NATIVE PLANTS, NATURAL LANDSCAPES

WILD ONES FRONT RANGE CHAPTER

Germination Guide for Native Seeds

Jan Midgley 9/15/22

E (easy) - M (moderate ease) - D (difficult)

FORBS

D *Abronia fragrans* (Fragrant Sand-verbena) - Nyctaginaceae

In fall, scarify (acid 10 minutes or sandpaper), soak 12-24 hours, sow in situ. Cover the seeds to depth.
The seeds require at least 2 months of cold moist treatment.
Seeds may take a few years to germinate.

E *Achillea millefolium* (Common Yarrow) - Asteraceae
Dry store the seeds at 70˚ over the winter. Sow, cover very lightly. Expose to 70-77˚ in the day and 60˚ at night. These temperatures are goals. The warm daytime temperature is the most important one.

M *Allium cernuum* (Nodding Pink Onion) - Alliaceae
Afterripen: store dry at 40-70˚ for 6 months before sowing or cold stratification.
Some people cold stratify for 1 month and some just sow the seeds in May after the after-ripening period. Either way seeds germinate at 70˚.
Cover the seeds to depth.

M *Allium textile* (Textile Onion) - Alliaceae
Collect the seeds when the scapes easily pull from the bulbs. Place the capsules in a paper bag to dehisce.
Sow in situ shortly after you collect the seeds (July-August) or sow in early March in a container or in situ. Cover the seeds.

E *Amsonia illustris* (Ozark Bluestar) - Apocynaceae
Regional species. central MO to KS and TX
Scarify the woody seeds with sandpaper and soak in tepid water for 12-24 hours. Then cold stratify for 60 days. The cold treatment can be accomplished in the fridge or by sowing in Nov. in deep cells or in situ.
Cover the seeds to depth.

E *Anaphalis margaritacea* (Pearly Everlasting) - Asteraceae
This species is dioecious or polygamo-dioecious (a plant can have female and bisexual flowers or male and bisexual flowers). If it is dioecious, it has male and female plants. You need both to get fertile seeds. The female heads can be recognized when the seeds are ripe by the reflexing of the involucral bracts. The receptacle "sticks its chest out" and displays the pouffy seed fluff. At this point you can easily pluck the seeds from the receptacle.
Store dry until the following spring.
After the last frost date, sow these tiny seeds on the soil surface and press in. They need light and 70˚. Mist or bottom water. Fall sowing might work, but I think losses would be large.
Germinate in 1-2 weeks.

Anemone patens* var. *multifida (Pasque Flower) - see ***Pulsatilla nuttalliana***

M *Antennaria* spp. (Pussytoes) - Asteraceae
Dioecious. Female heads are taller and skinnier than male heads which look like small heads of cauliflower.
Collect seeds when the pappus is fluffy, June-July.
Store dry at 40˚ or 70˚. The storage allows the embryo to afterripen which may be required for germination success in spring.
Sow mid-April in the Front Range (55-65˚). Be generous with the pinch of seeds. Barely cover the seeds.
Germinate in 1-2 months. The seedlings are tiny.
Pussy toes also increase by stolons and can be divided in early spring. Maintain sod-like sections.

Aquilegia chrysantha (Golden Columbine) - Ranunculaceae
"No cold stratification is necessary. Sow in May." Cover very lightly. email 11/2/20 from Sherry Fuller, propagator at the Gardens on Spring Creek, Ft. Collins, CO
Golden Columbine can be sown in situ in late fall or in spring.

Aquilegia coerulea (Rocky Mt. Columbine) - Ranunculaceae
Treat the same as *Aquilegia chrysantha.*

Argemone pleiacantha (Southwestern Prickly Poppy) - Papaveraceae
Annual to short-lived perennial.
Sow in situ outside in mid to late fall. Cover lightly.

Argemone polyanthemos (Crested Prickly Poppy) - Papaveraceae
Annual to short-lived perennial.
Sow in situ outside in mid to late fall. Cover lightly.
Annuals can be started in cells/pots in the spring. Use light cover material.

M *Artemisia frigida* (Fringed Sage, Prairie Sagewort) - Asteraceae
Collect seeds Sept-Nov. Store dry at 40˚ or 70˚ for 6 months (afterripen). Viable 2-3 years.
Sow after the last frost date. Ideally, the night time temperature is above 50. Lightly cover the seeds and make sure they do not dry out.
Germinate in 1 week.
Vegetative reproduction by cuttings (Feb-May) and by layering.

***Asclepias* spp. seed collection and cleaning.**
Collect seeds when the follicles begin to split. Contain the fly-away silks by putting a rubber band around the follicle until you are ready to clean the seeds. Clasp the silks and thumb the seeds off onto a piece of paper on a tray.
If the seeds and silks are already escaping, gather the entire mass into a paper bag. Add a coin or two and shake very hard for several minutes. Cut a slit in the bottom of the paper bag and shake the seeds out. Thank you Steven S. for this cleaning tip.

M *Asclepias incarnata* (Swamp Milkweed) - Apocynaceae
Store seeds dry at 40˚ for 5-6 months then sow. Cover **very** lightly. Sow at 75-85˚
OR
Cold stratify 30 days. Sow at 75-85˚. Cover **very** lightly.
OR
Sow outside in fall.

Asclepias pumila (Plains Milkweed) - Apocynaceae
Store cleaned, dry seeds in the fridge.

Cold stratify for 2-4 months in the fridge or in situ. Older seeds may need a longer stratification.
Cover the seeds very lightly.
Germinate outside in May in the Front Range of CO.

M *Asclepias speciosa* (Showy or Common Milkweed) - Apocynaceae
Sow outside in fall. Cover **very** lightly.
OR
Cold stratify 60 days. Sow, cover **very** lightly.
Germinates best when the temperature is above 80˚ day/ 60˚ night.

M *Asclepias sullivantii* (Prairie Milkweed) - Apocynaceae
Store seeds dry, 40˚.
Cold stratify 2 months. Germination temperature should be 70˚ or higher. Sow in situ or in cells.
Cover very lightly to meet the light requirement.

M *Asclepias syriaca* (Common Milkweed) - Apocynaceae
Follow directions for *Asclepias incarnata.*

M *Asclepias tuberosa* (Butterflyweed, Orange Milkweed) - Apocynaceae
Store the seeds dry at 40˚ at least 2 months and no stratification is necessary.
Sow when the temperature is above 70˚, preferably 80˚+ at least part of the day. Cover the seeds **very** lightly to allow light to the seeds. They should germinate in 7-10 days if the temperature is high enough.

Asclepias viridiflora (Green Comet Milkweed) - Apocynaceae
Sow in winter in cells and place outdoors or sow in situ.
OR
Cold stratify for 1 month in the fridge before sowing around the last frost date or later.
Cover the seeds very lightly.
Germination occurs when daytime temperatures hit highs of 70-80+.

M Astragalus drummondii (Woolly Milkvetch) - Fabaceae
Sandpaper, inoculate (opt.), sow in 2.5" pots or deep cells, cover well and put outside 1 month before your last frost date. The radicles begin to emerge in 11 days and continue emergence over the next month.

Milkvetches do not seem to tolerate root disturbance.

Bahia dissecta - see *Hymenothrix*

E *Berlandiera lyrata* (Chocolate Flower) - Asteraceae
Collect when the bracts are very dry and brownish for easy removal of the bracts. Rub hard on a soil sieve screen to dislodge the bracts.
Store dry at 40˚.
Start in late April to May. Soak the seeds in diluted peroxide (1/2 C. tepid water + 1/4 oz. 3% hydrogen peroxide) for 24 hours. Rinse well. Sow in cells or in situ. Cover very lightly for light exposure. Leaves emerge in 10 days. Skipping the peroxide soak just adds a few days to the germination time.

E *Brickellia eupatorioides* (False Boneset) - Asteraceae
No pretreatment necessary for this part shade tolerant plant. Sow at 70˚. Cover the seeds very lightly. The seeds germinate in 7-10 days.

D *Callirhoe involucrata* (Wine Cups, Purple Poppy Mallow) - Papaveraceae
Scarify with sandpaper and sow in situ in fall.
OR
Pour boiling water over the seeds in a pyrex dish. Let the water cool and soak the seeds 12-24 hours. Sandpaper scarify and try to peel the seed coat off of the seeds. Cold stratify for 1 month. Sow, cover lightly and expose to 70˚.
Flower the second year.

"Take tip cuttings as early as February, before buds form." Ann Grant 2/20/21 Zoom chat box at her propagation talk for CoNPS

E *Calochortus gunnisonii* (Gunnison's Mariposa Lily) - Liliaceae
Sow in November. Put several seeds in each cell. Use about 1/8" cover. Put outside. The radicles emerge in late fall and survive the winter in cells or pots. In the Denver area, the first leaves emerge early April. Move to larger pots in clumps within 3-6 weeks. First year seedlings in the Liliaceae tend to go dormant earlier than mature plants.

D *Calochortus nuttallii* (Sego Lily) - Liliaceae
Sow outside in late fall or early winter, in cells or in situ. L=D. Germinate in very cool temperatures. The first above ground shoot will emerge after temperatures warm.

E *Castilleja integra* (Wholeleaf Paintbrush) - Orobanchaceae
Hemiparasitic.
Place the seeds in the palm of one hand. Rub them with a finger to remove a loose net that surrounds each seed. Cold stratify the seeds for 3-4 months either in the fridge or outside. If giving an outdoor winter treatment, sow in situ near a grass or less aggressive artemisia or sow in cells/pots and cover lightly. Pile snow on top of the cells/pots. Water as necessary during the winter. With a constant moist 40˚, radicles begin to emerge as early as 16 days. Cotyledon leaves appear in 3.5

months. As soon as the seedling has two sets of true leaves, pot it in well draining soil with a host plant such as *Artemisia frigida*, *Liatris punctata, Penstemon* spp. or a nonaggressive grass.
An alternate method to try would be to sow the paintbrush seeds along with a few host seeds in a small pot, cover lightly and put the pot outside for cold stratification.

Castilleja linariifolia (Wyoming Paintbrush) - Orobanchaceae
Hemiparasitic.
Give 1-3 months cold stratification or plant outside fall to early spring. Cover very lightly.
Sow beside a host plant (see Castilleja integra suggestions) or with host plant seeds or pot with a host plant when the seedling has 1-2 sets of true leaves.

M *Chamerion angustifolium* (Fireweed) - Onagraceae
Harlequin Garden's propagator and the USFS (www.fs.fed.us/database/feis/plants) say no cold stratification is required. Some other sources recommend 60 days of cold before sowing at 70+˚. I'm voting for no stratification. Past failures may be due to aged seeds. They are only viable in dry storage for 18-24 months (USFS).

Sow after danger of hard frost has passed. If sowing in situ, press into the soil and protect with burlap until they germinate (Prairie Moon Nursery). The seeds need light. If sowing in cells, cover **very** lightly.
Germinate in 1 month.

Rhizomes of mature plants sprout readily and can bloom within a month (USFS).

E *Cirsium undulatum* (Wavy Leaf Thistle) - Asteraceae
The seeds of this species are often infested with weevils. Infested seeds get a darker color. Promptly after collecting dry heads of seeds, place the entire head in the freezer for 2 weeks. Then clean the seeds. Press the seeds with a thumbnail. Dispose of any that collapse under pressure.
Seven month old seeds stored dry at 40˚ and given a cold stratification (outside or in the fridge) germinate (extend a radicle) 75% in 1 month at the cold temperature. Because the seeds produce a gel when exposed to moisture it is easiest to sow the seeds in cells/pots and to place the container outside. Cover the seeds to depth. I used ant grit from the collection site to cover the seeds.

Clematis ligusticifolia (Western White Virgin's-bower) - Ranunculaceae
Store dry seeds at 40˚. Avoid storage. Viability decreases rapidly.
Sow fresh seeds in fall in situ or in cells. Cover lightly.
Stored seeds: Soak for 2-3 days. Remove the style and the pericarp by peeling the fruit with your fingernails or a dull paring knife. Cold stratify stored seeds for 2-6 months.
Sow in situ or in cells. Cover lightly.

***Cleome* (see *Peritome*)**

E *Coreopsis lanceolata* (Lanceleaf Tickseed) - Asteraceae
Introduced to CO from more eastern and southern states.
Sow the seeds in cells or in situ when the soil warms in spring. The seeds have a light requirement so cover them very lightly just to help keep them moist. They should germinate in about 18 days.

E *Coreopsis tinctoria* (Plains Coreopsis) - Asteraceae
Annual.
About 4 weeks after bloom, the inner bracts should be turning brown. If the seeds remove easily, cut the heads into a paper bag. Clean to remove chaff, leaves, receptacles, and any extraneous matter. Store dry at 40˚. Viable 3 years or more.
No pretreatment is necessary. Sow in fall or spring. Cover **very** lightly to meet the light requirement. Germinates in 8-9d.

D *Dalea purpurea* (Purple Prairie Clover) - Fabaceae
Store seeds dry at 40˚.
After the last frost in the spring, sandpaper the seeds. Next put them in a pyrex bowl and pour boiling water over them. Let the water cool and soak the seeds for 24 hours. Roll moist seeds around in a light dust of inoculant (opt. but helps). Sow in cells or pots. Cover with 1/8" of medium. Expose to 70˚.
Seeds can be sown in situ outside. I prefer early spring sowing to fall. The seeds need no cold stratification. After all the pretreatments, press into a prepared surface if you cannot easily cover the seeds lightly.
Rabbit candy.

Datura wrightii (Indian Apple, Sacred Datura) - Solanaceae
Regional.
In spring after danger of frost is past, soak the seeds for 24 hours, sow the seeds and cover with 1/8" soil. worldseedsupply.com

Delphinium geyeri (Geyer's Larkspur) - Ranunculaceae
Sow ASAP. Use fresh seeds. Sow in situ outdoors in fall and cover well. Delphinium species require dark. They germinate at 50-55˚. Dorn & Dorn, "Growing Native Plants of the Rocky Mountain Area", p 81)
Cold stratification of 120 days might replace outdoor treatment.

Delphinium nuttallianum (Nuttall's Larkspur) - Ranunculaceae
Follow directions for *D. geyeri.*

E *Dieteria bigelovii* (Bigelow's Tansyaster) - Asteraceae
Store seeds dry at 40 or 70˚ for 3-6 months before sowing (after-ripen).
Sow seeds at 70˚. Cover **very** lightly to meet the light requirement but still retain some moisture around the seeds.

E *Dieteria canescens* (Hoary Tansy-aster) - Asteraceae
Follow the directions for Dieteria bigelovii.

E *Echinacea angustifolia* (Prairie Coneflower) - Asteraceae
Sow in situ in fall.
OR
Cold stratify for 1-3 months before the last spring frost date. Sow in cells or in situ. Cover the seeds.

D *Echinocereus viridiflorus* (Nylon Hedgehog) - Cactaceae
Sow in late fall in situ. Add drainage material to loamy clay or clay soils. Cover very lightly.
The seeds benefit from a period of cold moist conditions. Seeds of some cactus species can sit in the soil bank for a number of years before germinating.

Engelmannia pinnatifida (Engelmann's Daisy) - Asteraceae
Sow in situ in early fall. Press tightly into the soil. The seeds require light to germinate.
wildflower.org

E *Erigeron* spp. - Asteraceae
(*Erigeron divergens, Erigeron speciosus, Erigeron vetensis*)
Self Sterile

Dry store at 40˚ or 70˚.
Surface sow (light requirement) or cover **very** lightly. Expose to 70˚.
Germinate in 1-2 weeks.

M-D *Eriogonum jamesii* (James' Buckwheat) - Polygonaceae
When the perianths turn brown or rusty colored, strip the seeds from the heads into a paper bag. Store them at 40˚. Long term storage at 70˚ is detrimental.
The radicle of buckwheat seeds is in the pointed tip. It can be damaged by aggressive rubbing on a screen. Rigorous cleaning is not necessary because the seeds can germinate with the perianth attached. About Dec. 1 to Jan. 1, sow the seeds outside (in cells or in situ), cover with about 1/16" of fine vermiculite and put the cells outside. Germination may occur at 70˚ or at 40˚ or anywhere in between.

M-D *Eriogonum umbellatum* (Sulfur Flower) - Polygonaceae
Be gentle when cleaning the seeds. The radicle is in the pointed tip.
Store dry at 40˚ (Storing 6 months at 70˚ is very detrimental according to Norm Deno.) Sow outside in late fall. Cover the seeds lightly. To cold stratify in the fridge, you must sow in cells or pots because the radicles emerge erratically for 2-3 months. Leaves will not emerge until they are darned ready in the spring.

Euphorbia marginata (Snow-on-the-Mountain) - Euphorbiaceae
Annual
In my experience, one month of cold stratification followed by a high germination temperature (up to 86-90˚ daytime and 68˚ at night or at least not below 40˚) results in good germination. The seeds should be covered to depth whether sown in cells or directly in the ground. If sowing in situ, sow 3 weeks before the last frost.
One online source recommends sandpaper scarification and soaking with no stratification.
selectseeds.com

E *Eutrochium maculatum* (Spotted Joepyeweed) - Asteraceae
Cold stratify for 1 month or more either in the fridge or by sowing in situ January 1 to April 1. The seeds require light to germinate. Either surface sow and bottom water or cover the seeds very lightly with medium.
Seed viability in storage may be 3 years or less.

D *Frasera speciosa* (Monument Plant) - Gentianaceae
Collect seeds August to Sept. Store dry at 70˚ until January 1. Sow in situ outdoors or cold stratify 4 months and then sow in cells or in situ. This plant is monocarpic. It dies after blooming and fruiting. It can take many years to germinate and 18-28 years to bloom.

E *Gaillardia aristata* (Blanketflower) - Asteraceae
No cold stratification is needed. Sow in situ after danger of frost has past in the spring. and press into the soil.
OR
Sow in cells and cover the seeds lightly. Germination can be erratic.

E *Gaillardia* x *grandiflora* (Blanket Flower) - Asteraceae
(*G. aristata* X *G. pulchella*) Tetraploid with large blooms.
Treat the seeds the same way you would *Gaillardia aristata.*

M-D *Geranium viscosissimum* var. *incisum* (Sticky Purple Geranium) - Geraniaceae
Scarification increases germination. If seeds have been air-dried, they are more permeable to water and will require less scarification. www.wildflower.org
Scarify with sandpaper, then soak in hot water for 12 hours. After treatment, plant outside 1/4”deep in fall or in spring after the last frost.
OR
In spring, about 4 weeks before the last frost, scarify, soak, cold stratify 30 days, sow in cells, cover to depth and put outside in sun.
Transplant into a deep pot filled with very well draining soil.

Glycyrrhiza lepidota (Wild Licorice) - Fabaceae
No cold stratification is required, but it will not harm the seeds.
If sowing outside in the fall, do not scarify the seeds. Inoculate the seeds with rhizobium inoculum (opt.) and cover the seeds well.
If sowing in the spring in situ or in cells, scarify the hard seed coat with sandpaper, inoculate (opt.) the seeds, and cover them well.
prairiemoon.com

E *Grindelia subalpina* (Subalpine Gumweed) - Asteraceae
Super pollinator plant. It is perennial and blooms for months.
Collect the seeds as late as possible hoping the stickiness of the involucral bracts will decrease. The pappus of the seeds can glue the seeds to each other and to the bracts. The involucral bracts make a cup that is upright, and the seeds remain in the cup for months. Alternatively cut a long stalked inflorescence and stick it into a chain link fence with the cup upright. After a month or more, the cleaning is much less gummy.
Freeze dry seeds for 2 weeks to kill seed eating pests.
Store dry at 40˚.
Sow mid-May. Cover lightly. Germinate within 2 weeks.

Grindelia squarrosa (Curlycup Gumweed) - Asteraceae
Sources online vary as to whether to cold stratify or not.
I plan to follow directions for *Grindelia subalpina* which work very well.

Harbouria trachypleura (Whiskbroom Parsley) - Apiaceae
Sow in situ in the fall.

Hedysarum boreale (Utah Sweetvetch) - Fabaceae
Remove the seeds from the loment before storing dry at 40˚.

Scarify before sowing. Boil some water. Set the kettle off the burner for a minute. Pour the water over the seeds in a small bowl. Let the seeds soak for 12-24 hours. Sow in situ or in cells in fall or spring. Cover the seeds with 1/4" of medium.

E *Helianthus annuus* (Common Sunflower) - Asteraceae
Annual.
After danger of frost is past in the spring, sow directly onto the soil where you want the plants. Space the seeds at least 12" apart. Cover with 1/2" of soil.
If the temperature is 68-75˚, the seeds should germinate in 2 weeks.
Self seeds prolifically so the seeds can survive very cold temperature outside.

E *Helianthus maximiliana* (Maximilian Sunflower) - Asteraceae
Store dry at 40 or 70˚. Cold stratify 6 weeks before sowing at 70-85˚. L=D so use light cover over the seeds.

M *Helianthus pumilus* (Little Sunflower) - Asteraceae
Once cleaned the seeds may need to go in the freezer for 2 weeks to treat for parasitic insects. Be sure they are very dry first.
Store dry at 40˚.
The seeds of this species have a higher germination rate when sown outside for cold stratification (temperature fluctuations?) and when they have some native soil in the medium.
Sow in mid Dec. in native soil instead of artificial mix when using a container or sow in situ. Cover the seeds lightly. Expose to outdoor winter and spring temperatures.

M *Heliomeris multiflora* (Showy Goldeneye) - Asteraceae
Keep seeds dry at 70˚ for a year to afterripen. Sow at 70-80˚. Cover lightly with soil.
OR
Cold stratify fairly fresh seeds for 4-6 weeks. Then sow at 70-80˚. Cover lightly.

E *Heterotheca foliosa* (Foliose False Goldenaster) - Asteraceae
Store seeds dry at 40˚. Sow after last frost in situ or in cells. Cover lightly. Expose to 70˚+.

E *Heterotheca villosa* (Hairy False Goldenaster) - Asteraceae
Store seeds dry at 40˚. Sow after last frost in situ or in cells. Cover lightly. Expose to 70˚+.

E *Humulus lupulus* var. *neomexicana* (Hops) - Cannabaceae
Cold stratify in the fridge or outside for at least 3 months. After sowing the seeds, cover them well (dark requirement). Germinate in 2.5-3.5 weeks at temperatures about 60˚ daytime and 35-45˚ nighttime.

E *Hymenothrix dissecta* (Cutleaf) - Asteraceae
Sow after your last frost date. Cover the seeds lightly to admit light. Heavy germination occurs from 7-28 days.
This biennial to short-lived perennial self seeds in the garden.

E *Hymenoxis hoopesii* (Orange Sneezeweed, Owl's Claw's) - Asteraceae
syn. *Helenium hoopesii*
No pretreatment of the seeds is required. Sow in cells or in situ in fall or spring. Cover lightly. Seeds germinate in 10-19 days. Bump up from cells 2 weeks after germination.

M *Ipomopsis aggregata* (Skyrocket, Scarlet Gilia) - Polemoniaceae
Biennial to short lived perennial, self sterile, monocarpic.
When stored at 40˚, viability decreased by years 3 and 4.
Sow the seeds promptly in situ shortly after collection.
OR
Cold stratify for 30 days. Sow. Cover lightly. Germinate in 3 weeks.

M-D *Iris missouriensis* (Rocky Mountain Iris) - Iridaceae
Native iris have a deep dormancy that is best tackled with scarification (in this western species) and outdoor stratification.
Sandpaper the seeds. Sow outside in situ or in cells or pots. Cover lightly. Exposure to temperature fluctuations coaxes higher germination percentages than consistent 40˚ in the fridge.
Including soil with artificial mix may increase germination.

E *Liatris ligulistylis* (Rocky Mountain Blazing Star) - Asteraceae
Provide 60 days of cold stratification either in the fridge or by sowing in situ in the fall. Press the seeds into the soil and/or cover them to depth.
Germinate in 19 days when sown after cold stratification.
They bloom in 2-3 years.
If the soil is quite rich and moist the plants can get to 5' and require staking.
Monarch favorite.

E *Liatris punctata* (Dotted Blazing Star or Gayfeather) - Asteraceae
Cold moist stratify 1-2 months. Outside stratification in situ or in cells is preferable to seeds in a resealable plastic bag in the fridge because the radicles begin to emerge in 19 days. Cotyledon leaves emerge 9 days after that at 65-70˚. Use light to medium cover. If you have an indoor grow light array and want to cold stratify in the fridge, it works well.
Seeds sown in late Feb. to early March, in cells placed outside, in the Denver area germinated in 34-42 days.

M *Ligustichum porteri* (Osha) - Apiaceae
Sow mid Dec. in cells or in situ. Cover with 1/4" soil or mix. Place outside. Germinate in about 5 months in the Front Range.

E *Linum lewisii* (Blue Flax) - Linaceae
Blue Flax germinates best when it has big temperature fluctuations before the seeds are exposed to 70˚. The easiest way to provide temperature swings is to cold stratify outdoors. Sow the seeds in winter either in cells or pots or in situ. Cover lightly. Pile snow on the cells regularly during the winter.

D *Lithospermum occidentale* (Western Marbleseed) - Boraginaceae
syn. *Onosmodium bejariense* var*. occidentale*
After cleaning freeze to seeds for 2 weeks to kill any pests.
Store dry at 40˚ for 4-6 months or longer (afterripen).
Sow in situ in the fall.
OR in winter
Before either of the following methods of cold stratification, give the seeds a boiling water soak. Put them in a pyrex bowl and pour boiling water over them. Let the water cool and soak the seeds for 24 hours. Fertile seeds will sink.
1. Sow around Jan. 1, cover the seeds 1/8" deep with medium, and put the cells/pots outside.
2. Or 3 months before the last frost date, cold stratify the seeds in the fridge, 40˚(3m). Sow in cells or direct sow in garden. Cover 1/8" deep.

M *Lupinus argenteus* var. *argenteus* (Silvery Lupine) - Fabaceae
Store seeds dry at 40˚ or 70˚.
For fall sowing: Scarify by pouring boiling water over the seeds. Let the water cool. Soak for 24 hours. Inoculate the seeds with rhizobium legume inoculant (opt.). Sow in situ or in cells/pots, cover the seeds. Containers will stay outside all winter.
OR
For spring sowing: 46 days before the last frost date, pour boiling water over the seeds. Let the water cool. Soak for 24 hours. Inoculate the seeds with rhizobium legume inoculant (opt.). Sow, cover the seeds, place containers outside if you did not sow in situ.

After scarification, radicles begin to emerge in 9 days at 40˚.

If you collect the seeds slightly "green" before they form a hard seed coat, you can sow them immediately. They will germinate in 10-14 days. They will be sticky and the color will be more tan than green. This has worked on every legume I have tried. It also helps avoid seed predation by insects. I use the term "green" to indicate a hard seed coat has not formed.

E *Machaeranthera tanacetifolia* (Tansyleaf Tansy-Aster) - Asteraceae
Taprooted Annuals or Biennials
Store seeds dry at 40˚.
Sow outside in spring in situ or in cells after the last frost date. No pretreatment is necessary. Cover very lightly.
Germinate in 4-8 days, even if the temperature is 20˚ below normal.

Maianthemum stellatum (False Solomon's Seal) - Ruscaceae
Remove the tan seeds from the red fruit. Sow them as soon as possible. Keep them moist until beginning required temperature cycles. The seeds require two years with 4 temperature cycles of 40-70-40-70. (Possibly one long cold period of 100+ days would suffice.) They form a radicle the first spring. Leaves emerge the second spring. The easiest way to germinate the seeds is outdoors in situ.

Take rhizome cuttings after flowering is finished.

Melampodium leucanthum (Blackfoot Daisy) - Asteraceae
see Jim Borland article in the Colorado Native Plant Society journal
www.CoNPS.org *Aquilegia* Volume 46 No. 1 Winter 2022, pg. 28

Mentzelia decapetala (Ten-petal Evening Star) - Loasaceae
Collect seeds when the pore in the membrane at the mouth of the wide capsule opens.
Seeds fall into the paper bag as they dry.
About 5 weeks before the last frost date, soak the seeds for 24 hours in tepid water. Seeds that float may not be fertile. Cold stratify in the fridge for 4-5 weeks. Sow in cells or in situ. Cover very lightly. They germinate in 14 days. They can be potted in a well draining mix in a 2.5" pot as early as 9 days later.
To sow in situ, sow fairly soon after collecting the seeds or in the fall.

Mentzelia multiflora (Adonis Blazingstar) - Loasaceae
Collect seeds when the pore in the membrane at the mouth of the wide capsule opens.
Seeds fall into the paper bag as they dry.

Soak the seeds in tepid water for 24 hours. Sow in situ in the fall or early spring. To sow in cells, pots, soak, then cold stratify for 5 weeks. Use very light cover when sowing.
Germinate in 10-14 days at 70˚.

Mentzelia nuda (Bractless Eveningstar) - Loasaceae
Collect seeds when the pore in the membrane at the mouth of the wide capsule opens.
Seeds fall into the paper bag as they dry.
Sow in situ in fall or cold stratify for 60 days. Cover very lightly. Dorn &n Dorn, "Growing Native Plants of the Rocky Mountain Area", 123.
Seeds sown in mid March in the Front Range germinated 42% in 35-66 days. This includes the time to cold stratify outdoor before warm weather.

M *Mertensia lanceolata* (Plains Bluebells) - Boraginaceae
From mid June to mid July, depending on elevation, collect fruits and put them in a paper bag. Each may have as many as 4 nutlets. Store the seeds dry, 40-65˚ until the fall.
In mid November, sow in situ and cover the seeds lightly. They will germinate the following spring and bloom the second year.
I have had minimal success sowing the seeds in deep cells and leaving them outside. It is difficult to keep the moisture consistent from June, through the summer and over the winter. They may also require mycorrhizae in the soil to germinate.
I have had no success with cold stratification in the fridge (2 years trying).
Rabbits are not overly fond of them but may snip a bloom just to taste.

E *Mirabilis linearis* var. *linearis* (Narrowleaf Four O'Clock) - Nyctaginaceae
Two weeks before the last frost date, sow in cells/pots or in situ. Cover the seeds.
When they are exposed to moisture the seeds form a gel so fridge stratification is difficult unless you can put the germination container in the fridge.
Leaves appear within 39 days.
Plants bloom the first year.

E *Mirabilis multiflora* var. *glandulosa* (Colorado Four O'Clock) - Nyctaginaceae
Collect the large dark seeds in early Sept. in the Front Range. The persistent bracts enfold the seeds. Put the whole thing into a paper bag. Many of the seeds will fall out of the bracts as they dry. It is fairly easy to remove the rest manually. Store dry at 40˚.
Give the seeds a peroxide soak for 24h (1 tsp 3% peroxide to 16 tsp water). Sow the seeds in cells or in situ. Cover lightly.
All the seeds will germinate over a 2 week period.
OR
Seeds can be sown in situ in the fall.
No cold treatment is required but it also does no harm. Many of the seeds will extend a radicle at week 7 and will need to be sown if they are in a baggie in the fridge.

E *Monarda fistulosa* var. *menthifolia* (Wild Bergamot) - Lamiaceae
No pretreatment of seeds is necessary. Sow the seeds in cells, pots or in situ after the last frost date, probably about May 10 on the Front Range.
Cover the seeds **very** lightly (light requirement). They germinate in 10-14 days.

E *Monarda pectinata* (Plains Beebalm) - Lamiaceae
Annual

Cold stratify for 45 days whether in a container or in situ. Cover the seeds very lightly. Germinate around 70˚.

E *Oenothera albicaulis* (Whitest Evening Primrose) - Onagraceae
Annual
No pretreatment of the seeds is necessary. Sow when the temperature is consistently close to 70˚. They require dark so cover them well.

M *Oenothera caespitosa* (Tufted Evening Primrose) - Onagraceae
Fruit formation is not reliable every year so do not share all of your seeds. Store some at 40˚.
Collect (cut off) the woody seed capsules when they turn brownish and the tips spread open. Put them in a paper bag to release as many seeds as possible. Let them dry for a week or more. Pliers may still be required to get the last seeds out.
Sow right away and leave outside.
OR
Store seeds dry at 40˚ and sow Dec-Jan outside in situ or in cells. Cover the seeds with 1/8" of grit or vermiculite.
Germination will be staggered after temperatures begin to warm.

Oenothera coronopifolia (Crownleaf Evening Primrose) - Onagraceae
Collecting any quantity of seeds is challenging.
Sow in situ in fall. Barely cover with soil. Dorn & Dorn, "Growing Native Plants of the Rocky Mountain Area", p. 128.
E Rhizomatous and easy to transplant.

E *Oenothera flava* (Yellow Evening Primrose) - Onagraceae
Locucidal fruits cluster at the base of the leaves of the basal rosette. They are woody and many seeds are still contained the following spring.
No pretreatment is required. Cover the seeds very lightly. Germinate in about 2 weeks at 70˚.

E *Oenothera macrocarpa* (Missouri Primrose) - Onograceae
syn. Oenothera missouriensis - a regional species for CO which has large yellow day blooms and makes a fine bedding plant.
The wings of the large fruits catch wind dispersing the seeds by tumbling quite rapidly.
Remove the wings before sowing the fruit.
Sow 2 months before the last frost date either in situ or outside in cells/pots. Cover the seeds well.
Radicles begin to emerge in 1 month. Leaves begin to emerge about a week before the last frost date. About 75% or more of the seeds germinate.
A good number of the plants bloom the first year.

Oenothera villosa (Hairy Evening Primrose) - Onagraceae
"No pretreatment. Plant outside fall to spring. Plant to 1/16 inch deep. Takes 3-4 weeks to germinate." - westernnativeseed.com

***Opuntia* spp.**
"Opuntias germinate more effectively the second year after harvest. Fresh seed often lies in the ground for about a year before germination." jelitto.com

Opuntia Fruit Cleaning
Use tongs to handle fruit as well as paddles.

Soak/ferment the fruit for several days to soften the flesh around the seeds. The chemical action of bacteria, yeasts or other microorganisms breaks down the soft flesh. Do not change the water, let it roil. Eventually you can lift and discard the skin with glochids. Again, use tongs. Rub the remaining seeds and pulp on a sieve under running water to separate the seeds which are about half a cm. in size. Dry the seeds on a paper towel in a warm place for a week or two until completely dry. Store dry at 40˚.

Opuntia Soil Mixes

I have minimal experience germinating and growing cacti.
From my research, I find cacti germination mix is higher in organic matter (as much as 65% of the mix) than the potting soil mixes.
Ex. of a potting mix: 3 parts light potting soil, 3 parts sand, gravel, or grit, and 2 parts perlite or pumice

M *Opuntia macrorhiza* (Western Pricklypear) - Cactaceae
No gel forms when seeds get wet.
When you are ready to sow the seeds, scarify with sandpaper or a boiling water soak or both. Sow the seeds 1" apart in pots. Just push them into the cactus mix gently and barely cover with medium. Mist regularly until they germinate. Maintain an ambient temperature of 70˚ in the daytime and above 45˚ at night. When potting, add extra drainage material to the mix and use small pots.
https://homeguides.sfgate.com/grow-prickly-pear-cactus-seeds-69589.html

I have extremely low germination rates the first year in pots. It is probably best to sow in situ if you do not have a set up for long term monitoring of seeds in containers.

E Cuttings
Using tongs, remove paddles from a large plant. Let them dry and callus for a few days. Stick the callused end into a pot of cactus soil mix or directly into the ground.

Opuntia phaeacantha (Tulip Pricklypear) - Cactaceae
When soaked in water overnight, a gelatinous material appears around the seeds. I am not sure if it is a germination inhibitor or if it helps hold moisture around the seeds in the ground in a natural situation. Maybe it does both.
See Opuntia macrorhiza.

M *Opuntia polyacantha* (Plains Pricklypear) - Cactaceae
Gel forms when seeds get wet.
See Opuntia macrorhiza.

Oreocarya virgata (Miner's Candle) - Boraginaceae
The drying stalks are prickly. Wear leather gloves. Cut a stalk and invert it into a large paper bag. In a few weeks tip the bag and let seeds roll out onto a paper on a tray with sides.
Store the seeds at 40˚.
These seeds germinate cool. Sow in cells or in situ in mid April. They germinate in 2 weeks in the dark (cover heavily).
Bloom the second year.

M *Oxyria dignya* (Alpine Mountain-sorrel) - Polygonaceae
Sow seeds collected the previous June to Sept. in mid-April to May. Use medium cover. Germinate in 48-63 days.
Seeds that have been stored longer may require pretreatment(s).

***Oxytropis* spp.**
Some sources recommend scarification and cold stratification. I get germination rates of around 45% with scarification and no stratification.

E *Oxytropis lambertii* (Purple Locoweed) - Fabaceae
Store seeds dry at 40˚.
When daytime temperatures hover consistently around 70˚ or after the last frost date, scarify seeds with sandpaper. Inoculate with rhizobium inoculant (opt.) and sow promptly in cells or direct sow in garden. Cover to depth.
Germinate in 3 days to 2 months.
Germination is **E**. Maintenance in pots is **D**. Use a well draining medium. It might be best to sow in situ or to sow in 2.5" pots instead of cells to avoid disturbing roots.

Oxytropis sericea* var*. sericea (White or Silky Locoweed) - Fabaceae
Treat the same as *Oxytropis lambertii*

D *Pediocactus simpsonii* (Mountain Cactus) - Cactaceae
In early winter, sow in a very well draining mix. Cover to depth with coarse sand or gravel. Let them be moist for 2-3 weeks, then dry for 2-3 weeks. Some seeds will germinate in the spring. Keep the tiny plants on the dryish side. Other seeds may take 5 years to germinate. https://www.new-mexico.cactus-society.org/pdocs/GerminationTipsforSclerocactus...--Rev1-09.pdf

***Penstemon* spp. germination information**
https://tomclothier.hort.net (updated 11/2000 by Jim Swayne https://tomclothier.hort.net/page08.html) <jas3255@yahoo.com (Jim Swayne)

Penstemon clutei (Sunset Crater Beardtongue) - Plantaginaceae
Arizona endemic.
Store seed @ 70ºF (21ºC) in a non-humid environment for 6 mo. Sow barely covered 8 wks @ 40ºF (4ºC), move to 60ºF (16ºC) for germ. under light. https://tomclothier.hort.net/page08.html

E *Penstemon cobaea* (Cobaea Beardtongue) - Plantaginaceae
Cold stratify 8 weeks outside in cells or in situ. Radicles begin to emerge at 5 weeks so fridge stratification is difficult unless you can place containers in the fridge. Cover the seeds **very** lightly (light requirement). True leaves develop when the temperature gets above 65˚ part of the day.

E *Penstemon grandiflorus* (Large Beardtongue) - Plantaginaceae
Regional.
Soak the seeds for 3 hours in tepid water. Sow 12 weeks before the last frost date in situ or in containers. Put the cells or pots outside for chilling. Surface sow or cover **very** lightly (light requirement.)
Germinate in about 2.5 months at 40˚-55˚.

E *Penstemon pinifolius* (Pineleaf Penstemon) - Plantaginaceae
Soak the seeds in tepid water for 2-3 hours before sowing.
Cold stratify the seeds 8 weeks at 40˚ in the fridge or sow midwinter in situ or in containers. Cover the seeds lightly. Put the container outside. Outside treatment in cells requires regular piling on of snow but avoids radicle extension from the seeds while in the fridge.

Germinate at around 50˚.

P. pinifolius can be grown from stem cuttings treated with rooting hormone.

E *Penstemon rostriflorus* (Bridges' Penstemon) - Plantaginaceae
Sow in cells or in situ 3 months before your last frost date. Surface sow or cover very lightly. Leaves emerge 85 days after sowing.

M *Penstemon secundiflorus* (Sidebells Penstemon) - Plantaginaceae
Cold stratify the seeds 6-8 weeks at 40˚ in the fridge in a pot or sow midwinter and put the container outside. Cover **very** lightly (light requirement). Outside treatment in cells requires regular piling on of snow.
OR
Sow late Dec. to Jan. in situ. Cover **very** lightly.
Radicles emerge at 40˚. Leaves emerge at 70˚.

E *Penstemon strictus* (Rocky Mountain Penstemon) - Plantaginaceae
Cold stratify the seeds at 40˚ for 3 months, preferably outside in cells. Cover the seeds **very** lightly.
Radicles develop in 6 weeks and leaves a month later.
OR
Sow the seeds in situ in the fall.
Self sows prolifically in gardens.

E *Penstemon virens* (Blue Mist or Front Range Beardtongue) - Plantaginaceae
Sow the seeds in cells or in situ 2 months before your last frost date. Surface sow or cover very lightly.
Leaves emerge in 2.5 months.

M *Penstemon virgatus* var. *asa-gray* (Oneside Penstemon) - Plantaginaceae
syn. *P. unilateralis*
Cold stratify 8 weeks at 40˚. Sow, cover lightly. Germinate around 65-70˚.
OR
In mid winter sow the seeds in situ or in cells placed outside.

E *Peritome serrulata* (Rocky Mountain Beeplant) - Capparaceae
syn. *Cleome serrulata*
Annual.
Direct sow where you want them in the garden fall to late winter. Cover 1/8-1/4".
Radicles begin emerging after 3 weeks of cold stratification.

Phacelia hastata (Silverleaf Phacelia) - Hydrophyllaceae
Store the seeds dry at 40˚.
Cold stratify for 3-4 months to break the seed dormancy. This can be done several ways.
1. Soak the seeds in tepid water for 24 hours, mix with a small amount of vermiculite or sterilized sand, add water to just barely moisten the mix, refrigerate for 3-4 months. Check the bag once a week for moisture level and any possible mold or even radicle emergence. Sow, cover with 1/4" of soil, expose to 70˚.
2. Sow in situ in early winter. Cover seeds lightly.

3. Sow in cells/pots, cover seeds lightly and place the container outside all winter, covering with snow or watering during warm dry periods.

https://plants.usda.gov/plantguide/pdf/pg_phha.pdf

In early Dec., I soaked seeds for 24 hours, sowed, covered to depth and put the cells outside. 69% of the seeds produced true leaves in 4.5 months.

E *Physalis longifolia* (Longleaf Ground Cherry) - Solanaceae
In early Nov., sow in cells. Cover. Put outside. Germinate heavily in 6.5 months or when temperature is 70˚.

M *Physaria bellii* (Front Range Twinpod) - Brassicaceae
Cold stratify for 6 weeks either in the fridge or outside. Sow in cells or in situ. Surface sow or use very light cover to admit light. In cells containing germination mix, leaves emerge in 50-60 days.
In two weeks, bump up to a 2.5" pot of well draining mix plus soil spiked with some broken cement (3 parts potting mix, 1 part soil).
Plant in early July.

E *Polanisia dodecandra* v. *trachysperma* (Redwhisker Clammyweed) - Capparaceae
Annual
(Horrible common name. It should be Beeblossom. There is a strange smell from the glandular foliage if you touch it, but it does not waft on the air.)
Late fall to winter, right before a snow, sow seeds of this annual outside where you want the plants to germinate.
It can be sown in pots in late winter. Plant as soon as it has a few true leaves.

Polemonium brandegeei (Brandegee's Sky Pilot) - Polemoniaceae
One to two months before your last frost date, sow the seeds in situ or in cells. Cover very lightly. Put outside. Cotyledon leaves emerge when the temperature is 65˚ part of the day. Bump up in 3 weeks. using well draining mix.

Polemonium foliosissimum (Leafy Jacob's Ladder) - Polemoniaceae
The seeds form a gel if soaked in water. Frog eggs are difficult to separate out into cells.
Sow dry seeds in cells about 2 weeks before your last frost date. Cover very lightly, water well and put outside. Cotyledon leaves emerge in 18 days. My germination rate with newly purchased seeds was 20%.
Some folks use no cold stratification and others recommend 2 months cold treatment or fall sowing. The jury is out.

M *Pulsatilla nuttalliana* (Pasque Flower) - Ranunculaceae
Sow outside from fall to early spring. Sow on the soil surface and cover with a thin layer of sand. Western Native Seed and Prairie Moon Nursery.

First year seeds, deplumed, sown in early March on germination mix in cells, covered lightly with grit and put outside (5620') germinated well.

E *Ratibida columnifera* (Prairie Coneflower) - Asteraceae
Sow outside in fall. OR Cold stratify for 30 days. Sow, cover lightly. Germinate in 8-21 days at 70˚ (slower if lower temp).

They need no cold treatment. Email Sherry Fuller, Gardens at Spring Creek, 11/2/20.
No strat or strat works.

E *Rudbeckia hirta* (Black-Eyed Susan) - Asteraceae
Annual, Biennial or Perennial
No pretreatment required according to most sources. *R. hirta* has varieties over most of the country so seed germination protocols could vary considerably.
Sow by the end of May. Cover the seeds **very** lightly.
They should germinate within 2 weeks. Avoid overwatering and thin seedlings.

E *Rudbeckia laciniata* var. *ampla* (Cutleaf Coneflower) - Asteraceae
Cold stratify the seeds for 30 days in the fridge or outside. Sow and keep moist, cover lightly, 70-75˚.
Some germinate in 9-10 days. Others will continue to germinate into very hot weather.

E *Salvia azurea* var. *grandiflora* (Azure Sage, Pitcher Sage) - Lamiaceae
Unstratified seed can be planted in the fall or stratified seed can be planted in the field in the spring. With no cold, moist stratification approximately 40 percent of the seed will germinate. Pretreatment of cold, moist stratification for 4 to 8 weeks will increase total germination to around 80 percent.
https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/kspmcfs8483.pdf

E *Salvia reflexa* (Rocky Mountain Sage) - Lamiaceae
Annual.
Sow in situ or in cells in the fall. Cover the seeds to depth. Germinate several weeks before last frost in the spring.
The blue blooms are quite small, but the plants bloom all summer and fall if sheared a few times. This species is a prolific seeder and would make a good green mulch. It does not get out of control if planted with prairie grasses.

Scrophularia macrantha (Red Birds in a Tree) - Scrophulariaceae
No pretreatment is required. Sow the tiny seeds, cover **very** lightly, and expose to 70˚. ***alplains.com***

M *Sedum lanceolatum* (Stonecrop) - Crassulaceae
After-ripen the seeds for 4-6 months at 40 or 70˚.
Collect seeds mid to late July. Seeds seem to lose viability over 4 years even when stored at 40˚.
Cold stratification is not necessary but will not harm the seeds.
Sow in early May (temps 50-60˚ and fluctuating). Surface sow. Mist or provide high humidity chamber.
True leaves appear in 3-10 days.
Bump up to pots with well draining medium and water sparingly.
Easy to germinate but difficult to maintain in pots.

Senecio flaccidus* var. *flaccidus (Theadleaf Ragwort) - Asteraceae
Sow in situ or in cells in early spring, late April to mid May in the Front Range. Cover the seeds **very** lightly.
Germinate in 2 weeks.

Senecio spartioides (Narrow-leaved Butterweed) - Asteraceae
Follow directions for *Senecio flaccidus*.

***Solidago* spp.** are self-incompatible. In order to collect fertile seeds, you must have more than one seed grown plant.
After-ripen: Store seeds dry for 4-6 months to allow the embryo to mature.
Light requirement.
Sow after last frost date. Cover **very** lightly. At 70-75˚, they germinate in 1-3 weeks.

Goldenrods generally do not need a cold stratification, but it probably does no harm to sow outside a month before the last frost date. Sowing in the fall could result in a larger loss of seeds if you only have a few.

E *Solidago canadensis* (Canada Goldenrod) - Asteraceae
Reproduces aggressively by rhizomes.

E *Solidago gigantea* (Giant Goldenrod) - Asteraceae
Likes a bit of moisture so the medium does not have to be well draining.

E *Solidago multiradiata* var. *scopulorum* (Rocky Mountain Goldenrod) - Asteraceae
Rhizomatous.
It occupies similar sites as *S. simplex,* and they can hybridize.

E *Solidago simplex* var*. simplex* (Mt. Albert Goldenrod) - Asteraceae
Tends to clump. Grows well in gardens at elevations below it's recorded range.

Sophora nuttalliana (Silky Sophora, Necklace Pod) - Fabaceae
Cleaning is a challenge. Enveloping the loments completely in a tarp (to contain runaway seeds) and stomping with heavy soled boots would work. Sandpapering with coarse sandpaper, then crushing with a rolling pin and finally scraping around on a strong soil sieve wire works but is time consuming. Seeds can be stored dry for many years at 40-70˚.
Before sowing, scarify the seeds with sandpaper and a boiling water soak. Pour boiling water over the seeds and let the water cool. Soak for 24 hours. If you have inoculant, apply it now. Sow the seeds in cells or in situ either in late fall or in spring. Cover the seeds well.
Mature plants are rhizomatous.

D *Sphaeralcea coccinea* (Scarlet Globemallow) - Malvaceae
Store the seeds dry at 40˚.
There is a woody mericarp enclosing each seed. It does not have to be removed, but it does help to breach it. Scarify the seeds with sandpaper. Next pour boiling water over the seeds and let the water cool. Soak for 24 hours. Cold stratify outside in cells or in situ. Radicles emerge erratically from 38-60+ days which makes stratification in the fridge inconvenient. Cover the seeds lightly.
My germination % is very low.

D *Sphaeralcea munroana* (Munro's Globemallow) - Malvaceae
Store the seeds dry at 40˚. Starting about 8 weeks before the last expected frost, scarify the seeds with sandpaper. Next pour boiling water over the seeds and let the water cool. Soak for 24 hours. Cold stratify for 6 weeks. Sow and cover the seeds **very lightly** if the mericarp has been removed which may be the situation with purchased seeds. Expose to 70˚.

D *Sphaeralcea parvifolia* (Small-leaf Globemallow) - Malvaceae
See *S. munroana.*

M *Stanleya pinnata* (Prince's Plume) - Brassicaceae
Many online references say that *Stanleya pinnata* seeds are not dormant and require no cold stratification. For 2 years, that technique did not work for me.
Add two steps: a gibberellic acid soak and cold stratification. Mix 3 Tbsp distilled water + a tiny bit (just dust on the end of a palette knife) of gibberellic acid (The Science Company, Lakewood, CO). Add the seeds and soak overnight. Cold stratify 3 months outside. Soaking the seeds reveals a thin covering of gel around each seed. If you cold stratify in the fridge, the seeds will clump together and be difficult to sow. I also found that some seeds developed a radicle in just 2 weeks when cold stratified in the fridge.

The Extension Service at Utah State University has a site called Native Plants in the Landscape. An article from that source is referenced by fs.fed.gov. They suggest cold stratification for 90 days and to "sow seed to a depth of 1⁄4′′ in a well drained, peat-based soil-less substrate".

E *Symphyotrichum ericoides* (White Heath Aster) - Asteraceae
Store seeds dry at 40 or 70˚.
No pretreatment is required. Sow a week or two after the last frost date in spring. Cover the seeds **very** lightly.

E *Symphyotrichum laeve* var. *geyeri* (Smooth Blue Aster) - Asteraceae
Cold stratify seeds 30 days either in the fridge or outside. Sow. Cover **very** lightly. Germinate in 7-9 days. Pot 2-3 weeks later.

E *Symphyotrichum oblongifolium* (Aromatic Aster) - Asteraceae
Follow directions for *S. ericoides.*

E *Thelesperma filifolium* (Stiff Greenthread)
Annual.
Cold stratify 2-4 weeks. Do it outside or in cells, not a baggie in a fridge, The radicles emerge in 9-17 days. Cover the seeds **very** lightly.

M *Thelesperma megapotamicum* (Hopi Tea Greenthread) - Asteraceae
Perennial.
Sow in cells or in situ in mid March (about 7 weeks before the last frost date). Cover lightly. Germinate in 2 months when temps around 60-65 and are fluctuating.

Thermopsis rhombifolia (Goldenbanner) - Fabaceae
Scarify with sandpaper. Do a boiling water soak until the seeds swell. You may need to repeat the boiling water soak. Sow. Cover to depth. Expose to 70˚.
They can also be scarified and sown in the fall.

Verbena stricta (Hoary Verbena) - Verbenaceae
Store seeds dry at 40 or 70˚.
Cold stratify 60 days in the fridge.
When sown, cover **very** lightly.
Leaves appear in 9 days.

Verbesina encelioides (Golden Crownbeard) - Asteraceae
Regional.

Annual.
This species is both self and cross pollinated.
In fall, surface sow in situ.
OR
In spring, surface sow the seeds in situ or in pots. If the crop is too heavy, snip off some of the seedlings.

D *Viola nuttallii* (Yellow Prairie Violet) - Violaceae
"I find the fullness of the seed to range from full to empty. I collect the entire above ground part of the plant when the first capsules dehisce and let them finish in a paper sack. I screen it as best as I can. I find the best way to separate these seeds from similar chaff is to gently move a sloping, flat surface and let them roll away from the debris. It can be done with a fan, but this is more efficient as far as yield. You still need to blow away some of the empty seeds."
Rick Brune email 6/21/21
The seeds need a period of cold stratification. Either sow them in situ upon collection or sow them as soon as you receive them. The seeds have an aril which suggests a long dry period in dry storage would be detrimental. Most plants with an aril are ant dispersed so ants may move them from where you sow them to another spot. The seeds can be held dry until early fall of the year collected.
Sow the seeds in situ and cover them with about 1/8" of soil or grit. Label the location so you will not disturb them before they can germinate early the following spring.

E-M *Wyethia amplexicaulis* (Mule's Ears) - Asteraceae
Store the seeds dry at 70˚ for 6 months (after-ripen). Cold stratify for 90 days either by sowing outside in the winter or by chilling the seeds in the fridge in a moist medium and sowing in cells. Cover lightly. Germinate at 60-70˚ in 2 weeks.

E *Wyethia scabra* (Whitestem Sunflower) - Asteraceae
Purchased seeds (unknown age but more than 2 years) sown in cells, in Feb., in Lakewood, 5690', covered and put outside germinated (50%) in 40 days, early April, more than a month before the last frost date.
Tolerate transplanting well.

Xanthisma spinulosum (Spiny Goldenweed) - Asteraceae
Clean to remove chaff. Store dry at 40 or 70 for 6 months.
Sow at 70˚ with very light cover over the seeds.

Yucca baccata (Blue Yucca) - Agavaceae
"Yuccas will germinate promptly from fresh seed held over winter (in moist sand in the fridge). Seeds germinate best in 60-70 degree temperatures. Yuccas may also be grown from rhizomes, stem cuttings, or by digging offsets from the side of established plants. Transplant into a well draining medium." wildflower.org

M *Yucca glauca* (Great Plains Yucca) - Agavaceae
Check the seeds carefully for insect predation. Discard seeds with holes. Put in the freezer for 2 weeks.
Sow the seeds at 70˚. Cover lightly. They will germinate erratically over 3 months.
Fall sowing should work as well.

Zinnia grandiflora (Rocky Mountain. Zinnia) - Asteraceae
No cold stratification is necessary. Sow the seeds in situ or in cells from mid spring to early summer (65-75˚). Cover lightly. Germination may be erratic.

Zizia aptera (Heartleaf Golden-Alexanders) - Apiaceae
Collect seeds Aug-Sept when the seeds roll easily from the umbel. Place in a paper bag. Clean. Store at 40˚.
Sow in cells or in situ outside in fall or at least by the first of the new year. Cover. Germinate in cool temperatures (in about 3.5 months if sown the first week of January).
Bloom in 2 years.

SHRUBS

M *Amorpha canescens* (Lead Plant) - Fabaceae
Scarify with sandpaper. Boiling water soak (Pour boiling water over the seeds. Let it cool and soak 12-24 hours). Cold stratify 30 days. Inoculate (opt.). Sow on well draining mix in deep cells or pots. Cover **very** lightly with mix or fine vermiculite. 70˚. Germinate in 1 week.

M *Amorpha nana* (Dwarf or Fragrant Wild Indigo) - Fabaceae
Treat the seeds the same as *A. canescens* seeds.

M *Atriplex canescens* (Fourwing Saltbush) - Chenopodiaceae
The plants are usually dioecious, ie. male and female flowers are on separate plants.
Afterripen (store dry at 70˚) for 90 days. USDA Forest Service Gen. Tech. Rep. RMRS-GTR-274. 2012 , p 69.

Soak the seeds in water for 24 hours. Cold stratify for 5 days. Sow and cover well.
Seed can also be sown in situ in fall or early spring and covered well. ***westernnativeseed.com***

When I used the fridge for the cold stratification, about 1/4 of the seeds germinated (radicles emerged) 5 days after putting in the fridge. The rest of the seeds never germinated.
When advancing from cells to a small pot, use a very well draining medium. This species can rot easily in pot culture.
Sowing soaked and stratified seeds directly into a 2.5” pot containing well draining mix in mid February works well.

Berberis aquifolium (Holly-leaved Barberry) - Berberidaceae
Pacific Northwest native plant.
Soak the seeds for 24 hours. Cold stratify for 90 days either in the fridge or outside. Cover with 3/8” medium.

Berberis fremontii (Fremont’s Barberry) - Berberidaceae
Remove flesh from the fruit.
Warm stratify for 3 days or more. Cold stratify for 3.5 months. Cover seeds to depth when sowing.
Carol Baskin, Jerry Baskin and Susan E. Meyer. https://www.jstor.org/stable/3672059

Berberis repens (Creeping Oregon Holly) - Berberidaceae
Soak and ferment the berries for a few days. Remove the soft dark blue flesh. An immersion blender is helpful and does not harm the seeds if the blade is dull.

Warm stratify the seeds for 90-120 days followed by cold stratification 90-120 days. USDA Forest Service Gen. Tech. Rep. RMRS-GTR-274. 2012 , p 69

Cover the seeds to depth.

***Ceanothus* spp.** (Redroot, Jersey Tea) - Rhamnaceae
soaking the seeds in hot water (180-200 degrees). Soak in cooling water 24 hours. Stratify all seeds for 60-90 days at 41 degrees. wildflower.org

***Cercocarpus ledifolius* (Curl-Leaf Mountain Mahogany) - Rosaceae**
60-90 days cold-moist stratification. Sow outside in fall to early spring. https://klamathsiskiyouseeds.com

E *Cercocarpus montanus* (Birchleaf Mountain Mahogany) - Rosaceae
De-plume the seeds and store the seeds dry at 40˚. The plume drills the seed into the ground in nature, but in horticulture, we cover the seeds with some medium.
Soak the seeds in water for 30 minutes. Cold stratify for 1 month. Sow and cover the seeds lightly.
First leaves appear 17 days after sowing.
Seeds can be soaked, and direct sown in the garden about a month or more before the last frost date. Cover the seeds lightly.

M *Chamaebatiaria millefolium* (Fernbush) - Rosaceae
Regional native
Sow outside in fall or early winter. Cover seeds to depth.
Fresh seeds are nondormant, whereas stored seeds require 1 to 3 months of chilling to overcome dormancy. The optimum temperature range for germination of southwestern populations is 18 to 26 °C (65-80˚F). https://www.fs.fed.us/rm/pubs_other/wo_AgricHandbook727

With fresh seeds cold stratification is ok but reduces the germination rate. Norman C. Deno, First Supplement, p30.

E *Ephedra viridis* (Mormon Tea, Green Ephedra) - Ephedraceae
Sow, cover, and cold stratify 1 month outside (radicles extend in 19 days). Leaves emerge in 29 days. Bump up as early as a week after leaves appear.

E *Ericameria nauseosa* (Rabbitbrush) - Asteraceae
Whether standard sized or dwarf this plant can self seed voraciously.
Use fresh seeds.
Sow in late fall either in situ or in cells. They need some light to germinate so cover lightly.
They germinate about 4 weeks before the last frost in spring.
Sow in Dec. rather than in spring to have plants ready for spring sales or swaps.

Eriogonum effusum (Spreading Buckwheat) - Polygonaceae
Collect seeds Sept-Oct. Store dry at 40˚.
Sow in early Feb. Cover the seeds lightly. Put outside for cold stratification. Long radicles extend beginning in 38 days. Leaves emerge when temperatures hit about 60-65˚.
Bump up can begin in about 3.5 months. Pot in well draining mix.

Fallugia paradoxa (Apache Plume) - Rosaceae
Collect seeds when the pink plumes turn white, and the seeds are easily plucked. Dry and remove the style (plume). This will provide better soil contact for the seeds when they are sown.

In more southern states with summer rains, no pretreatment is necessary. In CO, store the seeds dry at 40˚. One month before the last frost, cold stratify at 40˚ for 1 month. Sow the seeds and cover lightly, place outside at 70˚.

Gutierrezia sarothrae (Broom Snakeweed) - Asteraceae
Sow heavily in spring. Surface sow or cover very lightly. Mist or bottom water or cover with glass or plastic.
The seeds should germinate in 7 days at 70˚.

M-D *Holodiscus dumosus* (Rockspirea) - Rosaceae
Store the seeds dry at 40˚ for 6 months to allow the embryo to mature (afterripen).
The tiny seeds may have a low of 7% viability, and they have a deep dormancy. fs.fed.us/database
At the Denver Botanic Gardens, the horticulturists treat the seeds with sulfuric acid, cold stratify for 4.5 months, treat with Wright's Liquid Smoke and then surface sow. The tray of cells goes under mist at 70˚.
For homeowners, I suggest very light sandpaper scarification, cold stratification for 4.5 months, a smoke treatment before or after sowing, surface sowing and exposure to 70˚. Mist with a hand mister as often as possible or create a high humidity chamber of your own invention. If you have no liquid smoke, just skip that step.
Prepare a dilute smoke solution by adding one part commercial smoke flavoring to nine parts water. Either soak the seeds in this solution overnight (or until they swell), or water the pot or flat once with this solution. J. L. HUDSON, SEEDSMAN

Pericome caudata (Mountain Tail-leaf) - Asteraceae
Self-incompatible.
Collect seeds late Aug-Sept. Store dry. Viability unknown. First year seeds seem to germinate best. Cold stratify seeds for 6 weeks. Sow the seeds and cover **very** lightly to allow light to reach the seeds. Place the flat outside. Radicles begin to emerge in 16 days in cold stratification in the fridge. Leaves emerge when temps are 65-70˚.

E *Prunus americana* (American Plum) - Rosaceae
Remove the flesh from around the pits.
Shortly after cleaning, sow in situ or in pots outdoors. Cover to depth. They germinate in about 7 months in cool temperatures, including some frosts.
Cold stratification for 3 months or more could be done in the fridge.
Protect from rabbits.

Prunus pumila* var. *besseyi (Sand Cherry) - Rosaceae
Clean ASAP. Embryos have a dormancy period of several months, but dry storage reduces viability down to <30%. Store in barely moist perlite or vermiculite in the fridge over winter which accomplishes 3 months or more of cold stratification. Sow in spring, cover, protect from birds. (It works. Seedlings have two pairs of true leaves by early June.)

Softwood cuttings, IBA/NAA dip, take in cool part of day. Stick right away. They don't recover from wilting. All of this information is from the Judith Phillips book, "Plants for Natural Gardens", p 64.

Prunus virginiana (Chokecherry) - Rosaceae
Warm stratify the seeds in moist sand for 2 weeks. Then cold stratify (36-41 degrees) for 60-90 days. Plant well before high temperatures. wildflower.org
When sowing, cover to depth.

Purshia tridentata (Antelope Bitterbrush) - Rosaceae
Cold stratify for 30 days in the fridge in midwinter. While still winter, sow, cover just to depth, and put outside. True leaves develop in 55 days in cool temperatures at least a month before the last frost date.

E *Rhus glabra* (Smooth Sumac) - Anacardiaceae
Dioecious
Collect the seeds when they strip easily from the stem.
The red drupes have an oily mesocarp. The fruits can be cleaned after collection or stored at 40˚ dry until late winter and cleaned when they are drier. Rub them on a sieve to remove the red mesocarp. Another cleaning method is to "Place the seed heads in a plastic grocery bag, once they are completely dry. Tie the bag shut, and bang it against a hard surface to separate the seeds from the berries." https://homeguides.sfgate.com/grow-rhus-glabra-seeds
When you are ready to sow the seeds either fall or late winter, scarify the seeds with acid or sandpaper or a blender with plastic blades. Pour boiling water over the seeds and let the water cool. Soak for 24 hours or 2-3 days. If the seeds are imbibing water, they should sink.
Cold stratify the seeds for 2-3 months.
When sowing cover the seeds well.
Sow in situ in late fall after removing the red mesocarp and doing the pretreatments. Cover the seeds well.
OR
After the pretreatments in January-February and sowing in April-May, the seeds should germinate in 10 days at 70˚ and can be potted 3 weeks later.

Rhus trilobata* var. *trilobata (Skunkbush or Aromatic Sumac) - Anacardiaceae
Dioecious.
Follow the directions for *Rhus glabra.*

Ribes americanum (American Black Currant) - Grossulariaceae
Soak and ferment the black berries in order to remove the fruit from the seeds.
Cold stratify the seeds in the fridge or outside for 90-120 days. They can be sown in cells or in situ.

Location matters. This species grows "in shady places along streams and in moist meadows along the Front Range, 5500-7500'." Ackerfield, Jennifer, "Flora of Colorado", 2015, p 495.

M *Rosa blanda* (Smooth or Woods' Rose) - Rosaceae
syn. *Rosa woodsii*
Remove fleshy material after collection. To accomplish the cleaning, put the fruits in a small bowl with enough water to cover the seeds by 1 inch. Let the concoction sit for several days to ferment. When the fruits soften, remove the seeds.
Sow in fall, cover the seeds and put the containers outside. The seeds may need scarification as well as stratification cycles (warm moist first and then at least 3 months cold stratification). Germination can be erratic.

WOODY VINES

Parthenocissus quinquefolia (Virginia Creeper) - Vitaceae
Introduced to CO from eastern states.
"Collect fruits after they have turned bluish black by hand-stripping from vine. Extract seeds from pulp and air-dry. Store in sealed containers at 42 degrees.

Sow seeds in fall or stratified (in moist sand or peat for 60 days at 41 degrees.) and sow in spring." wildflower.org
Cover the seeds 1/4".

D *Smilax lasioneura* (Blue Ridge Carrionflower) - Smilacaceae
Soak, ferment and macerate the blue berries to remove the fleshy material around the seeds.
Cold stratify for at least 60 days before sowing in situ. Cover to depth. They may take a few years to germinate.

GRASSES

Many grasses, especially warm season grasses, benefit from big temperature swings anywhere in the range of 80-90˚ in the day to 34-50˚ at night.
Protect the seeds from birds and small mammals whether you sow in cells or in situ.

E-M *Andropogon gerardii* (Big Bluestem) - Poaceae
Warm season.
Store seeds dry at 40˚. Then sow seeds at 75-80˚ (a germination blanket would be helpful to achieve the desired warm temps but temps should drop dramatically every night). Large temperature fluctuations from day to night help warm season grasses germinate.
Big Bluestem has a low percentage of fertile seeds. I collected at least 5 ecotypes of seeds and established them in a meadow. Thereafter I collected many more fertile seeds.
Spring planting of plants would be desirable, but fall planting may succeed if the plant has a substantial root system. This warm season grass will not grow over the fall and winter. It will begin active growth when temps warm in spring.

Andropogon hallii (Sand Bluestem) - Poaceae
Warm season.
Grows on the top of sand dunes.
It is related to Big Bluestem, and it has the same fertility issues. It may have few fertile seeds in the inflorescence.
Store seeds dry at 40˚.
Seeds do not require cold treatment to germinate. They germinate in the fall and overwinter as seedlings. fs.fed.gov/database
No pretreatment. Plant seeds outside fall or spring 1/8 to 1/4" deep. - westernnativeseed.com

E *Bothriochloa laguroides* ssp. *torreyana* (Silver Bluestem) - Poaceae
(syn. *Andropogon saccharoides*)
Warm season.
At 5690', seeds sown in mid March will germinate within 2 months. Sow in cells or in situ. Cover very lightly and put the cells outside.
They bloom the first season.

E *Bouteloua curtipendula* (Sideoats Grama) - Poaceae
Warm season.
Store seeds dry at 40˚.
From mid March-mid may sow outside in cells or in situ (protect seeds from birds). Cover to depth.
The seeds do not require a pretreatment (cold stratification), but they germinate best when they are

exposed to large temperature swings (70-90˚ with nights 35-45˚). They will germinate in 2-7 weeks. The plants often bloom that year.

M-D *Bouteloua dactyloides* (Buffalo Grass) - Poaceae
syn. *Buchloe dactyloides*
Purchased seeds primed with KNO_3 sown after the last frost day, germinate in less than 3 weeks. Wild collected seeds may need to be older or have a cold stratification period. Cover seeds lightly.

M *Bouteloua gracilis* (Blue Grama) - Poaceae
Warm season.
Store dry at 40˚.
Sow mid April to mid May in situ or in cells. Cover lightly. Germination seems lower than in some of the other warm season grasses. Be generous when sowing the seeds.
Seeds collected from a cultivar such as 'Blonde Ambition' will probably be fertile, but the plants produced will not have the exact features for which the cultivar was selected.

Deschampsia caespitosa (Tufted Hairgrass) - Poaceae
Cool season.
Sowed heavily in cells in mid March in the Front Range. Covered lightly. . Heavy germination in 39 days. Began to pot mid May.

E *Elymus canadensis* (Canada Wild Rye) - Poaceae
Cool season.
Sow early-mid April in the FR. Cover the seeds **very** lightly. They germinate in 11-17 days. If you sow them in situ, protect the seeds from birds. If grown in cells, plant the plants by June. Cool season grasses left in cells in the heat of summer easily rot from overwatering.
They may bloom the first year.
This grass species can tolerate some shade.

E *Elymus elymoides* (Squirreltail) - Poaceae
Cool season.
Collect seeds mid June to mid July. The inflorescence tumbles. Store dry at 40-70˚.
No pretreatment is required. Sow in situ or in cells in spring or summer. Sow about 2 weeks before the last frost date. Cover with 1/8-1/4" of soil. The seeds germinate in about 2 weeks.
They can be moved from cells to small pots in 2-3 weeks.
Plant as soon as possible. Growth slows or ceases in hot weather.

E *Elymus glaucus* (Blue Wildrye) - Poaceae
Cool season.
Seeds sown mid March in the FR and covered lightly germinate in a month or less.
Pot or plant plugs directly into the ground before June 1.

E *Elymus trachycaulus* (Slender Wheatgrass) - Poaceae
syn. *Elymus violaceus*
Cool season.
Treat the same as *E. glaucus*.

E *Festuca arizonica* (Arizona Fescue) - Poaceae
Cool season.

About the third week in March (in the FR, 5690'), soak in tepid water for 24 hours. Sow in cells and cover by 1/4". Leaves emerge in 24 days. Pot as early as one week later if you sowed heavily and have a clump of plants.

E *Festuca idahoensis* (Idaho Fescue, Blue Bunchgrass) - Poaceae
Cool season.
Treat the same as *F. arizonica*. The water soak is not necessary.

E *Festuca saximontana* var. *saximontana* (Rocky Mountain Fescue) - Poaceae
Cool season.
Treat the same as *F. arizonica*. The water soak is not necessary.

E *Festuca thurberi* (Thurber's Fescue) - Poaceae
Cool season.
Treat the same as *F. arizonica*. The water soak is not necessary.

E *Hesperostipa comata* (Needle & Thread) - Poaceae
syn. *Stipa comata*
Cool season.
In mid March (in FR 5620') sandpaper the seeds. Sow in cells and cover 1/8" deep. Put outside. Leaves emerge in 44 days.
Plant the cells or pot within a few weeks.

Hilaria jamesii (Galeta) - Poaceae
Warm season.
Sow about 1 month before the last frost date or through the summer. Cover the seeds lightly. Germinate from 14 days to 2 months depending on the temperature.

E *Koeleria macrantha* (Junegrass) - Poaceae
Cool season.
Mid March (in the FR, 5690'), sow pinches of seeds in cells. Cover very lightly. Put outside. Germinate in about 1 month in cool temperatures.

E *Muhlenbergia montana* (Mountain Muhly) - Poaceae
Warm season.
Sow the seeds 2 weeks before your last frost date in the spring or on into the summer. Cover the seeds **very** lightly. Put outside. Leaves emerge in 1-2 weeks.

E *Nassella viridula* (Green Needlegrass) - Poaceae
Cool season.
In the FR (5690') collect seeds in July and store dry until the next spring. In early to mid March, sandpaper to scarify the seeds. Cold stratify 2 months in the fridge. Sow around your last frost date. Cover the seeds **very** lightly. Begin to germinate in 1 week.

E *Panicum virgatum* (Switchgrass) - Poaceae
Warm season.
Sow seeds anytime from April 1- May 1, in cells kept outdoors or sow in situ. Cover lightly. Switchgrass germinates best when the seeds receive large temperature swings (70-90˚ day-34-50˚ night). Germinate in 22-25 days.

E *Pascopyrum smithii* (Western Wheatgrass) - Poaceae
syn. *Elymus smithii*
Cool Season.
Cold stratify for 2 weeks or sow 2 weeks before your last frost date. Pretreatment is not required but speeds germination a bit. Cover well to provide dark. Germinate in 8 days if cold stratified.
Rhizomatous and tends to form monocultures.

E *Schizachyrium scoparium* (Little Bluestem) - Poaceae
Warm season.
Sow April 1 to mid summer in cells or in situ. Cover lightly. Germinate in about 20 days, depending on the temperature.

E *Sorghastrum nutans* (Indian Grass) - Poaceae
Warm season.
Store seeds dry at 40˚.
Sow anytime from April 1- May 1, in cells kept outdoors or in situ. Cover lightly.
Germinate in 30-48 days.

E *Sporobolus airoides* (Alkali Sacaton) - Poaceae
Warm season.
Collect seeds in the fall and store dry to after-ripen until the spring.
Sow in mid March in the FR (5690'). Use medium cover. Large temperature fluctuations speed germination which can occur anywhere from 2-6 weeks. Pot or plant plugs anytime after the leaves are 1.5"-2" tall.

E *Sporobolis heterolepsis* (Prairie Dropseed) - Poaceae
Warm season.
Sow about 5-6 weeks before your last frost date. Cover very lightly. Germinate around the last frost date and can be potted or planted 2 weeks later if desired.
Flower the first season.

FERN ALLIES

Marsilea vestita (Buffalo Clover) - Marsileaceae
"Marsilea is infrequently found in intermittent pools in small drainages on the Pawnee National Grassland. They are often classified as buffalo wallow plants. The areas are often heavily trampled by cattle which may serve to scarify the sporocarps. They produce floating fronds when water is present. As the water recedes, sporocarps are produced on the drying mud flats. Eventually the fronds shrink as moisture disappears. Then they bake in the hot sun on scorching soil during the summer. I believe their habitat is usually quite dry during the winter and the plants regrow with spring moisture. They do not do well indoors for a long period of time.

My procedure for growing it from sporocarps is as follows:

Scarify or cut in half the sporocarps. [Jan suggests large nail clippers.]
Outdoors! Place on soil (mine is Nunn-Clay Loam) in 0.5 inches of water or less. Add water to soil from bottom to neutralize any chlorination products. Provide different depths from about 1mm to 12mm. [The water is over the top of the soil.]
Sporophylls are produced in one hour.

Germination of megaspores in about 10 days. Fine, grass-like growth. It may or may not help to lightly tip the container to spread the microspores around with the megaspores.
After 3 more days, 200 - 300 grass-like growths 3-4 mm tall.
After 1 day, first fronds begin to appear as broader blade.
After 11 more days, first four-parted fronds appear.
After doing this several times, I think the procedure can probably vary considerable.
Have fun!" email from Rick Brune, 6/12/21

Useful Resource:
free downloads of Deno, Norman, Seed Germination Theory and Practice 2nd ed. and 2 supplements.
Copy and paste the link below.
https://naldc.nal.usda.gov/download/41278/PDF