Scientific name Common name	Propagation method	References	Remarks
Festuca spp.	1a: 5	Young and Young 1986	*Festuca* requires light and potassium nitrate (KNO_3) enrichment.
Festuca altaica	1	Densmore and others 1990	
Festuca idahoensis Idaho fescue	1	Weisberg 1993	
Festuca rubra Red fescue	1	Densmore and others 1990	
Festuca viridula Green fescue	1a: 112	Weisberg 1993 **Link 1993**	Seed ripens from June to September. Cold stratify the seed before planting it in a greenhouse. Transplant the seedlings.
Fouquieria splendens Ocotillo	1	Young and Young 1986	
Fragaria spp. Strawberry	1, 4, 8	Potash and Aubry 1997	Separate the seed from the fruit by flotation. Germination increases after exposure to light and a 2- to 3-month period of cold. Cuttings can be taken from runners.
Fragaria vesca Woodland strawberry	1, 4, 8	Rose and others 1998	Same as *Fragaria* spp.
Fragaria virginiana Broadpetal strawberry	1, 4, 8	Rose and others 1998	Same as *Fragaria* spp.
Fraxinus spp. Ash	1f: 30–90/60–90	Young and Young 1986	
Fraxinus velutina Arizona ash	1a: 90, 1e	Harris and Leiser 1979 **Young and Young 1992**	Direct seed during the fall or prechill the seed.
Fremontodendron californicum Flannel bush	1c	Harris and Leiser 1979 Young and Young 1992	Direct seed during the fall. Soak seed in hot water.

Scientific name Common name	Propagation method	References	Remarks
Fumariaceae	1	Young and Young 1986	
Gaillardia aristate Blanketflower	1e	Link 1993	
Galvezia speciosa Bush snapdragon	1e	Young and Young 1986	
Garrya flavescens Silk tassel	1a: 30–120, 4	Young and Young 1992	Seed ripens from June through December. Macerate the fruit and use flotation to separate the seed. Prechill the seed before soaking it in 100 parts per million of gibberellin.
Garrya fremontii	1a: 90	Young and Young 1992	Seed ripens from June through December.
Garrya ovatifolia Slender wintergreen	1, **2**	**Potash and Aubry 1997**	Berries are ripe during the early fall when they are dark blue. Seed is difficult to germinate. Take cuttings between August 1 and October 31. Cuttings take 10 to 12 weeks to grow.
Garrya shallon Salal	1e, 2, 5, 8, 9	Potash and Aubry 1997 Rose and others 1998 Young and Young 1992	Collect seed as recommended for *Garrya ovatifolia*. The seed has a low germination rate. Cuttings take 10 to 14 months to grow. Take stem cuttings that are 6 inches (150 millimeters) long, cutting just into the cambium. Start cuttings in perlite.
Garrya wrightii	1a: 90	Young and Young 1992	
Gaultheria hispidula Creeping snowberry	1a: 30–120	Young and Young 1992	Seed requires light to germinate. Sow seed during the fall.
Geranium viscosissimum Sticky geranium	1e	Link 1993 Young and Young 1986	Direct plant the seed into containers with a mixture of peat and perlite.
Geum triflorum Prairie smoke	1e	Link 1993	Direct plant the seed with a mixture of grass and forb seed. Plant the seed in flats for transplanting.

Scientific name Common name	Propagation method	References	Remarks
Gilia spp.	1	Schmidt 1980	Direct sow the seed during the fall (best) or during the early spring.
Grayia brandegei Spineless hopsage	1g	Young and Young 1992	Stratify the seed at 41 degrees Fahrenheit (5 degrees Celsius) for 16 hours and at 50 to 86 degrees Fahrenheit (10 to 30 degrees Celsius) for 8 hours.
Grayia spinosa Spiny hopsage	1g	Young and Young 1992	Same as *Grayia brandegei*.
Haplopappus parishii Parish goldenweed	1e, 4	Young and Young 1992	
Hedysarum alpinum	1a: 60	Densmore and others 1990	Inoculate the seedlings with a solution of root nodules.
Hedysarum boreale Northern sweetvetch	1	Link 1993	Prechill seed for 7 to 10 days. Inoculate the media with native soil.
Hedysarum sulfurescens Yellow sweetvetch	1	Link 1993	Same as *Hedysarum boreale*.
Helianthella uniflora Coneflower helianthella	1e	Link 1993	Direct seed.
Helianthus spp. Sunflower	1a	Young and Young 1986	
Hemizonia spp. Tarweed	1e	Young and Young 1986	
Heracleum lanatum Cow-parsnip	1e	Rose and others 1998	Seed ripens during August. Collect seed by hand during the late summer after dark stripes become evident. No stratification is needed, but leach the seed in water for 4 hours before planting. Broadcast the seed during the fall.

Scientific name Common name	Propagation method	References	Remarks
Heteromeles arbutifolia Christmas berry	1e	Harris and Leiser 1979 Young and Young 1992	Direct seed during the fall.
Heterotheca villosa Hairy golden aster	1e, 13	Link 1993	Direct seed or grow in containers. The timing of seed collection is critical. Seed shatters only a few days after it is ready.
Heuchera cylindrica Roundleaf alumroot	1e	Link 1993	
Hibiscus spp. Rose mallow	1e, 4	Young and Young 1992	Some introduced species are invasive.
Hieraceum albiflorum White hawkweed	1a: 90	**Potash and Aubry 1997**	Collect the seed when half of the flowers are still in bloom to avoid confusing this species with noxious hawkweeds. Shake the seed into a paper sack or collect the entire flower heads. Sow the seed during the fall, or stratify the seed and sow it during the spring.
Hieraceum gracile Slender hawkweed	1	Weisberg 1993	
Hilaria jamesii (See *Pleuraphis jamesii*)			
Hofmeisteria pluriseta Arrowleaf	1e	Young and Young 1992	
Holodiscus discolor Oceanspray	**1a**: **126**, 2, 3	**Potash and Aubry 1997** Rose and others 1998 Young and Young 1992	Seed ripens from September 1 to November 30 when it is no longer green. It drops soon afterward. Look for dark brown flower heads. If the flower heads are grey-brown, the seed probably has dropped already. Shake the seed into a bucket. Seed viability and germination are low. Sow the seed during the fall.
Holodiscus dumosus var. *glabrescens* Bush oceanspray	1a: 54–140	Link 1993	Dry the seed well before rubbing it by hand and sieving it.

Scientific name Common name	Propagation method	References	Remarks
Hordeum brachyantherum Meadow barley	1e	Rose and others 1998	Seed ripens during the late summer. Sow fresh seed during the fall at a depth of two times the seed height in a mixture of sand, pumice, and peat (1:1:1). Place the containers in a cold frame.
Hymenoclea salsola White burrowbush	1e	Young and Young 1986	
Ipomopsis aggregata Scarlet gilia	**1e**	Link 1993 **Rose and others 1998**	Fruit ripens during the summer. Plant the seed into flats. Keep the flats moist. Few plants were produced by direct seeding. Stratifying the seed did not improve germination.
Iris spp.	8	Weisberg 1993	
Isomeris arborea Bladder-pod	1e	Harris and Leiser 1979	Direct seed during the fall.
Juglans californica hindsii California black walnut	1a: 156, 1e	Harris and Leiser 1979 **Young and Young 1992**	Direct seed during the fall or prechill the seed and sow it during the spring.
Juncus mertensianus Merten's rush	1	Weisberg 1993	
Juncus parryi Parry's rush	1, **8**	Link 1993	Take divisions in January. Use Vitamin B1. Keep divisions in a cold frame for 7 days before moving them to a lathhouse. Plant divisions no deeper than the crown. Divisions will die if they are planted too deep.
Juniperus spp. Juniper	1d then a: 120, 1e, **9** (summer), cuttings of prostrate forms	Hartmann and others 1990 Weisberg 1993 Young and Young 1986	Use flotation to separate the seed from the fruit. Direct sow the seed during the fall. Take cuttings during the late fall or winter by stripping growing tips that are 2 to 6 inches (50 to 150 millimeters) long from older branches, leaving the "heel" (a small piece of old wood). Use indole-3-butyric acid (IBA). The rooting medium should be medium-coarse sand or a 10:1 mixture of perlite and peat moss. Apply high humidity and intense light. Apply bottom heat of 65 degrees Fahrenheit (18

Scientific name Common name	Propagation method	References	Remarks
			degrees Celsius) for 6 weeks before raising the temperature to 70 to 75 degrees Fahrenheit (21 to 24 degrees Celsius) to encourage rooting.
Juniperus communis Mountain juniper	1f: 90/90, **2**, 3	**Weisberg 1993** Rose and others 1998 Young and Young 1992	Sow seed during the fall or spring. Cover the seed with a layer of firm soil or sand.
Juniperus occidentalis Western juniper	1a: 30–60	Young and Young 1992	Stratify seed at 34 to 41 degrees Fahrenheit (1 to 5 degrees Celsius).
Juniperus osteosperma Utah juniper	1f: 30/60	Young and Young 1992	
Juniperus scopulorum Rocky Mountain juniper	1f: 60/40	Landis and Simonich 1983 Shaw 1983 Young and Young 1992	Seed ripens between September 1 and December 30. Start during the spring or summer. Plants take 12 to 16 months to grow.
Kalmia latifolia	9 (summer)	Weisberg 1993	
Kochia americana Red molly	1	Young and Young 1992	Direct seeding is not recommended. Transplant seedlings to an extremely arid and saline alkaline environment. Will naturalize.
Koeleria cristata Junegrass	1e	Rose and others 1998	Seed is produced during the second year. Treat the seed with fungicide to protect it from rust. Plant seed during the fall from 0.2 to 0.4 inch (5 to 10 millimeters) deep. Cover the seed with sawdust.
Larix spp.	1a: 20–60, 1e	Young and Young 1986	Most larch species germinate fairly well without pretreating the seed.
Larix laricina Tamarack	1a: 21, 1e	Young and Young 1992	Stratify the seed at 37 to 41 degrees Fahrenheit (3 to 5 degrees Celsius).

Scientific name Common name	Propagation method	References	Remarks
Larix lyalli Subalpine larch	1b	Young and Young 1986	Soak the seed for 24 hours in a 3-percent solution of hydrogen peroxide.
Larix occidentalis Western larch	1a: 18, 1e	Rose and others 1998 Young and Young 1992	Pick cones from trees when they are ripe and dry. Open cones with heat by putting them where they are exposed to the sun or in a kiln or heated room. Sow the seed during the fall or spring about 0.2 inch (5 millimeters) deep. Mulch.
Larrea tridentata Creosote bush	1b	Young and Young 1992	Collect ripe fruit during the spring and early summer. Dehull the seed.
Lathyrus spp. Wild pea	1b	Young and Young 1986	Treat the seed with hot water.
Lavatera assurgentiflora Malva rose	1e	Young and Young 1986	
Layia spp.	1	Young and Young 1986 Schmidt 1980	Requires afterripening and light. Seed germinates in 2 weeks.
Ledum glandulosum Western Labrador tea	1, 3	Link 1993 Young and Young 1992	Cuttings taken in mid-December will root well.
Lepidium fremontii Bush peppergrass	1	Young and Young 1986	Very dormant seed. No germination procedures have been developed.
Lepidospartum squamatum Scalebroom	1e	Young and Young 1986	
Leptarrhena pyrolifolia Leatherleaf saxifrage	1	Weisberg 1993	
Libocedrus decurrens Incense cedar	1a: 30–60	Young and Young 1986	

Scientific name Common name	Propagation method	References	Remarks
Lilium spp. Lily	5, 8	Young and Young 1986	
Linanthus spp.	1	**Schmidt 1980**	Sow seed during the fall. Cover the seed with branches to prevent birds from eating the seed.
Linnaea borealis Twinflower	1a: 60, 2, 4, 8	**Potash and Aubry 1997** Rose and others 1998	Cuttings will grow in 8 to 10 months. Plant the seed during the fall. If seed will be planted during the spring, stratify it at 34 degrees Fahrenheit (1 degree Celsius).
Linum grandiflorum Flowering flax	1b	Young and Young 1986	Germinate the seed without light.
Linum perenne lewisii Wild blue flax	1b	Young and Young 1986	Same as *Linum grandiflorum*.
Lithocarpus densiflorus Tanbark-oak	1e	Harris and Leiser 1979 Young and Young 1992	Direct seed during the fall.
Lonicera spp.	1a: 60–90, 3, 4	Hartmann and others 1990 Young and Young 1992	Use flotation to separate the seed from the fruit. Direct sow the seed during the fall ¼ inch (6 millimeters) deep and apply mulch or incubate the sown seed at 20 to 30 degrees Celsius. About 15 percent of the seed will mature to the seedling stage. Most species can be propagated from hardwood cuttings taken during the spring. Take leafy softwood cuttings during the summer and grow them under mist.
Lonicera involucrata Bush honeysuckle (Bearberry honeysuckle)	1a: 45–60, 2, 3, 4	Link 1993 Rose and others 1998	Cuttings have been very successful. Growth that was 1 year old and older rooted well without hormone treatment. If you are propagating from seed, sow the seed during the fall or stratify the seed for a long time.
Lotus spp.	1b	Young and Young 1986	Hot-water treatment is recommended, but it will reduce the seed's viability.

Scientific name Common name	Propagation method	References	Remarks
Luetkea pectinata Partridgefoot	**1**, 2, 8	**Potash and Aubry 1997**	Seed ripens from August 1 to September 30. Seed drops quickly. Flower heads can be cut when the fruits are red. The heads can be stored in open paper bags until they are ripe. Cuttings should be larger diameter.
Lupinus albifrons White-leaf lupine	1c	Harris and Leiser 1979 Young and Young 1992	Soak seed in hot water. Direct seed during the fall. This plant fixes nitrogen.
Lupinus arboreus	1c	Harris and Leiser 1979	Same as *Lupinus albifrons*.
Lupinus arcticus	1b, 1d	Densmore and others 1990	Inoculate seedlings with a solution of root nodules. Greenhouse pathogens may infect these plants.
Lupinus covillei	1	Link 1993	No treatment needed for fresh seed. Scarify dried seed or treat the seed with hot water.
Lupinus elmeri Dwarf lupine	1	Link 1993	Same as *Lupinus covillei*.
Lupinus latifolius Broadleafed lupine	1b, **3**	**Potash and Aubry 1997** Rose and others 1998	Seed ripens from June 1 to September 31. The pods explode. Cut the entire flower head when the lower pods are grayish tan. Seed takes 2 weeks to ripen. Sow the fresh seeds with no treatment. Stored seed should be abraded or soaked for 1 to 16 hours in boiling water. Inoculate with root nodules. Take cuttings from the side shoots of hardened stems during the spring.
Lupinus lepidus Prairie lupine	1b	Link 1993	Soaking seed in hot water may soften the seed coat.
Lupinus sericeus Silky lupine	1b	Link 1993	Seed should be inoculated with the appropriate *Rhizobium*. Direct seeding is best for silky lupine, which should not be handled any more than necessary.

Scientific name Common name	Propagation method	References	Remarks
Luzula campestris Field woodrush	1	Weisberg 1993	
Luzula parviflora Small-flowered woodrush	1	Weisberg 1993	
Lycium andersonii Anderson's wolfberry	1e	Young and Young 1992	
Lysimachia ciliata Fringed loosestrife	1	Young and Young 1986	Seed requires light for germination.
Machaeranthera Tansyaster	1	Young and Young 1986	Tansyaster seeds germinate better after receiving 2 weeks cool, moist treatment.
Madia spp. Tarweed	1e	Young and Young 1986	
Mahonia spp. Oregon grape	1a, 1e, 8, 9, 10 (summer)	Hartmann and others 1990 Young and Young 1992 Weisberg 1993	Separate the seed from the fruit by flotation.
Mahonia aquifolium Shining Oregon grape	1c then 1a: 90, 2, 4, 9	Rose and others 1998 Hartmann and others 1990	Seeds ripen during July and August. Macerate the fruit and separate the seed using flotation. Sow the seed immediately or stratify the seed and sow it during the spring. Heeled, nodal, and basal cuttings can be taken into the fall. Shining Oregon grape is susceptible to fungus, root rot, and mildew.
Mahonia fremontii Desert barberry	1e or 1a: 45	**Link 1993**	Although it is best to separate the seed from the fruit, entire berries can be planted.
Mahonia nervosa Oregon grape	1a: 42, 2, 4	Rose and others 1998	Macerate the fruit and separate the seed using flotation. Sow seed immediately into a mixture

Scientific name Common name	Propagation method	References	Remarks
			of soil and sand. Stratify the seed at 39 degrees Fahrenheit (4 degrees Celsius) and sow it during the spring. For cuttings, see *Mahonia aquifolium*.
Mahonia repens Creeping Oregon grape	1f: 30 cold/60 warm/196 cold, 4, 9	Rose and others 1998	Stratify seed at 34 degrees Fahrenheit (1 degree Celsius) and 68 degrees Fahrenheit (20 degrees Celsius) or at 36 degrees Fahrenheit (2 degrees Celsius) for 16 weeks in gibberellin. Seed can be sown directly during the fall.
Maiathemum dilatatum False lily-of-the-valley	1, **5**	Potash and Aubry 1997	Berries ripen from July 15 to September 30. Plant whole berries. Seed takes 2 years to germinate.
Malus spp. Apple	1a, 1e	Young and Young 1992	Sow untreated seed in the fall, or prechill the seed for planting during the spring.
Melica harfordii Harford's melic	1e	Rose and others 1998	Plant the seed about 0.25 to 0.4 inch (6 to 10 millimeters) deep during the fall. Cover the seed with sawdust. No fungal problems were reported.
Melica spectabilis Onion grass	1a: 80	Link 1993	Seed needs to be stratified at 32 degrees Fahrenheit (0 degrees Celsius) for 80 days. Direct seed.
Menodora scabra Rough menodora	1e	Young and Young 1992	
Mentzelia laevicaulis Blazing star	1e	Young and Young 1986	
Menyanthes trifoliata Bog buckbean	8	Weisberg 1993	
Mertensia paniculata	1	Densmore and others 1990	

Scientific name Common name	Propagation method	References	Remarks
Mimulus lewisii Pink monkey-flower	1e	Weisberg 1993 Young and Young 1986	
Monardella lanceolata Mustang mint	1e	Young and Young 1986	
Monardella macrantha	1e	Young and Young 1986	
Monardella odoratissima	1a: 84, 1e	Young and Young 1986	No treatment necessary for fresh seed. Dry seed requires stratification.
Myosotis alpestris	1	Densmore and others 1990	
Myrica californica Pacific bayberry	1a: 30–90	Young and Young 1992	Sow seed during the fall or prechill the seed.
Myrica hartwegii Sierra sweet bay	1a: 84	Young and Young 1986	
Nama lobbii Woolly nama	1c, 1g	Young and Young 1992	Leach seeds under mist, then soak them in gibberellin. Remove embryos from seed coat.
Oemleria cerasiformis Indian plum or osoberry	1a: 60–120, 2	Weisberg 1993 **Young and Young 1992**	
Oenothera hookeri Evening primrose	1e	Young and Young 1986	
Olneya tesota Desert ironwood	1e	Young and Young 1992	Stored seed should be scarified mildly and soaked for at least 24 hours before planting.
Oplopanax horridum Devil's club	1, 4, 9	**Potash and Aubry 1997** Rose and others 1998	Seed ripens from July 1 to September 31, about 4 weeks after flowering. The seed is shed quickly once the bright red fruit begins fading to brown. Cuttings should be about 6 inches (150 millimeters) long. Propagation is slow by all methods.

Scientific name Common name	Propagation method	References	Remarks
Opuntia spp. Prickly pear	1d	Young and Young 1986	Soak the seed for 30 to 60 minutes in sulfuric acid.
Oryzopsis hymenoides Indian ricegrass	1d	Young and Young 1986	
Osmaronia cerasiformis (See *Oemleria cerasiformis*)			
Osmorhiza occidentalis Sweet anise	1e	Rose and others 1998	Seed ripens during August and September. Collect the seed by hand. Plant seed directly during the fall about ¼ inch (6 millimeters) deep.
Oxalis oregana Wood sorrel	1e, **8**	Weisberg 1993 **Rose and others 1998**	Plant seeds into flats and keep them moist. Mature rhizomes can be divided during the early spring and replanted about ½ inch (13 millimeters) deep.
Oxytropis campestris	1b, 1d	Densmore and others 1990	Inoculate the seedlings with a solution of root nodules.
Oxytropis deflexa	1b, 1d	Densmore and others 1990	Same as *Oxytropis campestris*.
Oxytropis splendens Showy locoweed	1e	Link 1993	
Pachystima myrsinites Oregon boxwood	2, 9	**Potash and Aubry 1997** Rose and others 1998	Collect cuttings from August 15 to September 15. Rooting hormone is required. Start the cuttings in a mixture of perlite and vermiculite.
Paeonia brownii	1a: 84	Young and Young 1986	
Panicum dichotomiflorum	1b	Young and Young 1986	Scarify seed with acid.
Panicum obtusum	1b	Young and Young 1986	Scarify seed with acid for 90 minutes. Enrich the planting medium with potassium nitrate (KNO_3).

Scientific name Common name	Propagation method	References	Remarks
Penstemon spp. Beardstongue	1a: 28–56, 2	Weisberg 1993 Link 1993 Young and Young 1986	Sow seed during the fall or stratify the seed.
Penstemon albertinus Albert penstemon	1a: 30	Link 1993	Soak the seed in water for 24 hours, then freeze the seed for 30 days.
Penstemon confertus Yellow penstemon	1a: 30	Link 1993	Same as *Penstemon albertinus*.
Penstemon lyallii Lyall penstemon	1a: 30	Link 1993	Same as *Penstemon albertinus*.
Penstemon procerus Small-flowered penstemon	1a, 5	Rose and others 1998	Seed ripens during mid-August. Requires stratification at 68 degrees Fahrenheit (20 degrees Celsius) in the light and 86 degrees Fahrenheit (30 degrees Celsius) in the dark. Sow seed 0.08 inch (2 millimeters) deep during March. Keep the flats at 59 degrees Fahrenheit (15 degrees Celsius) for transplanting outdoors during May. Take cuttings from nodes during August. Place the cuttings in sandy soil in a cold frame.
Pentaphylloides floribunda (See *Dasiphora fruticosa*)			
Peraphyllum ramosissimum Squaw apple	1a: 90	Young and Young 1992	
Petalonyx thurberi	1	Young and Young 1992	Good seed is difficult to collect. Germination increases after seed has been stored.
Petesites frigidus Coltsfoot	1e, 8	Weisberg 1993 Potash and Aubry 1997	Seed ripens from May 15 to June 15 when the flower heads are opening. Shake the seed into a bag or collect the entire flower head. Dry the seed carefully. Sow the seed immediately. It cannot be stored.

Scientific name Common name	Propagation method	References	Remarks
Peucephyllum scottii Pigmy cedar	1	Young and Young 1992	Germination increases if the seed is stored.
Phacelia hastata Silverleaf phacelia	1e	Link 1993 Young and Young 1986	Fall seeding is recommended.
Phalaris arundinacea Reed canarygrass	1a	Young and Young 1986	The seed requires light to germinate. Reed canarygrass was native at the time of settlement, but is more widely distributed now as a cultivar. It is invasive.
Philadelphus lewisii Mock orange	1a: 56, 4	Rose and others 1998 Young and Young 1992	Stratify the seed at 41 degrees Fahrenheit (5 degrees Celsius) and 72 to 79 degrees Fahrenheit (22 to 26 degrees Celsius). Take softwood cuttings during June and July. Dip the cuttings in 1,000 parts per million indole-3-butyric acid (IBA) and stick them in a mixture of peat and perlite. Hardwood cuttings, about 8 inches (200 millimeters) long, can be taken during the fall or spring. Treat the cuttings with 2,500 to 8,000 parts per million IBA and plant them 6 inches (150 millimeters) deep in sandy soil. Plant the cuttings during the fall and apply mulch.
Phleum alpinum Alpine timothy	1a: 7	Weisberg 1993 **Link 1993** Rose and others 1998	Collect seed during August and September. Sow the seed during the fall or direct seed in April.
Phlox diffusa Phlox	2, **8**	Weisberg 1993 **Link 1993** Young and Young 1986	Plants are propagated by division in the nursery trade.
Photinia arbutifolia (See *Heteromeles arbutifolia*)			
Phyllodoce breweri Red mountain heather	1a: 56, 2	Link 1993	Keep the seed at 35 degrees Fahrenheit (2 degrees Celsius) for 2 months in moist

Scientific name Common name	Propagation method	References	Remarks
			vermiculite inside a sealed plastic bag. Results have been poor when red mountain heather has been propagated from cuttings.
Phyllodoce empetriformis Pink mountain heather	1, 2	Potash and Aubry 1997	Seed ripens from September 1 until the first snowfall. When the capsule is purplish-black, cut the branch tip with capsules and store it upside down in a paper bag. Seeds look like yellow dust. See additional information in appendix C.
Physocarpus capitatus Pacific ninebark	1, **3**, 4	**Rose and others 1998** Young and Young 1992	Seed ripens during August and September. Sow seed during the fall. Hardwood cuttings root better than softwood cuttings. Store the cuttings in sawdust and stick them into sand during late winter or early spring.
Physocarpus malvaceus Mallow ninebark	1, **3**, 4, 5	Link 1993 Rose and others 1998	Plant seed in containers during the fall or during the spring after seed has been chilled for 30 days. Mallow ninebark also can be propagated from root cuttings and rhizomes.
Picea spp. Spruce	1a: 21, 1e	**Young and Young 1992**	Do not sow Engelmann or blue spruce seed during the fall. Some species germinate better if the seed receives mild prechilling.
Picea breweriana Brewer spruce	1a: 16	Young and Young 1992	
Picea engelmannii Engelmann spruce	1a: 16	Young and Young 1992	Light is required for seed to germinate. Excessive moisture reduces survival. Use potassium nitrate (KNO_3) enrichment if the seed is dormant.
Picea pungens Colorado blue spruce	1a: 16	Young and Young 1992	Store seed at a constant temperature of 68 to 77 degrees Fahrenheit (20 to 25 degrees Celsius).
Picea sitchensis Sitka spruce	1a: 30, 1e	Rose and others 1998 Young and Young 1992	Seed will germinate better if it has been stratified. Sow seed 0.2 inch (5 millimeters) deep during the spring. Apply mulch. More than 8 hours of light may be beneficial.

Scientific name Common name	Propagation method	References	Remarks
Pinus spp.	1a: 60–252	Young and Young 1986	Soak the seed in water for 1 to 2 days, then stratify. Some species require a long stratification.
Pinus albicaulis Whitebark pine	1a: 90–120	Rose and others 1998	Collect cones when they turn dull purple to brown. Cones takes 15 to 30 days to dry and open. Stratify the seed by soaking it in water for 1 to 2 days before placing it in moist medium at 41 degrees Fahrenheit (5 degrees Celsius). Seed germinates poorly, but a small cut in the seed coat improves germination. Sow seed during the late fall or early spring, planting it ½ inch (13 millimeters) deep.
Pinus attenuata Knobcone pine	1a: 60	Young and Young 1992	Plant fresh seed directly or chill the seed before planting.
Pinus contorta Lodgepole pine	1a: 20–30	Young and Young 1992	Same as *Pinus attenuata*.
Pinus coulteri Coulter pine	1e	Harris and Leiser 1979	Direct seed during the fall.
Pinus flexilis White pine	1a: 90	Link 1993 Young and Young 1992	Soak the seed for 48 hours in water. Seed takes 90 days to germinate at 37 to 41 degrees Fahrenheit (3 to 5 degrees Celsius) in a moist mixture of peat and sand.
Pinus jeffreyi Jeffrey pine	1a: 0–60	Young and Young 1992	Direct seed during the fall or chill the seed before planting.
Pinus lambertiana Sugar pine	1a: 60–90	Young and Young 1992	Same as *Pinus jeffreyi*.
Pinus monophylla Single-leaf pinyon	1a: 28–90	Landis and Simonich 1983	Seed takes 8 to 12 months to grow.
Pinus monticola Western white pine	1a: 30–120	Young and Young 1992	Direct seed during the fall or chill the seed before planting.

Scientific name Common name	Propagation method	References	Remarks
Pinus ponderosa Ponderosa pine	1a: 30–40, 5, grafting	Rose and others 1998	Cold stratify stored seed. Sow seed during the late fall or spring about 0.2 inch (5 millimeters) deep.
Pinus radiata Monterey pine	1a: 0–7	Young and Young 1992	
Pleuraphis jamesii	1e	Young and Young 1986	
Poa alpina	1, 13	Densmore and others 1990	
Poa fendleriana Mutton grass	1e	Link 1993	
Poa nervosa Wheeler bluegrass	1e	Link 1993	
Poa scabrella Pine bluegrass	1a: 14	Rose and others 1998	Seed ripens from June to September. Prechill the seed before planting. Use potassium nitrate (KNO_3) and light for good germination. Keep temperature at 84 degrees Fahrenheit (29 degrees Celsius). Sow the seed in a mixture of peat and vermiculite (1:1). Grow for 3 months.
Poa secunda Sandberg bluegrass	1e	Rose and others 1998	Seed ripens during early summer. Plant the seed during the fall. Stratify at 54 degrees Fahrenheit (12 degrees Celsius) for 16 hours and 63 degrees Fahrenheit (17 degrees Celsius) for 8 hours. Do not plant the seed deeper than 1.2 inches (30 millimeters) in clay loam or sandy soil.
Polemonium occidentale Jacob's Ladder	1e	Link 1993	
Polygonum newberryi Newberry's fleece flower	1, **8**	Weisberg 1993 **Link 1993**	Divide sections of large root crowns with at least one visible bud. Seeding may be impractical due to limited availability of seed.
Polystichum munitum Sword fern	8	Weisberg 1993	

Scientific name Common name	Propagation method	References	Remarks
Populus spp.	1, 3, 4, 5	Weisberg 1993 **Young and Young 1992**	The seedlings are susceptible to drying, the washing action of rain or irrigation, and to damping off by fungi. A substrate that supplies moisture is critical for seedlings. Softwood and hardwood cuttings root readily. Take 12-inch (300-millimeter) cuttings from dormant 1-year-old wood.
Populus angustifolia Narrowleaf cottonwood	1, 2	Landis and Simonich 1983 Young and Young 1992	Start seed during the summer. Seedlings take 3 to 4 months to grow.
Populus deltoides Eastern cottonwood	3, 4, 5	Young and Young 1992	See *Populus* spp.
Populus tremuloides Quaking aspen	1, **5**	Landis and Simonich 1983 **Rose and others 1998**	Seed ripens from May to mid-June. Dry seed for 3 days at 75 degrees Fahrenheit (24 degrees Celsius). Sow seed on the surface of a moist seedbed at 59 to 77 degrees Fahrenheit (15 to 25 degrees Celsius). Start seed during the spring or summer. Seedlings take 3 to 4 months to grow. To propagate by rooting, collect lateral roots when the plant is dormant during early spring. Roots should be 0.4 to 0.8 inch (10 to 20 millimeters) in diameter and 1 inch (25 millimeters) long. Root in vermiculite for 6 weeks.
Populus trichocarpa Black cottonwood	1e, **2**, **4**	**Potash and Aubry 1997** Rose and others 1998	Seed ripens from May 15 to July 15 when capsules begin to open. Sow seed immediately, or dry the seed and store it. Cuttings should be 1 foot (310 millimeters) long or longer and from ½ to 1 inch (13 to 25 millimeters) in diameter. Cuttings can be rooted in water.
Porophyllum spp.	1	Young and Young 1992	Low seed viability. Storage increases viability slightly.
Potentilla arguta White cinquefoil	1	Link 1993	
Potentilla anserina Cinquefoil	8	Weisberg 1993	

Scientific name Common name	Propagation method	References	Remarks
Potentilla anserina Silverweed cinquefoil	1	Link 1993	
Potentilla flabellifolia Fan-leaf cinquefoil	1	Weisberg 1993	
Potentilla glandulosa Sticky cinquefoil	1	Link 1993	
Potentilla gracilis Northwest cinquefoil	1	Link 1993	
Prunus emarginata Bitter cherry	1a: 90–126, 1e, 4, 9	Young and Young 1992 **Rose and others 1998**	Direct seed during the fall, early enough to allow the seed to afterripen in the presence of oxygen and moisture before the ground freezes. The seed can be stratified at 41 degrees Fahrenheit (5 degrees Celsius) in a mixture of sand and peat before sowing during the spring.
Prunus ilicifolia Holly leaf cherry	1e	Harris and Leiser 1979	Direct seed during the fall.
Prunus subcordata Klamath plum	1a: 90	Young and Young 1992	Same as *Prunus ilicifolia*.
Prunus virginiana Choke cherry	1a: 120–160, 4, 5	Landis and Simonich 1983 Rose and others 1998	Seedlings take 3 to 5 months to grow.
Pseudotsuga macrocarpa Bigcone Douglas-fir	1a	Young and Young 1986	Bigcone Douglas-fir is native to coastal California. It is difficult to germinate.
Pseudotsuga menziesii Douglas-fir	1a: 30–40, 3	Rose and others 1998 Young and Young 1992	Collect cones from August to October when they are brownish purple. Use heat to dry the cones and open them. Sow the seed during the fall and allow it to stratify naturally over the winter or

Scientific name Common name	Propagation method	References	Remarks
			stratify the seed at 32 to 39 degrees Fahrenheit (0 to 4 degrees Celsius). Take cuttings from trees 9 to 12 years old or younger.
Psilostrophe spp.	1e	Young and Young 1992	The seed of *Psilostrophe* has poor rates of germination. Seed stored 1 year lost all viability.
Pteridium aquilinum Bracken fern	5	Potash and Aubry 1997	Collect rhizomes and plant them on the site during the fall.
Ptilagrostis kingii King's ricegrass	1	Link 1993	Keep seed moist and maintain temperatures of 65 to 70 degrees Fahrenheit (18 to 21 degrees Celsius) for germination.
Purshia glandulosa Desert bitterbrush	1a: 21–28	Young and Young 1992	Stratify seed at 32 to 41 degrees Fahrenheit (0 to 5 degrees Celsius).
Purshia tridentata Antelope bitterbrush	1a: 60–90, 4, 11	Landis and Simonich 1983 Shaw 1983 Rose and others 1998 Young and Young 1992	Seed ripens from June 25 to August 15. Treat seed with Captan or with 3-percent hydrogen peroxide for 5 hours to enhance germination. Plant seed during the fall. Seedlings take 4 to 8 months to grow. To propagate with cuttings, collect cuttings that are 4 inches (100 millimeters) long during June. Root cuttings in a mixture of sand, pumice, and vermiculite. To propagate by layering, bend a branch into a small hole beside the plants, keeping the tip of the branch vertical and above the soil level. Cover with soil. This plant fixes nitrogen.
Pyrus spp. (See *Malus* spp.)			
Quercus agrifolia Coast live oak	1e	Harris and Leiser 1979	Direct seed during the fall.
Quercus chrysolepis	1a: 0–60	Young and Young 1992	

Scientific name Common name	Propagation method	References	Remarks
Quercus douglasii Blue oak	1e	Harris and Leiser 1979 Young and Young 1992	Direct seed during the fall.
Quercus dumosa Scrub oak	1a: 30–90	Harris and Leiser 1979 **Young and Young 1992**	Direct seed during the fall.
Quercus durata Leather-leaf oak	1e	Harris and Leiser 1979	Direct seed during the fall.
Quercus gambelii Gambel oak	1	Landis and Simonich 1983	Start seed during the fall. Seedlings take 6 to 8 months to grow.
Quercus garryana Oregon white oak	1e	Rose and others 1998 Young and Young 1992	Soak fresh acorns overnight. Plant the acorns ½ inch (13 millimeters) deep during the fall. Fresh acorns germinate rapidly.
Quercus kelloggii California black oak	1a: 30–45, 1e	Harris and Leiser 1979 Rose and others 1998 Young and Young 1992	Direct seed during the fall. Plant seed immediately or store the seed and stratify it at 34 to 41 degrees Fahrenheit (1 to 5 degrees Celsius) before planting the seed during the spring.
Quercus lobata Valley oak	1e	Harris and Leiser 1979	Direct seed during the fall.
Rhamnus alnifolia Alder buckthorn	1e, 3, 4	Young and Young 1992	Direct seed during the fall.
Rhamnus californica California buckthorn	1e, 3, 4	Harris and Leiser 1979 Young and Young 1992	Direct seed during the fall.
Rhamnus crocea Redberry	1e, 3, 4	Young and Young 1992	Direct seed during the fall.
Rhamnus purshiana Cascara buckthorn	1e, 1a: 90–115, 3, 4, 9	Rose and others 1998 Young and Young 1992	Seed ripens from July through September. Pick fruit before it is fully ripe. Macerate the fruit and separate the seed using flotation.

Scientific name Common name	Propagation method	References	Remarks
			Plant seed during the fall or stratify seed at 34 to 41 degrees Fahrenheit (1 to 5 degrees Celsius) before sowing it during the spring. Take hardwood cuttings during September and October. Propagate by layering during the early spring.
Rhododendron spp.	1e, 9, 11 (spring/ summer)	Weisberg 1993 Young and Young 1992	Seed needs light to germinate.
Rhododendron albiflorum White-flowered rhododendron	5, 9	Rose and others 1998	Most rhododendrons do not require prechilling or scarification, but they do need light to germinate.
Rhododendron macrophyllum Pacific rhododendron	1, 4, 7, 9	Weisberg 1993 **Rose and others 1998**	Collect the seed as soon as the fruit loses its color. Mix seed with fungicide and sow on a mixture of peat and perlite. Cover the flat with glass or plastic. Or sow the seed on screened coarse peat, leaving the flat uncovered while providing bottom heat. Treat with fungicide weekly. The seed needs light to germinate. Take stem cuttings from current growth from May to September. Soak 1.5 to 3 inches (38 to 76 millimeters) of the cutting in benomyl. Wound lower 0.4 to 0.8 inch (10 to 20 millimeters) of the cutting to expose the cambium. Dip the cutting into 0.1- to 1.6-percent indole-3-butyric acid (IBA). Root in a mixture of peat and perlite. Apply bottom heat. When the root ball is 1.2 to 2 inches (30 to 50 millimeters) in diameter, transplant cuttings to a mixture of sawdust and peat. Move the cuttings outdoors to harden them during the early summer.
Rhus spp.	5	Weisberg 1993	
Rhus aromatica Fragrant sumac	1a: 30–90, 1d	Young and Young 1992	Scarify the seed with acid or hot water to break the hard seed coat.
Rhus glabra Smooth sumac	1d, 5	Rose and others 1998 Young and Young 1992	Pick the fruit late in the year. Soak seed in sulfuric acid for 1 to 3 hours. Keep seed in continuous light at a temperature of 68 degrees

Scientific name Common name	Propagation method	References	Remarks
			Fahrenheit (20 degrees Celsius) to promote germination. Sow the seed during the spring.
Rhus trilobata Skunkbush sumac	1a: 30–90, 1d	Landis and Simonich 1983 Young and Young 1992	Seed ripens from June 20 to October 10. Start seed during the fall. Seedlings take 4 to 6 months to grow.
Ribes spp.	1, 2, 3, 5, 10 (spring)	Weisberg 1993	
Ribes cereum Squaw currant	1a: 84–119, 1b, 3	Link 1993 **Rose and others 1998**	Seed ripens during August. Scarify and stratify the seed. Take hardwood heel cuttings during June. Dip cuttings into 0.8-percent indole-3-butyric acid (IBA).
Ribes erythrocarpum Crater Lake currant	1a: 120, 3	Link 1993	Cuttings do poorly. Stratified seed produces a high percentage of healthy plants.
Ribes lacustre Black gooseberry	1a: 120–200, 1d, 3, 9	**Rose and others 1998**	Fruit ripens during August. Extract the seed immediately. Sow the seed during the spring after stratifying it at 32 degrees Fahrenheit (0 degrees Celsius). Soaking the seed for 5 minutes in 2 to 10 percent sulfuric acid can improve germination. Sow the seed during the fall. Take 6- to 8-inch (150- to 200-millimeter) cuttings from 1-year-old wood during the fall.
Ribes montigenum Sierra gooseberry	1a	Link 1993	
Ribes viscosissimum Sticky currant	1a	Link 1993	Cuttings do poorly.
Robinia spp. Locust	1b, 5	Weisberg 1993 **Young and Young 1986**	Scarify the seed mechanically, with acid, or by soaking in boiling water. Plant seed ½ inch (13 millimeters) deep and mulch lightly.
Rosa spp. Wildrose	1, **2**, 3, 4, 9, 12	Hartmann and others 1990 Weisberg 1993	Separate the seed from the fruit by flotation. Outplant seedlings in late spring or early summer.

Scientific name Common name	Propagation method	References	Remarks
Rosa gymnocarpa Baldhip rose	1a: 90, 1e, 2	Rose and others 1998 Young and Young 1992	Pick red hips during August and September. Macerate the hips and use flotation to separate the seed. Germination is best when the seed is sown after cleaning. Stratify stored seed at 34 to 37 degrees Fahrenheit (1 to 3 degrees Celsius). When taking cuttings, include three to four nodes. Use root hormone.
Rosa nutkana Nootka rose	1f, 1e	Rose and others 1998 Young and Young 1992	Seed ripens during August and September. Clean the seed, which requires a period of afterripening. If the seed is sown during the spring, stratify the seed warm then cold. Sow fresh seed during the fall into a finely milled mixture of peat and vermiculite.
Rosa pisocarpa Cluster rose	1f	Rose and others 1998	Soak the hips in water for 5 to 7 days in a warm place before macerating the hips and floating away the pulp. During the fall, seed can be sown into a standard potting mixture and left outside over winter. Stratify the seed warm and cold if it will be sown during the spring.
Rosa woodsii Wood's rose	1f: cold 84/168, 4, 8, 9	Landis and Simonich 1983 **Rose and others 1998** Young and Young 1992	Sow fresh seed during the fall. If the seed will be sown during the spring, stratify it warm to cold at 39 degrees Fahrenheit (4 degrees Celsius). To propagate from cuttings, take 6-inch (150-millimeter) softwood cuttings during mid to late June. Wood's rose spreads by rhizomes.
Rubus spp.	12 (summer)	Weisberg 1993	
Rubus idaeus Red raspberry	1b, 1f: 90/90, 5, **8**, 9	Rose and others 1998 Young and Young 1992	Use flotation to separate the seed. Germination is best when the seed is scarified and sown during the fall. Scarify the seed in sulfuric acid for 20 to 60 minutes or in a 1-percent solution of sodium hyperchlorite for 7 days. If the seed will be sown during the spring, it should be stratified warm at 68 to 86 degrees Fahrenheit (20 to 30 degrees Celsius) and cold at 36 to 41 degrees Fahrenheit (2 to 5 degrees Celsius). Lightly cover the seed with soil. Take root cuttings when the plants are dormant.

Scientific name Common name	Propagation method	References	Remarks
Rubus lasiococcus Dwarf bramble	2, 5, **8**	Potash and Aubry 1997 Rose and others 1998	Fruits ripen from July 1 to September 30. Dwarf bramble can be propagated easily from runners.
Rubus leucodermis	5	Weisberg 1993	
Rubus nigerrimus	5	Weisberg 1993	
Rubus parviflorus Thimbleberry	1e or 1f: 90/90	**Potash and Aubry 1997** Rose and others 1998	Seed ripens from June 1 to September 30 when the berry is red. Process the berries immediately by macerating them and using flotation to separate the seed. Seed may not need treatment, but can be stratified for 90 days at 68 to 86 degrees Fahrenheit (20 to 30 degrees Celsius), then for 90 days at 36 to 41 degrees Fahrenheit (2 to 5 degrees Celsius). A sulfuric acid treatment before the cool stratification may increase germination.
Rubus pedatus Strawberry bramble	1, 2, 8	Weisberg 1993 Potash and Aubry 1997	Same as *Rubus lasiococcus*.
Rubus spectabilis Salmonberry	1f: 90/90, 3, 5, 8, 12	**Potash and Aubry 1997** Rose and others 1998 Young and Young 1992	Berries ripen from June 15 to September 30 when they are orange or red. Process the berries and treat them as recommended for *Rubus parviflorus*. Small offshoots can be transplanted. Hardwood cuttings will be ready for planting in 4 months. Use liquid rooting hormone and bury the cuttings in damp wood shavings.
Rubus ursinus Pacific blackberry	2, 5, 7, 9	Weisberg 1993 **Potash and Aubry 1997** Rose and others 1998	Berries ripen from June 1 to August 30 when they turn black. Process the berries and treat them as recommended for *Rubus parviflorus*. One vine can be used to make a number of cuttings.
Salazaria mexicana Bladder sage	1e	Young and Young 1992	
Salix spp. Willow	3, 9 (spring)	Weisberg 1993	Willow species are difficult to tell apart. Collect them from the appropriate habitat.

Scientific name Common name	Propagation method	References	Remarks
Salix alaxensis	1, **cuttings**	Densmore and others 1990	
Salix bebbiana Bebb willow	1e, 2, 3, 5, 9	Rose and others 1998 Young and Young 1992	It is not necessary to separate the seed from the capsule. Seed is viable just for a few days. Sow the capsules on beds, keeping them moist. To propagate Bebb willow from cuttings, take 12-inch (300-millimeter) cuttings from 1-year-old wood during the late fall or early spring. Plant the cuttings in heavy damp soil.
Salix lasiandra Pacific willow	1e, 2, 3	Rose and others 1998 Young and Young 1992	Sow seed in flats with a mixture of sand, perlite, peat, and vermiculite. Take cuttings from 1- to 4-year-old wood during the middle of the fall to early spring. The terminal end should be cut horizontally and the basal end should be cut at 45 degrees. Apply fungicide. Cuttings can be planted directly on the site.
Salix orestera Sierra willow	3	Link 1993	Transplant cuttings into cone cells with a medium of perlite, peat, vermiculite, sand, and Osmocote. Keep the cuttings moist with 70-degree-Fahrenheit (21-degree-Celsius) bottom heat. Place the cuttings in a lathhouse for the entire winter.
Salix scouleriana Scouler's willow	1e, **3**, **4**	**Potash and Aubry 1997** Rose and others 1998 Young and Young 1992	Seed ripens from April 1 to July 30 soon after flowering. Sow the seed immediately, or store moist seed for up to 30 days. To propagate Scouler's willow from cuttings, take softwood cuttings 1 foot (300 millimeters) long or hardwood cuttings 3 feet (910 millimeters) long, and cut them into 6-inch (150-millimeter) whips. This is an upland species. Cuttings should not be used for bioengineering applications, such as live stakes.
Salix sitchensis Sitka willow	1e, 4, **live stakes**	**Potash and Aubry 1997**	Collect and handle the seed as recommended for *Salix scouleriana*. To propagate Sitka willow from cuttings, take softwood cuttings 1 foot (300 millimeters) long when the plant is dormant. These cuttings can be used as live stakes for bioengineering applications.

Scientific name Common name	Propagation method	References	Remarks
Salvia leucophylla Purple sage	1e	Harris and Leiser 1979	Direct seed during the fall.
Salvia lyrata Lyre-leafed sage	1e	Link 1993	Broadcast seed at a rate of 3 to 4 pounds per acre (3.4 to 4.5 kilograms per hectare) during the early summer. Seed shatters easily.
Salvia sonomensis Creeping sage	1a	Young and Young 1992	Chill the seed before planting.
Sambucus spp.	9 (spring)	Weisberg 1993	
Sambucus canadensis Elderberry	1e	Link 1993	Seed ripens from June to September. Add some water before depulping the fruit in a blender. Plant the seed during the fall.
Sambucus cerulea Blue elderberry	1f: 60–90/90–112, 3	Landis and Simonich 1983 **Rose and others 1998** Young and Young 1992	Collect the seed and sow it during the fall. If the seed can't be planted after it is collected, stratify it with 8 hours of light daily. During the winter, take hardwood cuttings with a heel from the previous season's growth.
Sambucus racemosa Red elderberry	1c, d, then f: 70/84 2, 3, 4	Weisberg 1993 **Potash and Aubry 1997** Rose and others 1998	Berries ripen from July 1 to September 30 when they are red. Macerate the fruit and separate the seed using flotation. Provide light 8 hours per day for germination. Tip cuttings or side-shoot cuttings from pruned plants are the easiest cuttings to handle. Cuttings grow quickly. Outplant the cuttings early enough so they can become established before winter.
Sapindus drummondii Western soapberry	1a: 90, 1d	Link 1993 **Young and Young 1992**	Scarify the seed in acid for 2 to 2½ hours. Freshly collected seed germinates better than seed that has been dried.
Sarcobatus vermiculatus Greasewood	1	Young and Young 1986	Remove the seed from the fruit for best results.
Satureja douglasii Yerba Buena	1e	Young and Young 1986	

Scientific name Common name	Propagation method	References	Remarks
Saxifraga ferruginea Rusty saxifrage	6	Weisberg 1993	
Saxifraga tricuspidata	1	Densmore and others 1990	
Schinus molle California pepper tree	1e	Harris and Leiser 1979	Direct seed during the fall.
Senecio lugens	1	Densmore and others 1990	
Sequoia sempervirens Redwood	1e	Young and Young 1992	Sow seed during the spring when frost is not likely and soil temperatures are warm. Thin seedlings to 315 per 11 square feet (1 square meter) of seedbed. Keep seedlings in half shade.
Sequoiadendron giganteum Giant sequoia	1a: 60	Young and Young 1992	Soak seed overnight in distilled water, then stratify. Sow seed during the spring.
Setaria macrostachya Bristly foxtail	1b	Young and Young 1986	Scarify seed in acid for 15 to 30 minutes. This seed requires a prolonged afterrripening.
Shepherdia argentea Silver buffaloberry	1a: 0–90, **5**, 9	Landis and Simonich 1983 **Rose and others 1998** Young and Young 1992	Fruit ripens from June to August. Macerate the fruit and separate the seed using flotation. Scarify and stratify the seed. To propagate silver buffaloberry from cuttings, stick root cuttings into ordinary outside soil during February or March. Layer shoots during the fall.
Shepherdia canadensis Russet buffaloberry	1a: 60–90, 1d	Densmore and others 1990 **Young and Young 1992**	Scarify seed with acid before stratifying it. Sow seed during the fall or spring. This species is subject to greenhouse pathogens.
Silene spp.	1	Young and Young 1986	The seed needs light to germinate.
Silene acaulis	1	Densmore and others 1990	
Simmondsia chinensis Jojoba	1e, 4	Harris and Leiser 1979	Direct seed during the fall. Plant the seed 1.6 to 2 inches (40 to 50 millimeters) deep. Take

Scientific name Common name	Propagation method	References	Remarks
		Young and Young 1992	cuttings during the late spring or early summer.
Sitanion hystrix Squirreltail	1e	Young and Young 1986	
Smilacina racemosa False Solomon's-seal	1, 8, rhizomes	Rose and others 1998	The seed has double dormancy and requires 2 years to germinate. Sow during the fall in a shady, moist area. Propagate by divisions during the fall or early spring.
Solidago canadensis Canada goldenrod	1e, 8, 13	Link 1993	Seed ripens from mid-August to late October. Broadcast the seed. Plants can be divided and transplanted during the fall or spring.
Solidago multiradiata	1	Densmore and others 1990	
Sophora spp.	1b	Young and Young 1992	Scarify the seed with acid or mechanical scarification.
Sorbus scopulina Green mountain ash	1e, 2	Link 1993	
Sorbus sitchensis Sitka mountain ash	1a: 90–140, 1e	Potash and Aubry 1997 **Rose and others 1998**	Berries ripen from August 1 to October 31 when they are dark red. If the berries are collected early, keep them in heaps for 2 months so they can decompose. Macerate the fruit and separate the seed using flotation. Seed may take 2 years to germinate. Sow seed during the fall or early winter. If seed will be sown during the spring, stratify it at 34 to 41 degrees Fahrenheit (1 to 5 degrees Celsius) in moist peat. Use drills to sow cleaned seed. This species is difficult to start from cuttings.
Spirea betulifolia Birchleaf spirea	1e, 4, 8, 9	Rose and others 1998 Young and Young 1992	Seeds disperse during October. Seed can be sown during the fall and allowed to overwinter. Take cuttings during mid-June. Dip the cuttings in 3,000-parts-per-million indole-3-butyric acid (IBA) talc before sticking the cuttings into sand in an outdoor frame and applying bottom heat.

Scientific name Common name	Propagation method	References	Remarks
Spirea densiflora Subalpine spirea	**1e or 1a: 30–60** 2, 3, **4**, **8**	Potash and Aubry 1997 Rose and others 1998	Seed ripens from September 15 to November 15 when the capsule turns brown. Flower heads can be collected earlier and allowed to ripen in paper bags. Softwood cuttings can be taken at any time that the branches have leaves.
Spirea douglasii Hardhack or Douglas spirea	**1e**, **2**	**Potash and Aubry 1997** Rose and others 1998	Dry seed may require 1 to 2 months of cold before germination. Sow ¼ teaspoon (1.2 milliliters) of seed per flat during February or March. Cuttings should be taken during the fall from softer wood. They will root in 2 to 4 weeks and can be transplanted immediately. Be wary of aphids, leaf rollers, and fire blight.
Spirea splendens Alpine spirea	1a: 48, 2	Link 1993	Seed ripens from the end of August through September. Direct seed into containers, or root cuttings from 1-year-old wood using a mist bench. Cuttings should be taken from active wood during the summer.
Sporobolus airoides Drop seed	1a: 5	Young and Young 1986	
Sporobolus giganteus	1a: 5	Young and Young 1986	
Stanleya spp. Prince's plum	1e	Young and Young 1992	
Staphylea spp. Bladdernut	1b, 1f: 84/84	Young and Young 1992	Seed requires scarification with acid.
Stephanomeria pauciflora	1	Young and Young 1992	Germination increases if the seed is stored.
Stipa lemmonii Lemmon needlegrass	1a	Rose and others 1998	Seed ripens during early June. Cold stratify the seed in potassium nitrate and gibberellic acid and plant it in 3-cubic-inch (49-cubic-centimeter) containers with a 1:1 mixture of peat and vermiculite. Apply a low-nitrogen fertilizer once a week.

Scientific name Common name	Propagation method	References	Remarks
Stipa nelsonii Columbian needlegrass	1e	Link 1993	Germination was higher when the seed was started in a lathhouse rather than a greenhouse. Use misters and keep temperatures between 65 and 70 degrees Fahrenheit (18 and 21 degrees Celsius).
Stipa occidentalis Western needlegrass	1e	Link 1993	Seed ripens during late August to early September. Sow the seed during the fall in media amended with peat and slow-release fertilizer. Direct seed about 5 to 8 seeds in each container. Chill the containers outside for a week, then put them in a greenhouse.
Stipa richardsonii Richardson needlegrass	13	Link 1993	Seed ripens from mid-July to mid-August. Apply seed directly and mulch with forage harvested when the seed heads mature.
Streptopus spp. Twisted stalk	8	Weisberg 1993	
Styrax officinalis Snowdrop bush	1a: 60	Young and Young 1986	
Symphoricarpos spp.	1f, 8, root suckers	Hartmann and others 1990	Use flotation to separate the seed from the fruit. Stratify the seed with 90 to 120 days of warm and moist conditions, followed by 180 days at 41 degrees Fahrenheit (5 degrees Celsius).
Symphoricarpos albus Snowberry	**1f: 60 days at room temperature/180 days at 5 degrees Celsius**, 2, 3, 4, 5, 8	Weisberg 1993 Potash and Aubry 1997 **Rose and others 1998** Young and Young 1992	Extract the seed by running berries through a macerator with water. Seed is difficult to germinate. Keep seed at room temperature for 3 to 4 months, then at 41 degrees Fahrenheit (5 degrees Celsius) for 4 to 6 months. This species develops powdery mildew.
Symphoricarpos occidentalis Western snowberry	1f, 1b	Young and Young 1992	Seed requires acid scarification for 20 to 75 minutes. Seed should be stratified warm for 90 to 120 days before sowing in the fall.

Scientific name Common name	Propagation method	References	Remarks
Symphoricarpos oreophilus Mountain snowberry	1a: 60–300, 8, 9	Landis and Simonich 1983 Rose and others 1998	Seed has double dormancy and may need to be soaked in hot water before planting. Sow stratified seed during the spring or unstratified seed during the fall. Keep the seed moist after planting.
Taxus brevifolia Pacific yew	3	Weisberg 1993	
Tetracoccus hallii	1e	Young and Young 1992	The germination rate is about 50 percent. Seed can be stored for up to 2 years.
Tetradymia canescens Horsebrush	1a: 28–52	Young and Young 1992	
Thalictrum spp. Meadow rue	1e, 8	Weisberg 1993 Young and Young 1986	
Thalictrum fendleri Fendler meadow rue	1	Rose and others 1998	Place seed under running water for 4 hours. Stratify in a dilute solution of gibberellic acid on double layers of filter paper. Temperatures should be 72 degrees Fahrenheit (22 degrees Celsius) for 8 hours (with light) and 63 degrees Fahrenheit (17 degrees Celsius) for 16 hours (without light).
Thuja plicata Western red cedar	1a: 30–40, 1e, 3, 9	Weisberg 1993 Rose and others 1998 Young and Young 1992	Cones ripen during early August, turning yellow to brown. Dry the cones. Stratify stored seed at 34 to 37 degrees Fahrenheit (1 to 3 degrees Celsius). Sow seed during the spring, 0.2 inch (5 millimeters) deep. Keep seedlings shaded for the first year.
Tolmiea menziesii Piggyback plant	6	Weisberg 1993	
Torreya californica California nutmeg	1e	Young and Young 1992	The seed requires a long period of afterripening. Germination takes several months.
Trifolium spp. Clover	1b	Young and Young 1986	Ethylene or carbon dioxide enrichment is recommended.

Scientific name Common name	Propagation method	References	Remarks
Trisetum spicatum	1a	Young and Young 1986	Seed requires light to germinate.
Tsuga spp. Hemlock	9 (spring)	Weisberg 1993	
Tsuga heterophylla Western hemlock	1a: 21–90, 2, 9, grafting	Rose and others 1998 Young and Young 1992	Collect cones from the tree and air-dry them. Soak the seed in cold water for 24 to 26 hours. Stratify the seed before sowing it on the surface during the spring.
Tsuga mertensiana Mountain hemlock	1a: 90	Young and Young 1992	Do not chill the seed too long or it will be damaged.
Umbellularia californica Myrtlewood	1e, cuttings	Young and Young 1992	Collect the fruit during the late fall. Macerate the fruit and separate the seed with flotation. Seeds loses viability rapidly. Seedlings take several months to emerge.
Vaccinium spp.	10 (spring)	Weisberg 1993	
Vaccinium caespitosum Dwarf blueberry	2	Link 1993 Young and Young 1992	
Vaccinium deliciosum Cascade blueberry	1, 3, 4	Weisberg 1993 **Rose and others 1998**	Seed ripens during the late summer to early fall. Macerate the fruit, then separate the seed using floatation. Sow seed on a bed of moist peat. Ideal temperatures are 65 degrees Fahrenheit (18 degrees Celsius) during the day and 55 degrees Fahrenheit (13 degrees Celsius) during the night. Seven weeks after germination, increase temperatures to 68 degrees Fahrenheit (20 degrees Celsius) during the day and 52 degrees Fahrenheit (14 degrees Celsius) during the night. To propagate Cascade blueberry from cuttings, take 6-inch (150-millimeter) hardwood cuttings during January or February from 2-year-old wood. Plant the cuttings horizontally about 1 inch (25 millimeters) deep in a mixture of peat and sand. The cuttings will be ready to plant by the following winter or spring. Take 4-inch (100-millimeter) softwood heel cuttings as soon as new growth gets woody (from mid-June to July). Transplant cuttings to a nursery bed around the end of October. Outplant 1 year later.

Scientific name Common name	Propagation method	References	Remarks
Vaccinium membranaceum Mountain huckleberry	1e, 5	Link 1993 **Rose and others 1998**	Seed ripens during August. Overwinter in flats. Seed germinates best on moist peat at temperatures of 64 degrees Fahrenheit (18 degrees Celsius) for 12 hours and 55 degrees Fahrenheit (13 degrees Celsius) for 12 hours. Seven weeks after germination, increase the temperatures to 68 degrees Fahrenheit (20 degrees Celsius) and 57 degrees Fahrenheit (14 degrees Celsius). Take 4-inch (100-millimeter) cuttings from rhizomes during the early spring, late summer, and fall.
Vaccinium occidentale Western blueberry	1a: 90	Sheat 1948 Dirr and Heuser 1987	Use a lime-free potting mix. Sow seed during the late winter in a greenhouse. Just cover the seed with potting mix. The seed might require up to 3 months cold stratification. Once seedlings are about 2 inches (10 millimeters) tall, replant the seedlings in individual pots and grow them in a lightly shaded portion of the greenhouse, at least for their first winter.
Vaccinium parvifolium Red huckleberry	1, 2	Weisberg 1993 Potash and Aubry 1997 Rose and others 1998 Young and Young 1992	Use a blender to separate the seed. Float off the pulp. Seed should be chilled at 50 degrees Fahrenheit (10 degrees Celsius) for several days. Dry seed at 59 to 70 degrees Fahrenheit (15 to 21 degrees Celsius) for 2 days. Stored seed germinates well when kept at 82 degrees Fahrenheit (28 degrees Celsius) in the light for 14 hours and at 55 degrees Fahrenheit (13 degrees Celsius) in the dark for 10 hours. Take cuttings when the plants are dormant.
Vaccinium scoparium Grouse whortleberry	1e, 2, 5	Link 1993 Rose and others 1998	After collecting seed, place it in a plastic bag and store it at 41 degrees Fahrenheit (5 degrees Celsius) for a few days to a few weeks. Macerate the fruit, separate the seed using floatation. Seed does not require treatment before planting.
Vaccinium uliginosum occidentale Western blueberry	2	Link 1993	Transplant cuttings into cone cells with a mixture of perlite, peat, vermiculite, sand, and Osmocote. Apply bottom heat of 70 degrees Fahrenheit (21 degrees Celsius). Keep the medium moist. Place in a lathhouse for winter.

Scientific name Common name	Propagation method	References	Remarks
Valeriana sitchensis Sitka valerian	8	Weisberg 1993	
Vancouveria sitchensis Inside-out flower	8	Weisberg 1993	
Veratrum californicum False hellebore	1: 48–84	Link 1993 Young and Young 1986	False hellebore has a very low germination rate. Seed production is inconsistent from year to year.
Verbena spp.	1e	Young and Young 1986	*Verbena* requires light for germination.
Viburnum spp.	1, 3, 4	Young and Young 1992	Seed can be sown in nursery beds during the spring for warm stratification. By the following winter, the seed will be chilled. Seedlings will emerge the next spring. This species can be propagated with softwood or hardwood cuttings and with air layering.
Viburnum edule Highbush cranberry	1f, 2, 4, 9	Rose and others 1998	Seeds are difficult to germinate because of their hard seed coat and embryo dormancy. Take cuttings from 1-year-old and new growth during July and August.
Viburnum ellipticum Western viburnum	1f, 2, 4, 9	Randall and others 1978	
Vicia americana American vetch	1e	Rose and others 1998	Seed ripens during September. Seed should be at least 1 year old. Plant during the spring or fall in moist, clay soil.
Viguiera multiflora Showy goldeneye	1e	Link 1993	Seed ripens from early to mid-September. Dormant fall seeding is recommended. Seed should be broadcast.
Viola spp.	1e	Young and Young 1986	
Washingtonia filifera California fan palm	1e	Young and Young 1992	Macerate the fruit and float off the seed. Do not allow the seed to dry. Do not store the seed for a long time. Sow the seed in sand or a mixture

Scientific name Common name	Propagation method	References	Remarks
			of peat and sand. Apply bottom heat. Transplant seedlings to containers once the elongated second leaf appears. Grow seedlings in partial shade.
Wyethia amplexicaulis Mule's ear	1a: 28	Rose and others 1998 Young and Young 1986	Seed ripens during July and August.
Yucca baccata Spanish bayonet	1e	Link 1993	Sow seed directly into the final containers. Soak the seed for 24 hours or scarify the seed mildly.
Yucca elata Soaptree yucca	1b	Young and Young 1992	Soak the seed for 24 hours or scarify the seed mildly.
Yucca glauca Yucca	1, 2, 5, 8, rhizomes	Link 1993 Young and Young 1992	Soak seed for 24 hours or mechanically scarify the seed to remove its hard seed coat. Seedlings should be ready for transplanting during the second season. Yucca can be propagated by root cuttings covered with 4 inches (100 millimeters) of soil.
Xerophyllum tenax Beargrass	1e or 1a: 180 8	Potash and Aubry 1997	The seed requires no treatment for sowing during the fall. If the seed will be sowed during the spring, store flats of covered seed outside in a sheltered location until spring. Uncover the flat and add a layer of dry perlite. See additional information in appendix C.

References

Browse, P.M. 1979. The Royal Horticultural Society's encyclopedia of practical gardening: plant propagation. New York: Simon and Schuster, Inc. 96 p.

Densmore, R.V.; Dalle–Molle, L.; Holmes, K.E. 1990. Restoration of alpine and subalpine plant communities in Denali National Park and Preserve, Alaska, USA. In: Hughes, Glenn H.; Bonnicksen, Thomas M., eds. 1990. Proceedings: Restoration '89: the new management challenge. First annual meeting of the Society for Ecological Restoration; 1989 January 16–20; Oakland, CA. Madison, WI: Society for Ecological Restoration.

Dirr, M.A.; Heuser, M.W. 1987. The reference manual of woody plant propagation. ISBN 0942375009. Athens, GA: Varsity Press.

Harris, R.; Leiser, A. 1979. Direct seeding of woody plants in the landscape. Leaflet 2577. Division of Agricultural Sciences, University of California. 13 p.

Hartmann, H.T.; Kester, D.E.; Davies, F.T., Jr. 1990. Plant propagation: principles and practices. Englewood Cliffs, NJ: Prentice-Hall, Inc. 647 p.

Hingston, S.G. 1982. Revegetation of subalpine backcountry campgrounds: principles and guidelines. Resource Management Report Series KR–3. Alberta, Canada: Alberta Recreation and Parks, Kananaskis Region.

Landis, T.J.; Simonich, E.J. 1984. Producing native plants as container seedlings. In: Murphy, Patrick M., comp. The challenge of producing native plants for the Intermountain area: Proceedings: Intermountain Nurseryman's Association 1983 conference; 1983 August 8–11; Ogden, UT. Gen. Tech. Rep. INT-168. Ogden, UT: U.S. Department of Agriculture Forest Service, Intermountain Forest and Range Experiment Station: 16–25.

Link, E. 1993. Native plant propagation techniques for national parks. U.S. Department of Agriculture Soil Conservation Service and U. S. Department of the Interior National Park Service. 240 p.

Potash, L.L.; Aubry, C.A. 1997. Mt. Baker-Snoqualmie National Forest native plant notebook. Mountlake Terrace, WA: U.S. Department of Agriculture Forest Service, Mt. Baker-Snoqualmie National Forest. 412 p.

Randall, W.R.; [and others]. 1978. Manual of Oregon trees and shrubs. Corvallis, OR: Oregon State College Cooperative Association. 234 p.

Rose, R.; Chachulski, C.E.C.; Haase, D. 1998. Propagation of Pacific Northwest native plants. Corvallis, OR: Oregon State University Press. 256 p.

Schmidt, M.G. 1980. Growing California native plants. Berkeley, CA: University of California Press.

Shaw, N. 1984. Producing bareroot seedlings of native shrubs. In: Murphy, Patrick M., comp. The challenge of producing native plants for the Intermountain area: Proceedings: Intermountain Nurseryman's Association 1983 conference; 1983 August 8–11; Ogden, UT. Gen. Tech. Rep. INT-168. Ogden, UT: U.S. Department of Agriculture Forest Service, Intermountain Forest and Range Experiment Station: 6–15.

Sheat, W.G. 1948. Propagation of trees, shrubs, and conifers. New York: MacMillan and Co.

Weisberg, S. 1993. Revegetation handbook. Unpublished report. U.S. Department of the Interior National Park Service, Pacific Northwest Region.

Young, J.A.; Young, Cheryl G. 1986. Collecting, processing, and germinating seeds of wildland plants. Portland, OR: Timber Press. 236 p.

Young, J.A.; Young, Cheryl G. 1992. Seeds of woody plants in North America. Portland, OR: Dioscoridies Press. 407 p.