

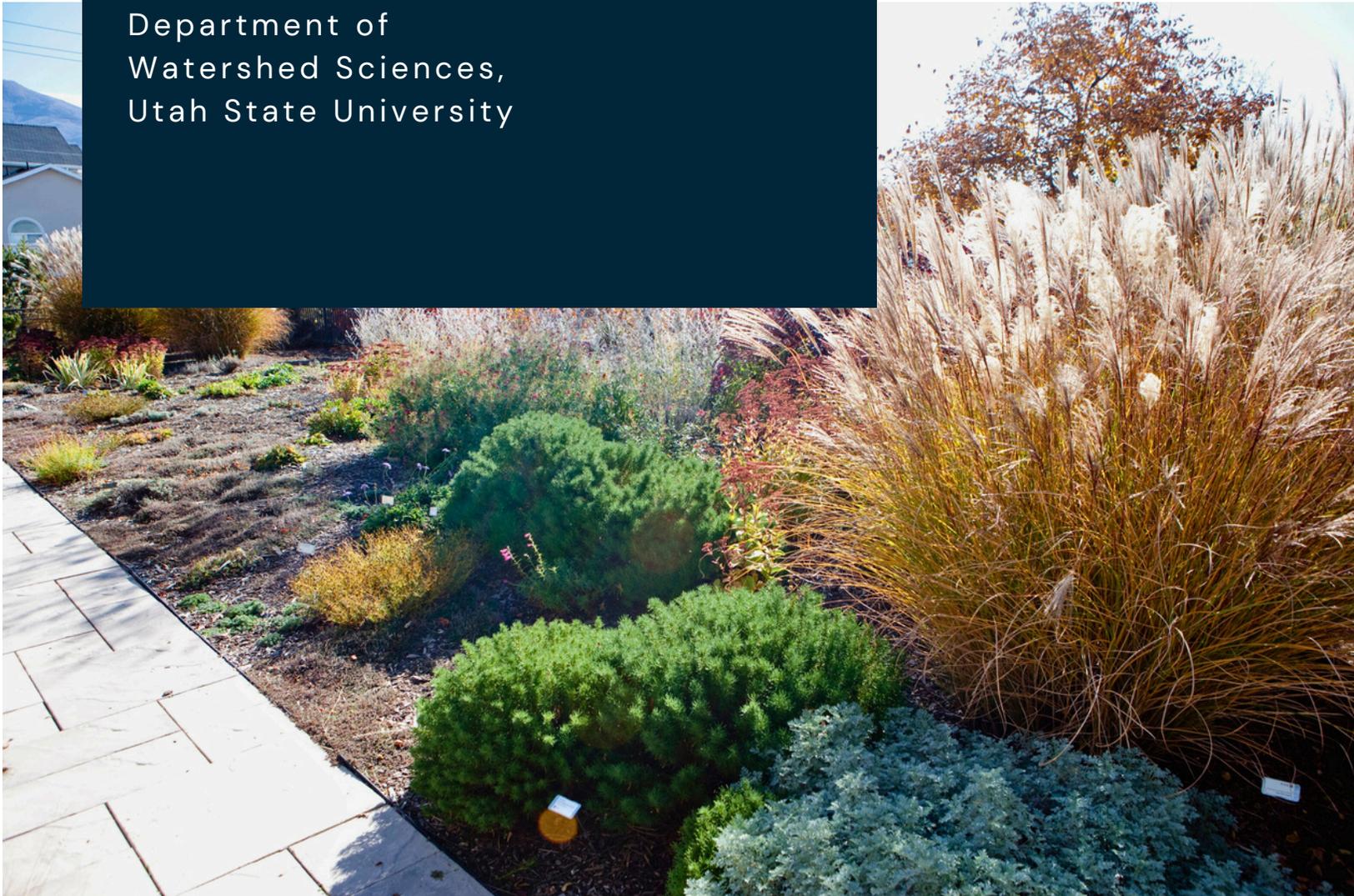
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APPENDIX 5

Low-Impact Development Planting Guide

PREPARED FOR :
Master's Degree Project

Department of
Watershed Sciences,
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TREE BOX FILTERS

Tree box filters are bioretention systems used when there is limited space. The design depends on whether the primary function will be water quality volume (retention) or flow (treatment). Both designs will also depend on the surrounding drainage area and imperviousness. The filters are generally designed to allow stormwater to flow through and receive treatment by the mulch, soil matrix, and plant roots. However, if the filter box is bottomless, the water can be retained and infiltrated into the native soils below.

Proper maintenance is important for the effective use of tree box filters. The flow filters must be clear of debris and trash to allow water to effectively flow through the system. Maintaining the soil and vegetation is important for the proper chemical and biological treatment to occur.

Pollutant	Effectiveness
Sediment	High
Nutrients	Moderate
Metals	Moderate
Bacteria	High
Oil/Grease	High

Primary Functions:



- Bioretention
- Volume Retention Varies
- Biofiltration



Benefits:

- Reduces and treats runoff from the surrounding area.
- Increases infiltration into soil and groundwater.
- Provides shade and local cooling effects.
- Creates neighborhood greening and aesthetic benefits.
- Can be installed almost anywhere, highly adaptable.

Maintenance Requirements

Table 6. The following table has been remade from the DWQ's tree box filters maintenance activity table in their LID manual ("A Guide to LID," 2020, pg. C-30).

Inspection	Frequency	Maintenance Activity	Effort
Inspect for trash and debris within tree box filters and at inlet and outlet structures.	Semiannual (Spring, Fall), as needed	Remove and dispose of trash and debris.	Low
Inspect performance.	Semiannual (Spring, Fall)	Replenish media filter layer with new mulch.	Moderate
Inspect for invasive species.	Semiannual (Spring, Fall)	Prune and weed filter box.	Moderate

Plant Selection

Tree box filters are primarily used for stormwater treatment and bioretention. This BMP usually receives more stormwater runoff pollution due to being located near roadways. It also receives water from every storm event. Therefore, the best plants for tree boxes:

- Can tolerate moist to boggy soils.
- Can tolerate salts and urban pollutants.
- Can uptake nutrients well.
- Can neutralize pollutants well.



Plant List Keys

Use these keys to interpret the following plant lists for each LID type.

For the Zone, refer to the [Plant Hardiness Zone map](#).

Each plant's soil needs are classified by type followed by a comma and the specialties.

Soil types:

Variety
Sandy
Clay
Loam
Gravel
Rocky

Soil specialties:

Rich
Dry
Wet
Humusy
Peaty
Acidic
Alkaline

Each plant's water needs are classified by the amount followed by a comma and the drainage type.

Water Amount:

Low
Moderate
High

Drainage Type:

Well-drained
Consistently moist

For the Drought Tolerant, Erosion Control, and Flooding Tolerant columns:

Y = Yes

N = No

Plant Type:

T = tree
SH = shrub
G = grass
P = perennial
GC = groundcover
V = vine
C = cactus
SU = succulent

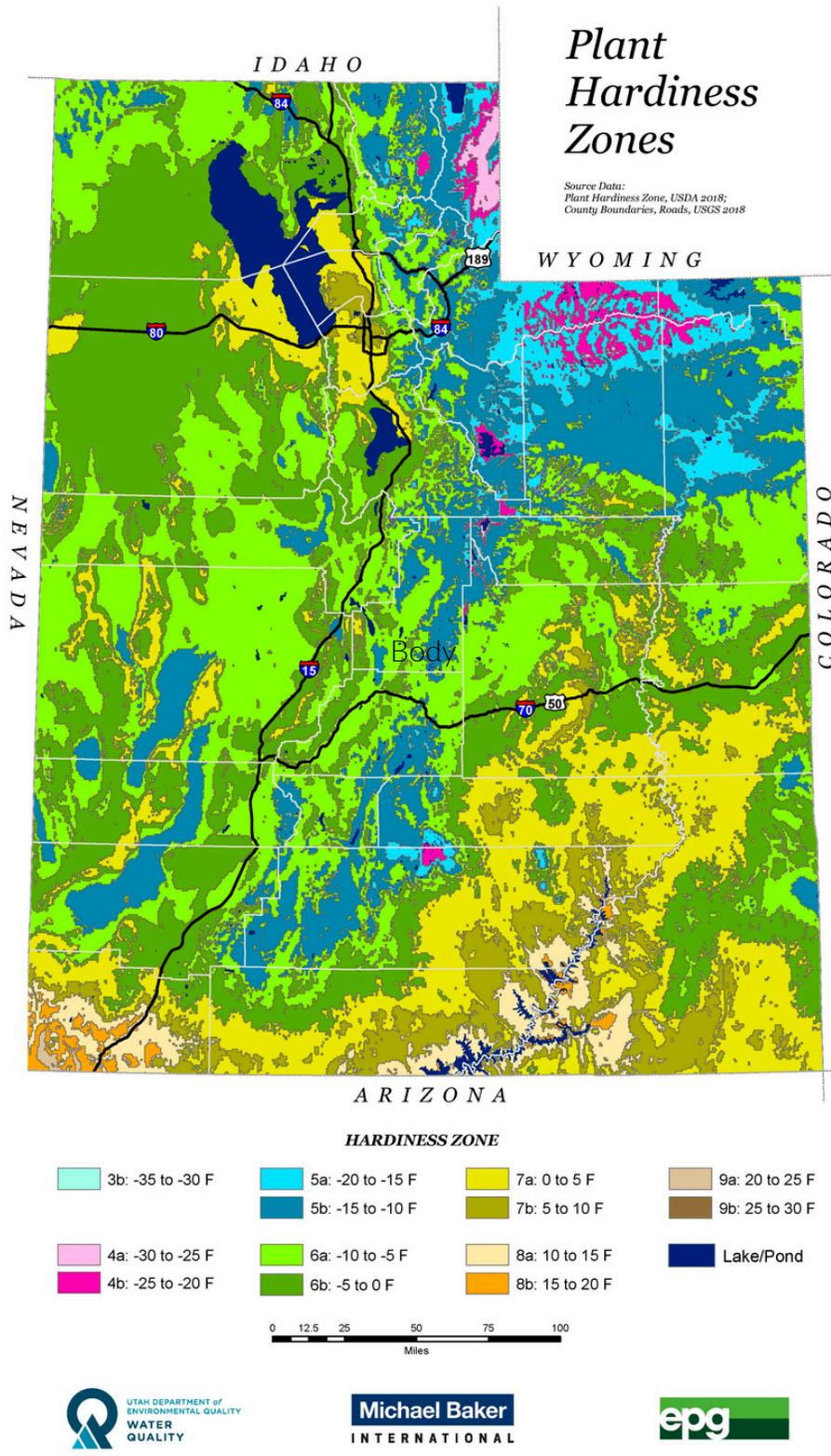
Growth Rate:

S = slow
M = moderate
F = fast

Light Needs:

○ = full sun
◐ = full sun to part shade
● = full shade

Plant Hardiness Zone Map



Source: Utah Division of Water Quality's "Plant Hardiness Zones" map included in their [LID manual](#) called "A Guide to Low Impact Development within Utah."

Tree Box Filters Plants List												
Scientific Name - Common Name	Plant Type	Zone	Drought Tolerance	Flooding Tolerance	Erosion Control	Growth Rate	Mature Size (HxW)	Light Needs	Soil Needs	Water Needs	Native	Benefits
Acer ginnala - Amur Maple	T	3b-8a	Y				H = 15-20' W = 15-20'	○	Clay, rich	Consistently moist	NE Asia, NW United States	
Acer macrophyllum - Big Leaf Maple	T	6a-7b					H = 40-75' W = 40-75'	○	Variety, acidic	Moderate, well-drained	British Columbia, S Alaska to CA	
Acer negundo 'Sensation' - Sensation Boxelder	T	4a-6b				F	H = 30' W = 25'	☼	Variety	Moderate		
Acer rubrum - Red Maple	T	3b-9b	Y	Y		M	H = 40-70' W = 30-50'	○	Variety, acidic	Moderate, well-drained	E and central North America	Cold tolerant Air pollution tolerant Attracts birds
Acer saccharinum - Silver Maple	T	4a-9b	Y	Y		F	H = 50-80' W = 35-70'	○	Sandy, variety	Moderate	E North America	Adaptable to salt Urban, air pollution tolerant
Acer tataricum - Tatarian Maple	T	3b-8b	Y			M	H = 25-30' W = 25'	○	Variety	Moderate, well-drained	SE Europe, W Asia	Adaptable growing conditions Adaptable to salt Urban pollution tolerant
Acer tataricum 'GarAnn' PP 15,023 - HOT WINGS® Tatarian maple	T	4a-9b	Y			M	H = 15-25' W = 15-20'	○	Variety	Moderate	SE Europe, W Asia	Adaptable growing conditions Adaptable to salt Urban pollution tolerant Attracts pollinators Wildlife resistant
Acer x freemanii 'Jeffersred' - Autumn Blaze Maple	T	3b-8b	Y	Y		F	H = 40-55' W = 30-40'	☼	Acidic	High, well-drained	Cultivated	Urban pollution tolerant Deer resistant
Betula occidentalis - Water Birch	T	3a-5b	Y	Y		F	H = 10-40' W = 10-30'	○	Variety	Moderate, consistently moist	Utah, W North America, S Canada	Adaptable to salt Wind tolerant Ornamental
Betula papyrifera - Paper Birch	T	3b-6b			Y	F	H = 50-70' W = 25-50'	○	Variety	Moderate, well-drained	North America	Adaptable to salt Pioneer species Deer resistant

Betula pendula - Silver Birch	T	3b-6b				F	H = 30-40' W = 15-30'	○	Variety, rich	Moderate, well- drained	Europe, Asia, W Siberia	Wind tolerant Ornamental Pioneer species Deer resistant
Betula pubescens - White Birch	T	3b-3b		Y		F	H = 30-65' W = 32'	○	Variety, acidic	High, consistently moist	N & central Europe, Russia, Siberia	Wind tolerant Wetland plant Nitrogen fixer Pioneer species Attracts wildlife
Celtis occidentalis - Common Hackberry	T	4a-9b	Y	Y		F	H = 40-60' W = 40-60'	○	Variety, rich	Low, well- drained	E & central North America	Adaptable growing conditions Adaptable to salt Heat, cold, wind tolerant Urban pollution tolerant Attracts pollinators, wildlife
Celtis occidentalis 'Prairie Pride' - Prairie Pride Hackberry	T	3b-9b	Y	Y		M	H = 50-60' W = 40-50'	○	Variety	Low, well- drained	E & central North America	Adaptable growing conditions Heat, cold, wind tolerant Urban pollution tolerant Attracts birds
Cercis canadensis - Eastern Redbud	T	5a-9b	Y			M	H = 20-30' W = 25-35'	○	Variety, acidic, alkaline	Moderate, well- drained	E & central North America	Urban pollution tolerant Ornamental Deer resistant Attracts pollinators, wildlife
Cercis canadensis 'Forest Pansy' - Forest Pansy Redbud	T	5a-9b				M	H = 20-30' W = 25-35'	○	Variety	Moderate, well- drained	E & central North America	Urban pollution tolerant Ornamental Deer resistant Attracts pollinators, wildlife
Cercis canadensis 'Ruby Falls' - Ruby Falls Redbud	T	6a-9b				M	H = 6-8' W = 4-6'	○	Variety, alkaline	Moderate, well- drained	E & central North America	Ornamental Deer resistant Attracts pollinators
Cercis canadensis 'The Rising Sun' - Rising Sun Redbud	T	6a-9b	Y			M	H = 8-12' W = 8-15'	○	Variety	Moderate		Adaptable growing conditions Heat, cold tolerant Urban pollution tolerant Ornamental Deer resistant Attracts pollinators
Nyssa sylvatica - Black Gum	T	3b-9b		Y			H = 30-50' W = 20-30'	○	Wet, acidic	High	E North America	Attracts birds

Taxodium distichum 'Shawnee Brave' - Shawnee Brave Bald Cypress	T	4a-9b			Y		H = 15-75' W = 15-20'	☉	Variety, acidic	Moderate	United States	Air pollution tolerant Deer resistant
Thuja occidentalis - American Arborvitae	T	3b-7b					H = 20-40' W = 10-15'	○	Variety	Moderate, well- drained	E United States, E to central Canada	Air pollution tolerant Attracts birds
Aronia arbutifolia 'Brilliantissima' - Brilliant Red Chokeberry	SH	4a-9b	Y	Y	Y	S	H = 5-8' W = 3-5'	○	Variety, peaty	Moderate, well- drained	E North America	Adaptable to salt Urban, air pollution tolerant Ornamental Wetland plant Deer resistant Attracts birds, pollinators
Aronia melanocarpa var. elata - Black Chokeberry	SH	4a-9b	Y	Y	Y	M	H = 5-8' W = 5-10'	○	Variety, peaty	Low, well- drained	E North America	Ornamental Wetland plant Deer resistant Attracts birds, pollinators
Berberis aquifolium - Barberry	SH	5a-8b	Y			S	H = 3-6' W = 2-5'	●	Variety, rich, acidic	Well-drained	N North America	Ornamental Deer resistant Attracts birds, pollinators
Berberis aquifolium repens - Creeping Oregon Grape	SH	5a-8b	Y		Y	M	H = 12-18" W = 12-18"	☉●	Variety, rich, acidic	Well-drained		Ornamental Deer resistant Attracts pollinators, wildlife
Celtis occidentalis - Common Hackberry	SH	4a-9b	Y				H = 40-60' W = 40-60'	○	Rich	Low, well- drained	NE & central North America	Air pollution tolerant Attracts birds, pollinators
Agrostis sp. - Redtop Bentgrass	G	3b-6b		Y	Y		H = 3-4'	○	Variety		Eurasia	Adaptable to salt Wetland plant
Buchloë dactyloides 'Legacy' - Legacy Buffalo Grass	G	3b-9b	Y			F	H = 4-6" W = 72"	☉	Clay, alkaline	Low		Attracts birds
Calamagrostis x acutiflora 'Eldorado' - Eldorado Feather Reed Grass	G	4a-9b	Y			M	H = 4-6' W = 2-2.5'	☉	Variety	Low		Attracts birds
Calamagrostis x acutiflora 'Karl Foerster' - Karl Foerster Feather Reed Grass	G	4a-9b	Y		Y	M	H = 3-5' W = 1.5-2.5'	☉	Variety, rich	Low	Europe, Asia	Air pollution tolerant Deer resistant
Calamagrostis x acutiflora 'Overdam' - Overdam Feather Reed Grass	G	5a-9b	Y		Y	M	H = 3-5' W = 2'	☉	Variety, rich	Low	Europe, Asia	Air pollution tolerant Deer resistant
Calamagrostis brachytricha - Korean feather reed grass	G	4a-9b	Y				H = 24-40" W = 20-24"	○	Variety	Low		Deer resistant
Carex 'Silver Sceptre' - Silver Scepter Sedge	G	5a-9b					H = 9-12" W = 9-18"	●	Variety	High	Japan	Deer resistant
Carex buchananii - Fox Red Curly Sedge	G	4b-9b	Y			S	H = 2-3' W = 2-3'	○	Variety, rich	Consistently moist	New Zealand	Deer, rabbit resistant

Cynodon dactylon - Bermuda Grass	G	7a-9b	Y		Y	F	H = 24" W = 20"	☉	Variety	Low to moderate	Europe, Africa, Australia, Asia	Heat tolerant
Deschampsia cespitosa 'Northern Lights' - Northern Lights Tufted Hair Grass	G	4a-9b			Y	M	H = 1-3' W = 1-3'	○	Variety, acidic	Moderate, consistently moist		Air pollution tolerant Deer resistant Attracts birds
Deschampsia cespitosa var. vivipara - Tufted Hair Grass	G	4a-9b					H = 2-3' W = 1-2'	○	Variety, rich	High, consistently moist		Air pollution tolerant Attracts birds
Elocharis palustris - Creeping Spike Rush	G	3b-8b		Y			H = 2-4' W = 1-2'	○	Wet	High, consistently moist	United States, Canada, Europe, Asia	Wetland plant
Eriogonum caespitosum - Mat Buckwheat	G	4a-9b					H = 4" W = 3'	○	Rocky		W United States	Cold tolerant Attracts pollinators
Festuca spp. - BioMeadow Fine Fescue Mix	G	4a-9b					H = 8-12" W = 6-8"	○		Moderate		Adaptable to salt
Festuca arundinacea - Dwarf Tall Fescue	G	5a-8b					H = 24-36" W = 12-18"	○	Clay	Moderate		Adaptable to salt
Festuca arundinacea 'Bolero' - BioTurf Dwarf Fescue Mix	G	5a-8b	Y			S	H = 2-3' W = 12-18"	○	Clay	Moderate		Heat tolerant Deer resistant
Festuca arundinacea 'Bonsai' - Bonsai Dwarf Tall Fescue	G	5a-8b					H = 24-36" W = 12-18"	○	Clay	Moderate		Deer resistant
Festuca glauca - Blue Fescue	G	4a-9b	Y				H = 9-12" W = 12-18"	☉	Variety	Low, moderate		Air pollution tolerant Ornamental
Glyceria striata - Fowl Manna Grass	G	3b-9b		Y			H = 2-4'	☉	Variety, rich	Moderate, consistently moist	North America	Wetland plant Deer resistant Attracts birds, pollinators
Imperata cylindrica 'Rubra' - Japanese Blood Grass	G	5a-9b	Y				H = 2-4' W = 2-4'	○	Variety	Low	Korea, Japan, China, India, E Africa	Air pollution tolerant Ornamental
Juncus effusus - Common Rush	G	4a-9b		Y	Y		H = 2-4' W = 2-4'	○	Wet	High, consistently moist	Britain, E & S Africa, Australia	Wetland plant
Koeleria macrantha 'BarKoel' - Turtleturf Prairie Junegrass	G	4a-9b					H = 4-18" W = 4-8"	○	Variety	Moderate		
Panicum virgatum 'Dallas Blues' - Dallas Blues Switch Grass	G	5a-9b	Y	Y	Y	M	H = 4-6' W = 2-3'	○	Sandy, clay	Low	Utah, North America	Air pollution tolerant Deer resistant Attracts birds
Panicum virgatum 'Cloud Nine' - Cloud Nine Switch Grass	G	5a-9b					H = 5-7' W = 2-3'	○	Variety	Moderate	Utah, North America	Adaptable to salt Attracts pollinators

Panicum virgatum 'Heavy Metal' - Heavy Metal Switch Grass	G	5a-9b	Y	Y	Y	F	H = 4-5' W = 1-3'	○	Sandy, clay	Low	North America	Air pollution tolerant Deer resistant Attracts birds
Panicum virgatum 'Prairie Sky' - Prairie Sky Switch Grass	G	4a-9b	Y		Y		H = 4-6' W = 2-3'	○	Sandy, clay	Low	E North America	Air pollution tolerant Attracts birds
Panicum virgatum 'Rotstrahlbusch' - Red Switch Grass	G	5a-9b	Y	Y	Y		H = 4-5' W = 2-3'	○	Variety	Low	E North America	Air pollution tolerant Attracts birds
Panicum virgatum 'Shenandoah' - Shenandoah Switch Grass	G	5a-9b	Y		Y	F	H = 3-4' W = 3-4'	○	Sandy, clay	Low	Utah, North America	Air pollution tolerant Deer resistant Attracts pollinators
Panicum virgatum 'Strictum' - Upright Switch Grass	G	4a-9b	Y			M	H = 4-6' W = 2-3'	⊙	Variety, dry	Low	Utah, North America	Attracts pollinators
Pennisetum alopecuroides 'Little Bunny' - Little Bunny Dwarf Fountain Grass	G	6a-9b	Y				H = 12-18" W = 18-24"	○	average, medium to wet soils	Moderate, consistently moist	E Asia	Adaptable to salt Air pollution tolerant Ornamental Deer resistant Attract birds
Schizachyrium scoparium - Little Bluestem	G	5a-9b	Y		Y		H = 2-4' W = 1.5-2'	⊙	Variety	Low, well-drained	North America	Heat tolerant Air pollution tolerant Ornamental Deer resistant Attracts pollinators
Schizachyrium scoparium 'Blaze' - Blaze Little Bluestem	G	4a-9b	Y		Y		H = 2-3' W = 1.5-2'	⊙	Variety	Low, well-drained	North America	Heat tolerant Air pollution tolerant Ornamental Deer resistant Attracts pollinators
Schizachyrium scoparium 'Prairie Blues' - Prairie Blues Little Bluestem	G	4a-9b	Y		Y		H = 32-36" W = 12-15"	○	Variety	Low, well-drained	North America	Heat tolerant Air pollution tolerant Ornamental Deer resistant Attracts pollinators
Schizachyrium scoparium 'Standing Ovation' - Standing Ovation little bluestem	G	3b-8b	Y		Y	F	H = 3-4' W = 1-2'	⊙	Variety	Low, moderate	North America	Air pollution tolerant Ornamental Deer resistant Attracts birds
Spartina pectinata - Prairie Cordgrass	G	4a-8b		Y			H = 20-30" W = 20-30"	⊙	Clay, loam, wet	High, consistently moist	North America	Wetland plant Deer resistant

Sporobolus airoides - Alkali Sacaton	G	4a-9b	Y				H = 4' W = 3'	○	Variety	Low, well- drained	North America	Adaptable to salt Deer resistant
Sporobolus wrightii - Giant sacaton	G	5a-8b	Y		Y	M	H = 5-7' W = 3-5'	○	Variety	Low	SW United States	Deer resistant
Sporobolus wrightii 'Windbreaker' - Windbreaker Giant Sacaton	G	5a-9b	Y				H = 8-10' W = 6'	⊙	Alkaline	Low, well- drained	New Mexico	Adaptable to salt Wind tolerant Deer resistant
Aquilegia caerulea - Rocky Mountain Columbine	P	3b-9b					H = 1-2' W = 1-2'	○	Variety	Moderate, well- drained	Utah, W North America	Deer, rabbit resistant Attracts birds
Aquilegia formosa - Western Columbine	P	3b-9b					H = 24-36" W = 18"	○	Sandy, loam	Moderate, well- drained	Utah, W North America	Rabbit resistant Attracts pollinators
Aquilegia McKana Group - McKana Hybrid Columbine	P	3b-9b					H = 2-2.5' W = 1-1.5'	○	Variety	Moderate, well- drained	N Hemisphere	Deer, rabbit resistant Attracts birds
Armeria maritima 'Bloodstone' - Bloodstone Thrift	P	3b-9b	Y		Y	M	H = 6-8" W = 12"	○	Sandy, loam	Low	North America	Deer, rabbit resistant
Armeria maritima 'Cotton Tail' - Cotton Tail Thrift	P	3b-9b	Y		Y	M	H = 4-6" W = 4-6"	⊙	Sandy, loam	Low	North America	Deer, rabbit resistant
Armeria maritima 'Düsseldorfer Stolz' - Dusseldorf Pride Thrift	P	3b-9b	Y				H = 6-12" W = 6-12"	⊙	Variety, dry	Low, well- drained		
Armeria maritima 'Rubifolia' - Red Leaf Thrift	P	3b-9b	Y		Y	M	H = 8-10" W = 12"	⊙	Sandy, loam, dry	Low, well- drained		Deer, rabbit resistant
Armeria maritima 'Splendens' - Splendens Common Thrift	P	3b-9b	Y		Y	M	H = 6-12" W = 6-12"	⊙	Variety, dry	Low, well- drained		Deer, rabbit resistant
Asarum caudatum - Wild Ginger	P	7a-9b	Y				H = 3-6" W = 6-18"	●	Variety, humusy, acidic	Moderate, consistently moist	W North America	Deer resistant
Verbena hastata - Blue Verain	P	3b-8b	N				H = 2-6' W = 1-2.5'	⊙	Variety, wet	High	W North America	Deer resistant Attracts pollinators
Asclepias speciosa Torr. - Showy Milkweed	P	5a-9b	Y			F	H = 1-3' W = 1-2'	○	Variety	Low, well- drained	Utah, W North America	Attracts wildlife, pollinators
Diachondra repens - Diochondra	GC	7a-9b	Y				H = 2"	○	Variety	Low, well- drained	Australia	
Nepeta racemosa 'Walker's Low' - Walker's Low Catmint	GC	4a-9b	Y				H = 2-2.5' W = 2..5-3'	○	Variety	Low, well- drained	Caucusus, N Iran	Adaptable to salt Air pollution tolerant Deer, rabbit resistant
Nepeta sibirica 'Souvenir d' André Chaudron' - Souvenir d Andre Chaudron Catmint	GC	3b-9b	Y				H = 1-3' W = 1-2'	○	Variety	Low, well- drained	Europe	Cold tolerant Deer resistant

Nepeta x faassenii 'Select Blue' - Select Blue Catmint	GC	4a-9b	Y			H = 1-1.5' W = 1-2'	○	Variety	Low, well- drained	Europe	Air pollution tolerant Disease resistant Deer, pest resistant
Nepeta 'Psfike' - Little Trudy Catmint	GC	4a-9b	Y		M	H = 8-14" W = 12-16"	○	Variety	Low, well- drained	Europe	Air pollution tolerant Deer, rabbit resistant Attracts pollinators

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