


Native wetland plant seed collection and cleaning guide for the Intermountain West

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Preface

Native plants are an integral part of wetlands and are critical for supporting all aspects of wetlands that society values, such as providing wildlife habitat; mitigating the effects of flooding, drought, and wildfire; storing carbon to reduce climate change impacts; and improving water and air quality.[1,2,3] Wetland plants can also be negatively impacted by invasive species, excessive livestock grazing, wetland filling and draining, alterations to wetland water levels, sedimentation, and water pollution.[3,4,5,6] Therefore, land managers, restoration practitioners, and private landowners are often interested in restoring native plants in wetlands to mitigate impacts. We developed this guide to help facilitate such restoration activities. In restoration, native species can be reintroduced directly as seeds, or plants can be grown from seed in the greenhouse or field and transplanted into wetlands. Because native seeds are a key component in this restoration, understanding how to collect and clean them is imperative. Here we provide guidance for seed collection and cleaning based on our experiences in the Intermountain West, a vast region spanning NV, UT, and ID as well as parts of WA, OR, CA, WY, CO, NM, and AZ. Building on our collective decades of experience with wetland restoration in the region, in partnership with many federal, state, and private landowners, we summarize principles and tips related to seed collection and cleaning. We highlight the 41 species that have been the focus of recent wetland restoration practice and research by our collaborative researcher and manager team, a fraction of the overall flora of this region.[7] Ultimately, we hope this guidance catalyzes further wetland restoration throughout the region. Enjoy!

Acknowledgments

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Bold and blue terms are defined in the Glossary.

Seed collection principles

The first step in using seed in wetland restoration is its collection, but where, when, and how to collect seed may not always be clear. Here, we provide some best practices based on our experiences and the literature.[8,9,10] Throughout this guide we use the term seed to refer to the individual dispersal unit of the plant. This unit may include other structures (e.g., **glume**, **utricle**, **perigynia**) that surround the seed.

Where to collect seed

- Collect species from a range of sites (e.g., wet *and* dry sites; sites with different plant communities and management regimes) to ensure sufficient genetic diversity.
- Source seed from within the same watershed if locally adapted seed is desired. However, many wetland species, particularly those consumed by waterfowl, are naturally broadly dispersed so collections across a region can be appropriate.[11]
- Collect from at least 50 individuals spread broadly across a site at each of at least three locations (and preferably five or more locations). Broader collections are particularly important for clonal species (e.g., *Schoenoplectus acutus* or *S. americanus*) where patches may be comprised of only one or a few genetically distinct individuals.[11]
- Do not take more than 5%–20% of the seed from a site in a given year to ensure the population remains stable over time.[8]

When to collect seed

- In general, seeds are ready to collect when they are easily released (i.e., shatter) from the **inflorescence**. Usually seeds will be dry to the touch and may darken as they mature.
- The **phenology** of seed production can vary greatly year-to-year based on weather patterns but keeping detailed notes on seasonal phenology (e.g., flowering, seeding, senescing, etc.) will help to anticipate when mature seeds will be ready to be collected across years. Keep in mind that this maturation happens at different times for individuals within a population, and even on an individual plant. Visiting a population multiple times will ensure sufficient genetic diversity is captured among seed maturation times.
- Collect seed when the **inflorescence** is dry (i.e., little morning dew; no moisture from rain or fog).

How to collect seed

- The amount of seed you need to collect and your equipment will help determine the best methods for seed collection. In the next section, we provide species-specific information on collection methods.
- Collect seed from **phenotypically** diverse individuals (e.g., tall and short plants; plants with wide leaves and narrow leaves) to improve genetic diversity.
- Harvest seed from multiple **inflorescences** on an individual when possible.
- It is best practice to press a **voucher specimen** for every seed collection. These specimens can be used to document and confirm plant identification long past the seed collection date.

Useful seed collection supplies

- Plant identification guides to ensure accurate species identification (See How to use this guide on pages 9–10.)
- Field notebook or seed **phenology** tracking data sheet to take detailed notes
- GPS for marking seed collection locations
- Necessary permits
- Plant press and small **hoedag** for **voucher specimen** collection
- Tennis racket for releasing seeds from the plant
- Small vacuum for collecting seeds
- Clippers for removing seed heads
- Paper bags of various sizes for collections
- Permanent marker to label bags
- Gloves to protect hands during collection

Seed cleaning principles

Once you have collected your seed, it is important to clean it to (1) determine how much actual seed you have, (2) limit space requirements for storage, and (3) facilitate seeding with equipment or by hand. Some best practices based on our experiences and the literature[7,9,10] are outlined below.

How to clean seed

- Most seeds in this guide can be cleaned by **threshing** and **winnowing**. Threshing is the process of agitating the seed away from the rest of the plant. Winnowing uses airflow to separate seed from chaff (i.e., debris like fragments of stems, leaves, insects, etc.), as light pieces (chaff) are separated from heavy pieces (viable seed).

- Seed size can be variable among individuals, populations, and collection years. It is important to adjust cleaning techniques to ensure that this genetic variability is maintained. While winnowing, seeds that are smaller or lighter may blow farther away and be associated with the chaff-laden "discard pile." Be sure to inspect this material for filled seed and adjust cleaning methods so as to not discard too many viable seeds.

Useful seed cleaning supplies

Note: See Appendices A and B on pages 54-55.

- For **threshing**: threshing machine, **Dybvig seed cleaner**, threshing board, **hammermill**, rubberized gloves, sandpaper, and a small or large vacuum with a suction hose
- For **winnowing**: blower machine, box fan, or air column separator
- Sieves of various sizes for separating large debris and small chaff from the seed collections
- Brushes (large paint brushes) for moving seeds and cleaning out collection containers
- Tarps used on the floor in the winnowing process to make cleanup easier
- Broom and pan for sweeping seeds off the tarp or ground
- Funnels to easily pour collected seed into cleaning machines
- Various containers for sorting seed (e.g., wash bins, rectangular containers)
- Paper bags of various sizes for storing seeds
- Permanent markers and tape for labeling bags and containers
- Notepad for taking good notes
- Personal protective equipment (PPE): Glasses or safety goggles to protect eyes from debris while threshing; ear plugs when using a loud thresher or hammermill; KN95 masks for threshing and winnowing to protect lungs from small particles

Seed storage principles

Rarely will seed go straight from the cleaning process to the greenhouse or field for sowing. Thus, careful consideration of seed storage and dormancy-breaking practices is needed to ensure **germination** of your hard-earned seed. Some best practices based on our experiences and the literature[8,9,10] are outlined below.

- Before combining collections and storing seed, be sure to inspect your collections with a hand lens or under a microscope. Insect-infested collections should be stored separately, or discarded, so as not to contaminate or lower the viability of the overall collection.
- Dry seeds can be stored in breathable paper bags at room temperature. Very small seeded species, such as *Juncus* spp., may be stored in small plastic bags only when completely dry. Wet seeds may decompose.
- Research your species to see if they require a **cold stratification** treatment to break **physiological dormancy** (the most common type of dormancy in wetland species) and improve **germination**. There are lots of resources for obtaining seed dormancy information on plant species that should be consulted for best practices.[9,12,13] Consider wrapping species that exhibit physiological dormancy in a permeable material (e.g., cloth, organza fabric) and burying them in a container filled with saturated sand and sphagnum moss at a cold temperature (~2–4 ℃; not freezing) for a couple to several months before sowing.

Resources

We intend for this guide to be used with plant identification resources. Here are resources we recommend. Complete citation information can be found in the References section. Bolded references in this list below were used to compile the information on plant identification throughout this guide.

- **A Utah Flora[15]**
- Field Guide to Colorado's wetland plants[16]
- Field Guide to Intermountain Rushes[17]
- Field Guide to Intermountain Sedges[18]
- **Flora of North America[19]**
- Flora of the Central Wasatch Front[20]
- Grasses of the Intermountain Region[21]
- Intermountain Flora[22]
- Intermountain Biota[23]
- Plant Identification Terminology: An Illustrated Glossary[24]
- PlantNet App[25]
- Sedges of Colorado[26]
- USDA Plant Database[27]
- Utah Plant Identification Facebook Group[29]
- Utah Wildflowers App[28]
- **Vascular Plants of Northern Utah[30]**
- **Wetland Plants of Great Salt Lake[7]**

How to use this guide

This page defines the content provided for each species. Information about photos follows on page 10.

Scientific name

Common name

Family name

Wetland Indicator Status: Indicator code (defined in Table 2) is for the Arid West as well as the Western Mountains, Valleys, and Coast regions (Table 1 and map).[14] Our area is at the junction of both regions. Thus, each plant may have two different Wetland Indicator Statuses. If they have only one listed, they have the same status for both regions.

Table 1. *Regions*
Defined by the U.S. Army Corps of Engineers[14]

Region	Geographic areas in region
Arid West (AW)	AZ, CA, CO, ID, MT, NM, NV, OR, TX, UT, WA, WY
Western Mountains, Valleys, and Coast (WMVC)	AZ, CA, CO, ID, MT, NV, NM, OR, SD, UT, WA, WY

Table 2. *Wetland Indicator Status categories*
National Wetland Plant List indicator rating definitions from the U.S. Army Corps of Engineers[14]

Indicator status	Indicator code	Designation	Short definition (estimated probability of occurrence)
Obligate wetland	OBL	Hydrophyte	Almost always occurs in wetlands (>99% of time)
Facultative wetland	FACW	Hydrophyte	Usually occurs in wetlands but may occur in non-wetlands (67–99% of time)
Facultative	FAC	Hydrophyte	Occurs in wetlands and non-wetlands (34–66% of time)
Facultative upland	FACU	Non-hydrophyte	Usually occurs in non-wetlands, but may occur in wetlands (1–33% of time)
Obligate upland	UPL	Non-hydrophyte	Almost never occurs in wetlands (<1% of time)

Map: U.S. Army Corps of Engineers[14]

Flowering: Approximate flowering times in the Intermountain West.

Seeding: Approximate seeding times in the Intermountain West.

Identification: Brief description of the species. Important distinguishing characteristics and other plant species that it may be confused with will be mentioned here.

Collection: Description of potential collection techniques.

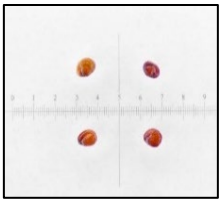
Cleaning: Description of potential cleaning techniques.

Seed number: Approximate number of seeds per gram after cleaning. There is a lot of variability in seed size and weight, so this number will vary among seed source and year.

Notes: Anything else worth mentioning about the species.

Synonyms: Accepted or past accepted synonyms, if applicable.

Photos: For each species, we will show four photos as follows:

The top photo will typically be at a distance to show defining features of the plant or ecosystem.	
The two photos in the middle will show defining features of the species' flowers, seeds, or leaves.	 
The bottom photo is of seeds taken with a microscope camera. Additional photos at the bottom of the page show distinct seed characteristics. Measurements are in millimeters (mm).	

Allenrolfea occidentalis[31]

Iodine bush

Amaranthaceae

Wetland Indicator Status: FACW

Flowering: July–November

Seeding: September–November

Identification: Perennial shrub 30–100 cm tall with alternate green branches; woody at the base. **Succulent** leaves are alternate, triangular, and reduced to **scales**.

Allenrolfea occidentalis is easily distinguished from other playa shrubs by the dark hue of its stems as well as its alternate leaves. *Sarcocornia* species appear similar but have opposite leaves. *Salicornia* species are herbaceous, rather than shrub-like.

Collection: When the plant begins to **senesce** (turn tan or reddish), strip the leaves and stems with hands. Collecting some scale-like leaves along with the seeds is unavoidable.

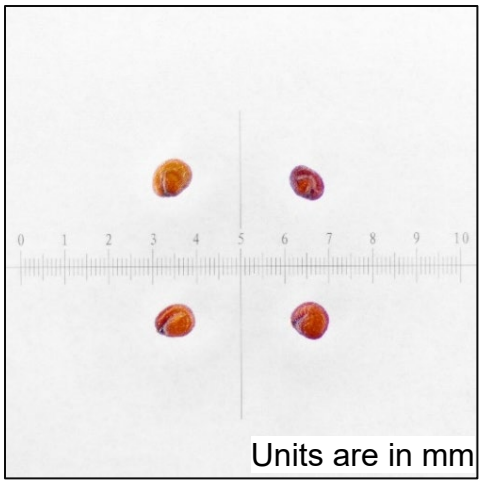
Cleaning: Use a thresher or **Dybvig** to separate small, dark, round seeds away from other plant biomass. Use a sieve to separate large woody pieces, then a 1/22-inch-holed sieve to separate small seeds from finer debris. **Winnow** away chaff. Alternatively, after **threshing**, use an air column separator. Some seed will remain in the **utricle**.

Seed number: ~8,960 per gram[31]

Notes: This is the only species of its genus in North America.

Synonym: *Halostachys occidentalis*

The utricle



Units are in mm

Asclepias incarnata[32]

Swamp milkweed

Apocynaceae

Wetland Indicator Status: OBL

Flowering: June–August

Seeding: September–October

Identification: Perennial forb 40–200 cm tall. Leaves are opposite, narrow, and **lanceolate** with few hairs. Flowers are pink, rarely white. Grows in wetter places and leaves are narrower (0.2–3 cm) than *A. speciosa* (3–14 cm).

Collection: Pick ripe pods that have cracked but are not fully opened. Split the pod open and apply pressure to the silk (i.e., **pappus**) with one hand while using the other hand to scrape the seeds away from the silk. It is okay to collect some seeds that are attached to the silk. If using machines to clean, there is no need to remove the silk from the cracked pod.

Cleaning: If the seeds were scraped off the silk during collection, further cleaning may be unnecessary. A collection with a lot of silk or whole pods should be dumped into a thresher machine or **Dybvig**. Connect the vacuum hose to the upper portion of the machine to remove the silk. The seed will free from the silk and can be funneled from the bottom of the machine into a bucket.

Seed number: ~300 per gram

Open seed pods

Units are in mm

Asclepias speciosa

Showy milkweed

Apocynaceae

Wetland Indicator Status: FAC

Flowering: June–July

Seeding: July–September

Identification: Perennial forb 40–150 cm tall. Leaves are opposite and **ovate**, smooth or only slightly hairy on the upper surface while woolly underneath. Flowers are white to pink. Grows in drier places and leaves are wider (3–14 cm) than *A. incarnata* (0.2–3 cm).

Collection: See *A. incarnata* because the collection approaches are identical to this species.

Cleaning: See *A. incarnata* because the cleaning approaches are identical to this species.

Seed number: ~140 per gram

Synonym: *Asclepias giffordii*

Photo: Jes Braun

Units are in mm

Bidens species

Beggarticks

Asteraceae

Wetland Indicator Status: OBL in AW; FACW in WMVC

Flowering: July–August

Seeding: August–October

Identification: Annual forbs with serrated leaves and tall, sometimes hairy, stem. Native *B. cernua*, *B. comosa*, and *B. frondosa* can grow together and are difficult to tell apart, thus they are grouped together in this guide. They can be distinguished in these ways: *B. cernua* and *B. comosa* have simple toothed leaves. *Bidens cernua* has heads that nod with age, **disc corollas** that are usually five-lobed, and **exserted anthers**. *Bidens comosa* has erect heads, four-lobed disc corollas, and **included** anthers. *Bidens frondosa* has **pinnately compound** leaves with three to five leaflets.

Collection: Rub your thumb against the middle of the flower; dark brown seeds will readily fall off when mature.

Cleaning: Seeds are large and there is minimal debris in collections. Using a **Dybvig** or **threshing** board can help to remove some of the barbed **awns**. Sieve and **winnow** debris away.

Seed number: ~830 per gram

Notes: Barbed awns of seeds embed into fabric and ruin clothing; wear waders or tough fabric when collecting. This genus includes over 230 species spread across the world.

Synonyms: *Bidens cernua* synonym: *B. glaucescens; B. comosa* synonym: *B. tripartita, B. acuta*

Plants may or may not have yellow **ray flowers**.

Units are in mm

Bolboschoenus maritimus[33]

Alkali bulrush

Cyperaceae

Wetland Indicator Status: OBL

Flowering: June–August

Seeding: August–October

Identification: Perennial graminoid with triangular, concave **culms** 20–150 cm tall. Each culm with several flat or folded leaf blades on the lower 2/3 of the culm. Stems are loosely clustered between **tuberous rhizomes**.

Collection: With gloved hands, rub the **inflorescence** between fingers and collect large brown seeds. When ripe, seeds should come off easily. Alternatively, collect entire dried seed heads for later cleaning.

Cleaning: Use gloved hands, a **threshing** board, or a **hammermill** to break up large debris and knock seed loose from chaff.[33] **Winnow** chaff away with a fan or a blower machine.

Seed number: ~360 per gram

Notes: Be sure to use gloves and glasses to protect hands and eyes from sharp, irritating **bracts** in the seed heads when collecting and cleaning.

Synonyms: *Scirpus maritimus, S. pacificus, S. paludosus, S. fernaldii, Bolboschoenus paludosus*

Carex praegracilis

Clustered field sedge

Cyperaceae

Wetland Indicator Status: FACW

Flowering: May–August

Seeding: May–August

Identification: Perennial graminoid with 15–70 cm tall **culms** that are solitary or clustered. Dark brown to black **rhizomes**. **Scales** are light brown; **perigynia** is light brown and convex.

Collection: Use fingers to loosen seeds from **inflorescence** or clip dried inflorescence from stalk.

Cleaning: Use a **threshing** board to break apart harvested **spikes**, if any. Use sieves to remove large debris. **Winnow** away chaff. **Seeds** usually remain in the perigynia.

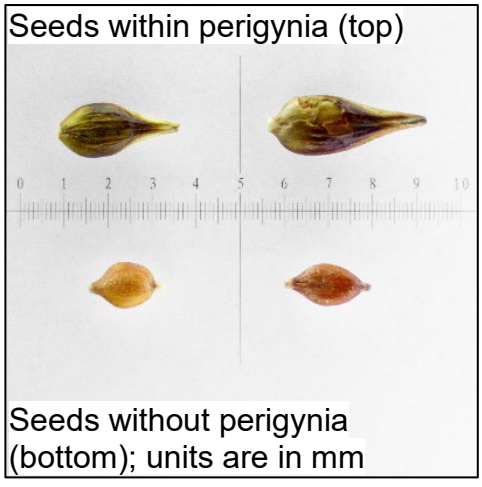
Seed number: ~1,490 per gram

Synonym: *Carex camporum*

Photo: Max Licher[1]

Photo: Sue Carnahan[2]

Seeds within perigynia (top)



Seeds without perigynia (bottom); units are in mm

Castilleja minor var. *exilis*[34]

Lesser Indian paintbrush

Orobanchaceae

Wetland Indicator Status: OBL

Flowering: July–September

Seeding: August–October

Identification: Annual forb with tall stems that are usually single and erect. Has showy bright red **bracts** resembling petals. The actual flower parts are yellow with a helmet-shaped structure that shows above the **calyx**. The calyx (and fruit) is pod-like and these form clusters around the stem.

Collection: In late summer to fall, remove the tan, dry seed pods. Mature seeds are small, tan, and surrounded by an **aril**.

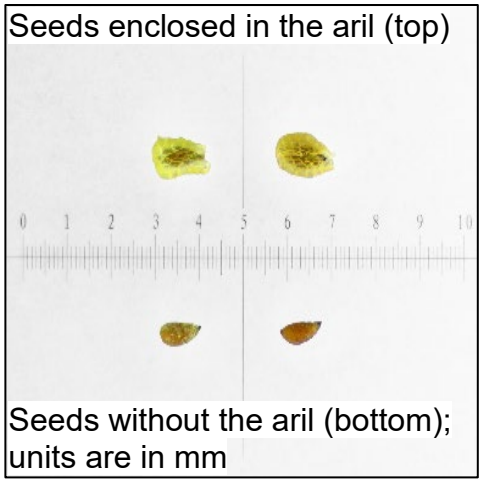
Cleaning: Mature seeds will fall out of the pods easily. Rub pods in between fingers or use a **threshing** board to loosen seeds. Sieve and **winnow** if needed to clean further.

Seed number: ~10,850 per gram

Synonym: *Castilleja exilis*

Photo: Jes Braun

Photo: Jes Braun



Seeds enclosed in the aril (top)

Seeds without the aril (bottom); units are in mm

Cleomella serrulata

Rocky mountain beeplant

Cleomaceae

Wetland Indicator Status: FACU

Flowering: July–Early October

Seeding: September–October

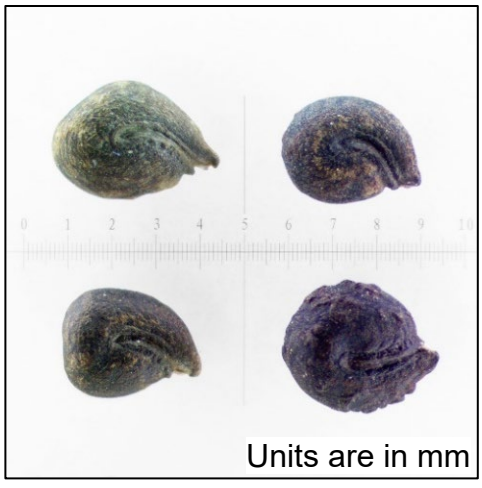
Identification: Annual forb with three **palmately compound** leaflets (like a clover). Flowers are conspicuous, usually purple or pink with six equally long **stamens** that extend past the rest of the flower. Fruit is a pendulous pod like in the *Fabaceae* family.

Collection: Collect dry, whole pods. Alternatively, break open dry pods by twisting with fingers and collecting the falling seeds.

Cleaning: If whole pods are collected, lightly thresh to release seeds. **Winnow** the resulting product to get rid of empty (usually white) seeds. Fully mature seeds will be a dark brown color and fairly heavy. A blower machine will also work to separate seeds.

Seed number: ~130 per gram

Synonym: *Peritoma serrulata, Cleome serrulata*



Distichlis spicata

Saltgrass

Poaceae

Wetland Indicator Status: FAC in AW; FACW in WMVC

Flowering: June–July

Seeding: August–September

Identification: Perennial grass with flattened **spikelets** that ripen to a gold color. Leaves are stiff with only a few white hairs along the base of the leaf and the **ligule**. Salt crystals may accumulate on the leaves. Seeds are brown and found inside a golden **lemma** and **palea**.

Collection: Rake hands through seed heads to collect spikelets that easily release.

Cleaning: Use a **threshing** board or **Dybvig** to break apart spikelets and release seed. Seeds will germinate while surrounded by the palea and lemma, so further cleaning to a bare seed is not necessary.

Seed number: ~1,230 per gram

Notes: Saltgrass has creeping **rhizomes** that allow it to colonize an area quickly and form thick sod mats.

Synonym: *Uniola spicata*

Seeds within the palea and lemma (top)

Seeds without the palea and lemma (bottom); units are in mm

Eleocharis palustris[34]

Common spikerush

Cyperaceae

Wetland Indicator Status: OBL

Flowering: June–September

Seeding: August–October

Identification: Perennial graminoid 10–70 cm tall with smooth round **culms** clustered together above **rhizomes**. Culms are thinner (0.5–3 mm) than *Schoenoplectus acutus* (5–20 mm). The **inflorescence** is terminal with 20 or more flowers. **Seeds** are **lenticular** shaped and are topped with a cap-like **tubercle**.

Collection: Strip seed from the plant by hand or clip entire inflorescence.

Cleaning: A **hammermill**, thresher machine, or a **threshing** board can break up the inflorescence and knock seed loose. Sieves and **winnowing** can be used to clean further.[34]

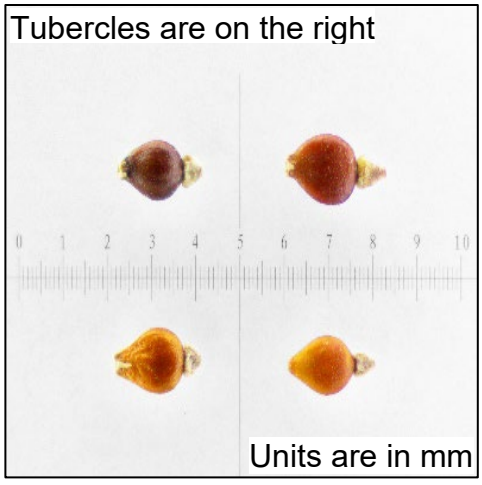
Seed number: ~1,340 per gram

Notes: *Eleocharis palustris* is often the first to populate bare areas following disturbance or a drawdown.

Photo: Gerald Carr[3]

Clonal growth

Photo: Sue Carnahan[4]



Tubercles are on the right

Units are in mm

Epilobium ciliatum

Fringed willowherb

Onagraceae

Wetland Indicator Status: FACW

Flowering: Late June–September

Seeding: July–October

Identification: Perennial forb with tall, erect stems. Leaves are opposite or alternate, **lanceolate** to **ovate** with minutely toothed edges. The upper leaves have short, fine hairs. Flowers have four deeply notched petals that are pink to white. Seed capsules are long and thin, and split open into four pieces when mature, revealing many seeds. The **pappus** allows for wind dispersal.

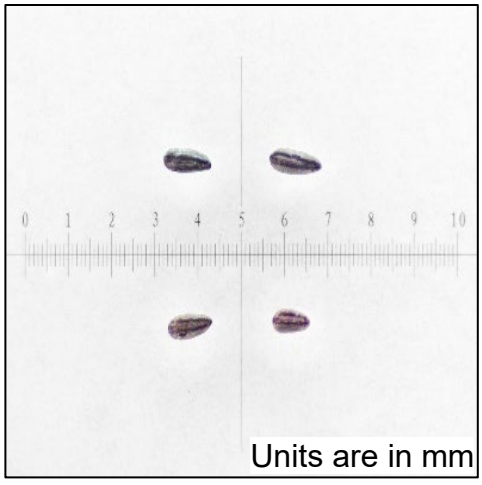
Collection: Seed pods can be pinched off with fingers or clipped. Collect pods when dry (light tan), but not fully open, to maximize the quantity of seeds collected. Seeds readily blow away when pods are completely open.

Cleaning: Put dry pods and any loose seeds with the pappus attached into a thresher machine or **Dybvig**. A shop vacuum can be used to suck the pappus from the Dybvig. Seeds can be retrieved from the shop vacuum and Dybvig seed output. Use a sieve with 40 holes per square inch to further separate chaff from seed. A fan can also be used to **winnow** away smaller chaff.

Seed number: ~15,470 per gram

Notes: This species grows well in disturbed areas and is sometimes considered weedy.

Photo: Jes Braun



Units are in mm

Euthamia occidentalis

Western goldentop

Asteraceae

Wetland Indicator Status: FACW

Flowering: July–August

Seeding: August–September

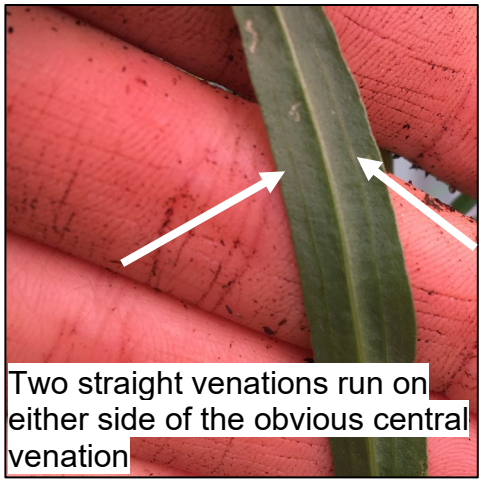
Identification: Perennial forb with alternate, **sessile**, **lanceolate** leaves and many small yellow flowers. Leaves have two parallel venations that run on either side of an obvious central venation. *Euthamia occidentalis* is sometimes confused with *Chrysothamnus viscidiflorus* (green rabbitbrush, a shrub), *Solidago canadensis* (yellow flowered, but with a pyramidal head shape), or *Symphyotrichum ciliatum* (lacks yellow **ray flowers** and is generally shorter than *E. occidentalis*).

Collection: With fingers, pinch seeds and **pappi** away from each flower.

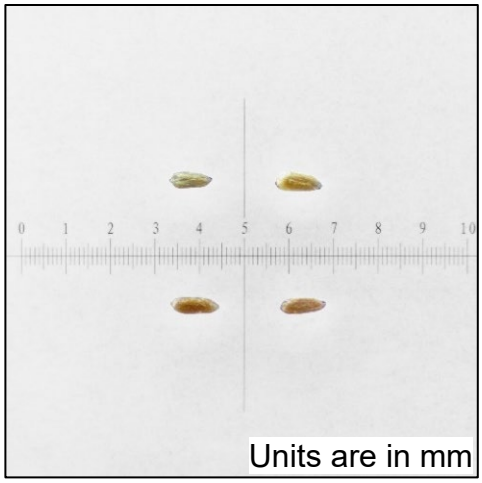
Cleaning: See *E. ciliatum* because the cleaning approaches are identical to this species. Sieves or **winnowing** can be used to clean further.

Seed number: ~14,200 per gram

Synonyms: *Euthamia californica, E. linearifolia, Solidago occidentalis*



Two straight venations run on either side of the obvious central venation



Units are in mm

Eutrochium maculatum

Spotted Joe Pye weed
Asteraceae

Wetland Indicator Status: OBL

Flowering: July–September

Seeding: September–October

Identification: Perennial forb with sharply serrated leaves in whorls of three or four. Stems are completely purple or have purple spots. **Inflorescence** more or less flat, topped with conspicuous, purple to pink **disc flowers**. Mature seeds are attached to white bristly **pappi**.

Collection: See *Euthamia occidentalis* because the collection approaches are identical to this species.

Cleaning: See *E. ciliatum* because the cleaning approaches are identical to this species. Sieves or **winnowing** can be used to clean further.

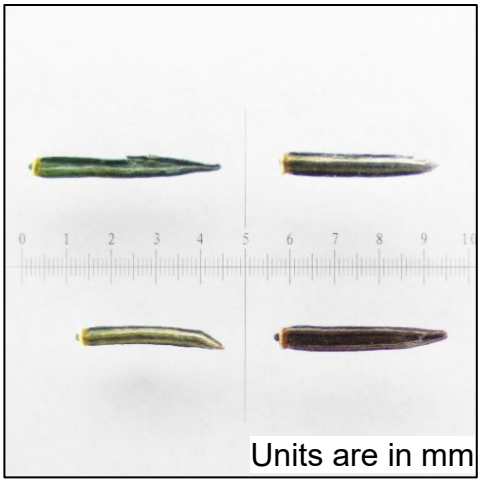
Seed number: ~3,490 per gram

Notes: This is the only species of this genus in the western United States.

Synonyms: *Eupatorium maculatum, E. purpureum, Eupatoriadelphus maculatus*


Photo: Kate Sinnott


Photo: Kate Sinnott



Units are in mm

Glaux maritima

Sea milkwort

Primulaceae

Wetland Indicator Status: OBL

Flowering: June–July

Seeding: July–September

Identification: Low-lying perennial forb with opposite leaves and small thin stalks that are often <20 cm in height. Leaves are fleshy, **sessile**, and oblong to narrow in shape. Flowers are cup-shaped, pink to white in color, and located in the leaf axils along the entire length of the stem. Seeds can be found in round seed pods in the leaf axils.

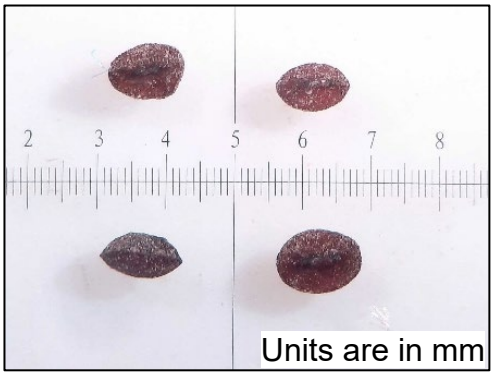
Collection: Seed pods are firmly attached to the stem; thus, we would not recommend collecting them individually. Instead, hold the stem in your palm and strip the seed pods and leaves off the stem. Pods are ready to be harvested once they turn light brown in color. Once ripe, seed pods burst open and scatter their seeds, so don't wait too long.

Cleaning: Use a **threshing** board or threshing machine to break open the seed pods. Then use a sieve or **winnow** to separate the seed from the chaff.

Seed number: ~3,670 seeds per gram

Notes: Rhizomatous growth means that this plant is often found in patches.

Synonyms: *Lysimachia maritima*



Glycyrrhiza lepidota

Wild licorice

Fabaceae

Wetland Indicator Status: FAC

Flowering: June–August

Seeding: July–Early October

Identification: Perennial forb with alternate, **pinnately compound** leaves. Flowers are usually white to green. The brown fruit (12–25 mm) has hooked spines that easily stick to clothing.

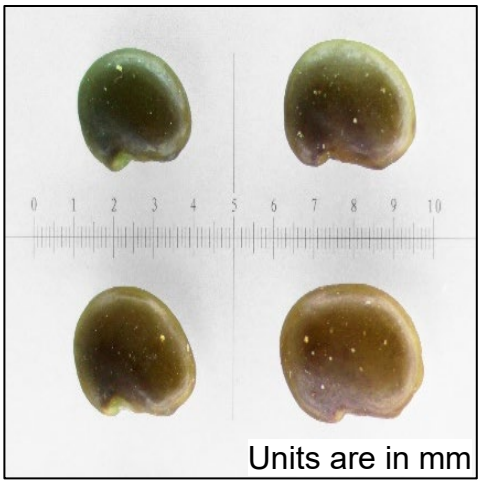
Collection: Use gloved hands to pick bur-like pods. Alternatively, clip entire stem.

Cleaning: Use a **hammermill** or thresher to crush seed pods. Sieve out larger chaff from broken material and **winnow** to further clean. A **Dybvig** seed cleaner is not harsh enough to break seeds out of the pods.

Seed number: ~120 per gram

Notes: Insect damage is common. Collect more pods than needed to account for damage.

Synonyms: *Glycyrrhiza glutinosa*



Grindelia squarrosa[36]

Curlycup gumweed

Asteraceae

Wetland Indicator Status: FACU

Flowering: August–October

Seeding: September–October

Identification: Biennial or perennial forb. Leaves are **sessile**, alternate, and simple with minutely toothed edges. Yellow **disc** and **ray flowers**. Flower **bracts** are strongly reflexed (appearing hooked), sticky, and smell sweet. The flower cups are resinous and fill entirely with milky latex prior to flowering.

Collection: With gloved hands, gently pull dry seeds or seed heads off with fingers or shake dry seed heads into a bag. Whole seed heads can be collected, but this adds an extra cleaning step.

Cleaning: Lightly thresh with **threshing** board or gloved hands to break up seed heads, then sieve out any chaff larger than the seed. **Winnow** smaller and lighter chaff away with a fan, blower machine, or an airscreen.[35]

Seed number: ~750 per gram

Helianthus annuus[37]

Common sunflower
Asteraceae

Wetland Indicator Status: FACU

Flowering: August–September

Seeding: September–October

Identification: Annual forb, growing up to 3 m tall. Prolific in uplands, wetlands, and disturbed places. This species has **ovate**, sometimes heart-shaped, leaves and yellow **ray flowers** with brown centers. This species should not be confused with the perennial *H. nuttallii*, which has much narrower leaves.

Collection: Cut dry seed heads from stalks with scissors or clippers. Be sure to collect from both higher and lower heads. It may be necessary to dedicate extra time to achieve a high quantity of seed because the seeds are large and birds often eat them once mature.

Cleaning: Use a **threshing** board or **hammermill** to loosen seeds from the seed head. Sieve to separate any chaff from the seed. **Winnow** to remove lighter chaff. A blower machine also works to separate chaff from seeds.

Seed number: ~160 per gram

Synonyms: *Helianthus aridus*, *H. lenticularis*

Helianthus nuttallii[37]

Nuttall's sunflower

Asteraceae

Wetland Indicator Status: FACW

Flowering: August–September

Seeding: September–October

Identification: Perennial forb with **lanceolate** or narrow leaves rarely wider than 3 cm, which helps to distinguish it from the broad-leaved *H. annuus*. Leaves **sessile** or with a short **petiole**. This species tends to grow in tall clusters.

Collection: See *H. annuus* because the collection approaches are identical to this species.

Cleaning: See *H. annuus* because the cleaning approaches are identical to this species.

Seed number: ~480 per gram

Notes: *Helianthus nuttallii* can grow up to 4 m tall.

Juncus arcticus[38]

Mountain rush

Juncaceae

Wetland Indicator Status: FACW

Flowering: June–August

Seeding: August–September

Identification: Perennial graminoid 30–90 cm tall, with round, tightly clustered **culms**. Dark brown to black **rhizomes** visible at base. A long **bract** extends beyond the flowers. Flower clusters can have a few to more than 75 flowers.

Collection: Rub the capsules over a paper bag to release the very small, dark seeds. Alternatively, clip the **inflorescences** from the culms.

Cleaning: The entire inflorescence can be run through a **thresher** or **hammermill** to release the small seeds.[37] **Winnow** to remove chaff.

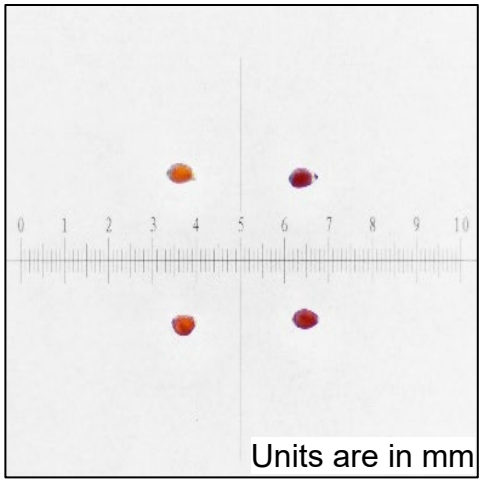
Seed number: ~25,560 per gram

Notes: This species shows wide-ranging characteristics across North America, which has led to the description, and debate, of many subspecies. Molecular investigation will likely be needed to resolve regional taxonomic differences.

Synonyms: *Juncus balticus*

Photo: Steve Matson[5]

Photo: Brent Miller[6]



Units are in mm

Juncus torreyi

Torrey's rush

Juncaceae

Wetland Indicator Status: FACW

Flowering: June–September

Seeding: July–October

Identification: Perennial graminoid 40–100 cm tall, growing from robust creeping **rhizomes**, often with swollen, **tuber**-like segments. The flowers are arranged in a spherical shape.

Collection: With gloved hands, pull off the whole **inflorescence** or rub the seeds out of the inflorescence over the collection bag.

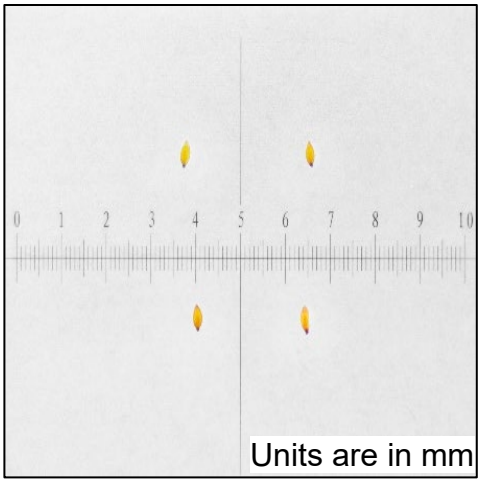
Cleaning: The seeds are extremely small and easy to clean. Use a sieve with 40 holes per square inch, and the seeds will fall through. If collecting seed heads, thresh the heads first.

Seed number: ~95,270 per gram

Notes: Rhizomatous growth makes *J. torreyi* a good choice for restoring bare or disturbed areas.

Photo: Jes Braun

Photo: Paul Rothrock[7]



Units are in mm

Mentha arvensis

Wild mint

Lamiaceae

Wetland Indicator Status: FACW

Flowering: July–September

Seeding: August–October

Identification: Perennial forb with light pink to purple flowers that are clustered in rings around the leaf bases. Stem is square with opposite, hairy leaves. Leaves are elliptical to **lanceolate**. A minty smell is obvious when leaves are crushed.

Collection: Pinch off dried **inflorescences** with hand. Seeds are very small.

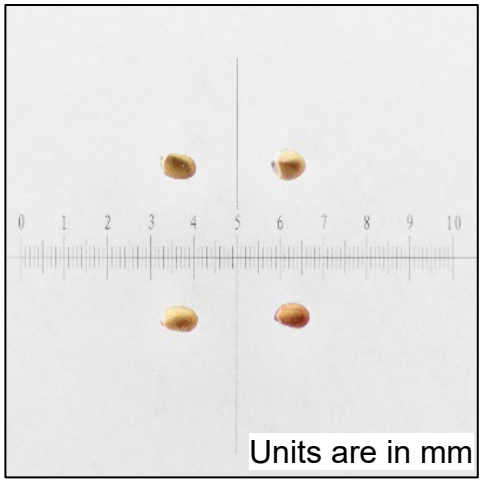
Cleaning: Rub the inflorescence and chaff on a fine sieve (40 holes per square inch works well), then **winnow** with a fan. Despite cleaning efforts, some debris tends to remain.

Seed number: ~9,630 per gram

Notes: Subspecies of *M. arvensis* exist across North America, Europe, and Asia. For this reason, this species is sometimes referred to as Japanese mint.

Synonyms: *Mentha canadensis, M. gentilis*, *M. glabrior*, *M. penardii*

Photo: Steve Matson[8]



Units are in mm

Muhlenbergia asperifolia

Scratchgrass

Poaceae

Wetland Indicator Status: FACW

Flowering: June–July

Seeding: August–September

Identification: Perennial grass with open and fine **panicles**, about equally as long as wide. The **spikelet** stalk is much longer than the spikelet itself. Flowers are purple. Leaves are hairless, as opposed to the fuzzy leaves of the look-alike species *Panicum capillare*.

Collection: Starting at the base of the **inflorescence**, grasp the stalk and run hands up the inflorescence, grabbing loose seeds.

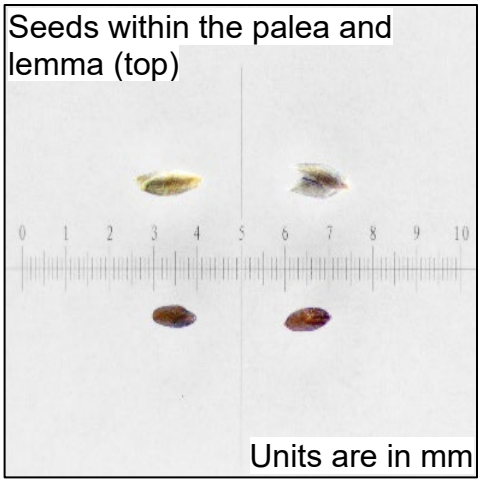
Cleaning: Sieve twice with a 1/22-inch sieve, then **winnow** away the chaff with a low fan speed. For a gentler winnow, blow on the sieved material instead of using a fan. Seeds may remain within the **palea** and **lemma** after cleaning.

Seed number: ~12,840 per gram

Notes: Dense patches of this species will have a cloud-like appearance from afar. The common name “scratchgrass” comes from the rough texture felt when you run your hands along the leaf blades.

Synonyms: *Sporobolus asperifolius*

Seeds within the palea and lemma (top)



Persicaria lapathifolia

Pale smartweed

Polygonaceae

Wetland Indicator Status: FACW

Flowering: June–October

Seeding: Late July–October

Identification: Annual, broad-leaved forb with large **lanceolate** leaves and white to pink flowers. The **ocrea** is a diagnostic characteristic of Polygonaceae and is present around the nodes. This species can be confused with non-native *P. maculosa*, which has a red spot on the center of the leaf and pink flowers. Hybridization is possible.

Collection: Rub **inflorescence** between hands or fingers to loosen dry, brown to tan seeds.

Cleaning: Rub collection against sieve screens, or between hands to free seeds from their papery covering. **Winnow** away any small chaff to further clean.

Seed number: ~1,040 per gram

Notes: This species spreads rapidly along heavily disturbed areas, such as roadsides.

Synonyms: *Persicaria incarnata, P. tomentosa, Polygonum lapathifolium, P. incarnata, P. incanum, P. nodosum, P. oneillii, P. pensylvanicum, P. scabrum, P tomentosum*

Photo: Luigi Rignanese[9]

Photo: Ron Vanderhoff[10]

Photo: Ron Vanderhoff[10]

Phragmites australis

Common reed

Poaceae

Wetland Indicator Status: FACW

Flowering: August–September

Seeding: October–November

Identification: Large, perennial graminoid, growing up to 5 m tall. Leaves blue-green with a tightly adhered leaf **sheath** and **ligules** with prominent hairs. The **inflorescence** is a **panicle**, purplish when young, straw colored at maturity. Reproduction commonly occurs by **rhizome** and tillers, and **culms** can commonly be seen lying over and sprouting new growth.

Collection: Cut the entire seed head off the culm using scissors. Seeds are ready once the seed head has become fluffy. Goggles and gloves are recommended as the fuzz contains barbs that can be irritating to your skin and eyes.

Cleaning: A **hammermill** is required for this species to separate the seed from the seed head. Feed the entirety of the seed head into the machine. Then **winnow** to remove the seed from the chaff.

Seed number: ~7,202 seeds per gram

Notes: This is a highly invasive species and should NOT be planted outdoors or moved between sites. Seeds should be discarded into a landfill, not a compost bin. This species is included in this guide and collected for research purposes only.

Photo: Paul Rothrock[11]

Units are in mm

Puccinellia nuttalliana

Nuttall's alkaligrass

Poaceae

Wetland Indicator Status: FACW

Flowering: May–July

Seeding: July–September

Identification: Perennial bunchgrass, green to yellow in color. **Culms** usually erect and solitary or in small groups. **Panicle** open, widely spaced, and often purple-tinged. Leaves are mostly **basal** with a hairless and triangular **ligule**. Not to be confused with *Leptochloa fusca*, which has **lemmas** that are clearly 3-**nerved**, **glumes** that are clearly 1-nerved, and a panicle that is not as fully open as *P. nuttalliana*.

Collection: See *M. asperifolia* because the collection approaches are identical to this species.

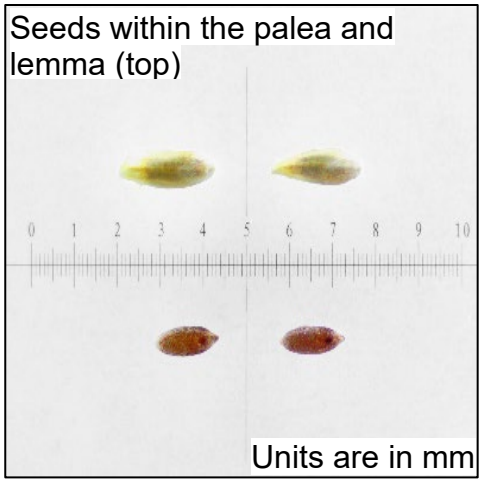
Cleaning: Use a **threshing** board for small collections or a thresher machine for larger ones. Thresh collection to release seeds from **spikelets**. Sieve once with 1/10 inch, then again with a smaller sieve. **Winnow** or use a blower to remove excess chaff. Seeds may remain within the **palea** and lemma after cleaning.

Seed number: ~3,610 per gram

Notes: This species grows in salty and alkaline depressions and lakeshores.

Synonyms: *Puccinellia airoides, P. cusickii*

Seeds within the palea and lemma (top)



Ranunculus sceleratus

Cursed buttercup

Ranunculaceae

Wetland Indicator Status: OBL

Flowering: Late May–August

Seeding: June–August

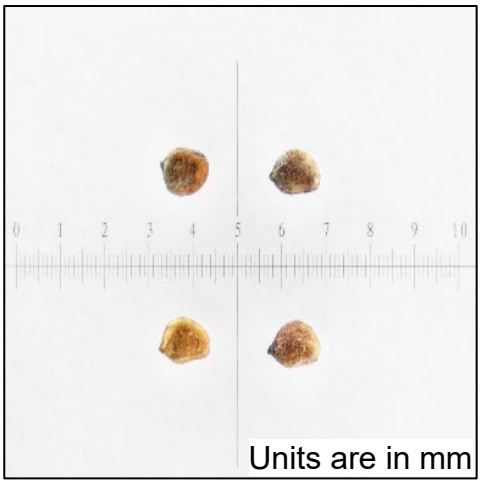
Identification: Annual forb or a short-lived perennial 20–60 cm tall. Leaves deeply lobed and divided. Stems tubular and **succulent**. Flowers have five yellow petals and a green domed center. Fruit is bumpy, green, and elliptical. This species could be confused with *R. cymbalaria* which does not have deeply lobed leaves.

Collection: Seeds may ripen in late spring, which is earlier than all other species in this seed collection guide. Use your fingers (but wear gloves) to remove tan seeds that will easily fall off the plant.

Cleaning: Seeds collected with this method are usually clean, but a sieve can be used to remove large debris.

Seed number: ~6,390 per gram

Notes: The juice of this plant is toxic and can cause irritation to the skin. Gloves should be worn when collecting.



Rumex maritimus[39]

Golden dock

Polygonaceae

Wetland Indicator Status: FACW

Flowering: June–August

Seeding: July–September

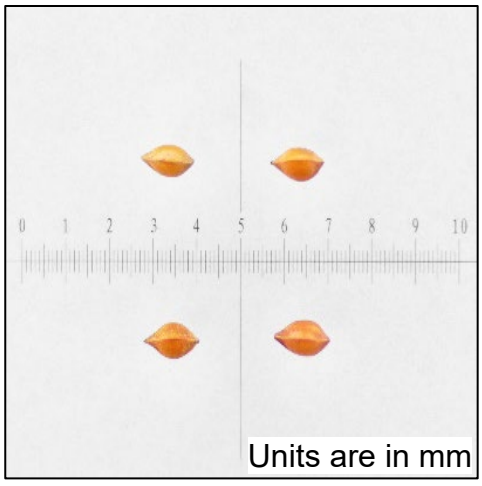
Identification: Annual or biennial forb with tall, erect stems and linear to **lanceolate** leaves with smooth edges. Seeds of *Rumex* spp. are in persistent membranous, finely toothed **perianths**. This species could be confused with two non-native *Rumex* spp. *Rumex stenophyllus* has obviously toothed and much larger perianths and *R. crispus* has rounded perianth margins.

Collection: Papery, winged perianths will turn dark red and brittle when seeds are mature. Grasp the base of the **inflorescence** and run hands up to the top to collect the seeds.

Cleaning: Use a **threshing** board to rub off the red, papery perianths. The trigonal seeds will not be damaged by abrasive threshing. Sieve with a 1/22-inch screen so that dust and cleaned seeds fall through. Continue to thresh any seeds that remain in the perianth. **Winnow** away dust and non-viable seeds.

Seed number: ~5,530 per gram

Synonyms: *Rumex fueginus, R. persicarioides*



Sagittaria cuneata

Arum-leaved arrowhead

Alismataceae

Wetland Indicator Status: OBL

Flowering: July–September

Seeding: September–October

Identification: Perennial forb with erect flowering stems and a rosette of arrowhead shaped, glabrous, **basal** leaves. The basal lobe of the leaf is shorter than the remainder of the blade. Flowers are white and are whorled in groups of three in a spike-like raceme on top of the stem. It can be confused with *Sagittaria latifolia*, which is distinguished by its larger leaf size where the basal lobe is as long as the remainder of the blade, and where the seeds have a horizontal beak.

Collection: Place bag underneath seed head and crumble seeds off the seed head into the bag with your fingers. The seeds are ripe when they are fully brown and easily crumble/shatter.

Cleaning: Seeds are relatively clean when they are collected. Crumble any clumped seeds or seed heads and sieve out any remaining debris.

Seed number: ~2,778 seeds per gram

Notes: Grows in shallow standing water.

Salicornia rubra

Pickleweed

Amaranthaceae

Wetland Indicator Status: OBL

Flowering: July–September

Seeding: October–November

Identification: Annual forb or subshrub 10–30 cm with slender taproots. The main stem is seldom over 3 mm thick. *Salicornia* is herbaceous at base, as opposed to the woody *Allenrolfea*. It can be confused with *Sarcocornia utahensis* (Utah swampfire), which is distinguished by its perennial **rhizomes**, fibrous roots, and a main stem usually over 3 mm thick.

Collection: When plant biomass is dry and tan, collect the stems and leaves with gloved hands or clippers. It is okay to harvest non-seed plant biomass during seed collection.

Cleaning: Use a **threshing** board to separate the seed from the **inflorescence**. Sieve out large chaff, and then **winnow** away small chaff. Some seed will remain in the **utricle**.

Seed number: ~6,430 per gram

Notes: *Salicornia rubra* is typically found on playas and is one of the most salt-tolerant species in the region.

Synonym: *Salicornia europaea*

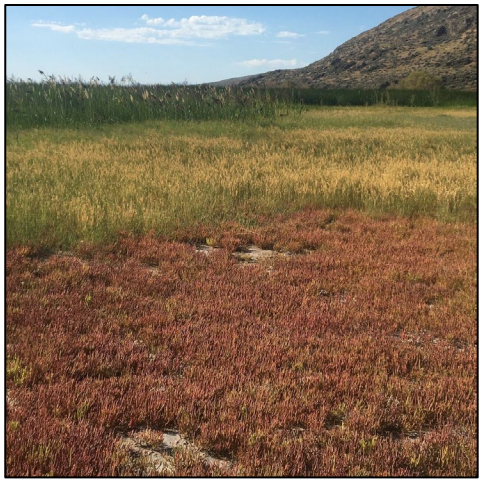


Photo: Robert Sivinski[12]

The utricle

Units are in mm

Schoenoplectus acutus[40]

Hardstem bulrush

Cyperaceae

Wetland Indicator Status: OBL

Flowering: June–August

Seeding: August–September

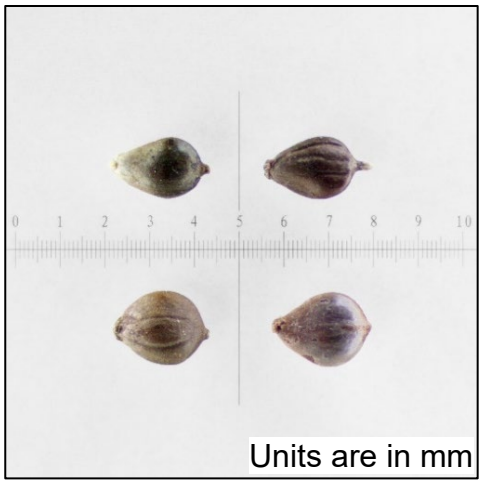
Identification: Perennial graminoid 1–3 m tall with dark green, firm, cylindrical, bladeless **culms**, and robust **rhizomes**. This species should not be confused with *S. tabernaemontani* (softstem bulrush), which has softer, lighter green culms and has many stalked flower clusters compared to *S. acutus*. Other *Schoenoplectus* spp. in this guide have triangular culms.

Collection: Use a gloved hand to loosen mature seeds from seed heads. Alternatively, clip seed heads or use a tennis racket and a large container to knock the seeds out of the **inflorescence**.

Cleaning: Thresh seed heads to separate seeds (if applicable). After **threshing** or if only the seed was collected, **winnow** chaff away. An air column separator can also be used to remove chaff.

Seed number: ~920 per gram

Notes: This species is sometimes referred to as tule, which comes from the Nahuatl name for the species.[39]



Schoenoplectus americanus

Chairmaker's bulrush

Cyperaceae

Wetland Indicator Status: OBL

Flowering: June–August

Seeding: August–September

Identification: Perennial graminoid 0.5–1.5 m tall with robust **rhizomes**. **Culms** distinctly triangular; concave on broad sides and commonly winged on edges. This species can be difficult to distinguish from *S. pungens*, which lacks concave sides, has thinner culms, and can be shorter.

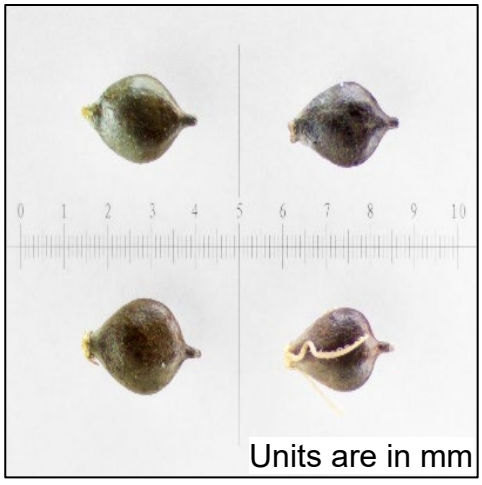
Collection: See *S. acutus* because the collection approaches are identical to this species.

Cleaning: See *S. acutus* because the cleaning approaches are identical to this species.

Seed number: ~830 per gram

Synonyms: *Scirpus americanus, S. chilensis, S. conglomeratus, S. olneyi, S. pungens*

Photo: Sue Carnahan[13]



Units are in mm

Schoenoplectus pungens

Common three-square bulrush

Cyperaceae

Wetland Indicator Status: OBL

Flowering: June–September

Seeding: August–September

Identification: Perennial graminoid, commonly <50 cm, but up to 1 m tall with robust **rhizomes**. **Culms** are triangular and sharply angled to occasionally almost round, though not concave with winged edges and not as tall as *S. americanus*.

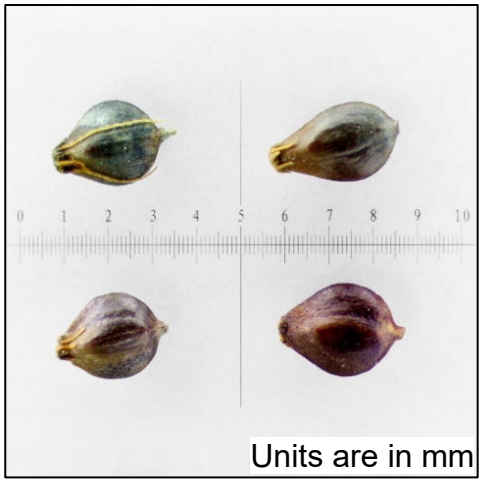
Collection: See *S. acutus* because the collection approaches are identical to this species.

Cleaning: See *S. acutus* because the cleaning approaches are identical to this species.

Seed number: ~440 per gram

Photo: Steve Matson[14]

Photo: Cynthia Powell[15]



Units are in mm

Senecio hydrophilus

Water groundsel

Asteraceae

Wetland Indicator Status: OBL

Flowering: August–September

Seeding: September–October

Identification: Perennial or biennial forb with smooth, alternate, and elliptical blades that are slightly **succulent** or leathery. Stems are purple with yellow flowers. This species could be confused with other *Senecio* species in the area; however, those species are found in foothill or alpine areas.

Collection: Collect when **pappi** and seeds are easily released with the grasp of fingers.

Cleaning: See *E. ciliatum* because the cleaning approaches are identical to this species. Sieves and fans can be used to clean further.

Seed number: ~1,120 per gram

Notes: This species grows in saline and alkaline areas with standing water.

Synonyms: *Senecio sandvicensis*

Units are in mm

Sesuvium verrucosum[41]

Verrucose sea-purslane

Aizoaceae

Wetland Indicator Status: FACW

Flowering: August–September

Seeding: September–November

Identification: Perennial, low growing shrub. Leaves are opposite, linear to widely spatulate in shape, lightly curled, and **succulent**. Flowers are singular, scattered across the shrub and bright pink in color. Seeds are found in shriveled, light brown, cone-shaped pods in the leaf axils.

Collection: Seed pods are strongly attached to stems and picking off individual pods is not recommended. Collection can be done by stripping the leaves and pods from the stem or removing entire stems from the shrub.

Cleaning: Run all plant material through a **hammermill** or similar **threshing** machine to break up leaves and stems and break open seed pods. **Winnow** to separate seeds from the chaff.

Seed number: ~3,977 per gram

Notes: This species grows in playas and salt marshes. It is adapted to flooding in the spring and then hot, dry conditions through the summer and fall.

Solidago canadensis

Canada goldenrod

Asteraceae

Wetland Indicator Status: FACU

Flowering: Late July–September

Seeding: August–October

Identification: Perennial forb with creeping **rhizomes**. Leaves are mostly crowded and flat against stem, 2–10 cm long. Heads pyramidal with 10–17 yellow **ray flowers**. The pyramidal head shape easily distinguishes this species from the yellow flowered, but flat-topped *Euthamia occidentalis*.

Collection: Collect when **pappi** and seeds are released easily with the grasp of fingers.

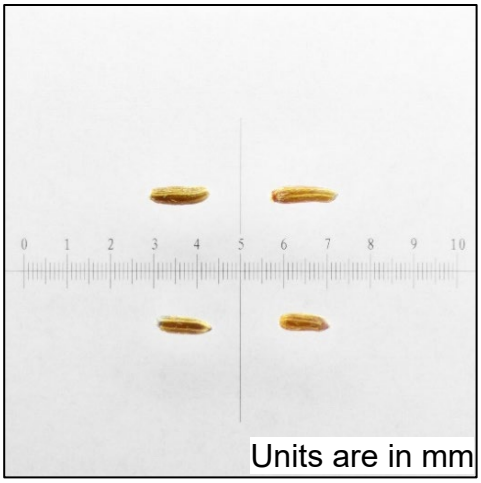
Cleaning: See *E. ciliatum* because the cleaning approaches are identical to this species. Sieves and fans can be used to clean further.

Seed number: ~12,510 per gram

Notes: Although native, this species sometimes grows in dense monocultures.

Photo: Cynthia Powell[16]

Photo: Keir Morse[17]



Units are in mm

Sporobolus airoides

Alkali sacaton

Poaceae

Wetland Indicator Status: FAC

Flowering: June–August

Seeding: July–October

Identification: Perennial bunchgrass that grows in large clumps with dense **culms**. Leaf blades flat or rolled. **Sheaths** are open with tufts of hair at the collar and on the **ligule**. **Panicle** is open and pyramidal.

Collection: Starting at the base of the **inflorescence**, run hands up the panicle; mature seeds will easily fall off.

Cleaning: Lightly thresh collection to release seed from chaff. Sieve once with 1/10-inch sieve, then again with smaller sieve. Seeds may remain within the **palea** and **lemma** after cleaning.

Seed number: ~4,250 per gram

Notes: Although this species typically grows in moist, alkaline soils, it is tolerant of both flooding and drought.

Synonyms: *Agrostis airoides*

Photo: Ron Vanderhoff[18]

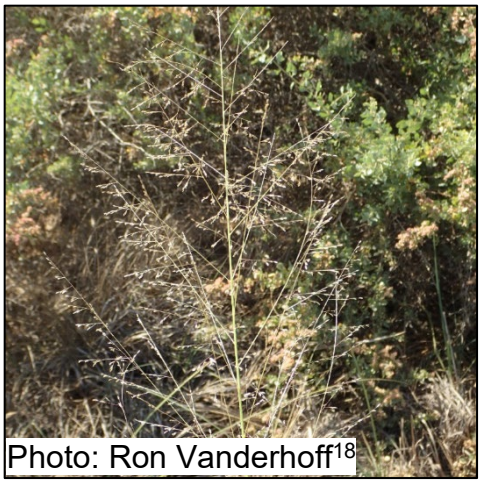
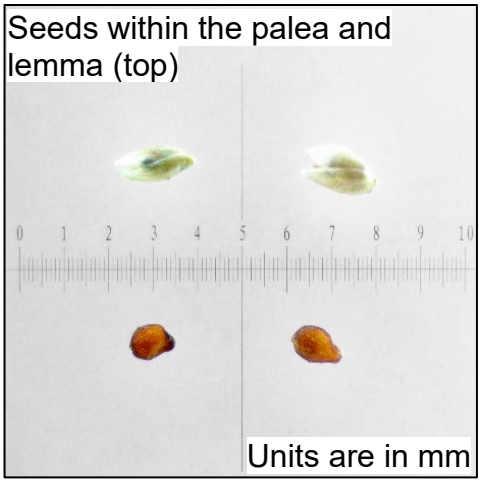


Photo: Ron Vanderhoff[18]

Photo: Ron Vanderhoff[18]

Seeds within the palea and lemma (top)



Units are in mm

Suaeda calceoliformis

Pursh seepweed

Amaranthaceae

Wetland Indicator Status: FACW

Flowering: July–October

Seeding: September–November

Identification: Annual forb with green to red, waxy, and **glaucous** stems and **succulent** leaves. Grows to 50 cm, turning black in the late fall. This species could be confused with two others. *Suaeda nigra* looks similar, but is distinguished by its perennial, branching, and shrubby growth habit. *Suaeda occidentalis* has many spreading branches which give large plants a spherical shape, while *S. calceoliformis* has a more erect structure with the main stem mostly branching in the upper half of the plant.

Collection: Collect entire stems with clippers when dry.

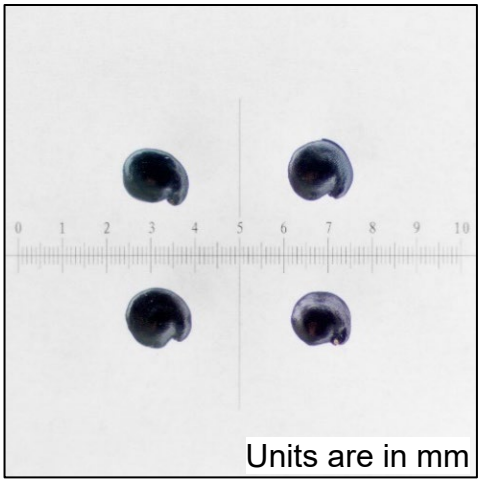
Cleaning: Thresh lightly to separate seeds from the stem. Sieve out stems and other large debris. Continue to thresh, sieve, and **winnow** to clean as needed.

Seed number: ~590 per gram

Notes: This species is found in highly saline and alkaline soils.

Synonyms: *Chenopodium calceoliformis*, *Suaeda americana, S. depressa, S. erecta*

Collect seeds when plants turn black later in the growing season



Units are in mm

Symphyotrichum ciliatum

Rayless alkali aster

Asteraceae

Wetland Indicator Status: FACW

Flowering: August–October

Seeding: September–October

Identification: Annual forb. Flowers are white with **pappus** bristles longer than the **ray flowers**, appearing rayless, blooming late into the growing season. Seeds are slightly flattened. This species can be confused with *S. frondosum*, which has ray flowers longer than the **style**. It can also be confused with *Euthamia occidentalis*, which has yellow flowers and is generally taller (40–120 cm) than *S. ciliatum* (9–53 cm).

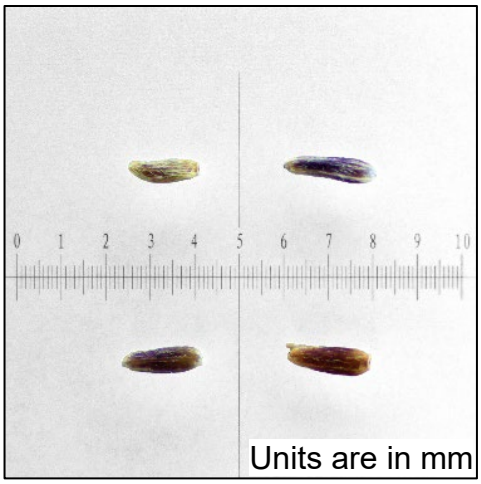
Collection: See *E. occidentalis* because the collection approaches are identical to this species.

Cleaning: See *E. ciliatum* because the cleaning approaches are identical to this species. Sieves and fans can be used to clean further.

Seed number: ~9,230 per gram

Notes: This species is known to attract native bees.

Synonyms: *Aster brachyactis, Brachyactis angusta, B. ciliata, Tripolium angustum*



Triglochin maritima

Seaside arrowgrass

Juncaginaceae

Wetland Indicator Status: OBL

Flowering: May–August

Seeding: Late July–August

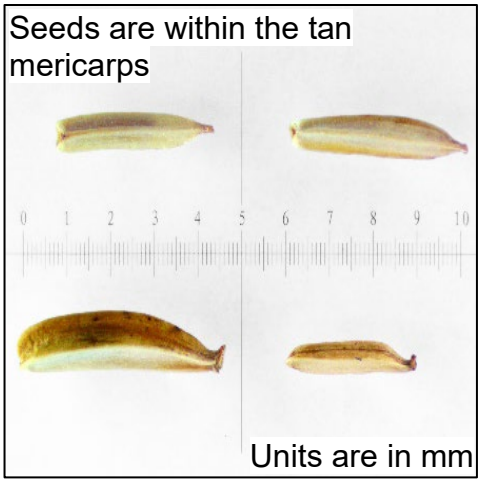
Identification: Perennial graminoid that grows 30–100 cm tall with a **rhizome**. Leaves are flattened and narrow. Flower clusters have many flowers with a green or yellowish **perianth**.

Collection: Roll the dried **inflorescence** between fingers to release seeds or cut the entire inflorescence when dry for later cleaning.

Cleaning: Lightly thresh to release seeds from **schizocarps** and stems. Sieve using a 1/8-inch screen, then **winnow** away chaff. Seeds will remain in **mericarps**.

Seed number: ~2,090 per gram

Synonyms: *Triglochin elata, T. maritimum, T. concinna*



Seeds are within the tan mericarps

Units are in mm

The schizocarp

Mericarps that make up the schizocarp

Verbena hastata

Swamp verbena

Verbenaceae

Wetland Indicator Status: FAC

Flowering: July–September

Seeding: August–October

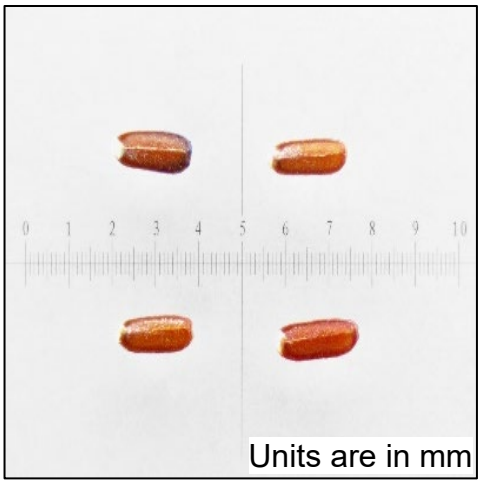
Identification: Perennial forb with erect stems that branch out like a candlestick. Flowers are blue to purple in dense clusters on top of stems. Leaves are narrow, toothed, hairy, and pointed at the tip. Stems are hairy and square.

Collection: Remove part of the **inflorescence** with clippers or fingers when dry.

Cleaning: Sieve to separate out large stems and leaves. Use a **threshing** board on the remaining plant material. **Winnow** away dust.

Seed number: ~3,530 per gram

Notes: This species can grow well in degraded or disturbed wetland habitats, such as roadside ditches.



Veronica anagallis-aquatica[42]

Water speedwell

Plantaginaceae

Wetland Indicator Status: OBL

Flowering: May–September

Seeding: July–October

Identification: Biennial or perennial forb. Individual flowers are very small with four lobes, pale blue to lavender with a green center and dark purple lines on petals. Flower clusters can have many individual flowers on them, although not all will be in bloom at the same time. Clusters are opposite and located at leaf base. Leaves are **sessile** or clasping (leaf base wrapped around the stem).

Collection: Collect dried **inflorescence** with clippers or break off with fingers.

Cleaning: Rub seed and chaff on a fine sieve (about 40 holes per square inch), then **winnow** with a fan.

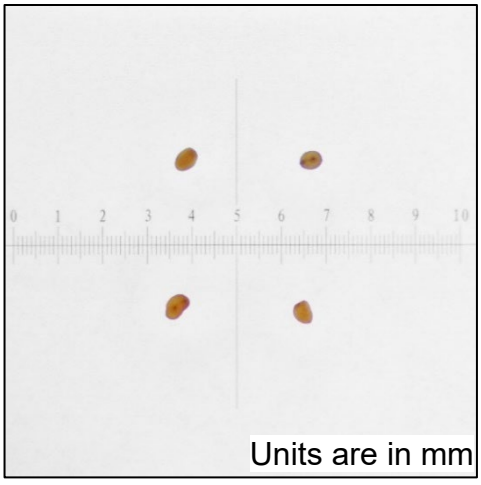
Seed number: ~34,580 per gram

Notes: Classification of plants in this genus is debated and the nativity status may vary by state.[40]

Synonyms: *Veronica anagallis, V. catenata, V. comosa, V. connata, V. glandifera, V. x lackschewitzii, V. micromeria, V. salina*

Photo: Jes Braun

Photo: Steve Matson[19]



Units are in mm

Glossary

Note: The definitions in this glossary were taken from Harris and Harris (2001)[24].

Anthers: The pollen bearing portion of the male reproductive organ of a flower. See **stamen**.
Aril: A fleshy appendage surrounding a seed.
Awn: A narrow, bristle-like structure.
Basal: Arising from the base; leaves that grow from the base of the stem.
Bract: A reduced leaf—sometimes resembling a petal or stem—positioned beneath the flower.
Calyx: All the sepals of an individual flower; the outer whorl. See **perianth**.
Cold stratification: The process of mimicking wet, winter conditions to break dormancy and increase seed **germination**.
Compound: Two or more like parts in one organ.
Corolla: All the petals of an individual flower; the inner whorl. See **perianth**.
Culm: For species in Cyperaceae, Poaceae, or Juncaceae; hollow or pithy stems.
Disc flower: A flower in the center of the composite head of Asteraceae species; see **ray flower** for contrast.
Dybvig seed cleaner: A seed cleaning machine that can be adjusted for different seed and collection sizes.
Exserted: Extending beyond the surrounding parts. See **included** for contrast.
Germination: Protrusion of the embryonic root, or radicle, from the seed.
Glaucous: A white, gray, or blue waxy coating, as on the surface of a grape.
Glume: For species in Poaceae, the pair of **bracts** at the base of each **spikelet**; surrounding the **lemma** and **palea**.
Hammermill: Machine that uses a series of hammers and screens to remove seeds from pods and chaff.
Hoedag: A dual-bladed handheld garden tool with one wide edge and one narrow edge. Useful for digging out **voucher specimens** for species confirmation.
Hydrophyte: A plant that lives in water; an aquatic plant.
Included: Contained within; not extending beyond surrounding parts. See **exserted** for contrast.
Inflorescence: An inclusive term for the flowering part of a plant, a flower cluster, or the arrangement of flowers on the entire flowering stalk.
Lanceolate: Much longer than wide, tapering to a pointed tip with the widest part below the middle.
Lemma: For species in Poaceae, the lower of two **bracts** surrounding a flower (the upper being the **palea**).
Lenticular: Shaped like a lentil.
Ligule: For species in Poaceae or Cyperaceae, a small membranous extension found at the junction of the **sheath** and the leaf blade, arising from the inner surface of the leaf blade.
Mericarp: A single unit of a **schizocarp**.
Nerved: With distinct veins or ribs, as in the midvein of a leaf.
Ocrea: A **sheath** around the stem formed by a pair of leaf-like extensions at the base of a **petiole**.
Ovate: Shaped like an egg.
Palea: For species in Poaceae, the upper of two **bracts** surrounding a flower (the lower being the **lemma**).

Palmate: Originating from a single point and fanning out, such as fingers on a hand.
Panicle: A flower cluster with many branches.
Pappus/pappi: A fluffy appendage that aids in the dispersal of a seed.
Perianth: The non-reproductive parts of the flower, made up of petals and sepals.
Pericarp: The fruit wall that is derived from the ovary wall.
Petiole: A stalk that attaches the leaf to the stem.
Perigynia: For species in Cyperaceae, a sac-like **bract** that encloses the seed.
Phenology: The timing of events in a life cycle (e.g., when a plant flowers, sets seed, or **senesces**).
Physiological dormancy: A type of seed dormancy; embryos prevent **germination** through germination-inhibiting hormones until specific environmental conditions are met.
Pinnate: A **compound** leaf with leaflets arranged on opposite sides of a single axis, as in a feather.
Ray flower: The outer flowers of the composite head of Asteraceae species, which look like flower petals; see **disc flower** for contrast.
Rhizome: Horizontal underground stem that grows new shoots and allows for clonal spread.
Scale: A thin, flat structure; for species in *Cyperaceae*, a short papery **bract** that usually subtends the seed.
Schizocarp: Dry fruit that splits into one-seeded units when ripe.
Senesce: To age and fall off the plant.
Sessile: Attached directly, as in a leaf connected to the stem without a **petiole**.
Sheath: The base of a grass leaf that surrounds the stem; these can be open (with a gap between the two sides) or closed (with sides touching).
Spikelet: For species in Poaceae, the cluster of one or many flowers subtended by two **glumes**.
Stamen: The male reproductive organ of a flower, consisting of an **anther** and filament (the stalk that supports the anther).
Style: The elongated portion of the female reproductive organ of a flower that carries pollen to the ovary.
Succulent: Fleshy to help store water.
Threshing: The process of agitating the seed away from the rest of the plant.
Tuber: A thickened, solid, short underground stem with nodes bearing buds.
Tubercle: A small **tuber**-like prominence or nodule; the persistent base of the **style** in some Cyperaceae.
Tuberous: Producing or resembling a **tuber**.
Utricle: A thin-walled, one-seeded fruit where the seed is loosely attached to the **pericarp**.
Voucher specimen: A plant specimen pressed and preserved for use in identification.
Winnowing: Using airflow to separate seed from chaff, as light pieces (chaff) are separated from heavy pieces (viable seed).

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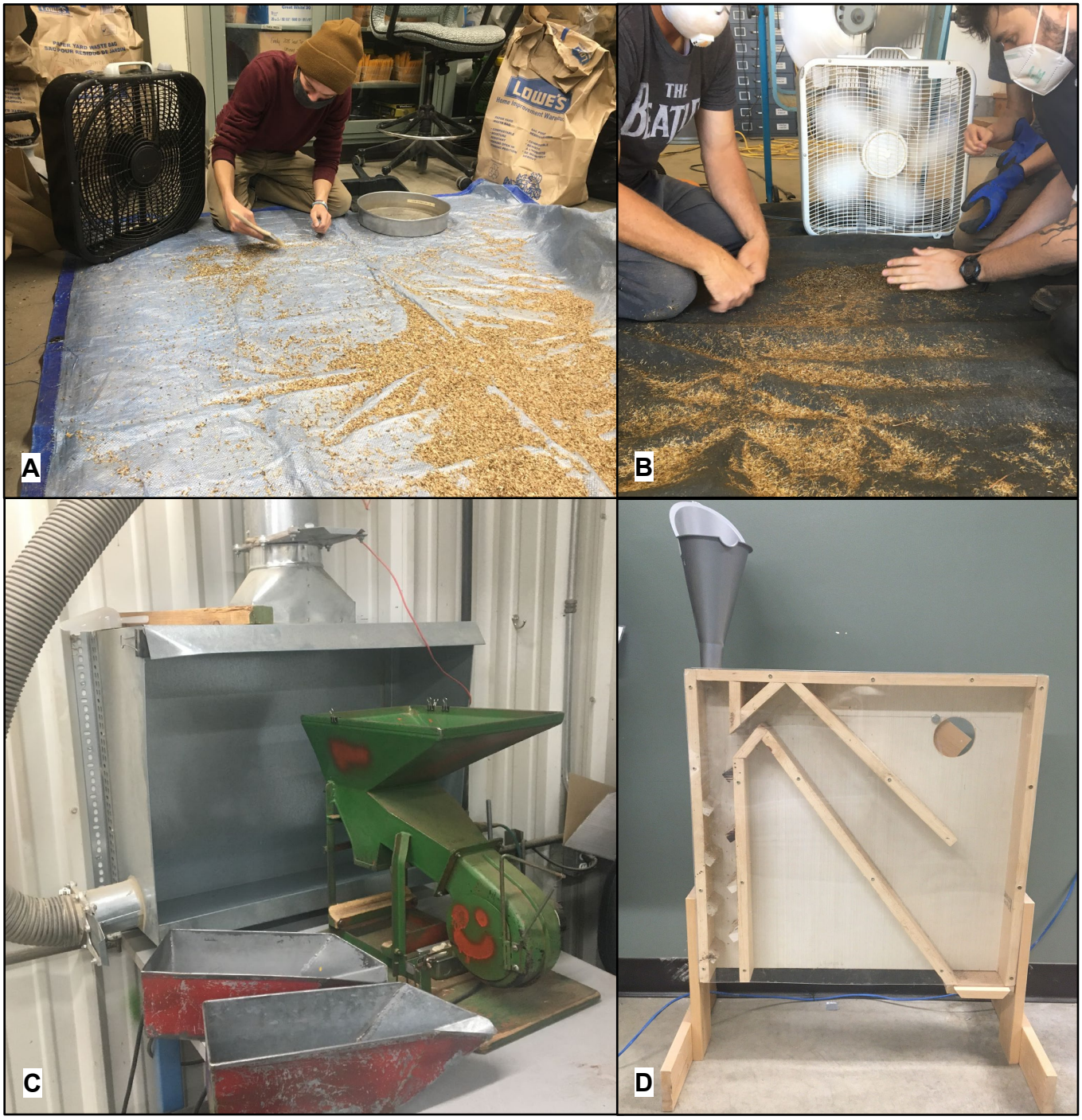
Appendix A: Seed Cleaning Equipment — Threshing

Notes. (A) A **threshing board** is used to break up *Helianthus* seed heads. (B) A **threshing machine** (thresher) is used to agitate seed away from chaff or break up seed pods. (C) Cleaned seed comes out of the threshing machine and can be cleaned further with sieves. (D) A **Dybvig seed cleaning machine** is used to separate seed away from the pappus. (E) A hammermill is used to release seeds from other plant material. (F) A **large-holed sieve** is used to separate *Cleomella serrulata* seeds away from dried pods.

Appendix B: Seed Cleaning Equipment — Winnowing



Notes. (A & B) A **box fan** is used to winnow chaff away from seed on a tarp. (C) A **blower** is used to winnow away unwanted plant material. (D) An **air column separator** is used to separate seed from chaff.