MONARCH JOINT VENTURE

**Monarchs & More Western Habitat Program**
2026-2027 Seeding & Planting Resources

## IMPORTANT CONSIDERATIONS BEFORE SEEDING/PLANTING:

***Please note:*** *The recommendations and resources below are general guidelines. Each M&MWHP project and location is different and will require some experimentation to learn what techniques work best for your capacity and specific site conditions. If you have any specific questions regarding your individual site, please contact Sydney Cho, scho@monarchjointventure.org.*

**Don't forget about Site Prep! It's much easier to control weeds BEFORE the wildflower seeds and plant plugs are planted than AFTERWARD.** First, remember a properly prepared site is the most important part of pollinator habitat establishment!

Quick Seeding Guide if seeding: To make sure your native seeds thrive, we recommend "flushing out" any remaining weed seed banks before putting down your native wildflower seed for optimal success. We recognize that everyone is different, has different equipment, and different growing techniques. If you did not have time to prepare the soil with a smother crop, solarization, grazing, prescribed burn or sheet mulching, a general quick way to get a last minute weed seed bed flushing is repeated shallow cultivation:

1. Before any remaining weeds go to seed, till or hoe the entire area as deep as needed to kill any weed's deep tap roots.
2. Let the disturbed plant material dry out on top or rake it aside if wet.
3. Install irrigation (see Irrigation Considerations below)
4. Irrigate to germinate the next top layer of weed seeds ("flushing the seed bank").
5. Harrow or lightly hoe the newly emerged weed seedlings (about 2" deep).
6. If there's time, repeat steps 3-4 multiple times (water the top 2" and then cultivate the top 2"; water the top 2" and then cultivate the top 2" and so on). This will create a sterile seed bed.
7. If there are any outlier weeds with deep roots, hand weed to eradicate.

The short-term disruption of the top-soil to create a sterile seed bed will ensure successful establishment of your native habitat, which will in turn create long-term healthy soil with a top seed bank layer of native seeds, less invasive weeds, and less long-term maintenance.

# 2026-2027 M&MWHP Seed Mix and Milkweed Plug Planting

## ABOUT THE PLANTS:

- **Understanding Plant Phenology:**

Plant phenology refers to the stages of plant growth in response to local conditions. It's important to understand and pay attention to when a plant blooms, dries out and produces

seeds and naturally senesces (deteriorates with age). This will help to determine where to place your plants to streamline management later on.

- SEED MIX:
  - The M&MWHP wildflower seed mixes should have different blooming species throughout each season (early season blooms, mid-season blooms, and late-season blooms).
  - Different conditions under each season (water availability, temperature, and soil health) will cause the seeds to germinate, bloom, and senesce at different times.
  - This means the seed mix will grow in succession and it may sometimes be necessary to trim back one season's older seeded out growth to spread that season's seeds and to allow more sun exposure and make way for the next season's germinating plants below.
- MILKWEED PLUGS:
  - The milkweed plugs show vegetative growth throughout the entire spring, summer and fall, and could host eggs, caterpillars and adult monarchs throughout the entire vegetative season. Check **this map** to see the best management windows for monarchs.
  - The best way to manage milkweed for monarchs is to observe your plants yourself to begin to understand when monarchs use your plants and when they don't.
- NATIVE NECTAR PLANTS:
  - If you are receiving native plants for your project, they will be perennial plants, meaning they will come back each year.

## IRRIGATION CONSIDERATIONS:

- Most native wildflower plantings in California will germinate and thrive without additional watering after fall rains, because native species are adapted to the locally dry conditions. Weedy species often outcompete natives if plantings are watered too much. However, limited supplemental fall and spring watering can promote wildflower establishment in severe drought years, and infrequent watering (around once every two weeks) can extend bloom periods of many species.
- The type of irrigation set up will depend on your specific site and capacity.
  - Generally, sprinklers work better for wildflower plantings that are broadcast seeded.
  - Drip irrigation is best for seeds that are planted in rows near the drip emitters.
  - Milkweed plugs and native plants will perform best along drip irrigation as they are already established plugs.
- If the weed seed bed has not been flushed out, anywhere that irrigation hits will sprout resident weeds (See "Don't forget about site prep" note at the beginning of this document.
- As soon as irrigation is installed, think of it as an opportunity to flush out resident weed seeds before planting desired wildflower seeds. It's always easier to remove weeds prior to planting wildflower seeds than after.
- A benefit of using native seeds is that, once they are established, they typically will not need additional irrigation. However, for the first one to two years of establishment, supplemental irrigation provides the best long-term results.
- If natural rainfall occurs, skip watering on any days with more than 1/4 inches of rain. New seeds typically take 6-10 weeks before their roots are deep enough to hit the water table. Once this happens, they will be able to draw groundwater and should no longer need additional irrigation.
  - During periods of drought and if irrigation is the first moisture of the season, you should plan on applying water for 6-8 days before the seeds are able to connect with the water in the soil.
  - Pay attention to the levels of rain and the soil moisture. If you begin the seeding process in November, the ETo (evapotranspiration) rate is around 1/8 inch per day. When seeding in the late fall, watering every other day is recommended if there is not consistent rain. From December through February, the ETo rate is typically

around 1/16 inch per day, so plan to irrigate every 3rd day if there is not consistent rain.

## PLANTING ARRANGEMENT / LAYOUT:

- **Planting Arrangement/Layout Based on Plant Phenology:**
  - Because the seed mix will grow in succession, different plants will be at different stages depending on local conditions, which may also mean management for the wildflowers will be more regular than the milkweed portion of your habitat, which will only need to be cut back once at the beginning of winter when all monarchs have flown to their overwintering grounds.
  - **Planting your milkweed in a separate area from your wildflower seeds is recommended, so the milkweed can grow and you can manage any senesced wildflower plants separately if needed.**
  - Milkweed and wildflower seeds should be planted near irrigation in case of drought and the need for supplemental irrigation.
    - Milkweed will do best on drip irrigation and wildflower seeds are more easily managed with sprinklers.
  - By the third year of growth, Narrow Leaf Milkweed will grow into a plant that is about 2.5 feet in radius. Therefore, **planting 3-5 milkweed plants in a group 3 feet apart from each other per milkweed patch** is recommended to provide enough plant forage for multiple caterpillars in one area as plants get established.
  - This technique also allows the milkweed to establish a more noticeably large patch more quickly over time as each single milkweed plant grows into the 3 foot radius, eventually almost meeting with the next plant's growth to create a large healthy patch.
  - You do not need to plant milkweed densely in a large row. Planting 3-5 plants per patch at a 3 foot distance between each plant will create enough space to form a large patch over time and prevent mold and disease from spreading amongst plants that are too densely planted. Space and air are healthy for milkweed.
    - If you have several milkweed plants surrounding one drip emitter, consider adding some spaghetti lines to spread the irrigation capacity to each plant.

- **Planting Arrangement/Layout Based on Surrounding Environment:**
  - In general, native pollinator plants prefer sunny areas and direct sunlight especially if irrigated. Some shade is ok, especially if not irrigated, as partially shaded areas tend to retain more moisture in dry conditions.
  - If possible, plant near areas that have pesticide-free woody perennials, brush or trees that can provide shelter, nesting sites for native bees, protection and reliable perennial opportunities for adult monarchs and other species to rest along their migration, and safe opportunities for caterpillars to crawl away and form their chrysalis. **Caterpillars can crawl up to 30 ft away from their milkweed host plant to form their chrysalis!**
  - If you don't have bushes or trees nearby, you can plan to add some woody pollinator-friendly perennials around your wildflower planting over time. Here are some plant options:
    - Monarch Nectar Plant List by region
    - Other CA/OR Butterfly Host Plants
    - California Regional Pollinator Plant Lists
    - Oregon/Pacific Northwest Regional Pollinator Plant Lists
  - If you don't have time to add more woody perennials, placing large branches and brush piles near your habitat so caterpillars can anchor their chrysalis to a sturdy protected structure is another option.
  - If you don't have access to irrigation, planting near a water source such as a riparian corridor, a seasonal spring or mesic meadow is best.
  - Avoid planting your habitat near areas that use pesticides (insecticide, fungicide, and herbicide).
    - A good standard is if neonicotinoids must be used on your property or might be used on an adjacent property, maintain a buffer of at least 125 ft between areas of neonicotinoid use and habitat areas.

        - Maintain a buffer of at least 40 ft between areas of ground-based pesticide (including organic) application and habitat areas, and 60 ft between air blast spray areas and habitat areas.
    - Avoid indiscriminate weed eating, mowing and/or trampling during egg laying and caterpillar seasons.
        - Notify everyone who may work in the area about the habitat so it is not accidentally disturbed.

- **Planting Arrangement/Layout Based on Monarch Butterfly Behavior**
    - Adult monarchs are very mobile and move from plant to plant sporadically. Studies show that in one nectar-rich area, an adult female monarch will fly in a 50 meter radius feeding or laying eggs during her visit to that site. She may also choose to roost in a sheltered tree overnight and continue using the site for multiple days.
        - Therefore, depending on the space available, you may plant your wildflowers in a large swath to create a meadow or in larger rows or patches to create a connected corridor.
    - Juvenile monarchs (eggs and larvae) are not as mobile during their egg and larval stages and will usually live out their 5 larval instars on one or two milkweed host plants before crawling off to form their chrysalis.
        - Planting 3-5 milkweed plants in a group 3 feet apart from each other per milkweed patch is recommended to provide enough plant forage for multiple caterpillars in one area as plants get established.
        - The distance between each 3-5 milkweed plant patch can be larger to allow female monarchs to fly from patch to patch, but to allow for enough caterpillar food in each patch. Depending on how much space you have, you can allow for between 5 feet and 20 feet between grouped milkweed plantings. Overtime, it is recommended to fill these gaps with other native perennial flowers that bloom throughout the growing seasons, native bunch grasses and native perennial woody species to create the most healthy ecosystem for monarchs and more. (See “Find More Native Plants” section at the end of this document)
    - Since caterpillars will be eating the entire plant material and are relatively immobile during their milkweed eating stages (anytime between early spring and late fall):
        - 1. Do not plant milkweed or wildflowers anywhere near areas that use pesticides (insecticides, herbicides, or fungicides) as these can have negative effects.
        - 2. Do not plant milkweed in an area where it could be accidentally damaged (mowed, weedeated, trampled, grazed, burnt, etc.) before winter!

## PLANTING HOW TO’S:

- **Helpful Tips for Planting:**

    - Keep wildflower seed planting separate from, but nearby milkweed plug planting, as they may require separate management activity.
    - Keep plantings supplementally irrigated, especially within the first two years to ensure proper establishment.
    - Plant milkweed in groups of at least 3-5 plants 3 feet apart from each other. This will allow your plants to fill in more quickly over time and provide more plant material for caterpillars to eat and crawl to if you get lots of activity.
        - ➢ In the first couple of years while milkweed gets established, if your milkweed is on drip irrigation and you are concerned that the 3-5 milkweed plants are not getting enough water through one emitter, consider putting out some spaghetti tubing to provide more water spread during times of drought.
    - Keep your site free of pesticides (including insecticides, herbicides, and fungicides)
    - Flag where you plant your milkweed plugs as they will naturally die back in the winter.
    - Educate anyone managing the habitat on what native Narrow Leaf Milkweed and Showy Milkweed (if you’re in northern California or Oregon) looks like, where it is located, and put up signs. If crews can avoid California poppies, they can avoid native milkweed!

        - A good rule of thumb is to **just leave milkweed alone until winter once all monarch activity has ended**. Then cut back the milkweed stems to prevent sooty mold and bacteria from spreading and to prepare a fresh start for next spring's growth.

- **General Planting Method - Seed Mix:**

Helpful video on seeding wildflower seeds from Integrated Crop Pollination Project from the USDA, UC Davis and Xerces Society

- Timing: Seeding should occur in the fall/winter to take advantage of rainfall.
    - Most native seeds need to experience the cold temperatures and moisture of winter to germinate, a process called stratification.
    - The ideal time to get seed on the ground is after the first or second significant rain of the season; as a rule of thumb, at least 0.5 inches within a 12 to 24-hour period would be a significant enough rain in most regions. The most effective technique is to have seed down one week before a "germinating rainfall," which is a stretch of 5-7 days with consistent moisture.
    - If there is no rain for two weeks after seeding, you may need to use irrigation to keep the top inch of soil moist, allowing the early growth stage of the seed to continue.
- Soil surface should be clear of any large debris and other plant material.
- The M&MWHP seed mixes are **8lbs per acre**, so take this into account with planning your seeding rates.
    - It's recommended to **combine the seed mix with an extension medium**, such as dry course sand (like #12 grit builder's sand or poultry grit), rice hulls, wheat hulls, or sawdust to help visually aid in broadcasting evenness. It's recommended to have at **least a 4 part extension medium to 1 part native seed mix ratio**.
    - To ensure even distribution of seeds, it is recommended to measure out your planting before starting and use a seed drill or broadcast seeder. You may hand broadcast the seed, but should broadcast small amounts at a time to try to get even coverage.
    - **Start slowly and spread seed conservatively, as it's better to end up with leftover seed and take a second pass than to run out of seed before finishing the first pass.**
        - ➢ After the first 2/3 of the seed has been applied, lightly rake the soil to incorporate them into the top 1/8-1/4 inch soil. The final 1/3 of the seed can then be applied to the surface of the soil using the same technique as before. This final step ensures diversity in the depths of the seed, maximizing the soil-to-seed contact.
    - If seeding along a drip-line, a more controlled approach will be necessary to ensure seeds have access to the water's spread. This will mean planting in rows with seeds around every 2-4 inches along the row. Consider a walk-behind push seeder, such as an Earthway.
- The depth of seeds should only be about **⅛ " - ¼" deep**
- **Establish good seed-to-soil contact.**
    - If broadcasting seed by hand or with a drop seeder, use a cultipacker, ring roller, turf roller or your own feet and body weight to tamp seeds into the top layer of soil after seeding. This will ensure that seeds receive the soil contact needed for germination. Do not disk, harrow, or cover sown seeds with additional soil or mulch; they will germinate best close to the soil surface. This step is not necessary if using a no-till drill.
- If your area is prone to rodent and/or bird pressure, consider covering your tamped in seeds with a very light layer of weed-free straw, but don't cover seeds too much because many seeds need sunlight to germinate. Often being tamped down into the soil with a roller or your body weight is enough to keep birds from eating the seeds; the straw is just a precaution for severe pressure.
- For the most even distribution possible, try to seed on a day with little to no winds.

## General Planting Method - Milkweed & Other Native Plant Plugs:

- Timing: It is highly recommended to plant the milkweed plugs during their active fall season when moisture is more readily available (rainy season), the plants become dormant during winter making it much more difficult to establish/be successful.
- Create a hole that is at least double the size of the milkweed plug. You may loosen more surrounding soil if you'd like to have more friable soil for the roots to spread through more readily.
  - You can add a little compost if you'd like, but native plants tend to adjust to many soil types.
  - If using compost, till it into the existing soil at a 6-inch depth so you're not just planting into direct compost as this may cause root rot. Take note that this may bring up a deeper layer of weed seeds that may need to be cultivated around the milkweed plug.
- Remove milkweed start from pot/tray, place in hole and cover with soil mixture up to the base of the stem. Water the milkweed in.
  - If you'd like to capture more rainwater around your milkweed, you can form a small berm or raised collar out of the soil surrounding the plant to round up water at the base of each plant. See the example in this video from the California Native Plants Society.
- If you are in an area with hard freezes, cover your milkweed planting with straw to keep it warm and protected. Since native milkweed is a deciduous perennial, the top of the plant will die back, but the roots will still be alive. When temperatures get warm enough in the spring, the plant will reemerge.
- If you live in a region that gets hard freezes, you will want to get your cuttings and container stock plants (plugs, 1-gallons, etc.) in the ground prior to hard freezes. This may mean that you have to plant prior to the onset of seasonal rains, and would need to water your plantings until rain comes.
  - Alternatively, if you get hard freezes and you have access to a greenhouse or hardening off station, you can choose to overwinter your plants in a more protected area and outplant them in the early spring. Just make sure to keep roots moist.
- Watering: Moisten soil as needed- the milkweed plugs should be kept moist at least through the first two growing seasons to establish deep root growth. Once they are well established, milkweeds are largely drought tolerant.
- You can use mulch around the base of new plantings when they are established to help retain moisture at the base of the plant. Use natural wood fiber or chipped mulch free of invasive weed seeds, plastics, and chemicals

- **Best Practices After Planting:**
  - Educate your management crew on the importance of your pollinator habitat. Help them identify Narrow Leaf Milkweed (or other milkweed species if you have them on your property) and tell them to leave the plants alone. Milkweed should only be cut back in the winter when all monarch activity is done for the season.
  - **Flag where you planted your milkweed because they will go dormant in the winter and seemingly disappear until spring!**
  - Put up educational signage! MJV pollinator habitat signs are available in English and Spanish to post around your site early on! This is especially important if you have contracted crews coming in to manage your site and you may not have relayed this information to everyone on the crew.
    - Often crews are hired to mow everything and don't consider the important native species that are still green and in bloom during the most crucial times for native insects. Really stress that the maintenance of the habitat site is different from the normal routine maintenance that they may be used to.
  - Keep your plants irrigated. Pay attention to weather conditions and if drought occurs, water at least every 2 weeks. Monitor plants and water more if they show signs of stress from heat and drought.

- The rule of thumb of native container plantings, including the milkweed plugs, is water deeply and infrequently (i.e., up to a gallon/plant, no more frequently than every two weeks). This encourages healthy, deep root development. Watering shallowly promotes shallow root development which is not good for the plant, especially during the summer.
- **Many native plants are sensitive to root rot and over watering, so don't overdo it!**
- Supplemental watering during the first two summers following planting (regardless of how good the rainy season was) may be necessary – using the 'deep and infrequent' rule of thumb.

## RESOURCES:

For more resources and a general timeline of the Monarchs & More Western Habitat Program (M&MWHP), please review the document: **2. 2026-2027 M&MWHP Overview & Resources (for participants)**