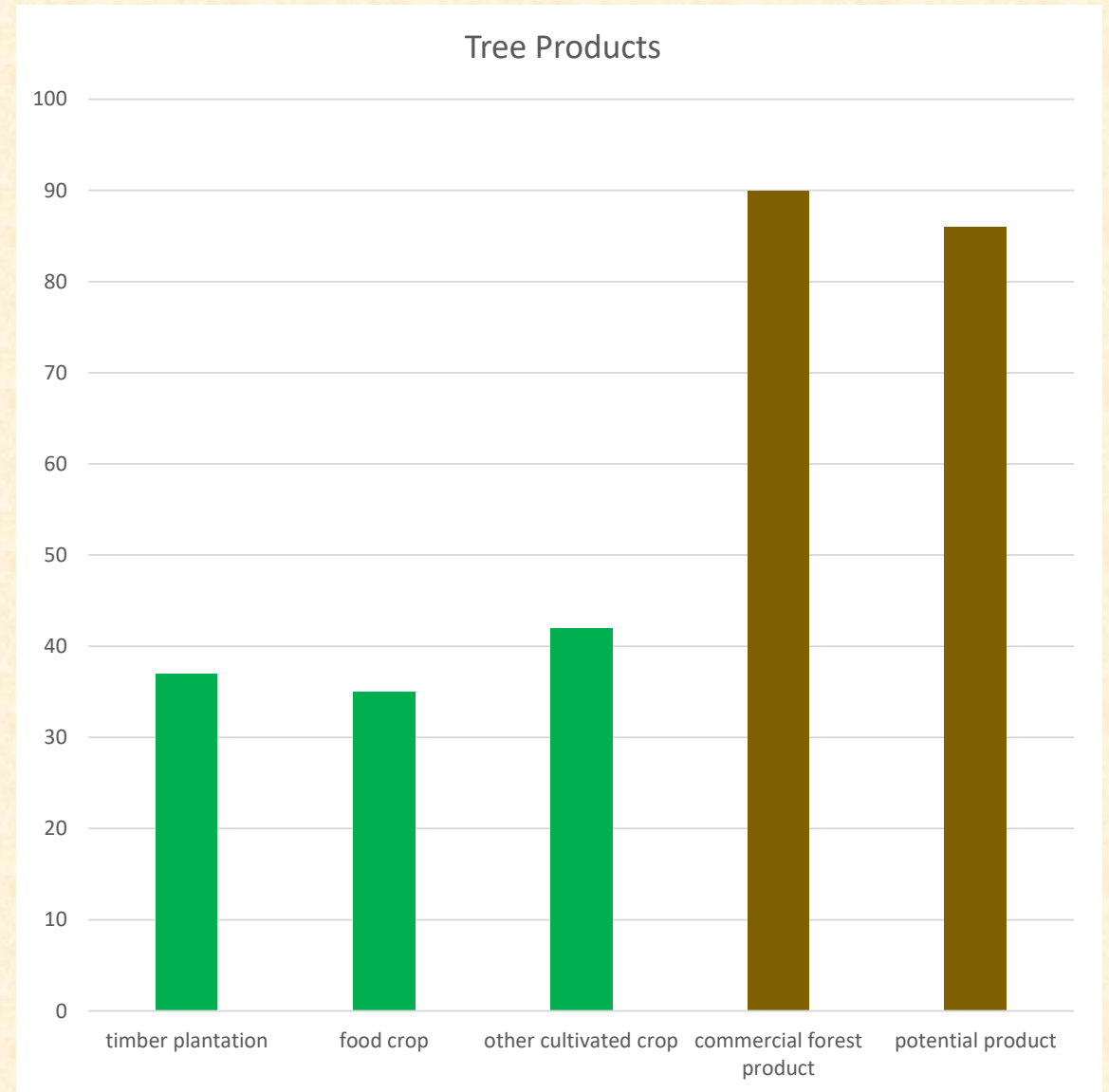
- Invasive issue here as well
- Nursery stock
 - Plantable with mechanical planters
 - Bare root prevents jumping worms
- Want and can't get
 - Pine nuts, wholesale grafted nuts, local germplasm of native species, regionally adapted nuts, tubelings for conservation species, wholesale in general

The Spreadsheet

200 species and 257 cultivars

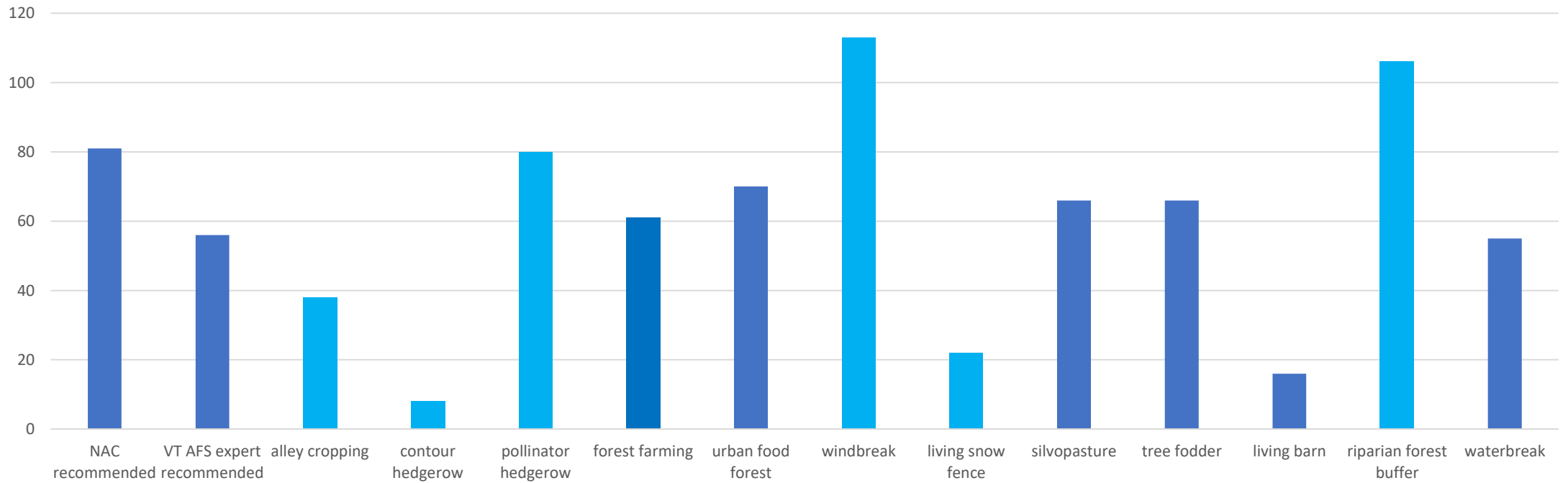


Products

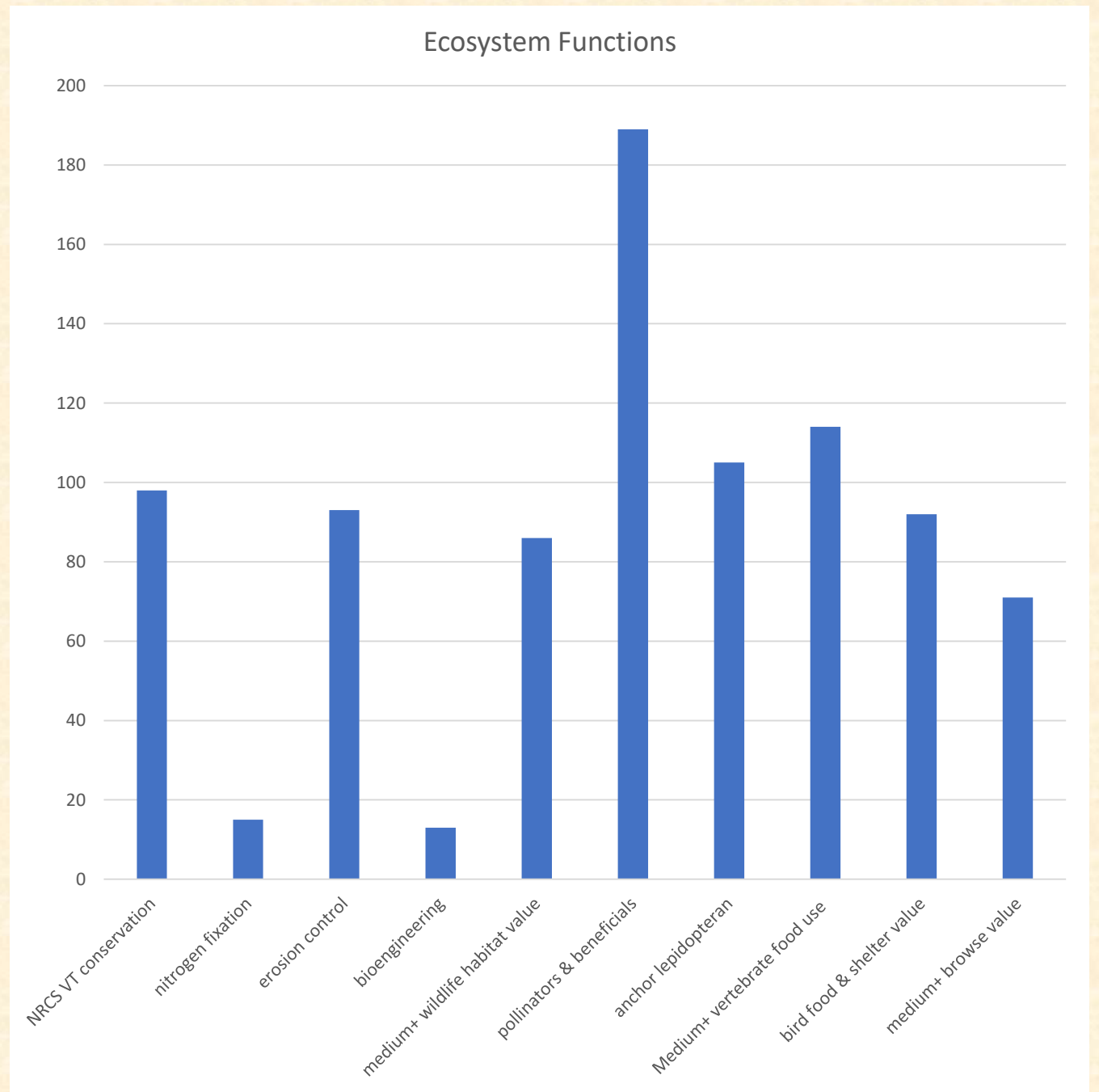


Agroforestry System Uses

of Species Used in Agroforestry Systems

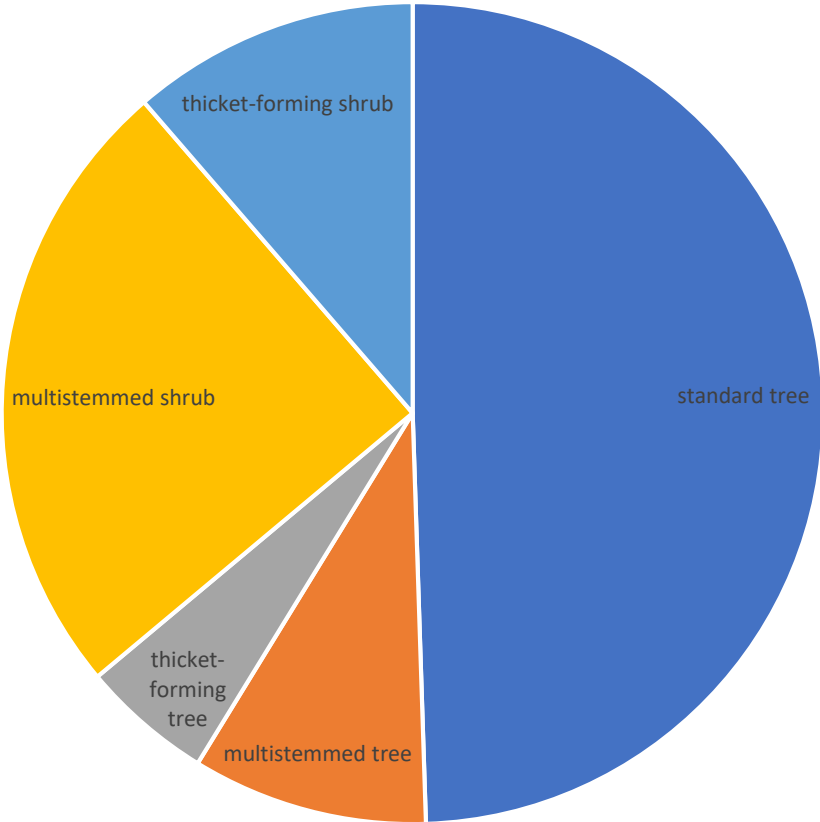


Ecosystem Functions

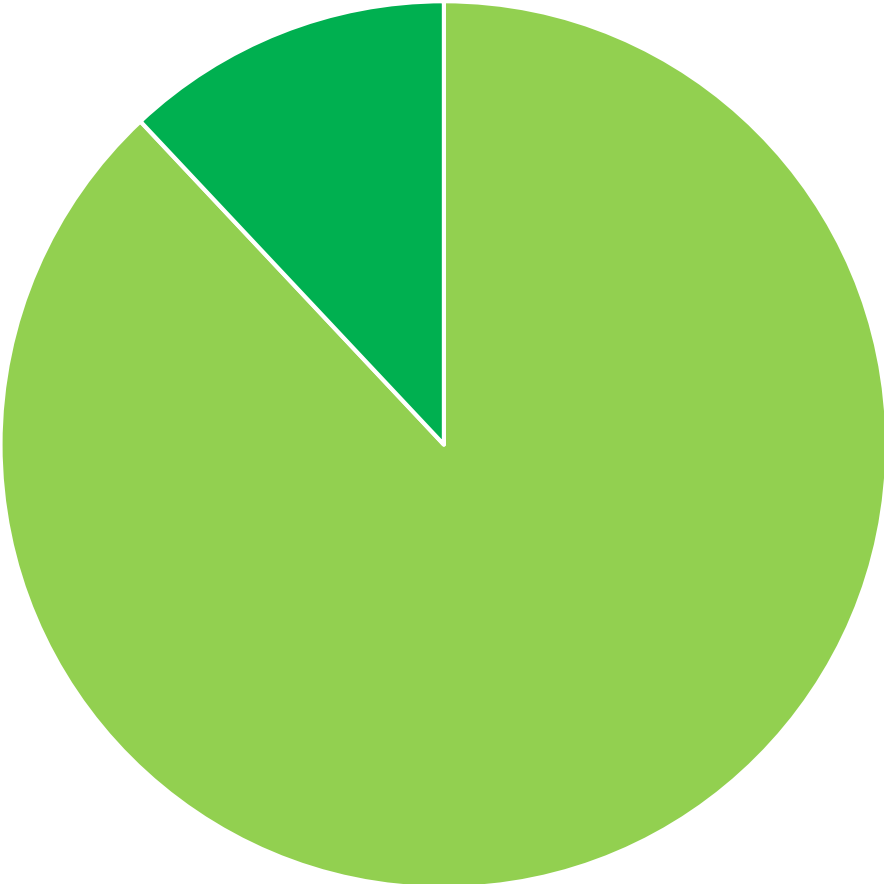


Form & Habit

Form & Habit



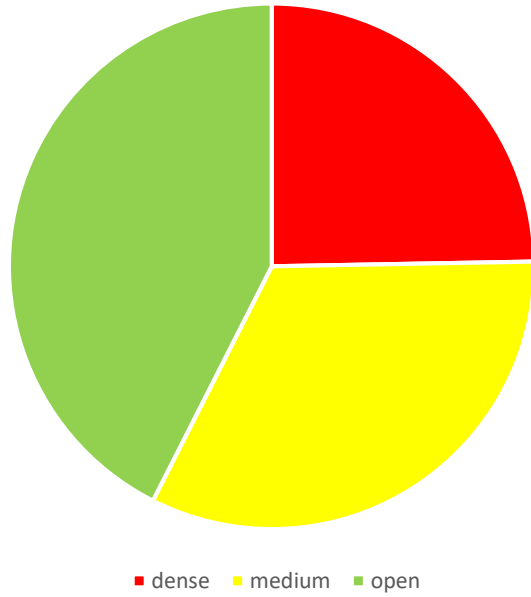
Deciduous vs. Evergreen



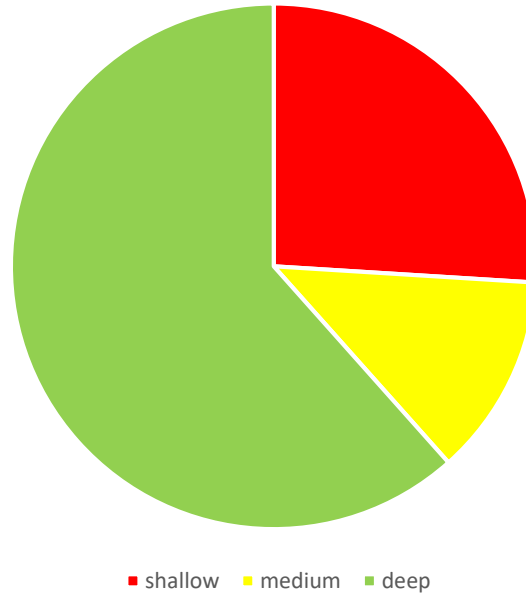
■ deciduous ■ evergreen

Agroforestry Characteristics

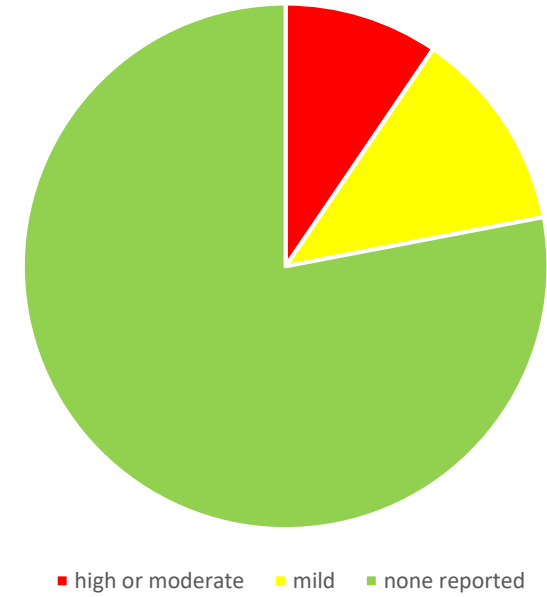
Summer Canopy Density



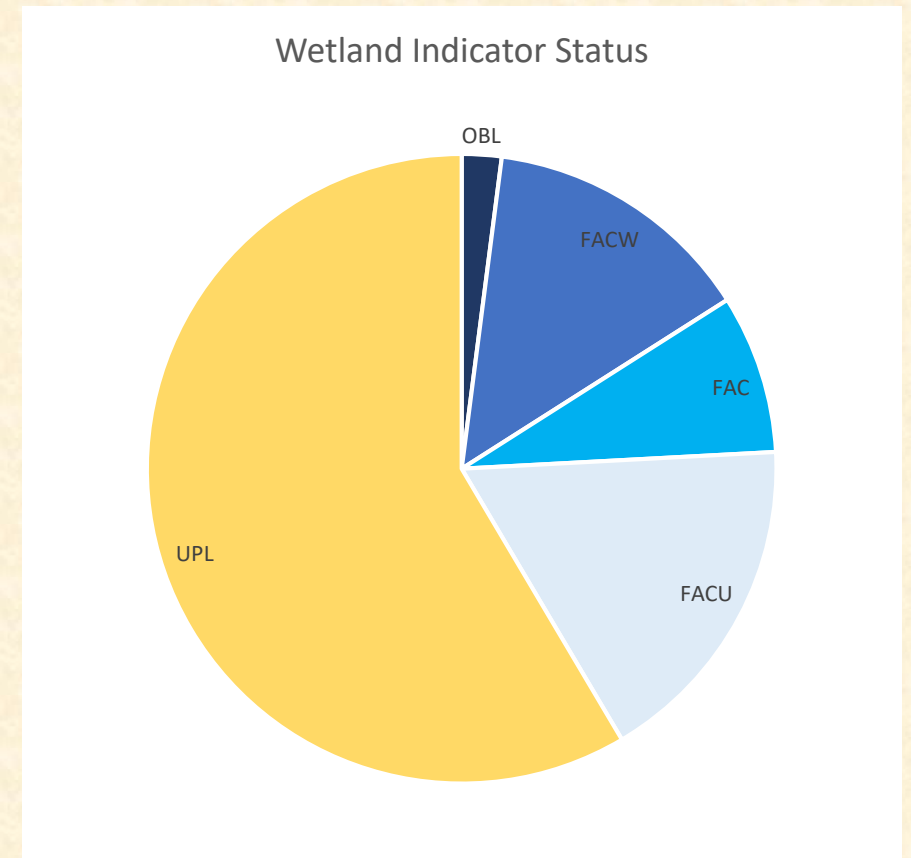
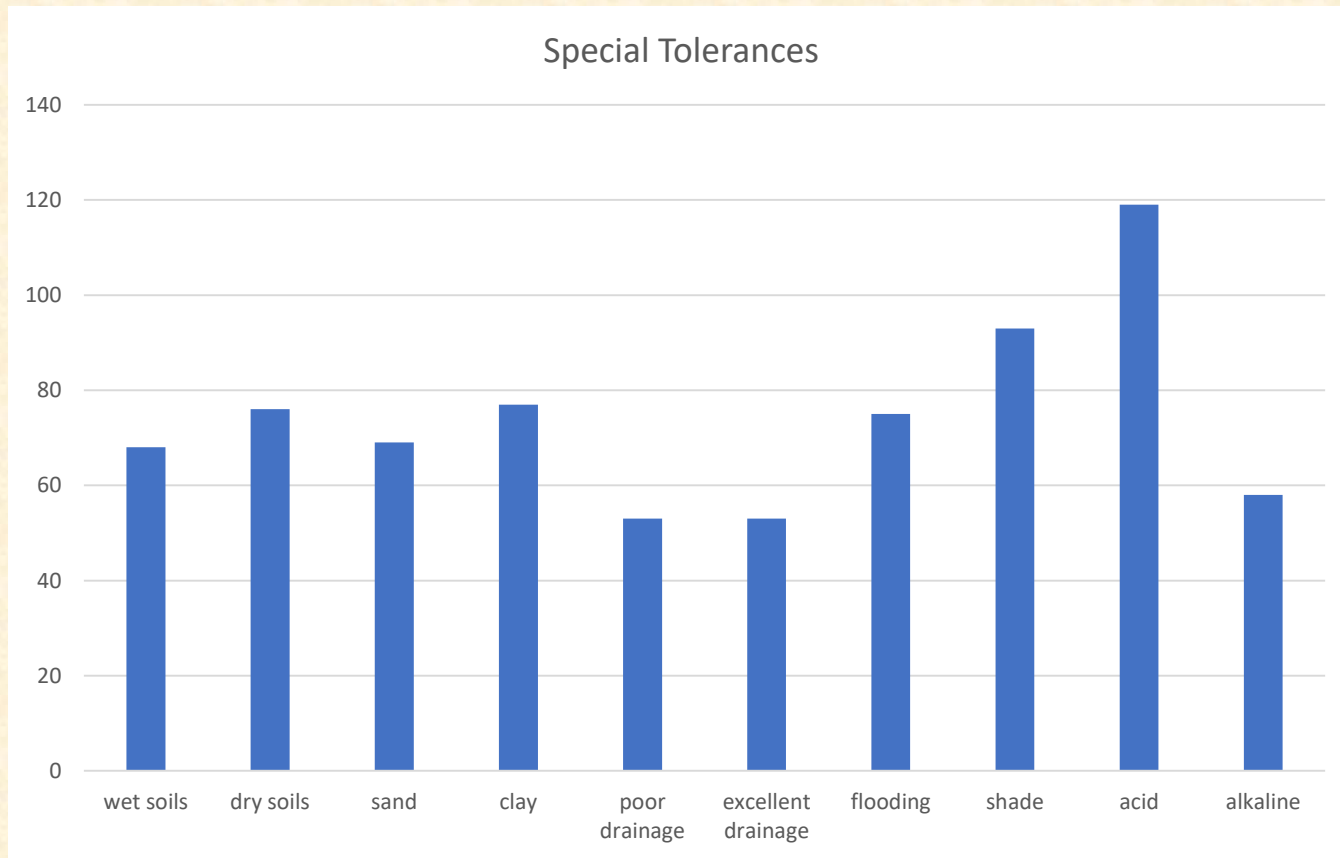
Rooting Depth



Allelopathy

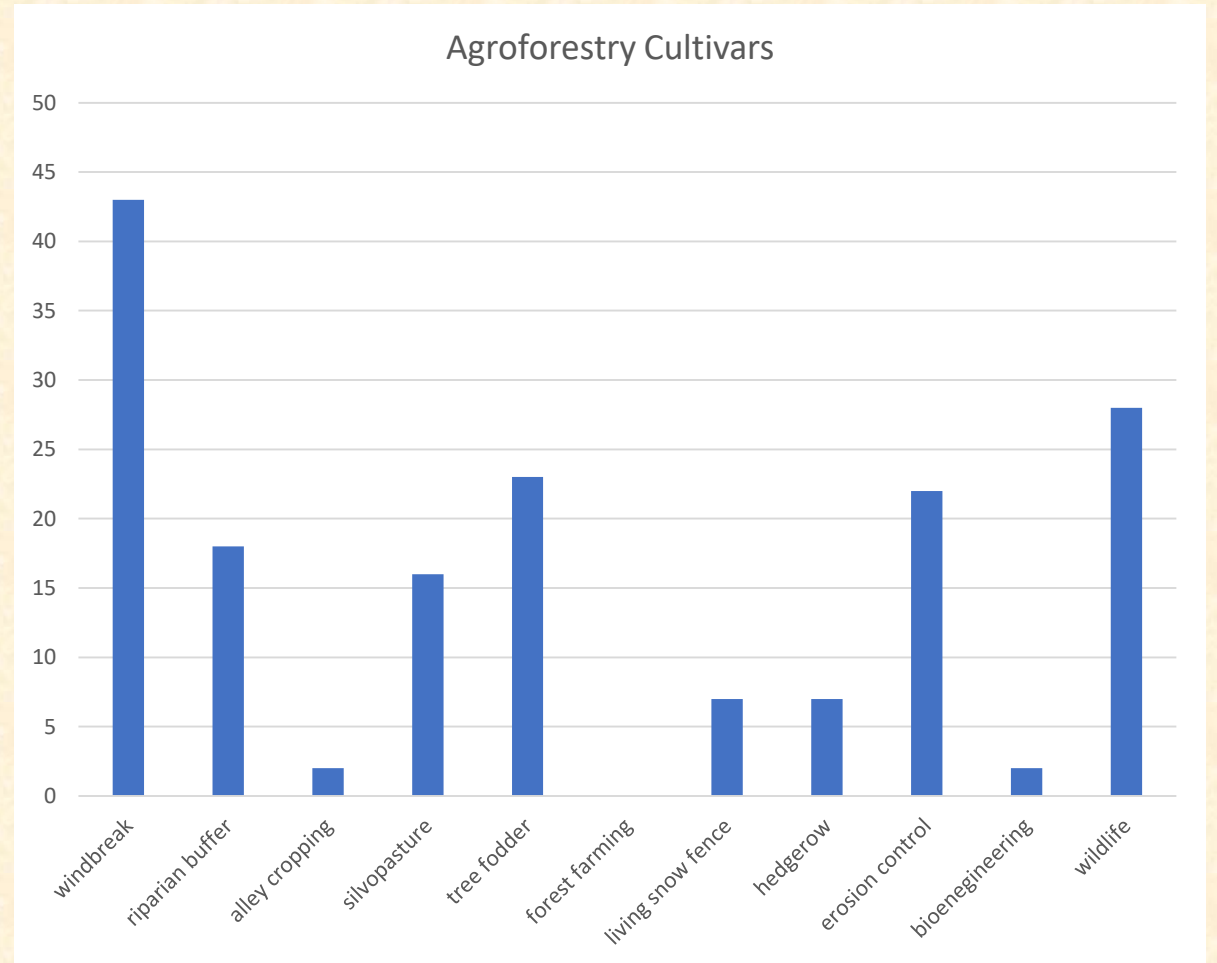
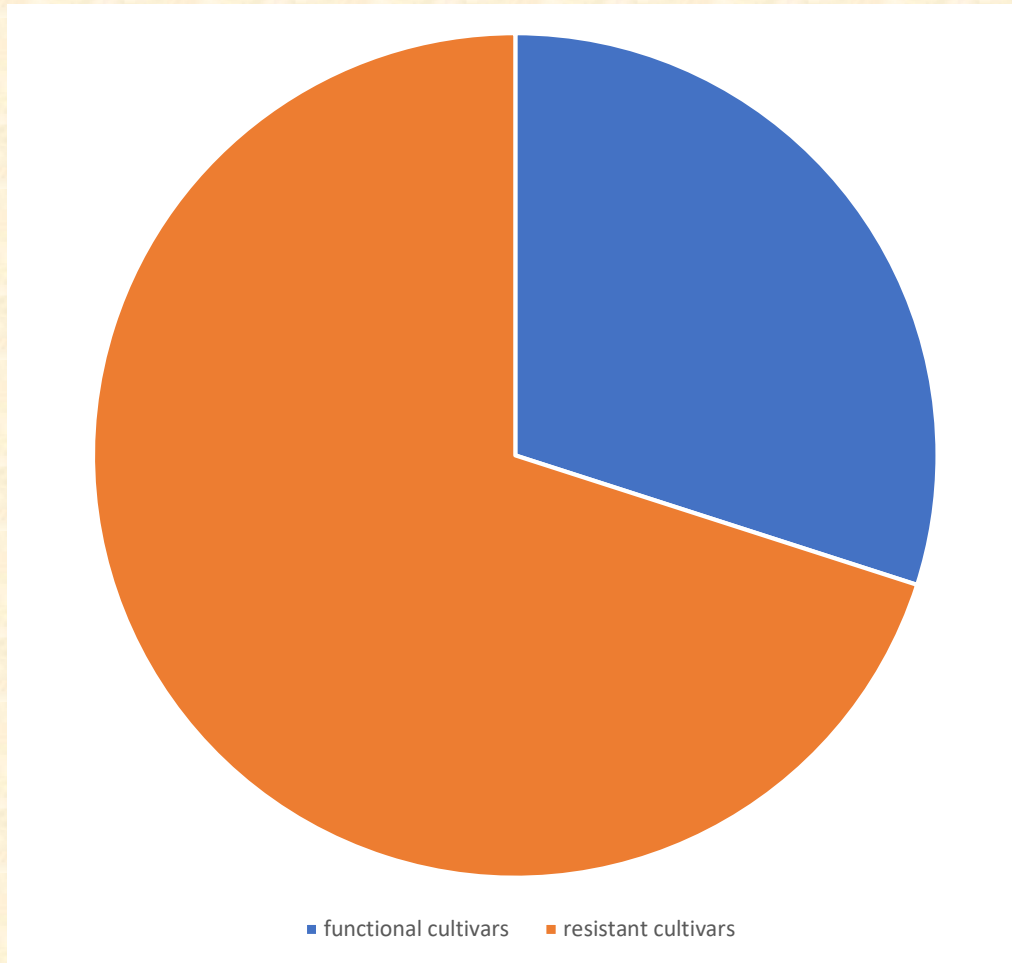


Special Tolerances



Cultivars

Cultivars



Windbreak	Riparian Buffer	Silvopasture	Tree Fodder	Living Snow Fence	Hedgerow	Riparian Stabilization	Wildlife
<p><i>Amorpha fruticosa</i> “Missouri Covey”, “Survivor”</p> <p><i>Celtis occidentalis</i> “Oahe”</p> <p><i>Cephalanthus occidentalis</i> “Keystone”</p> <p><i>Cornus amomum</i> “Indigo”</p> <p><i>Cornus sericea</i> “Ruby”</p> <p><i>Corylus americana</i> “Sun Harvest”</p> <p><i>Crataegus anomala</i> “Homestead”</p> <p><i>Fraxinus pensylvanica</i> “Cardan”</p> <p><i>Myrica pensylvanica</i> “Wildwood”</p> <p><i>Populus deltoides</i> “Siouxland”, “Straight Plains”, “CanAm”</p> <p><i>Populus hybrids</i> “Imperial”, “Spike”, “Nor’easter”, “Robusta”, “Norway”, “Northwest”, “Eugenei”</p> <p><i>Prunus americana</i> “Prairie Red”, “Midwest Premium”</p> <p><i>Prunus virginiana</i> “Schubert”, “Colorow”</p> <p><i>Quercus macrocarpa</i> “Boomer”, “Ekalaka”, “Lippert”</p> <p><i>Salix alba</i> “Chermesina”, “Vitellina”</p> <p><i>Salix caprea</i> “S365”</p> <p><i>Salix eriocephala</i> “Green USA”</p> <p><i>Salix exigua</i> “Silver Sands”</p> <p><i>Salix hybrids</i> “SC1”</p> <p><i>Salix miyabeana</i> “SX 64”, “SX 67”</p> <p><i>Salix pentandra</i> “Aberdeen”</p> <p><i>Salix purpurea</i> “Streamco”</p> <p><i>Salix sericea</i> “Riverbend”</p> <p><i>Salix x cotteti</i> “Bankers”</p> <p><i>Sambucus canadensis</i> “Vintage”</p> <p><i>Thuja occidentalis</i> “Affinity”</p> <p><i>Viburnum opulus americanum</i> “Leelanau”</p>	<p><i>Alnus serrulata</i> “Panbowl”</p> <p><i>Celtis occidentalis</i> “Prairie Harvest”</p> <p><i>Cornus amomum</i> “Indigo”</p> <p><i>Cornus sericea</i> “Ruby”</p> <p><i>Liriodendron tulipifera</i> “Union”</p> <p><i>Morus alba</i> “Kokuso”</p> <p><i>Populus hybrids</i> “Imperial”</p> <p><i>Quercus macrocarpa</i> “Ekalaka”, “Lippert”</p> <p><i>Salix caprea</i> “S365”</p> <p><i>Salix eriocephala</i> “S25”</p> <p><i>Salix exigua</i> “Greenbank”, “Silver Sands”</p> <p><i>Salix purpurea</i> “Fish Creek”</p> <p><i>Salix sericea</i> “Riverbend”</p> <p><i>Sambucus canadensis</i> “Vintage”</p> <p><i>Thuja occidentalis</i> “Affinity”</p> <p><i>Viburnum opulus americanum</i> “Leelanau”</p>	<p><i>Gleditsia triacanthos</i> “Ashworth”, “Piat”, “Lancaster North”, “Lancaster South”, “Monroe”</p> <p><i>Populus deltoides</i> “Brooks 1”, “DN 34”, “Green Giant”</p> <p><i>Robinia pseudoacacia</i> “Algonquin”, “Allegheny”, “Appalachia”</p> <p><i>Salix alba</i> “Charlie”, “Pseudo”</p> <p><i>Salix miyabeana</i> “SX 64”, “SX 61”</p>	<p><i>Gleditsia triacanthos</i> “Ashworth”, “Piat”, “Lancaster North”, “Lancaster South”, “Monroe”</p> <p><i>Morus alba</i> “Kokuso”</p> <p><i>Populus deltoides</i> “Brooks 1”, “DN 34”, “Green Giant”</p> <p><i>Quercus alba</i> “Lint”</p> <p><i>Quercus bicolor</i> “Bucks Unlimited”</p> <p><i>Quercus hybrids</i> “Manna”, “Dale’s Giant”, “Sweet It Is”, “Dynamo”, “Nutty”</p> <p><i>Quercus macrocarpa</i> “Ashworth”, “Hershey”</p> <p><i>Robinia pseudoacacia</i> “Appalachia”</p> <p><i>Salix alba</i> “Charlie”, “Pseudo”</p> <p><i>Salix miyabeana</i> “SX 64”, “SX 61”,</p>	<p><i>Salix caprea</i> “S365”</p> <p><i>Salix eriocephala</i> “S25”</p> <p><i>Salix miyabeana</i> “SX 64”, “SX 67”</p> <p><i>Salix purpurea</i> “Streamco”</p> <p><i>Salix x cotteti</i> “Bankers”</p>	<p><i>Cornus amomum</i> “Indigo”</p> <p><i>Populus hybrids</i> “Imperial”,</p> <p><i>Salix purpurea</i> “Streamco”, “Fish Creek”</p> <p><i>Salix sericea</i> “Riverbend”</p> <p><i>Sambucus canadensis</i> “Vintage”</p> <p><i>Thuja occidentalis</i> “Affinity”</p> <p><i>Viburnum opulus Americanum</i> “Leelanau”</p>	<p><i>Salix purpurea</i> “Streamco”</p> <p><i>Salix x cotteti</i> “Bankers”</p>	<p><i>Alnus serrulata</i> “Panbowl”</p> <p><i>Amorpha fruticosa</i> “Iowa Covey”, “Illinois Covey”, “Missouri Covey”, “Survivor”</p> <p><i>Celtis occidentalis</i> “Oahe”, “Prairie Harvest”</p> <p><i>Cephalanthus occidentalis</i> “Keystone”,</p> <p><i>Cornus amomum</i> “Indigo”</p> <p><i>Cornus sericea</i> “Ruby”</p> <p><i>Corylus americana</i> “Sun Harvest”</p> <p><i>Crataegus anomala</i> “Homestead”</p> <p><i>Fraxinus pensylvanica</i> “Cardan”</p> <p><i>Myrica pensylvanica</i> “Wildwood”</p> <p><i>Prunus americana</i> “Prairie Red”, “Midwest Premium”</p> <p><i>Prunus maritima</i> “Ocean View”</p> <p><i>Prunus virginiana</i> “Schubert”, “Colorow”</p> <p><i>Quercus bicolor</i> “Bucks Unlimited”</p> <p><i>Salix exigua</i> “Silver Sands”</p> <p><i>Salix pentandra</i> “Aberdeen”</p> <p><i>Salix purpurea</i> “Streamco”</p> <p><i>Salix x cotteti</i> “Bankers”</p> <p><i>Sambucus canadensis</i> “Vintage”</p> <p><i>Thuja occidentalis</i> “Affinity”</p> <p><i>Viburnum opulus americanum</i> “Leelanau”</p>

The Two-Page Summary

Agroforestry Species for Vermont

Suitability by Agroforestry Practice

Commercial fruits & nuts	Serviceberry; aronia; hickory; chestnut; hybrid hazel; walnut; apple & pear; mulberry, peach, cherry & plum; currants & gooseberry; elderberry; highbush blueberry
Commercial plantation timber & biomass	Walnut; Eastern red cedar; white pine; Eastern cottonwood; hybrid poplar; oaks; black locust; willows
Commercial other	Sugar maple (syrup); witch hazel (medicinal); elderberry (medicinal); highbush cranberry (medicinal)
Alley cropping	River locust; aronia; chestnut; hybrid hazel; walnut; apple & pear; white pine; Eastern cottonwood; hybrid poplar; peach, cherry & plum; oak; currants & gooseberries; black locust; elderberry; arborvitae
Contour hedgerow	River locust; aronia; mulberry; elderberry
Pollinator hedgerow	Serviceberry; river locust; red osier dogwood; apple & pear; American plum, peach, cherry & plum; chokecherry; black locust; willows; elderberry; highbush blueberry; highbush cranberry
Forest farming	Sugar maple; witch hazel; mulberry; currants & gooseberries; black locust
Urban food forest	Sugar maple; serviceberry; river locust; aronia; hickory; chestnut; hybrid hazel; witch hazel; walnut; apple & pear; mulberry; American plum; peach, cherry & plum; chokecherry; currants & gooseberries; black locust; elderberry; highbush blueberry; highbush cranberry
Windbreak	Sugar maple; serviceberry; river locust; aronia; hickory; red osier dogwood; hybrid hazel; honey locust; walnut; Eastern red cedar; mulberry; white pine; Eastern cottonwood; hybrid poplar; American plum; chokecherry; oaks; black locust; willows; elderberry; arborvitae; highbush cranberry
Living snow fence	Red osier dogwood; willows; arborvitae; highbush blueberry; Eastern red cedar; American plum
Silvopasture	Sugar maple; river locust; honey locust; walnut; mulberry; white pine; Eastern cottonwood; hybrid poplar; oaks; black locust; willows; elderberry
Tree fodder (leaves)	River locust; mulberry; Eastern cottonwood; hybrid poplar; black locust; willows
Tree fodder (mast)	Honey locust; mulberry; oaks
Living barn	Eastern red cedar; white pine; arborvitae
Riparian buffer	Sugar maple; serviceberry; aronia; hickory; red osier dogwood; honey locust; witch hazel; white pine; Eastern cottonwood; hybrid poplar; chokecherry; oaks; willows; elderberry; arborvitae; highbush blueberry; highbush cranberry
Waterbreak	River locust; aronia; red osier dogwood; honey locust; Eastern cottonwood; hybrid poplar; oaks; willows; elderberry; arborvitae; highbush blueberry; highbush cranberry

Recommended Species Details

+*Agroforestry cultivars available.

Species	Commercial Products	Systems	Functions	Tolerances
Sugar maple <i>Acer saccharum</i>	Syrup	Windbreak, silvopasture, riparian buffer, forest farming, urban food forest	Native, conservation, wildlife (moderate), pollinators, caterpillars	Sand, shade
Serviceberry <i>Amelanchier spp.</i>	Fruit (some)	Pollinator hedgerow, urban food forest, windbreak, riparian buffer	Native, conservation, wildlife (high), erosion control, pollinators,	Dry, sand, poor drainage, acid, shade (depends on species)
River locust* <i>Amorpha fruticosa</i>		Alley cropping, contour hedgerow, pollinator hedgerow, urban food forest, windbreak, silvopasture, tree fodder, waterbreak	Nitrogen fixation, erosion control, pollinators	Wet, dry, sand, poor drainage, excessive drainage, acid, alkaline, flooding.
Aronia <i>Aronia melanocarpa</i>	Fruit	Alley cropping, contour hedgerow, urban food forest, windbreak, riparian buffer, waterbreak	Native, conservation, erosion control, pollinators	Wet, dry, sand, clay, poor drainage, excessive drainage, acid, flooding
Hickory <i>Carya spp.</i>	Nuts, oil	Urban food forest, windbreak, riparian buffer	Native, conservation, erosion control, wildlife (moderate), caterpillars	Wet, dry, sand, excessive drainage, acid (depends on species)
Chestnut <i>Castanea spp.</i>	Nuts	Alley cropping, urban food forest	Caterpillars	Sand, acid
Red osier dogwood* <i>Cornus sericea</i>		Pollinator hedgerow, windbreak, living snow fence, riparian buffer, waterbreak	Native, conservation, erosion control, bank stabilization, wildlife (high), pollinators	Wet, alkaline, flood, shade
Hybrid hazel <i>Corylus spp.</i>	Nuts	Alley cropping, urban food forest, windbreak	Caterpillars	Sand, clay, acid

Honey locust* <i>Gleditsia triacanthos</i>		Windbreak, silvopasture, fodder tree, riparian buffer, waterbreak	Erosion control, pollinators	Dry, clay, poor drainage, flood
Witch hazel <i>Hamamelis virginiana</i>	Medicinal	Forest farming, urban food forest, windbreak, riparian buffer	Native, conservation, erosion control, pollinators	Dry, sand, alkaline
Walnut <i>Juglans spp.</i>	Nuts, veneers, lumber	Alley cropping, urban food forest, windbreak, silvopasture	Native (some), conservation, wildlife (medium to high), caterpillars	Clay, alkaline (depends on species)
Eastern red cedar <i>Juniperus virginiana</i>	Lumber, posts, veneers	Windbreak, living snow fence, living barn	Native, conservation, erosion control, wildlife (high)	Dry, sand, clay, excessive drainage
Apple & pear <i>Malus pumila, Pyrus spp.</i>	Fruit	Alley cropping, pollinator hedgerow, urban food forest	Pollinators, caterpillars	
Mulberry* <i>Morus alba & M. rubra</i>	Fruit	Contour hedgerow, forest farming, urban food forest, windbreak, silvopasture, tree fodder	Native (some), erosion control	Dry, sand (depends in species)
White pine <i>Pinus strobus</i>	Lumber, veneers, pulpwood	Alley cropping, windbreak, silvopasture, living barn, riparian buffer	Native, conservation, erosion control, wildlife (high), caterpillars	Sand, clay, poor drainage, acid, shade
Eastern cottonwood* <i>Populus deltoides</i>	Lumber, veneers pulpwood, biomass	Alley cropping, windbreak, silvopasture, tree fodder, riparian buffer, waterbreak	Native, conservation, erosion control, bank stabilization, wildlife (moderate), caterpillars	Wet, sand, clay, poor drainage, excessive drainage, flood, shade
Hybrid poplar* <i>Populus hybrids</i>	Lumber, veneers pulpwood, biomass	Alley cropping, windbreak, silvopasture, tree fodder, riparian buffer, waterbreak	Erosion control, caterpillars	Wet, sand, clay, poor drainage, excessive drainage, flood (depends on cultivar)
American plum* <i>Prunus americana</i>		Pollinator hedgerow, urban food forest, windbreak, living snow fence	Native, erosion control, pollinators, caterpillars	Dry, acid
Peach, cherry, plum <i>Prunus spp.</i>	Fruit	Alley cropping, pollinator hedgerow, urban food forest	Pollinators, caterpillars	
Chokecherry* <i>Prunus virginiana</i>	Fruit	Pollinator hedgerow, urban food forest windbreak, riparian buffer	Native, conservation, erosion control, pollinators caterpillars	Dry, sand, clay, acid, alkaline, shade
Oaks* <i>Quercus spp.</i>	Lumber, veneers	Alley cropping, windbreak, silvopasture, tree fodder (mast), riparian forest buffer, waterbreak	Native, conservation, erosion control, wildlife (very high), caterpillars	Dry, sand, clay, flood (depends on species)
Currants & Gooseberry <i>Ribes spp.</i>	Fruit	Alley cropping, forest farming, urban food forest	Pollinators	Acid, shade
Black locust* <i>Robinia pseudoacacia</i>	Lumber, posts, pulpwood, biomass	Alley cropping, pollinator hedgerow, forest farming, urban food forest, windbreak, silvopasture, tree fodder	Nitrogen fixation, erosion control, pollinators	Dry, sand, excessive drainage, acid
Willows* <i>Salix spp.</i>	Pulpwood, biomass	Alley cropping, pollinator hedgerow, windbreak, living snow fence, silvopasture, tree fodder, riparian buffer, waterbreak	Native (some), conservation, erosion control, bank stabilization, wildlife (medium), pollinators, caterpillars	Wet, sand, clay, poor drainage, acid, flood (depends on species)
Elderberry* <i>Sambucus spp.</i>	Fruit, medicinal	Alley cropping, contour hedgerow, pollinator hedgerow, urban food forest, windbreak, silvopasture, riparian buffer, waterbreak	Native (some), conservation, erosion control, wildlife (high), pollinators	Wet, dry, sand, clay, poor drainage, acid, flood
Arborvitae* <i>Thuja occidentalis</i>		Alley cropping, windbreak, living snow fence, living barn, riparian buffer, waterbreak	Native, conservation, erosion control, wildlife (medium)	Wet, clay, flood, shade
Highbush blueberry <i>Vaccinium corymbosum</i>	Fruit	Pollinator hedgerow, urban food forest, living snow fence, riparian buffer, waterbreak	Native, conservation, erosion control, wildlife (high), pollinators, caterpillars	Wet, dry, sand, clay, poor drainage, acid, flood
Highbush cranberry* <i>Viburnum opulus americanum</i>	Medicinal	Pollinator hedgerow, urban food forest, windbreak, riparian buffer, waterbreak	Native, conservation, erosion control, wildlife (medium), pollinators	Wet, clay, poor drainage, flood