

Living Snow Fences

Species Matrix for New York State



State University of New York
College of Environmental Science and Forestry



Justin P. Heavey
Timothy A. Volk

Forest & Natural Resource Management
SUNY ESF

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Living Snow Fences Species Matrix

Species selection is an important step in the design of effective and efficient living snow fences. A species matrix assists in the plant selection process for living snow fences by providing a palette of suitable species, and a summary of relevant plant traits to compare and contrast species. Recent research at SUNY ESF has built on previous research (Tabler, 2003) and identified key plant traits for living snow fences. Twenty-eight species that possess the traits relevant to living snow fences have been identified and included in this plant matrix. These species are tolerant to a variety of roadside conditions across New York State, and possess the traits necessary to achieve adequate snow trapping and snow storage capabilities. Every plant species is unique, and this matrix is therefore intended as a selection tool to compare and contrast a variety of plants for living snow fences within the context of design goals and site conditions.

Plant Traits for Living Snow Fences

The morphological traits of height and stem density are the two most important factors influencing the function of living snow fences. Mature height should be at least eight feet to achieve adequate snow storage capacity. Stem density should be 40-60% to achieve optimal snow trapping efficiency and drift shape. Deciduous shrubs and evergreen trees are most suitable for expressing these traits in the landscape. Most species in this matrix have been proven suitable for living snow fences or windbreaks, but some species remain untested, as indicated on the first page of the matrix. Additional physiological traits and ecological tolerances relevant to living snow have also been included in this matrix to assist in plant selection. For example, plants with rapid growth rates are desirable to achieve functional heights and densities as quickly as possible. The traits considered most critical to living snow fences are listed on the following pages for each of the twenty-eight species included in this matrix.

Choosing a Species

A variety of factors should be considered when choosing a species from this matrix for a living snow fence. A thorough analysis of the site conditions should inform the species selection. Tolerances to soil conditions and the potential stressors listed in this matrix can greatly impact the vigor and survival of the fence. Choosing a species that is well suited to the environmental conditions of the site can greatly influence the success or failure of the fence. Considerations such as native status, edible fruit



Shrub-willow living snow fence in late summer. Rt. 30, Grand Gorge, Delaware County, NY.

production, and ornamental flowers can also be considered in the selection process.

Shrub-Willow Living Snow Fences

The shrub-willow cultivars included in this matrix possess many of the desirable characteristics for living snow fences such as sufficient height, density, and rapid growth rate. Shrub-willow living snow fences can be propagated from dormant stem cuttings with greater ease, and lower costs than using rooted stock of other species. Shrub-willows also tolerate a variety of site conditions, and are resistant to most pests and pathogens. Shrub-willows have also been more widely tested as living snow fences in New York State than other species and have been proven effective. Research on shrub-willow living snow fences is ongoing. Additional information on shrub-willows is available at: www.esf.edu/willow

	<u>Common Name</u>	<u>Scientific Name</u>	<u>Family</u>	<u>Native Status</u>	<u>Tested as LSF or windbreak</u>	<u>Growth Form</u>	<u>Planting Stock</u>
Deciduous	common serviceberry	<i>Amelanchier arborea</i>	Rosaceae	Native	No	Multi-stem shrub	Bareroot/container
	caragana	<i>Caragana arborescens</i>	Fabaceae	Introduced	Yes	Multi-stem shrub	Bareroot/container
	silky dogwood	<i>Cornus amomum</i>	Cornaceae	Native	Yes	Multi-stem shrub	Bareroot/container
	redosier dogwood	<i>Cornus sericea ssp. sericea</i>	Cornaceae	Native	Yes	Multi-stem shrub	Bareroot/container
	American hazelnut	<i>Corylus americana</i>	Betulaceae	Native	No	Multi-stem shrub	Bareroot/container
	beaked hazelnut	<i>Corylus cornuta</i>	Betulaceae	Native	No	Multi-stem shrub	Bareroot/container
	Amur privet	<i>Ligustrum amurense</i>	Oleaceae	Introduced	Yes	Multi-stem shrub	Bareroot/container
	northern bayberry	<i>Morella pensylvanica</i>	Myricaceae	Native	Yes	Multi-stem shrub	Bareroot/container
	American plum	<i>Prunus americana</i>	Rosaceae	Native	Yes	Multi-stem shrub	Bareroot/container
	nanking chery	<i>Prunus tomentosa</i>	Rosaceae	Introduced	Yes	Multi-stem shrub	Bareroot/container
	smooth sumac	<i>Rhus glabra</i>	Anacardiaceae	Native	No	Multi-stem shrub	Bareroot/container
	shrub willow var. 'S365'	<i>Salix caprea</i>	Salicaceae	Cultivar	Yes	Multi-stem shrub	Unrooted stem cutting
	shrub willow var 'S25'	<i>Salix eriocephala</i>	Salicaceae	Native	Yes	Multi-stem shrub	Unrooted stem cutting
	shrub willow var. 'SX64'	<i>Salix miyabeana</i>	Salicaceae	Cultivar	Yes	Multi-stem shrub	Unrooted stem cutting
	shrub willow 'fish creek'	<i>Salix purpurea</i>	Salicaceae	Cultivar	Yes	Multi-stem shrub	Unrooted stem cutting
	shrub willow var. 'SX61'	<i>Salix sachalinensis</i>	Salicaceae	Cultivar	Yes	Multi-stem shrub	Unrooted stem cutting
	silver buffaloberry	<i>Shepherdia argentea</i>	Elaeagnaceae	Native	Yes	Multi-stem shrub	Bareroot/container
	common lilac	<i>Syringa vulgaris</i>	Oleaceae	Introduced	Yes	Multi-stem shrub	Bareroot/container
	highbush blueberry	<i>Vaccinium corymbosum</i>	Ericaceae	Native	No	Multi-stem shrub	Bareroot/container
Evergreen	nannyberry	<i>Viburnum lentago</i>	Caprifoliaceae	Native	Yes	Multi-stem shrub	Bareroot/container
	blackhaw	<i>Viburnum prunifolium</i>	Caprifoliaceae	Native	No	Multi-stem shrub	Bareroot/container
	common juniper	<i>Juniperus communis</i>	Cupressaceae	Native	No	Single stem shrub	Bareroot/container
	eastern redcedar	<i>Juniperus virginiana</i>	Cupressaceae	Native	Yes	Single stem tree	Bareroot/container
	Norway spruce	<i>Picea abies</i>	Pinaceae	Introduced	Yes	Single stem tree	Bareroot/container
	white spruce	<i>Picea glauca</i>	Pinaceae	Native	Yes	Single stem tree	Bareroot/container
	blue spruce	<i>Picea pungens</i>	Pinaceae	Native	Yes	Single stem tree	Bareroot/container
	English yew	<i>Taxus baccata</i>	Taxaceae	Introduced	No	Single stem shrub	Bareroot/container
	arborvitae	<i>Thuja occidentalis</i>	Cupressaceae	Native	Yes	Single stem tree	Bareroot/container

	<u>Common Name</u>	<u>Growth Rate</u>	<u>Height base age (ft)</u>	<u>Mature Height (ft)</u>	<u>Lifespan</u>	<u>Temp Min (°F)</u>	<u>Density per Acre (Min)</u>	<u>Density per Acre (Max)</u>	<u>Hedge Tolerance</u>
Deciduous	common serviceberry	Slow	25	36	Moderate	-47	700	1700	Low
	caragana	Rapid	12	12	Moderate	-38	1212	2728	Medium
	silky dogwood	Moderate	7	10	Moderate	-38	1200	4800	Medium
	redosier dogwood	Moderate	12	12	Moderate	-38	1212	4850	Low
	American hazelnut	Moderate	10	10	Short	-33	700	1700	Low
	beaked hazelnut	Moderate	15	15	Long	-47	700	1700	Medium
	Amur privet	Moderate	12	12	Moderate	-38	680	2722	High
	northern bayberry	Slow	9	12	Long	-28	1210	2722	Low
	American plum	Moderate	24	24	Long	-38	700	1200	Low
	nanking cherry	Moderate	8	8	Long	-38	680	1200	Medium
	smooth sumac	Moderate	12	12	Short	-33	300	1200	Low
	shrub willow var. 'S365'	Very Rapid	15	20	Medium	-40	1 per foot	1 per foot	High
	shrub willow var 'S25'	Very Rapid	20	25	Medium	-40	1 per foot	1 per foot	High
	shrub willow var. 'SX64'	Very Rapid	20	30	Medium	-40	1 per foot	1 per foot	High
	shrub willow 'fish creek'	Very Rapid	20	25	Medium	-40	1 per foot	1 per foot	High
	shrub willow var. 'SX61'	Very Rapid	15	25	Medium	-40	1 per foot	1 per foot	High
	silver buffaloberry	Rapid	18	18	Moderate	-38	300	1800	Medium
	common lilac	Moderate	20	20	Moderate	-38	700	1200	High
	highbush blueberry	Moderate	12	12	Moderate	-33	1200	1700	Low
	nannyberry	Slow	28	28	Long	-33	300	1200	None
	blackhaw	Slow	16	16	Long	-33	700	1200	Low
Evergreen	common juniper	Slow	5	10	Long	-43	700	2200	Medium
	eastern redcedar	Slow	25	50	Moderate	-43	300	1200	Medium
	Norway spruce	Slow	35	130	Moderate	-39	300	700	High
	white spruce	Slow	30	100	Moderate	-65	300	700	Low
	blue spruce	Slow	20	100	Long	-38	300	700	Low
	English yew	Slow	25	40	Moderate	-28	300	1200	High
	arborvitae	Slow	25	50	Long	-33	300	1200	High

	<u>Common Name</u>	<u>Moisture Use</u>	<u>Root Depth Minimum (in)</u>	<u>Fertility Requirement</u>	<u>Adapted to Coarse Soils</u>	<u>Adapted to Medium Soils</u>	<u>Adapted to Fine Soils</u>	<u>pH (Min)</u>	<u>pH (Max)</u>	<u>Nitrogen Fixation</u>
Deciduous	common serviceberry	Medium	20	Medium	Yes	Yes	No	4.8	7.5	None
	caragana	medium	16	Low	Yes	Yes	Yes	5	8.5	Medium
	silky dogwood	High	16	Medium	Yes	Yes	Yes	5	7	None
	redosier dogwood	High	20	Low	Yes	Yes	Yes	4.8	7.5	None
	American hazelnut	Medium	20	Medium	No	Yes	Yes	5	7	None
	beaked hazelnut	Medium	16	Medium	No	Yes	No	4.8	7.5	None
	Amur privet	Medium	20	Medium	No	Yes	Yes	5.8	7.5	None
	northern bayberry	Medium	20	Low	Yes	Yes	No	5.5	7.8	Medium
	American plum	Medium	24	Medium	Yes	Yes	No	5	7	None
	nanking cherry	Medium	20	Medium	Yes	Yes	No	5.7	7.2	None
	smooth sumac	Low	24	Low	Yes	Yes	No	5.3	7.5	None
	shrub willow var. 'S365'	Medium	18	Medium	Yes	Yes	No	5.5	8	None
	shrub willow var 'S25'	Medium	18	Medium	Yes	Yes	No	5.5	8	None
	shrub willow var. 'SX64'	Medium	18	Medium	Yes	Yes	No	5.5	8	None
	shrub willow 'fish creek'	Medium	18	Medium	Yes	Yes	No	5.5	8	None
	shrub willow var. 'SX61'	Medium	18	Medium	Yes	Yes	No	5.5	8	None
	silver buffaloberry	Medium	24	Low	Yes	Yes	No	5.3	8	Medium
	common lilac	Medium	14	Medium	Yes	Yes	Yes	5.8	7.8	None
	highbush blueberry	Medium	16	Medium	Yes	Yes	Yes	4.7	7.5	None
	nannyberry	Medium	14	Medium	No	Yes	Yes	5	7	None
	blackhaw	Medium	18	Low	No	Yes	Yes	4.8	7.5	None
Evergreen	common juniper	Low	14	Low	Yes	Yes	Yes	5.5	8	None
	eastern redcedar	Low	20	Low	Yes	Yes	Yes	4.7	8	None
	Norway spruce	Medium	28	Medium	No	Yes	Yes	5	7	None
	white spruce	Medium	30	High	Yes	Yes	Yes	4	8.2	None
	blue spruce	Medium	18	Medium	Yes	Yes	No	5.5	7.8	None
	English yew	Medium	16	Medium	No	Yes	No	5.3	7.8	None
	arborvitae	Medium	30	Medium	Yes	Yes	Yes	5.2	7	None

	<u>Common Name</u>	<u>Anaerobic Tolerance</u>	<u>Drought Tolerance</u>	<u>Salinity Tolerance</u>	<u>Coppice Potential</u>	<u>Deer Browse</u>	<u>Seed Spread Rate</u>	<u>Vegetative Spread Rate</u>	<u>Edible Fruit/Nut</u>	<u>Ornamental Flower</u>
Deciduous	common serviceberry	Medium	Low	Low	No	Low	Moderate	None	Yes	Yes
	caragana	Low	High	Medium	Yes	Low	Moderate	None	No	Yes
	silky dogwood	Medium	Low	None	Yes	Low	Slow	Slow	No	Yes
	redosier dogwood	High	Low	None	No	High	Slow	Moderate	No	Yes
	American hazelnut	None	Medium	None	No	Medium	Slow	None	Yes	No
	beaked hazelnut	None	Medium	None	No	Medium	Slow	Slow	Yes	No
	Amur privet	Low	Medium	None	Yes	Low	Slow	None	No	Yes
	northern bayberry	Low	High	Medium	No	Low	Slow	Slow	No	No
	American plum	Medium	None	Low	No	Medium	Slow	None	Yes	Yes
	nanking cherry	None	Medium	Low	Yes	Low	Slow	None	Yes	Yes
	smooth sumac	Low	Medium	Medium	Yes	Low	Slow	Moderate	No	No
	shrub willow var. 'S365'	Medium	Medium	Medium	Yes	Medium	None	None	No	No
	shrub willow var 'S25'	Medium	Medium	Medium	Yes	Medium	None	None	No	No
	shrub willow var. 'SX64'	Medium	Medium	Medium	Yes	Medium	None	None	No	No
	shrub willow 'fish creek'	None	Medium	Medium	Yes	Medium	None	None	No	Yes
	shrub willow var. 'SX61'	Medium	Medium	Medium	Yes	Medium	None	None	No	No
	silver buffaloberry	None	Medium	High	Yes	Medium	Slow	Rapid	No	Yes
	common lilac	None	Medium	Medium	No	Low	Slow	Moderate	No	Yes
	highbush blueberry	Medium	Low	High	No	Medium	Slow	None	Yes	No
	nannyberry	Medium	Low	None	No	Low	Slow	None	No	Yes
	blackhaw	None	Medium	None	Yes	Medium	Slow	None	Yes	Yes
Evergreen	common juniper	None	High	Medium	No	Low	Slow	None	No	No
	eastern redcedar	Low	High	Low	No	Low	Rapid	None	No	No
	Norway spruce	None	Medium	Low	No	Low	Slow	None	No	No
	white spruce	None	High	Medium	No	Low	Slow	Slow	No	No
	blue spruce	None	Medium	Low	No	Low	Moderate	None	No	No
	English yew	None	Medium	Medium	No	Low	None	None	No	No
	arborvitae	Medium	Low	Medium	No	High	Moderate	None	No	No

Glossary of Terms

(Adapted from USDA Plant Database: <http://plants.usda.gov/charinfo.html>)

Native Status

Native status of the species. "*Native*" rating indicates the species is native to the northeast or North America. "*Introduced*" rating indicates the species is not native to the continental US and is also not listed on any state or federal invasive species list according to the USDA Plant Database as of June, 2012. "*Cultivar*" rating indicates a cultivated variety obtained through traditional breeding of native and/or non-native species.

Tested as LSF or Windbreak

Presence of information in the literature or on the web that indicates the species has been successfully used as a living snow fence or windbreak planting.

Growth Form

General morphology of species in terms of tree or shrub, and single or multiple main stems.

Planting Stock

Type of planting stock commonly used and commercially available.

Growth Rate

Rate of growth after successful establishment relative to other species with same growth form.

Height at Base Age

Maximum height under ideal conditions, at a base age. The base age is 10 years for shrubs and 20 years for trees.

Height at Maturity

Expected height of species at maturity. This is an estimate of the median mature height of a species or cultivar. Within a species mature height varies so this estimate is provided only to give a rough idea for planning purposes.

Lifespan

Expected lifespan relative to other species with the same growth form. For trees: Short < 100; Moderate 100 - 250; Long >250. Life spans for shrubs are not quantified.

Temp Min

Cold hardiness rating of the species, or the lowest winter temperature the plant will tolerate.

Density per Acre Min/Max

Recommended minimum/maximum number of plants per acre.

Hedge Tolerance

Tolerance of species to hedging (close cropping).

Moisture Use

Ability to use (i.e., remove) available soil moisture relative to other species in the same (or similar) soil moisture availability region.

Root Depth Minimum

The minimum depth of soil required for good growth.

Fertility Requirement

Relative level of nutrition (N, P, K) required for normal growth and development.

Adapted to Coarse/Medium/Fine Soils

Indicates species ability to establish and grow in soil with a coarse/medium/fine textured surface layer.

Coarse Textured soils include: sand, coarse sand, fine sand, loamy coarse sand, loamy fine sand, loamy very fine sand, very fine sand, and loamy sand.

Glossary of Terms

(continued)

Medium Textured soils include: silt, sandy clay loam, very fine sandy loam, silty clay loam, loam, fine sandy loam, sandy loam, coarse sandy loam, and clay loam.

Fine Textured soils include: Sandy clay, silty clay, and clay.

pH Min/Max

The minimum/maximum soil pH of the top 12 inches of soil within the species known geographical range.

Nitrogen Fixation

Amount of atmospheric nitrogen fixed by the species in a monoculture. Rating of "None" is 0 lb. N/acre/year; "Low" <85; "Medium" 85-160; "High" >160.

Anaerobic Tolerance

Relative tolerance to anaerobic (saturated) soil conditions.

Drought Tolerance

Relative tolerance of the species to drought conditions compared to other species with the same growth form from the same geographical region.

Salinity Tolerance

Species tolerance to soil salinity. Tolerance to a soil salinity level is defined as only a slight reduction (not greater than 10%) in plant growth. None = tolerant to a soil with an electrical conductivity of the soil solution extract of 0-2 dS/m; Low = tolerant to 2.1-4.0 dS/m; Medium = tolerant to 4.1-8.0 dS/m; High = tolerant to greater than 8.0 dS/m

Coppice Potential

Ability of a species to respond favorably to coppicing. Coppicing completely removes the canopy of woody plants, cutting them just above ground level.

A favorable response to coppicing for LSF applications is defined as increased number of stems, increased vigor, and/or higher optical density during the snow season.

Deer Browse

Palatability of species to deer and other browsers relative to other species with similar growth form.

Seed Spread Rate

Capability of the species to spread through its seed production compared to other species with the same growth form.

Vegetative Spread Rate

Capability of the species to spread vegetatively (suckering, rhizomes, layering, etc) compared with other species with the same growth form.

Edible Fruit/Nut

Species is capable of producing fruit or nut product palatable to humans as an auxiliary benefit.

Ornamental Flower

Species produces flowers that are conspicuous from landscaping aesthetics standpoint.

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Matrix data adapted from:
USDA Plant Database: www.plants.usda.gov
and
SUNY ESF Willow Facts Sheets: www.esf.edu/willow

Works Cited:

Tabler, R.D. 2003. *Controlling blowing and drifting snow with snow fences and road design*.
Tabler and Associates. Niwot, CO.

Prepared by SUNY ESF for New York State Department of Transportation

Photos courtesy of SUNY ESF & NYSDOT



Shrub-willow living snow fence on I-81 SB in Preble, Cortland County, NY



Spruce living snow fence on Rt. 167, Manheim, Herkimer County, NY.