

Voluntary Guidelines for Selecting Horticultural Plant Material for Montana

Most plants used in horticulture and agriculture are not native to this continent. The vast majority of these introduced plants serve their purpose and benefit humankind without problem; however a few escape cultivation and become invasive. Indeed, deliberate introductions, such as tamarisk, Dalmatian toadflax and leafy spurge, are the single most common source of naturalized exotic plant pests in the United States. Invasive exotic plants pose a threat to Montana's native plant communities as well as our two most significant industries: agriculture and tourism. Many nursery professionals and landscapers are aware of the problem and would like to avoid introducing invasive plants.

These guidelines were developed by the Montana Landscape and Nursery Association and the Montana Native Plant Society. They are **VOLUNTARY**, meant to help nursery professionals and landscapers with recommendations regarding the selection of horticultural material. They are a rule-of-thumb not a mandate. The guidelines must be looked at **COLLECTIVELY**. None of the criteria is intended to stand alone. For example, lilac is sterile and has a long horticultural history without having become invasive; although it grows tall and spreads underground, it is not likely to become a problem. Contact your county weed supervisor if you suspect a plant of being invasive or if you have information on infestations (see Appendix A).

Studies conducted over the past fifteen years have addressed the question of identifying common characteristics of invasive plants. Although identifying which plants will become invasive with complete accuracy is not possible, four conclusions have emerged: (1) Exotic plants that originate in a similar climate, especially genera not found in North America, are more likely to become invasive here. (2) Species that are invasive elsewhere are more likely to be invasive here. (3) Plants with prolific seed production or vegetative spread are more likely to become invasive; shrubs and trees with animal dispersed fruits are more likely to become invasive. (4) Plants that grow rapidly are more likely to become invasive than smaller, slower-growing species. The following guidelines reflect the results of these studies (see Appendix C).

1. Use horticultural plants with a long history of non-invasiveness (e.g., daffodils, caragana).
2. Whenever possible use plants native to North America, especially to Montana and surrounding states (e.g., mock orange, elderberry, purple coneflower, liatris)
3. Choose plants and cultivars that do not produce viable seed (e.g., petunia, lilac)
4. Avoid plants that produce prolific seeds or fruits, especially woody plants with edible fruit dispersed by animals (e.g., buckthorn, Russian olive).
5. Avoid plants that spread aggressively by roots or underground stems as well as seed.
6. Avoid plants that grow rapidly and become tall quickly.
7. Be cautious of exotics that originate in parts of Europe, Asia, Africa, South America and Australia with a climate similar to Montana. Know where plants originate (Dirr, 1998) .
8. Don't use plants that are known to be invasive in Montana; it is unlawful to use plants listed as noxious by the Montana Dept. of Agriculture (see Appendix A). Avoid using plants or their close relatives that are invasive elsewhere in western North America, (Appendix B). Plant invasions start in one place first; invasive plants don't become invasive everywhere at once.

Guidelines and Appendix A, B, and C can be found at www.mtnativeplants.org/ Find the link under Native Plant Conservation

Appendix A. State noxious weed list determined by the Montana Department of Agriculture. Many counties have lists compiled by county weed boards containing additional species that are a problem in their county but are not yet listed for the state as a whole.

Noxious weeds listed by Montana State Department of Agriculture

Cardaria draba (whitetop)
Centaurea diffusa (diffuse knapweed)
Centaurea maculosa (spotted knapweed)
Centaurea repens (Russian knapweed)
Centaurea solstitialis (yellow starthistle)
Chondrilla juncea (rush skeletonweed)
Chrysanthemum leucanthemum (ox-eye daisy)
Cirsium arvense (Canada thistle)
Convolvulus arvensis (field bindweed)
Cynoglossum officinale (houndstongue)
Crupina vulgaris (common crupina)
Euphorbia esula (leafy spurge)
Hieracium aurantiacum (orange hawkweed)
Hieracium pratense (meadow hawkweed)
Hypericum perforatum (St. Johnswort)
Isatis tinctoria (dyers woad)
Linaria dalmatica (Dalmatian toadflax)
Lythrum salicaria, *L. virgatum* (purple loosestrife)
Potentilla recta (sulfur cinquefoil)
Ranunculus acris (tall buttercup)
Senecio jacobea (tansy ragwort)
Tamarix ramosissima (tamarisk)
Tanacetum vulgare (common tansy)

Plants listed as noxious by one or more Montana counties (partial list)

Anthemis cotula (dog fennel)
Artemisia absinthium (absinth wormwood)
Azolla mexicana (mosquito fern)
Butomus umbellatus (flowering rush)
Campanula rapunculoides (creeping bellflower)
Carum carvi (caraway)
Centaurea X pratensis (Meadow knapweed)
Cichorium intybus (chicory)
Cytisus scoparius (Scotch broom)
Dipsacus sylvestris (teasel)
Echium vulgare (blueweed)
Elaeagnus angustifolia (Russian olive)
Gypsophila paniculata (baby's breath)
Hydrilla verticillata (water thyme)
Iris pseudacorus (yellow iris)
Knautia arvensis (bluebuttons)
Linnaria vulgaris (common toadflax, butter-and-eggs)
Lycium barbarum (matrimony vine)
Myriophyllum spicatum (Eurasian water milfoil)
Polygonum cuspidatum (Japanese knotweed)
Reseda lutea (yellow mignonette)
Salvia nemorosa (woodland sage)
Silybum marianum (milkthistle)

Appendix B. Exotic plants listed as noxious weeds in one or more western states or provinces: Alberta (AL), British Columbia (BC), Colorado (CO), Idaho (ID), Nebraska (NE), North Dakota (ND), Oregon (OR), Saskatchewan (SK), South Dakota (SD), Utah (UT), Washington (WA), Wyoming (WY).

Abutilon theophrasti (CO, OR, WA, BC)
Acaena novae-zelandiae (OR)
Aegilops cylindrica (WA, ID, CO, BC, OR)
Aegilops geniculata (OR)
Aegilops tauschii (OR)
Aegilops triuncialis (OR)
Aegilops ventricosa (OR)
Alhagi maurorum (WA, OR, CO)
Alliaria petiolata (WA)
Alopecurus myosuroides (WA)
Alternanthera philoxeroides (SK)
Amaranthus retroflexus (AL)
Anchusa officinalis (WA, BC)
Anchusa arvensis (WA)
Anoda cristata (CO)
Anthemis cotula (CO)

Anthemis arvensis (CO)
Anthriscus sylvestris (BC, WA)
Arctium minus (BC, CO, WY)
Artemisia absinthium (ND, CO)
Avena fatua (AL, CO, BC)
Azolla pinnata (SK)
Berteroa incana (BC)
Brassica rapa (CO)
Bromus tectorum (AL, CO)
Bryonia alba (WA)
Cabomba caroliniana (WA)
Calystegia sepium (AL)
Campanula rapunculoides (AL)
Capsella bursa-pastoris (AL, CO)
Cardaria spp. (all)
Carduus pycnocephalus (OR, WA)
Carduus nutans (OR, UT, WA, ID, NE, CO, WY, AL, ND)
Carduus tenuiflorus (OR, WA)
Carduus acanthoides (WY, NE, CO, BC, WA)
Carthamus baeticus (OR)
Carthamus leucocaulos (OR)
Carthamus oxyacantha (OR)
Carthamus lanatus (OR)
Carum carvi (CO)
Caulerpa taxifolia (SK)
Cenchrus longispinus (WA)
Centaurea calcitrapa (OR, WA, CO)
Centaurea diffusa (OR, AL, WA, WY, ID, ND, CO, NE, BC, UT)
Centaurea iberica (OR)
Centaurea jacea (WA)
Centaurea macrocephala (OR, WA)
Centaurea maculosa (ID, AL, OR, CO, WA, NE, BC, UT, WY, ND)
Centaurea nigra (WA)
Centaurea nigrescens (WA, OR)
Centaurea pratensis (WA, OR, BC, ID)
Centaurea repens (CO, BC, UT, AL, WA, ND, SD, OR,)
Centaurea solstitialis (AL, WA, OR, UT, CO, UT, NE, ND)
Centaurea trichocephala (OR)
Centaurea triumphettii (CO, UT, OR)
Cerastium vulgatum (AL)
Chondrilla juncea (BC, OR, WA, ID, CO)
Chorisporea tenella (CO)
Chrysanthemum leucanthemum (AL, WY, BC, WA, CO)
Cichorium intybus (CO)
Cirsium palustre (BC)
Cirsium arvense (all)
Cirsium vulgare (OR, CO, WA)
Clematis vitalba (WA)
Clematis orientalis (CO)
Conium maculatum (ID, CO, OR, WA)
Convolvulus arvensis (SD, OR, WA, UT, CO, AL, ID, ND, WY)
Crepis tectorum (AL)
Crupina vulgaris (OR, ID, WA, BC, CO)

Cuscuta spp. (OR, WA, BC, AL)
Cynodon dactylon (UT)
Cynoglossum officinale (AL, BC, WY, CO, WA, OR)
Cyperus rotundus (BC, OR,)
Cyperus esculentus (BC, WA, CO, OR)
Cytisus scoparius (WA, OR, ID)
Cytisus striatus (OR)
Datura stramonium (CO)
Daucus carota (WA)
Descurainia sophia (CO, AL)
Dipsacus fullonum (CO)
Echium vulgare (BC, WA, AL)
Egeria densa (OR, WA, SK)
Eichhornia azurea (SK)
Eichhornia crassipes (SK)
Elaeagnus angustifolia (CO)
Elytrigia repens (BC, OR, UT, CO, WY, AL)
Erodium cicutarium (CO, AL)
Erucastrum gallicum (AL)
Erysimum cheiranthoides (AL)
Euphorbia cyparissias (AL, CO)
Euphorbia dentata (ID)
Euphorbia esula (all)
Euphorbia myrsinites (WA, CO,)
Euphorbia oblongata (WA)
Fagopyrum tartaricum (BC, AL)
Galega officinalis (WA)
Galeopsis tetrahit (AL)
Galium spurium (AL)
Genista monspessulana (OR)
Geranium robertianum (WA)
Gypsophila paniculata (WA)
Halogeton glomeratus (OR, CO)
Hedera helix (OR, WA)
Helianthus ciliaris (WA, OR)
Hemizonia pungens (WA, OR)
Heracleum mantegazzianum (OR, WA)
Hesperis matronalis (CO)
Hibiscus trionum (CO)
Hieracium atratum (WA)
Hieracium aurantiacum (WA, CO, ID, BC)
Hieracium caespitosum (ID, WA)
Hieracium floribundum (WA)
Hieracium pilosella (WA)
Hydrilla verticillata (OR, CO, SK, WA)
Hygrophila polysperma (SK)
Hyoscyamus niger (ID, CO, WA)
Hypericum perforatum (OR, WA, CO)
Hypochaeris radicata (WA)
Impatiens glandulifera (WA)
Ipomoea aquatica (SK)
Iris pseudacorus (WA)
Isatis tinctoria (CO, ID, WA, WY, OR, UT)

Knautia arvensis (AL, BC)
Kochia scoparia (BC, CO, WA, OR)
Lagarosiphon major (SK)
Lamium amplexicaule (AL)
Lappula squarrosa (AL)
Lepidium latifolium (UT, OR, ID, CO, BC, WA, WY)
Lepyrodiclis holosteoides (WA, OR)
Limnophila sessiliflora (SK)
Linaria dalmatica (OR, WA, ND, WY, BC, ID, AL, CO)
Linaria vulgaris (CO, WA, OR, WY, BC, ID, AL)
Lolium persicum (AL)
Ludwigia uruguayensis (SK, WA)
Lysimachia vulgaris (WA)
Lythrum salicaria (all)
Lythrum virgatum (WA, NE, ND)
Madia sativa (CO)
Malva rotundifolia (AL)
Matricaria maritima (AL, WA, BC)
Melaleuca quinquenervia (SK)
Milium vernale (ID)
Monochoria vaginalis (SK)
Monochoria hastata (SK)
Myriophyllum spicatum (SK, AL, CO, ID, WA, OR)
Myriophyllum aquaticum (WA)
Najas minor (SK)
Nardus stricta (ID, OR)
Neslia paniculata (AL)
Nymphaea odorata (WA)
Nymphoides peltata (WA)
Odontites vernus (AL)
Onopordum acanthium (UT, ID, BC, WY, OR, WA, CO)
Onopordum tauricum (CO)
Ottelia alismoides (SK)
Panicum miliaceum (CO, OR)
Peganum harmala (OR, CO)
Phalaris arundinacea (WA)
Phragmites australis (WA, SK)
Picris hieracioides (WA)
Pistia stratiotes (SK)
Polygonum convolvulus (AL)
Polygonum cuspidatum (WA, OR)
Polygonum persicaria (AL)
Polygonum polystachyum (OR, WA)
Polygonum sachalinense (WA, OR)
Potentilla recta (OR, WA, CO, BC)
Potentilla norvegica (AL)
Pueraria montana (OR, WA)
Ranunculus acris (AL)
Raphanus raphanistrum (AL)
Rorippa austriaca (WA)
Rubus discolor (OR)
Salsola kali (AL, CO, BC)
Salsola collina (CO)

Salvia aethiopsis (OR, CO, WA)
Salvia pratensis (WA)
Salvia sclarea (WA)
Salvinia molesta (CO)
Salvinia herzogii (SK)
Saponaria officinalis (CO)
Scleranthus annuus (AL)
Secale cereale (WA)
Senecio jacobaea (WA, CO, ID, BC, OR)
Senecio vulgaris (CO)
Setaria viridis (CO, BC)
Setaria pumila (CO)
Setaria viridis (AL)
Silene cserei (AL)
Silene latifolia (AL, BC, WA, AL,)
Silene noctiflora (AL, BC)
Silybum marianum (OR, WA)
Sinapis arvensis (CO, AL, BC)
Solanum elaeagnifolium (WA, ID, OR,)
Solanum nigrum (CO)
Solanum sarrachoides (CO)
Solanum tampicense (SK)
Soliva sessilis (WA)
Sonchus arvensis (SD, ID, BC, CO, WY, AL, WA)
Sonchus oleraceus (BC, AL)
Sorghum halepense (UT, OR, WA, ID, CO)
Sparganium erectum (SK)
Spartina alterniflora (OR, WA)
Spartina anglica (OR, WA)
Spartina densiflora (OR, WA)
Spartina patens (WA, OR)
Spartium junceum (OR, WA)
Spergula arvensis (AL)
Sphaerophysa salsula (OR, CO, WA)
Stellaria media (AL)
Taeniatherum caput-medusae (OR, UT, CO)
Tamarix ramosissima (CO, WY, WA, ND)
Tamarix parviflora (CO)
Tanacetum vulgare (CO, WA, BC, AL)
Taraxacum officinale (AL)
Thlaspi arvensis (AL)
Thymelaea passerina (WA)
Torilis arvensis (WA)
Trapa natans (SK)
Tribulus terrestris (ID, CO, BC, OR, WA)
Tussilago farfara (OR)
Ulex europaeus (WA, OR, BC)
Vaccaria hispanica (AL)
Verbascum blattaria (CO)
Verbascum thapsus (CO)
Xanthium spinosum (OR, WA)
Zygophyllum fabago (ID, OR, WA)

C. Review of evidence for common attributes among invasive plants.

(1) Exotic plants that originate in a similar climate, especially genera not found in North America, are more likely to become invasive here. Darwin, in his book “On the Origin of Species” (1859), noted that of the 162 genera of naturalized plants known from northeastern North America at the time, 100 were indigenous to other continents. Species in genera not native to California are significantly over-represented in the state’s weed flora (Rejmanek 1996), while most of the 20 invasive species in the Czech Republic analyzed by Pysek et al. (1995) were of Asian or North American origin. Reichard and Hamilton (1997) identified 350 woody plant species introduced into the U.S. before 1930. They found that species from other parts of North America were unlikely to become invasive when introduced outside their native range in the U.S.

Almost three dozen species of American evening primroses (*Oenothera*) have been introduced into Europe, many for horticultural purposes. Mihulka and Pysek (2001) found that the most invasive species came from climates very similar to those of the places in Europe they invaded. Panetta and Mitchell (1991) found that knowing the climate of those portions of Australia invaded by Cape tulip (*Homeria flaccida*) allowed them to accurately predict its range in New Zealand. Only 20 trees and shrubs have become invasive in the South African chaparral (fynbos), although several hundred have been introduced. Most of these 20 came from other regions with a similar climate (Tucker and Richardson 1995). Pines are common and native to the Northern Hemisphere, and many have been introduced in the Southern Hemisphere. Pines that have proven invasive are more likely to be native to regions with a similar climate (Rejmanek 1995, 1996). Many plants invading New Zealand roadsides, such as viper’s bugloss (*Echium vulgare*) and Scotch thistle (*Onopordum acanthium*), occur in a similar climate in their native European range; however, this climatic correlation does not always occur (Wilson et al. 1992).

(2) Species that are invasive elsewhere are more likely to be invasive here. A large proportion of native Montana plants that have become weeds in other parts of the world are common and widespread in their native North American range (Lesica 2001). Williamson and Fitter (1996) analyzed the British flora of 1777 native and naturalized species (500 less than Montana) and found that invasive plants tend to be more widespread and have higher local abundance compared to non-invasive species. Goodwin et al. (1999) compared each of 165 European species that were naturalized in New Brunswick, Canada with an ecologically similar European species in the same genus that had not invaded. They found that the invasive species of the pairs had larger native geographic range in 70% of the cases. Of Northern European plants introduced into North America, those with the largest European range are the most invasive (Rejmanek 1996). Brome grasses (*Bromus* spp.) with the largest native ranges have invaded the largest number of continents (Roy et al. 1991). Species of bugloss (*Echium*) invasive in Australia have larger native ranges than most species that have not invaded (Forcella et al. 1986). A large proportion of invasive species in the British Isles are invasive elsewhere (Williamson and Fitter 1996). Woody plants that are invasive elsewhere are likely to be invasive in the U.S. (Reichard and Hamilton 1997). Native South African plants that are weedy and/or widespread in their home country were more likely to be invasive in Australian agricultural areas, especially if they are closely related to other invasive plants (Scott and Panetta 1993).

(3) Plants with prolific seed production or vegetative spread are more likely to become invasive; shrubs and trees with animal dispersed fruits are more likely to become invasive. Introduced pines that have become invasive in the Southern Hemisphere have higher seed production than those that are non-invasive (Rejmanek 1995, Rejmanek and Richardson 1996). Higher seed production was a trait that Perrins et al. (1993) associated with invasiveness among three species of jewelweed introduced in Britain. Most of the trees and shrubs that have become invasive in the South African chaparral (fynbos), have a higher seed output compared to those that have not become troublesome (Tucker and Richardson 1995). Based on theories of population dynamics, Noble (1989) predicted that species with a high reproductive output will have a high invasive potential, and it stands to reason that, all other things being equal, plants that produce more seed will spread more quickly.

Some species of pine as well as woody broad-leaved plants appear to be invasive by virtue of having large fruits or seeds that are dispersed by birds or mammals (Rejmanek 1995, Rejmanek and Richardson 1996). The ability to spread vegetatively was strongly associated with invasiveness among broad-leaved woody plants introduced into the U.S. prior to 1930 (Reichard and Hamilton 1997).

(4) Plants that grow rapidly are more likely to become invasive than smaller, slower-growing species. Perrins et al. (1993) compared three species of North American jewelweed (*Impatiens*) that were naturalized in Britain. Their experiments suggested that fast growth and large size were traits responsible for increased invasiveness. There was a strong tendency for the most invasive plants in native habitats of the Czech Republic to be the tallest, even when

trees and shrubs were omitted from the analysis (Pysek et al. 1995). Invasive exotics in Britain are taller, on average, than the native flora (Williamson and Fitter 1996). It stands to reason that plants able to grow rapidly are more likely to compete for light with native vegetation.

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