Appendix B—Propagation and Establishment of Requirements for Selected Plant Species

The information displayed for each plant species was gleaned from just a few sources. Additional information is available for these plant species, but this chart should provide a starting point. In the *Propagation Method* column, numbers in **bold** text indicate the method of propagation that the literature suggested would be the most successful. In the *References* column, authors in **bold** text indicate works with more complete descriptions.

Key to Propagation Methods

1. Seed
    a. Cold moist stratification: the number of days required for stratification follows (for example, 1a: 60)
    b. Scarification
    c. Water leaching
    d. Treatment with sulfuric acid
    e. No treatment needed
    f. Warm/cold stratification (days required for warm/cold stratification; for example, 1f: 45/140)
    g. Other
2. Semihardwood stem cuttings
3. Hardwood stem cuttings (firm stems after leaves have dropped)
4. Softwood or herbaceous cuttings
5. Root cuttings
6. Leaf cuttings
7. Leaf bud cuttings
8. Divisions
9. Simple layering
10. Mound layering
11. Trench layering
12. Tip layering
13. Seed-increase program

Scientific name Common name	Propagation method	References	Remarks
Abies spp.	1a: 14–28	Young and Young 1986	Germinates in or on melting snowbanks in the wild.
Abies grandis Grand fir	1a: 15–30	Rose and others 1998	The seed is fragile and requires afterripening in the cone. Do not extract it immediately. Stratify and sow the seed 0.2 inch (5 millimeters) deep during the spring.
Abies lasiocarpa Subalpine fir	1, 2	Weisberg 1993	
Abronia latifolia Yellow sand verbena	1	Schmidt 1980	Direct sow the seed during the fall on sandy soil in full sun. Expect spotty germination. Seedlings do not tolerate disturbance.
Abronia umbellata Pink sand verbena	1	Schmidt 1980	Direct sow the seeds during the fall. Protect the seedlings from moles and rabbits until they have become established.
Abronia villosa Desert sand verbena	1	Schmidt 1980	Annual species. Direct sow the seed on sandy soil during the fall or early spring.
Acer circinatum Vine maple	1a: 120–240 or 1f: 30–60 warm/ 30–90 cold	**Potash and Aubry 1997** Landis and Simonich 1983 **Link 1993** Rose and others 1998	Collect the seed when it is green, from August to October. Stratify the seed immediately or plant the seed on the site. Start the seed during the spring. It takes 3 to 4 months to grow. Bareroot and containerized stock also have been planted successfully.
Acer glabrum Rocky Mountain maple	1f: 180 warm/180 cold	**Link 1993** Rose and others 1998	Apply seed directly on the site. Expect 25-percent germination.
Acer macrophyllum Bigleaf maple	1a: 40–80, 8	Weisberg 1993 **Rose and others 1998**	Seed decays rapidly. Collect seed late in the fall before the rains. Stratify the seed before sowing it at 34 to 41 degrees Fahrenheit (1 to 5 degrees Celsius). Sow during February or early March or plant directly during the fall.

Scientific name Common name	Propagation method	References	Remarks
Achillea millefolium Western yarrow	1, 8 (spring)	Potash and Aubry 1997 **Rose and others 1998** Young and Young 1986	Seed ripens between August 1 and October 31. Cut off the seed heads. Plant seed directly during the fall or late April, or plant 1.6-inch (40-millimeter) rhizome fragments. Lift divisions during the early spring and divide them into small groups of rosettes. Cut back the leaves and plant them.
Achlys triphylla Vanilla leaf	8	Weisberg 1993	
Actaea rubra Baneberry	1, 1a	Schmidt 1980	Remove the seed from pulpy fruit. Add peat or wood humus to the soil before sowing the seed. If germination is poor, cold stratification may help.
Adenocaulon bicolor Trail plant	8	Weisberg 1993	
Adenostoma fasciculatum Chamise	1d	Young and Young 1992	The hard seedcoat requires acid treatment. An alternative is to sow seed in soil in flats and burn pine needles on the surface.
Adenostoma sparsifolium Red shank	1d	Young and Young 1986	Treat seed in sulfuric acid for 15 minutes.
Adiantum spp. Maidenhair fern	8, spores	**Schmidt 1980**	Schmidt (1980) includes the complete protocol for propagating ferns from spores.
Aesculus californica California buckeye	1e	Harris and Leiser 1979	Direct seed during the fall.
Agave utahensis Century plant	1e	**Link 1993**	Grow seedlings in deep-ridged containers with well-drained medium. Fertilize seedlings with each watering.
Agoseris glauca	1	Weisberg 1993	

Scientific name Common name	Propagation method	References	Remarks
Agropyron macrourum	1e, 13	Densmore and others 1990 Young and Young 1986	
Agropyron spicatum Bluebunch wheatgrass	1e	Rose and others 1998	Collect seed during the fall. Remove awns with a hammer mill. Sow a minimum of 100 to 160 seeds per square acre during the fall.
Agrostis scabra Rough bentgrass	1e	**Link 1993**	Seed ripens from July 15 to August 15. Collect seed for a seed-increase program. Broadcast the seed and rake it into the soil.
Ailanthus altissima Tree of heaven	1a: 60	Young and Young 1986	
Allium spp.	1a	Young and Young 1986	
Alnus spp.	1a: 180	Young and Young 1986 Hartmann and others 1990	Thoroughly clean the seed. Sow the seed when it is fresh or chill the seed before planting.
Alnus crispa	1	Densmore and others 1990	This alder fixes nitrogen. Inoculate its seedlings with a solution made from root nodules.
Alnus incana Thinleaf alder	1a: 180, 1e, 4	Rose and others 1998	Collect fruit during the fall when the bracts start to separate. Fresh seed will not stratify. Dried seed stratifies at 41 degrees Fahrenheit (5 degrees Celsius). Sow during the spring.
Alnus rubra Red alder	**1e**, 4	**Potash and Aubry 1997** Rose and others 1998	This alder fixes nitrogen. The seed ripens from September 1 to October 15. Seed from the upper one-third of the tree is more likely to be viable. The seed is ripe when the strobile (a fruiting structure characterized by rows of overlapping scales) twists easily and its scales part. Start seed during the spring or sow onsite during the fall. Seed needs light to germinate. Plants are more likely to become established when they are planted in mineral soil, watered, and supplied with fertilizer that is low in nitrogen and high in phosphorus.

Scientific name Common name	Propagation method	References	Remarks
Alnus sinuata Sitka alder	**1a: 30–90**, 4	**Potash and Aubry 1997** Rose and others 1998	This alder fixes nitrogen. See *Alnus rubra* for instructions on handling seed. Inoculate the planting medium with root nodules.
Amelanchier alnifolia Saskatoon serviceberry	1e or 1a: 112–168, 5, 8	**Rose and others 1998**	Collect seed during the late summer. Macerate fruit with water. The seed has a tendency to develop fungal mold. Plant the seed during the winter or stratify the seed at 34 to 43 degrees Fahrenheit (1 to 6 degrees Celsius) and plant it in sandy soil during the spring. Take root cuttings from December to February. Cut segments of fleshy roots 2 inches (50 millimeters) long. The cut should be horizontal at the end closest to the root crown and slanted at the end farthest from the crown. For reproduction by division, divide plants during the early spring.
Amelanchier utahensis Utah serviceberry	1a: 60 4	**Link 1993**	Seed ripens between April 1 and August 31. Clean seed by macerating fruit and washing the pulp over screens. Dry the pulp, then rub the seed through the screens.
Amorpha californica California false indigo	1e	Young and Young 1992	Soaking seed in hot water for 10 minutes may improve germination.
Amorpha canescens	1e	Young and Young 1992	
Amorpha fruticosa	1e	Young and Young 1992	
Amorpha nana	1e	Young and Young 1992	
Anaphalis margaritacea Pearly-everlasting	1e, 8 (spring or fall)	Potash and Aubry 1997 **Rose and others 1998**	Seed ripens between July 1 and October 31 when the flower's center is dark brown. Collect the entire seed head. The pappus (hairs or bristles attached to an achene) can remain on the seed. Sow seed under a thin layer of soil during the spring. For reproduction by division, replant the divided plants during the spring or fall.
Andromeda polifolia Bog rosemary	1a, **2**	Young and Young 1992	The seed needs prechilling. Winter cuttings can be rooted easily.

Scientific name Common name	Propagation method	References	Remarks
Andropogon gerardii Bluestem	1a: 14	Young and Young 1986	The seed needs light and potassium nitrate (KNO_3) to germinate.
Andropogon hallii	1a: 14	Young and Young 1986	The seed needs light and potassium nitrate (KNO_3) to germinate.
Andropogon virginicus Broomsedge bluestem	1e	**Link 1993**	The seed is very difficult to collect and clean because the very small seed is encased in hairy appendages and the leaf sheath.
Anemone multifida Cutleaf anemone	1e	**Link 1993**	Direct seed.
Anemone occidentalis Western pasqueflower	1a: 30–90	**Link 1993**	The seed ripens between August 1 and 31. Dry the seed in an oven to break off the long, plumose tails. During greenhouse trials, seedlings emerged, but did not survive.
Antennaria alpina Alpine pussytoes	1	Weisberg 1993	
Antennaria corymbosa Pussytoes	8	**Link 1993**	When plants that had been divided were planted above the crown, they died back.
Antennaria microphylla Littleleaf pussytoes	1e	**Link 1993**	The seed ripens between June 15 and July 15. Seed production is low. Use cone-tainers or direct seed.
Antennaria neglecta Field pussytoes	1e	**Link 1993**	The seed ripens between June 15 and July 10. Seed production is low. Use cone-tainers or direct seed.
Aquilegia formosa Red columbine	1e	**Link 1993** Rose and others 1998 Young and Young 1986	The seed ripens between June 1 and August 15. Start seed during the spring or fall in cone-tainers or use direct seeding. Seed needs to be chilled for 3 days before planting or it will not germinate.
Arabis spp. Rock cress	1	Young and Young 1986	Seed requires light and potassium nitrate (KNO_3) to germinate.

Scientific name Common name	Propagation method	References	Remarks
Aralia spp. Ginseng	1a, 1b	Young and Young 1992	May need a period of afterripening and scarification, followed by prechilling.
Arbutus menziesii Pacific madrone	1a: 30–90, 4, 9	Rose and others 1998 Young and Young 1992	Collect berries from October to December. Macerate the berries and separate the seed by drying or flotation. Stratify at 36 to 41 degrees Fahrenheit (2 to 5 degrees Celsius) or stratify naturally outdoors over winter.
Arctostaphylos spp. Manzanita	1d, 1f: 60–120/60–90 Cuttings	Landis and Simonich 1983 **Young and Young 1992**	Scarify the seed in sulfuric acid for 3 to 6 hours. Use warm/cold stratification.
Arctostaphylos columbiana Bristly manzanita	2	Weisberg 1993	
Arctostaphylos nevadensis Pinemat manzanita	1a, 1b, 1d, **3**, **4**	**Link 1993** Rose and others 1998	Use cuttings from 1- or 2-year-old wood. Seed is difficult to germinate.
Arctostaphylos patula Greenleaf manzanita	1a: 90, 1b, **4**	**Rose and others 1998**	Seed ripens from July to September. Macerate the fruit and separate the seed using floatation. Scarify the seed in hot water and stratify the seed at 39 degrees Fahrenheit (4 degrees Celsius) in moist sand. Seed can be sown in coarse soil during the early summer. Keep the seedbed mulched over the winter. Take cuttings from stems with five to six nodes of the current year's growth.
Arctostaphylos uva-ursi Kinnikinnick	1d or 1d then f: 60 warm/60 cold 2, 5	**Potash and Aubry 1997** **Rose and others 1998**	The fruit is ripe when it is red or pink, usually from June 1 to October 15. Collect stem cuttings 2 to 6 inches (50 to 150 millimeters) long during the fall. Collect 3- to 5-inch (75- to 150-millimeter) root cuttings during the fall. Separate the seed by flotation or by grinding when the seed is dry. Establish seedlings on well-drained sandy or gravelly soils.
Arctostaphylos viscida Whiteleaf manzanita	1a, 1b, 9	Rose and others 1998	Plant seed during the late summer. Seed needs heat and mechanical or chemical scarification. Stratify the seed over the winter.

Scientific name Common name	Propagation method	References	Remarks
Aristidia longiseta	1e	Young and Young 1986	
Aristidia purpurea Triple-awned grass	1e	Young and Young 1986	
Arnica spp.	8	Weisberg 1993	
Arnica frigida	1	Densmore and others 1990	
Arnica latifolia Mountain arnica	1	Weisberg 1993	
Arnica sororia Twin arnica	1e	**Link 1993**	Seed ripens between July 15 and 31. Seed production is low. Plant in cone-tainers.
Artemesia arbuscula Low sagebrush	1a: 60	**Link 1993** Young and Young 1992	Seed ripens between October 1 and December 31. Sow in rows and transplant to pots or direct sow the seed under ¼ inch (6 millimeters) of soil and cover with light mulch.
Artemesia frigida Fringed sagebrush	1a: 10, 1d	**Link 1993**	Seed ripens during the fall. Direct sow the seed on top of the soil if the soil is moist. Fringed sagebrush is easy to propagate.
Artemesia ludoviciana Sagewort	1a: 14, 1d	**Link 1993**	Seed ripens between July 15 and October 15. Grow in containers or direct seed. Sagewort is easy to grow.
Artemesia tilesii	1	Densmore and others 1990	
Artemesia tridentata Big sagebrush	1a: 0–10, 3	Landis and Simonich 1983 Rose and others 1998	Seed ripens between November 5 and January 15. Start seedlings during the spring, summer, or fall. Seed takes 2 to 3 months to grow.
Aruncus sylvester Goatsbeard	1, 8 (spring)	Potash and Aubry 1997	Seed ripens between July 1 and November 30. Shake the seed loose or strip the heads. Sow seed during the fall when the soil is moist.

Scientific name Common name	Propagation method	References	Remarks
Asarum caudatum Wild ginger	1, 5, **8**	Weisberg 1993 **Rose and others 1998**	Mature seed is difficult to collect, but the plant readily seeds itself. For divisions, divide the plant during the early spring or fall when it is dormant. Plant the rhizomes 0.4 inch (10 millimeters) deep with the tip reaching the soil level. Keep the soil moist by mulching. Take cuttings during the summer; start them in sand for planting during the fall.
Asarum hartwegii Marble-leaf ginger	1, 5, 8	Schmidt 1980	Same as *Asarum caudatum*.
Asclepias cordifolia Purple milkweed	1	Schmidt 1980	Requires sun and porous soil.
Asclepias speciosa Butterfly weed	1, 5	Schmidt 1980	Spreads rapidly underground. Butterfly weed is a host plant for the monarch butterfly.
Aster alpigenus Alpine aster	1	Weisberg 1993 Young and Young 1986	
Aster foliaceus Leafybract aster	1e	**Link 1993** Weisberg 1993	The seed ripens between June 1 and September 15. Rub the seed to remove fuzz. Dry the seed quickly. Use mothballs to control insects.
Aster glaudoces Blueleaf aster	1e	**Link 1993**	Seed ripens between August 1 and September 30. Rub the seed to remove fuzz.
Aster integrifolius Thickstem aster	1a: 7	**Link 1993**	Seed ripens between August 15 and September 15. Rub the seed to remove fuzz. Dry the seed quickly. Use mothballs to control insects. Grow in cone-tainers. Direct seed by broadcast seeding and raking.
Aster ledophyllus Cascade aster	1	Weisberg 1993	

Scientific name Common name	Propagation method	References	Remarks
Aster leevis Smooth aster	1e	**Link 1993**	Seed ripens between August 15 and September 30. Direct seed by broadcast seeding and raking.
Aster modestus Modest aster	1e	**Link 1993**	Dry the seed quickly. Use mothballs to control insects. Grow in cone-tainers.
Aster sibericus	1	Densmore and others 1990	
Astragalus spp.	1b	Young and Young 1986	
Astragalus antiselli	1e	Young and Young 1986	
Astragalus eucosmus	1b or 1d	Densmore and others 1990	Inoculate seedlings with a solution of root nodules.
Atriplex spp. Saltbush	1a	Young and Young 1992	Direct seed.
Atriplex canescens Fourwing saltbush	1a: 30–50	Landis and Simonich 1983	Seed ripens between October 20 and March 1. Store seed in the open. Start plants during the spring, summer, or fall. Seeds take 3 to 4 months to grow.
Atriplex confertifolia	2	Landis and Simonich 1983	
Atriplex cuneata	2	Landis and Simonich 1983	
Atriplex lentiformis Quail bush	1e	Harris and Leiser 1979	Direct seed during the late winter or spring.
Baccharis pilularis Coyote bush	1e	Harris and Leiser 1979 Young and Young 1992	Direct seed during the fall.
Baileya spp. Desert marigold	1	Young and Young 1986	Seed requires light for germination.

Scientific name Common name	Propagation method	References	Remarks
Balsamorhiza sagittata Arrowleaf balsamroot	**1a: 56–84**, 8	**Rose and others 1998**	Seed ripens by mid-June. Harvest seed by hand. Clean seed by drying, fanning, and macerating. Stratify seed at 25 degrees Fahrenheit (–4 degrees Celsius). Broadcast seed when sowing and cover the seeds. Fall or winter sowing is recommended. Plants can be salvaged by transplanting root crowns.
Beloperone californica Chaparosa	1e	Young and Young 1992	
Berberis spp. (See also *Mahonia* spp.)	1a: 14–48, 1e, 2, 8, 9, 10 (summer)	Hartmann and others 1990 Young and Young 1992	Separate the seed from the fruit by flotation. Remove all pulp from the seed. Stratify seed at 40 degrees Fahrenheit (4 degrees Celsius) or direct sow the seed during the fall. Root cuttings under mist. Application of 2,000 to 8,000 parts per million IBA (indole-3-butyric acid) aids rooting for some species.
Berberis fremontii (See *Mahonia fremontii*)			
Berberis nervosa Oregon grape (See also *Mahonia nervosa*)	1a: 45–150 3, 4, 5, 7 (summer or fall)	Browse 1979 Potash and Aubry 1997	Seed ripens between August 1 and September 30. Process the seed immediately by flotation or by rubbing the fruit on a screen. Store the seed above freezing without drying. Start seed during the spring. With cuttings, take no more than 5 percent of the donor plant.
Betula glandulosa	1e	Young and Young 1992	Needs light to germinate best.
Betula occidentalis Water birch	1e	Rose and others 1998	Collect strobiles (a fruiting structure characterized by rows of overlapping scales) while they are still green and spreading and dry them during the late summer. Sow the seed during the fall. Seedlings require shade for 2 to 3 months during their first summer.
Betula papyrifera Paper birch	1e, 4	Rose and others 1998	Collect seed from September to November. Pick strobiles while they are still green. Unstratified seed germinates better than stratified seed. Sow seed during the late summer and fall. For cuttings, the timing is critical—

Scientific name Common name	Propagation method	References	Remarks
			shoots should be active with the base of the cutting just becoming firm. Nodal cuttings from 6 to 8 inches (150 to 200 millimeters) long are best. Plant cuttings during warm, dry conditions with good air and moisture.
Bouteloua breviseta Chino grama	1e	**Link 1993**	Seed ripens during November. Seed is difficult to collect because of the short period that it is available, its tendency to shatter, and its low viability.
Bouteloua curtipendula	1e	Young and Young 1986	
Bouteloua hirsuta Hairy grama	1e	**Link 1993**	Seed ripens during November. Seed is easy to collect, but has low viability.
Brickellia californica Brickle brush	1e	Young and Young 1992	
Bromus carinatus Mountain brome	1e	**Link 1993** Young and Young 1986	Seed ripens between June 1 and August 31. Avoid plants with smut. Direct seed. Can be used in a seed-increase program.
Bromus vulgaris Columbia brome	1e	**Link 1993**	Seed ripens between July 1 and August 31. Avoid plants with smut. Direct seed. Can be used in a seed-increase program
Buchloe dactyloides Buffalo grass	1a: 42	Young and Young 1986	Seed requires light and potassium nitrate (KNO_3) during germination.
Calamagrostis breweri Shorthair reedgrass	1, 8	**Link 1993**	Start divisions in January. Use vitamin B1. Don't cover the root crown with soil.
Calamagrostis canadensis Bluejoint reedgrass	1e	**Link 1993** Young and Young 1986	Seed ripens during the spring. Plant seed ¾ to 1 inch (20 to 25 millimeters) deep. Plant in moist to saturated soil with no standing water.
Calamagrostis rubescens Pinegrass	1e	Rose and others 1998	Diurnal fluctuating temperatures are needed: 16 hours at 68 degrees Fahrenheit (20 degrees Celsius) and 8 hours at 86 degrees Fahrenheit

Scientific name Common name	Propagation method	References	Remarks
			(30 degrees Celsius). Needs adequate moisture and light.
Callicarpa spp. Beauty bush	1e, 4	Young and Young 1992 **Link 1993**	Take cuttings from June to September. Treat with 1,000 parts per million IBA (indole-3-butyric acid) talc. Expect 50-percent germination when planting seed in trays. Seedlings should be transplanted to containers.
Callicarpa americana American beautyberry	1e	Young and Young 1992 **Link 1993**	Same as *Callicarpa* spp.
Caltha asarifolia Marshmarigold	8	Weisberg 1993	
Caltha biflora White marshmarigold	1	Weisberg 1993	
Calycanthus occidentalis Western spice bush	1e	Harris and Leiser 1979	Direct seed during the fall.
Carex exserta Shorthair sedge	1e, 8	**Link 1993**	Start divisions during January. Use vitamin B1. Don't cover the root crown with soil.
Carex illota Small-headed sedge	1	Weisberg 1993	
Carex mertensii Mertens sedge	1e	**Link 1993**	Seed ripens between August 1 and September 1.
Carex microptera Smallwing sedge	1a: 60	**Link 1993**	Soak seed for 60 days in water at 33 to 45 degrees Fahrenheit (0.5 to 7 degrees Celsius) in the dark. Plant seed in moist soil that is not submerged in water.
Carex nigricans Black alpine sedge	1, 8	Potash and Aubry 1997	Seed ripens between August 15 and September 30. Ripe seed comes off easily in the fingers. Store seed in the cold for several months to

Scientific name Common name	Propagation method	References	Remarks
			stratify. After direct seeding during early summer, use plastic sheeting on the soil to force germination.
Carex obnupta Slough sedge	1e	**Link 1993**	Sow seed during the fall. Slough sedge needs very wet soil.
Carex paschystachya Thick-headed sedge	1	**Link 1993**	Seed ripens between July 30 and August 30. Seed can be planted during the fall without removing the hull.
Carex phaecephala Dunhead sedge	1	Weisberg 1993	
Carex rossii Ross sedge	1, 8	**Link 1993**	Start divisions during January. Use vitamin B1.
Carex rostrata Beaked sedge	1	Rose and others 1998	Harvest achenes during August or September. Sow seed into moist soil during the fall.
Carex spectabilis Showy sedge	1	Weisberg 1993	
Carex utriculata Sedge	1a: 60	**Link 1993**	Same as *Carex microptera*.
Carpenteria californica Bush anenome	1e, 4	Young and Young 1992	Collect seed between July and October. Bush anemone suckers freely and can be propagated easily by cuttings.
Carya aquatica Water hickory	1a: 30–150	**Link 1993**	Direct seed during the fall. Soak seeds before planting in the spring.
Cassia armata Armed senna	1d	Young and Young 1986	

Scientific name Common name	Propagation method	References	Remarks
Cassiope mertensiana White mountain heather	1, 2, 9, 10	Potash and Aubry 1997	Seed ripens between September 1 and the first snowfall. See appendix C for more detailed information.
Castanopsis chrysophylla Golden chinkapin	1e	Young and Young 1992 **Link 1993**	Seed has 53-percent germination. Expect problems with seedling survival. Poor results with cuttings.
Castilleja spp. Indian paintbrush	1	Link 1993 Young and Young 1986	
Castilleja miniata Common red paintbrush	1a: 28–84	**Rose and others 1998**	Stratify the seed at temperatures between 34 and 41 degrees Fahrenheit (1 and 5 degrees Celsius). Seed germinates at 70 degrees Fahrenheit (21 degrees Celsius), but grows slowly. Seedlings need a constant supply of nitrogen. Seeds germinate best near the roots of other plants they can parasitize.
Cathestecum erectum False grama	1, 8	**Link 1993**	Irrigate, fertilize, and cultivate seedlings. Good stands of false grama are difficult to establish.
Ceanothus arboreus Feltleaf ceanothus	1c	Harris and Leiser 1979	Direct seed during the fall. Soak seed in hot water. Ceanothus can fix nitrogen.
Ceanothus cordulatus	1e	Young and Young 1992	
Ceanothus crassifolius	1a: 90, 1e	Young and Young 1992	
Ceanothus cuneatus Buck brush	1c	Harris and Leiser 1979 Rose and others 1998	Same as *Ceanothus arboreus.*
Ceanothus diversifolius	1: 90, 1e	Young and Young 1992	
Ceanothus fendleri	1e	Young and Young 1992	

Scientific name Common name	Propagation method	References	Remarks
Ceanothus foliosus Wavyleaf ceanothus	1c	Harris and Leiser 1979	Same as *Ceanothus arboreus.*
Ceanothus fresnensis Fresno mat	1a: 90, cuttings	**Link 1993**	Cuttings should be at least 6 inches (150 millimeters) long.
Ceanothus greggii	1a: 60	Young and Young 1992	
Ceanothus impressus Santa Barbara ceanothus	1c	Harris and Leiser 1979	Same as *Ceanothus arboreus.*
Ceanothus integerrimus Deerbush ceanothus	1a: 90, 1e	Young and Young 1992	Plant seed directly during the fall or stratify the seed before planting. Deerbush ceanothus germinates rapidly after wildfires. This plant can fix nitrogen.
Ceanothus leucodermis Whitethorn	1c	Harris and Leiser 1979	Same as *Ceanothus arboreus.*
Ceanothus megacarpus Bigpod ceanothus	1c	Harris and Leiser 1979	Same as *Ceanothus arboreus.*
Ceanothus oliganthus	1a: 90, 1e	Young and Young 1992	
Ceanothus prostratus Squaw carpet		Rose and others 1998 Young and Young 1992	Soak seed in water at 180 degrees Fahrenheit (82 degrees Celsius). Cool the seed, mix it with sand, and place the mixture in a refrigerator. Once the seed swells, sow it in containers. Plants will be ready for outplanting in 2 years.
Ceanothus rigidus	1a: 90, 1e	Young and Young 1992	
Ceanothus sanguineus Redstem ceanothus	1a: 90, 1d	Rose and others 1998 Young and Young 1992	Viable seed will turn dark as it matures. Soak the seed in hot water and stratify it or soak the seed in acid or gibberellin for 30 minutes. Sow seed directly during the fall after heat treatment or pretreat the seed and sow it in spring.

Scientific name Common name	Propagation method	References	Remarks
Ceanothus sorediatus Jim brush	1c	Harris and Leiser 1979 Young and Young 1992	
Ceanothus thyrsiflorus Blueblossom	1c	Harris and Leiser 1979 Young and Young 1992	
Ceanothus velutinus Snowbrush ceanothus	1a: 60–85, 4	Hingston 1982 **Rose and others 1998** Young and Young 1992	Nitrogen fixer. Seed ripens from July to September. Soak seed in hot water and stratify seed before sowing it in flats during December or January. Seedlings are susceptible to damping off (dying suddenly because of fungal attacks). Take cuttings during the summer. Treat them with 0.8-percent IBA (indole-3-butyric acid) and plant them in a damp, sandy mixture of medium- to coarse-textured soils with low nutrient content. Apply bottom heat. Pot seedlings after they have rooted.
Celtis occidentalis	1a: 56–84, 1e, 4, 5	Young and Young 1992	
Celtis reticulata	1a: 84, 1e, 4	Young and Young 1992	
Cephalanthus occidentalis Common buttonbrush	1e, 4	Young and Young 1992	
Ceratoides lanata Winterfat	1e	Young and Young 1992	Seed requires 2 to 3 months afterripening. Plant during cool weather.
Cercidium floridum Palo Verde	1e	Young and Young 1986	
Cercis occidentalis Western redbud	1a: 84, 1c, 1d, 1g	Young and Young 1992 Harris and Leiser 1979	Scarify the seed with acid or soak the seed in boiling water for 1 minute or expose the seed to dry heat, 230 degrees Fahrenheit (110 degrees Celsius), for 9 minutes. Stratify the seed. Direct seed during the fall. Western redbud can fix nitrogen.

Scientific name Common name	Propagation method	References	Remarks
Cercocarpus betuloides Mountain mahogany	1e	Harris and Leiser 1979	Direct seed during the fall.
Cercocarpus ledifolius Curlleaf mountain mahogany	1a	Rose and others 1998 Young and Young 1992 **Link 1993**	Seed ripens during August and September. Stratify seed before sowing or sow the seed into flats and stratify the flats. Provide drainage to prevent root rot.
Cercocarpus montanus Mountain mahogany	1a: 30–90	Rose and others 1998 Young and Young 1992 Landis and Simonich 1983	Fruit ripens during late summer to early fall. Stratify the seed. Sow stratified seed during the spring or sow unstratified seed during the fall. Outplant seedlings after 1 to 2 years. Mountain mahogany can fix nitrogen.
Chaenactis douglasii Douglas dustymaiden	1	**Link 1993** Young and Young 1986	Seed ripens during August.
Chamaebatia foliolosa Bearmat	1a: 28–84	Young and Young 1992	
Chamaebatiaria millefolium Fernbrush	1a: 90, 8	**Link 1993**	Seed should be sown directly into growing containers and thinned to one plant per cell to increase survival.
Chamaecyparis Port Orford cedar	1f: 30/30	Young and Young 1986	
Chamaecyparis nootkatensis Alaska cedar	1a: 21	Young and Young 1992	
Chilopsis linearis Desert willow	1a: 3	Young and Young 1992	Sow seed ½ inch (13 millimeters) deep during the spring. Desert willow can be propagated by cuttings.
Chimaphila umbellata Prince's pine	**2**, 8	**Rose and others 1998**	Prince's pine flowers from June to August. Take summer stem cuttings and root them in a mixture of sand and peat. Plant them in late spring about 6 to 8 inches (150 to 200

Scientific name Common name	Propagation method	References	Remarks
			millimeters) apart. Prince's pine produces long, fast-growing rhizomes. Underground stems can be divided.
Chrysolepsis chrysophylla Golden chinkapin	1e, 9, grafting, budding	Rose and others 1998	Pick burs after they are ripe in late summer, but before they open. Plant the seed directly.
Chrysolepsis sempevirens Sierra chinkapin	1e	Link 1993 Young and Young 1992	Sierra chinkapin has 53-percent germination. Expect problems with seedling survival.
Chrysopsis villosa Golden aster	1e	Young and Young 1986	Golden aster has 30-percent germination. Expect problems with seedling survival and poor results with cuttings.
Chrysothamnus nauseosus Rubber rabbitbrush	1a: 0–120	Landis and Simonich 1983	Start seed during the spring or summer. Seedlings take 3 to 4 months to grow.
Chrysothamnus viscidiflorus Green rabbitbrush	1a: 0–28	Young and Young 1992	
Circium edule Edible thistle	1	Weisberg 1993	
Clarkia spp.	1	Schmidt 1980	Direct sow the seed or propagate *Clarkia* in flats. *Clarkia* is an annual.
Clarkia unguiculata	1e	Young and Young 1986	
Clematis spp.	1a: 56–168	Young and Young 1992	Propagation requirements vary by species.
Cleome spp. Rocky Mountain bee plant	1	Young and Young 1986	Rocky Mountain bee plant is difficult to germinate. It needs light, potassium nitrate (KNO_3) enrichment, and warm temperatures.
Coleogyne ramosissima Blackbrush	1a	Young and Young 1992	

Scientific name Common name	Propagation method	References	Remarks
Collinsia grandiflora Blue lips	1	Schmidt 1980	Direct sow the seed during the fall or spring or propagate in flats. *Collinsia* is an annual.
Collinsia heterophylla Purple Chinese houses	1	Schmidt 1980	Direct sow the seed during the fall or spring or propagate in flats. *Collinsia* is an annual.
Colubrina californica Colubrina	1e	Young and Young 1986	
Coreopsis spp.	1	Young and Young 1986	*Coreopsis* requires light and potassium nitrate (KNO_3) enrichment.
Coreopsis calliopsidea Leafystem coreopsis	1	Schmidt 1980	Direct sow the seed during November or December. *Coreopsis* prefers sunny areas and sandy loam. *Coreopsis* is an annual.
Coreopsis douglasii Douglas's coreopsis	1	Schmidt 1980	Direct sow the seed. Coreopsis is an annual.
Coreopsis stillmanii Stillman's coreopsis	1	Schmidt 1980	Direct sow the seed. Coreopsis is an annual.
Coreopsis tinctoria Plains coreopsis	1	**Link 1993**	Seed ripens around July 1.
Cornus spp. Dogwood	1, 9 (spring and summer)	Hartmann and others 1990 Weisberg 1993 **Young and Young 1986**	Separate the seed from the fruit by flotation. Dogwood stones can be sown without extracting the seed from the fruit. Sow seed immediately after collecting it. Some species can be started from cuttings.
Cornus canadensis Bunchberry dogwood	1b, 1f: 45/140, 9	**Link 1993**	Collect soil and duff from a native stand to provide mycorrhizal inoculum. Seed germinates best if it is sown during the fall right after it has been cleaned.
Cornus nuttallii Pacific dogwood	1a: 90–120, 1b, 1e, 4	Rose and others 1998	Sow fresh seed in fruit directly during the fall or macerate the fruit and separate the seed using floatation. Scarify stored seed for 4 hours, stratify seed at 37 degrees Fahrenheit (3 degrees

Scientific name Common name	Propagation method	References	Remarks
			Celsius), and sow during the fall. Take cuttings during June or July. When transplanting, place transplants in a ring of native shrubs to protect them from the sun.
Cornus stolonifera Redosier dogwood	1a: 60–90, 2, 3, 9	Shaw 1983 Potash and Aubry 1997 Rose and others 1998	Seed ripens between July 1 and October 31. Sow fresh seed or fruit during the fall. Branch tips 2 to 3 inches (50 to 76 millimeters) long can be collected during the late summer and planted during late spring. Collect 2- to 4-foot- (0.6- to 1.2-meter-) long whips of 1-year-old wood during midwinter. Outplant the whips during late winter or early spring. Whips can be planted directly in moist soil.
Corylus cornuta California hazelnut	1a: 56–168	Young and Young 1992	Plant during the fall or chill the seed before planting.
Cowania mexicana Cliffrose	1e, 1f: 28/30	Landis and Simonich 1983 **Young and Young 1992**	Seeds are not likely to germinate without treatment. Chilling seed for 2 weeks at 5 degrees Celsius produced mean optimal germination of 55 percent.
Crataegus columbiana Columbia hawthorn	1a: 120–180	Young and Young 1986	The seed must be treated in moist medium at low temperature before it will germinate.
Crataegus douglasii Douglas hawthorn	1a: 84–112, 1b, 9	Rose and others 1998	Seed ripens from late July through August. Use flotation to separate the seed and stratify the seed at 41 degrees Fahrenheit (5 degrees Celsius). Scarify the seed in acid for up to 3 hours. Sow the seed during early fall.
Crepis acuminata Hawk's beard	1e	Young and Young 1986	
Crossosoma californicum	1e	Young and Young 1992	
Cupressus spp. Cypress	1a: 21	Young and Young 1992	Many species. The seed of most species needs to be prechilled.
Dalea spp. Indigo bush	1b, 1e	Young and Young 1992	The seed needs to be scarified.

Scientific name Common name	Propagation method	References	Remarks
Danthonia californica California oat grass	1a: 84, 8	Link 1993 **Rose and others 1998**	Pretreat divisions with vitamin B1. Collect plants when they are dormant. Bring them into the greenhouse. In January, divide the plants, making sure each division has a single root system. Keep the plants moist at 64 to 70 degrees Fahrenheit (18 to 21 degrees Celsius). After 2 weeks, move the plants to a lathhouse. If you are propagating from seed, soak the seed for 1 to 3 days. Stratify the seed at 34 to 41 degrees Fahrenheit (1 to 5 degrees Celsius).
Danthonia compressa Mountain grass	1	**Link 1993**	*Danthonia* does not grow well in direct sunlight.
Danthonia intermedia Timber oatgrass	1a: 30–60	Weisberg 1993 **Link 1993**	Plant the seed directly during the fall.
Dasiphora fruticosa Shrubby cinquefoil	1a: 60, 4, 9	Densmore and others 1990 Landis and Simonich 1983 **Rose and others 1998** Link 1993	Direct sow the seed or stratify it at 34 degrees Fahrenheit (1 degree Celsius). Take softwood cuttings in July. Dip cuttings in 1,000 parts per million indole-3-butyric acid (IBA) and root them in a mixture of peat, perlite, and sand.
Delphinium spp. Larkspur	1a: 112	Young and Young 1986	
Dendromecon rigida Stiff bushpoppy	1	Young and Young 1992	Sow the seed in moist medium at temperatures alternating diurnally from 41 to 72 degrees Fahrenheit (5 to 22 degrees Celsius).
Deschampsia atropurpurea Mountain hairgrass	1, 1a: 112	Potash and Aubry 1997 Rose and others 1998	Seed ripens from August 1 to October 31. Start plants during late May or early June. The seed takes 30 days to germinate.
Deschampsia caespitosa Tufted hairgrass	1	**Rose and others 1998**	Keep seed for 6 weeks at 68 degrees Fahrenheit (20 degrees Celsius) for 16 hours and 50 degrees Fahrenheit (10 degrees Celsius) for 8 hours, then reduce the temperatures to 59 degrees

Scientific name Common name	Propagation method	References	Remarks
			Fahrenheit (15 degrees Celsius) for 16 hours and 41 degrees Fahrenheit (5 degrees Celsius) for 8 hours. Sow seed during the fall or spring.
Dicentra formosa Bleeding heart	1a: 48, **8**	Link 1993 **Rose and others 1998** Young and Young 1986	Seed ripens from August through early September. Sow seed fresh during late summer or fall. Divide rhizomes after the plant has flowered.
Distichlis spicata Desert saltgrass	1	Young and Young 1986	Desert saltgrass has low seed production. The seed germinates best with temperatures of 50 degrees Fahrenheit (10 degrees Celsius) at night and temperatures of 105 degrees Fahrenheit (41 degrees Celsius) during the day.
Dodecatheon clevelandii Shootingstar	1e	Young and Young 1986	
Downingia concolor Fringed downingia	1	Schmidt 1980	Sow seed thickly directly into the soil. Provide ample water. Fringed downingia is an annual.
Downingia cuspidata Toothed downingia	1	Schmidt 1980	Same as *Downingia concolor.*
Draba aureola Alpine draba	1	Weisberg 1993	
Dryas drummondii Yellow dryad	1	**Link 1993**	Seed ripens from August 1 to 15.
Dyssodia cooperi	1	Young and Young 1992	Seed has about 20-percent germination.
Eastwoodia elegans	1	Young and Young 1992	Seed has about 35-percent germination.
Eleocharis coloradoensis Spikerush	1a	Young and Young 1986	Seed should be stored in cold water.

Scientific name Common name	Propagation method	References	Remarks
Elymus canadensis Wild rye	1a: 14	Young and Young 1986	
Elymus cinereus	1e	Young and Young 1986	
Elymus elymoides Bottlebrush squirrel tail	1e	**Link 1993**	Seed directly during the spring or fall. Expect 40- to 60-percent germination.
Elymus glaucus Blue wild rye	1e, 13	Potash and Aubry 1997 Young and Young 1986	Seed ripens from August 1 through October 31. Heads shatter, so collect seed during the soft- to hard-dough phase or as the heads turn gold. A nursery can produce 10 to 50 pounds of seed per acre (11 to 56 kilograms per hectare) during the first year and 250 to 600 pounds of seed per acre (280 to 673 kilograms per hectare) during the second year. Plant seed at 10 to 50 pure live seeds per foot (30 to 150 pure live seeds per meter) or 10 pounds of seeds per acre (11 kilograms per hectare) if the seeds are drilled. Plant 20 pounds of seeds per acre (22 kilograms per hectare) if they are broadcast. Sow the seed during the fall and cover it lightly with soil and mulch.
Elymus innovatus	1	Densmore and others 1990	
Elymus salinus Saline wild rye	1a: 30	**Link 1993**	Seed ripens from July 15 through July 30. Expect 30- to 70-percent germination.
Elymus triticoides	1e	Young and Young 1986	
Encelia spp.	1e	Young and Young 1992	
Ephedra californica	1e	Young and Young 1992	
Ephedra nevadensis Gray ephedra	1e	Young and Young 1992	

Scientific name Common name	Propagation method	References	Remarks
Ephedra viridis Mormon tea	1e	Landis and Simonich 1983 Shaw 1983 Young and Young 1992	Seed ripens from July 15 to September 1. Store seed in the open. Start seed during the spring, summer, or fall. Plants take 4 to 6 months to grow.
Epilobium spp. Willowherb	1	Weisberg 1993	
Epilobium angustifolium Fireweed	1, 5	Potash and Aubry 1997	Seed ripens from July 15 to September 30 when 50 percent or more of the flowering surface has fluffed out. Collect the seed during dry weather. Cut the entire flower head and store it upside down in paper bags to mature. Seed may not need to be cleaned. Sow the seed during the fall or spring with a seed spreader. Mix the seed with three parts medium vermiculite and one part fine peat. Root cuttings should be 12 to 24 inches (31 to 610 millimeters) long. Plant root cuttings directly, about 2 inches (50 millimeters) deep and 4 inches (100 millimeters) apart.
Eremocarpus setigerus Doveweed	1e	Young and Young 1986	
Ericameria bloomeri Bloomer rabbitbrush	1	**Link 1993**	Expect germination to be 20 percent or less.
Erigeron peregrinus Subalpine daisy	1	Weisberg 1993 Young and Young 1986	
Eriogonum fasciculatum California buckwheat	1	Young and Young 1992	Seed ripens during August. Germination is epigeal (the cotyledons are photosynthetic above the ground). Considerable dormancy. Low viability.
Eriogonum heermannii Zigzag bush	1	Young and Young 1992	

Scientific name Common name	Propagation method	References	Remarks
Eriogonum inflatum Desert trumpet	1	Young and Young 1992	
Eriogonum marifolium Wild buckwheat	1a: 48–56	**Link 1993**	Establish plants from seed in a greenhouse. Expect 14- to 19-percent germination.
Eriogonum nudum Bare stem buckwheat	1e	**Rose and others 1998**	Seed ripens during July and August. Plant during the fall in coarse soil. Cover the seed with sphagnum moss. Transplant seedlings into 3-inch (76-millimeter) pots during the spring.
Eriogonum umbellatum Sulfur buckwheat	1e	Rose and others 1998	Same as *Eriogonum nudum*.
Eriophyllum confertiflorum Golden yarrow	1e	Young and Young 1986	
Eriophyllum nevinii Catalina silver lace	1e	Young and Young 1986	
Erythronium montanum Avalanche lily	1	Weisberg 1993	
Eschscholzia spp. California poppy	1e	Schmidt 1980 Young and Young 1986	*Eschscholzia* will self-seed abundantly.
Euonymus occidentalis Western burning bush	1a: 84	Young and Young 1986	
Euphorbia spp.	1a: 56	Young and Young 1986	
Fallugia paradoxa Apache plume	1e	Young and Young 1992	Sow seed during the spring or during summer rains.