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MONARCH BUTTERFLY HABITAT: DEVELOPMENT AND MAINTENANCE

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Photo by John Anderson. Hedgerow Farms, Winters, CA.

This Technical Note provides guidance on monarch butterfly habitat creation and management in Idaho. The monarch life cycle and habitat requirements are described, and guidance is provided on site preparation, seed mixtures and necessary management inputs.

Monarch butterflies are one of the most iconic species of North America, but unfortunately, monarch numbers have been steadily and dramatically decreasing. More research is needed to know all the elements that negatively impact monarchs, but factors that are thought to stress individual monarchs and the general population include pesticides, habitat fragmentation, climate and loss of breeding and foraging habitat. Creation and management of suitable habitat can help mitigate losses and keep this species from becoming endangered.

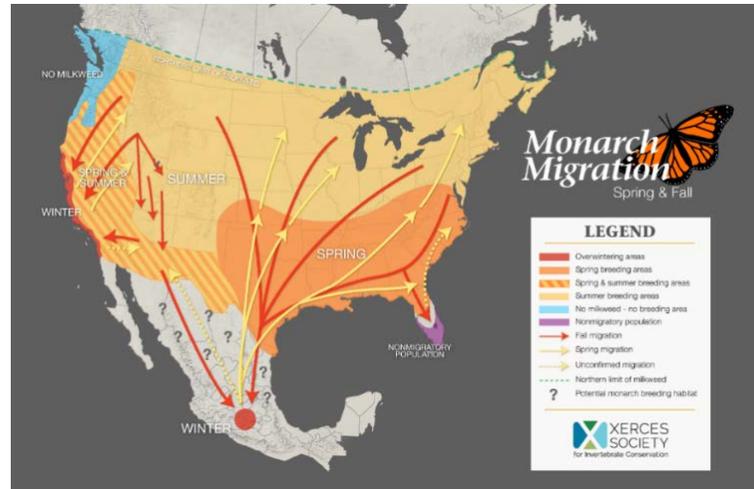


Figure 1. Migration of western and eastern monarch butterfly populations.

Monarchs have two major populations: an eastern population that overwinters in central Mexico, and a western population that overwinters in colonies along the coast of California in part of a fascinating and complex life cycle (Figure 1). Each year, adult butterflies of the western population fly east and north from their winter roosts along the California coast, spreading out over the course of multiple generations. Monarch adults eventually arrive in Idaho where they are most abundant from June to early September, going through at least two generations. An adult monarch can lay up to 500 eggs, but they prefer to lay only one egg per plant. The eggs hatch in 3 to 12 days revealing the distinctive in black, white, and yellow banded caterpillars. The caterpillars then go through 5 instars of development before building a chrysalis in which they change into an adult monarch butterfly. In late summer, most adults in Idaho fly south or west, heading back to California to overwinter.

Milkweeds

Monarchs will only lay eggs on milkweed (*Asclepias* spp.) plants from which the caterpillars accumulate toxins making them unpalatable to birds and other predators. Without milkweeds, monarchs wouldn't be able to complete their life cycle; however, milkweed abundance has dramatically decreased over the past several decades as herbicide use has increased. At one time, milkweed was classified as a noxious weed due to reported toxic effects on livestock, and efforts were made to eradicate it. A better understanding of the risk factors regarding milkweed and livestock however can lead to successful management strategies and improve monarch habitat conditions without posing a serious threat to livestock.



Figure 2. Showy milkweed (*A. speciosa*). Photo by Derek Tilley, USDA-NRCS.

There are several species of milkweed native to Idaho, but two are especially valuable for monarch habitat plantings. Perhaps the most abundant milkweed species in Idaho is showy milkweed (*Asclepias speciosa*) (Figure 2). This species is common along ditch banks and in pastures throughout Idaho, up to elevations of about 6,000 ft. Like all milkweeds, showy milkweed is toxic to livestock, but this species is not known to have caused major problems with grazing animals. Due to its bitter taste and large leaves is much less likely to be accidentally grazed than the narrow-leaved species.

One slightly less common milkweed that can be found in Idaho is swamp milkweed (*A. incarnata*) (Figure 3). It is more limited in distribution than showy milkweed, but it is highly attractive to monarchs and grows in the wetter areas where monarchs are known to congregate. Swamp milkweed occurs naturally along river banks and pond shores throughout most of North America but is limited to the southwest portions of Idaho. It can, however, be successfully grown in flower beds and pollinator gardens under the proper growing conditions.

One other milkweed worth mentioning here is narrow-leaf milkweed (*A. fascicularis*). Narrow-leaf milkweed can be found in much of western Idaho, but it is more common in dry sunny areas of the valleys and foothills. Because of its linear, nearly grass-like leaves, narrow-leaf milkweed is more frequently accidentally eaten by livestock than other milkweeds. It should only be planted in gardens and flowerbeds or other areas where livestock won't have access.

There is new research indicating that female monarchs may prefer laying eggs on some species over others. In controlled laboratory experiments Ladner and Altizer (2005) showed that monarchs lay more eggs on swamp milkweed than any other species and laid very few eggs on narrow-leaf milkweed with showy milkweed intermediate between the two species (Figure 4). For most artificial monarch butterfly habitat plantings in Idaho, it would be appropriate to plant a mixture of showy and swamp milkweed. For restoration and natural habitat projects, consult the distribution maps in the PLANTS Database to determine which species are native to the site.



Figure 3. Swamp milkweed (*A. incarnata*). Photo by Derek Tilley, USDA-NRCS.

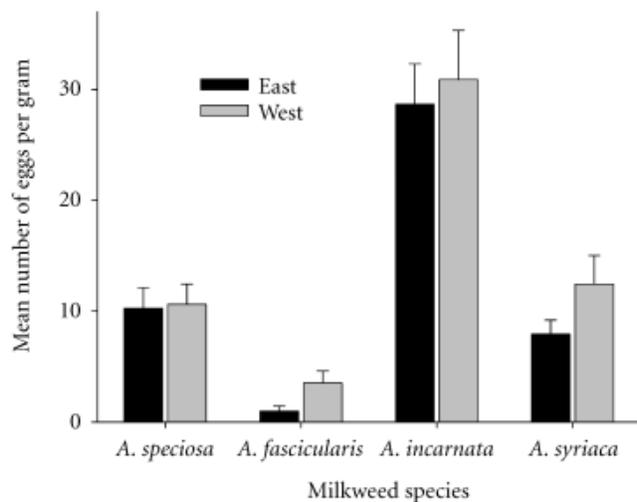


Figure 4. Egg laying preference of eastern and western monarchs measured by proportion of eggs laid on each milkweed species per gram of plant material. From Ladner and Altizer (2005).

Milkweed Propagation

Milkweed can be easily grown from seed which can be sown either directly into well-prepared weed-free soil, or into pots or other containers for later transplanting. The soil should be kept moist; however, watch for signs of fungal infections like damping off and root rot. Under good conditions, transplants are ready after a few months.

In addition to seed, milkweeds can be vegetatively propagated using rhizomes, or by transplanting entire plants. Showy milkweed produces a large taproot and rhizomes that may branch to produce multiple plants. These roots can be easily dug up in fall or in early spring before the new shoots have arisen and transplanted (Figure 5). When fall planting, allow enough time for the plants to establish a root system to survive the winter. The roots can be cut into smaller sections as little as 2 inches long, so long as each piece of rhizome has at least one bud. Plant the rhizomes fairly deep, about 4 to 6 inches, to avoid surface drying. Irrigation the first year will improve survival. Both seedlings and cuttings will usually bloom in the second year, although cuttings will occasionally bloom their first year.



Figure 5. Young milkweeds emerging from a cut section of rhizome. Photo by Derek Tilley, USDA-NRCS.

Plants for Adults



Figure 6. Monarchs foraging on goldenrod, an excellent source of nectar. Photo from USFWS.

Adult monarchs differ from the caterpillars in obvious ways, but maybe not so obvious is the fact that adult monarchs have a completely different diet due to their changed mouth parts. During the metamorphosis from caterpillars to adults, all caterpillars lose their chewing mouthparts that they used to eat milkweed plants and develop a long straw-like feeding proboscis. With only this tube for eating, adults are limited to a very specific food source, nectar. Butterflies travel from flower to flower sucking the nectar that the plants make as a reward for pollination services.

Adult monarchs in the Intermountain West need large quantities of nectar to give them energy for egg laying, and to develop energy stores that can carry them on their long journey back to California. Monarch habitat and butterfly gardens in our area should have a diverse array not only of pollinator friendly plants, but specifically plants known to be good nectar sources. The table at the end of this document lists commercially available plants known to be good sources of nectar for adult monarchs.

Cover

In addition to nectar producing plants, adult monarchs require roosting sites and areas of shade during the summer heat. Good monarch habitat will include nearby shrubs and trees where they can hide and rest. Descriptive information regarding woody species suitable for use in the Intermountain West can be found in Idaho Plant Materials Technical Note 43 Tree and Shrub Planting, Care and Management.

Establishment

Initial establishment is the key to creating a sustainable monarch and pollinator habitat. Once a well-designed and implemented pollinator habitat has achieved its climax phase, it can become largely self-sufficient; renewing desirable wildflowers and grasses from seed and limiting weed invasion thanks to increased cover and competition. However, successfully achieving the climax phase can be very challenging, especially on lands that have been disturbed or historically cultivated. Such lands are commonly infested with numerous species of introduced weeds that are aggressive in nature and propagate themselves from either a long-lasting soil weed bank or from migration from off-site.

Initial site preparation can take one to several years depending on the existing weed abundance and seed bank. Proper control of weeds cannot be understated, as planting failure resulting from weed competition is common. It is crucial to understand the weeds present at a site, their abundance or density and the likelihood of an underground seed bank. Obtaining adequate weed control takes time and effort. In some cases, two years of tillage and/or chemical fallow is necessary to significantly reduce long term competition (note: if using chemical fallow, do not till your site after you have begun weed eradication or you will bring up buried weed seed). In the planning phase it is important to consider how much work will be required to control the current competition as well as weed seed bank implications. One should also consider the possible secondary effects of weed control such as residual herbicide activity and increased erosion potential. Post seeding herbicide treatment options are limited, especially where forbs and shrubs are planted. University Extension weed control specialists are an excellent resource for herbicide questions.

Typical Protocols for Preparing a Seedbed Currently in Perennial Vegetation

1. Reduce existing cover
 - a. Mow, shred or burn
2. Treat existing weeds with one or more of the following techniques
 - a. Chemical
 - b. Mechanical
 - c. Solarization
3. Treat emergent weeds with repeat applications as necessary
 - a. Irrigate to promote emergence if possible or wait for natural precipitation
 - b. Do not allow emerging weeds to go to flower or to drop seed
4. Repeat for 1 to 2 full seasons
5. Seed/plant fall dormant if non-irrigated or during spring/summer if irrigation is available

It is important to remember that these are starting recommendations. Each site is different and may require variations to this starter recommendation. The bottom-line message is that competition needs to be controlled and the seedbed must be in the best condition possible to facilitate seed germination and establishment.

Seed Mixes

Monarch habitat should include a diverse mixture of well-adapted forbs, particularly those that will provide nectar for adult butterflies as well as milkweed species for reproduction. The floral mixture should be created to ensure that plants are flowering throughout the period in which monarchs could be in the area; May through October for the Intermountain West. A small percentage of bunch grass seed should also be included in the mix for site stability and nesting habitat for other native insects. Idaho Plant Materials [Technical Note 2A: Plants for Pollinators in the Intermountain West](#), provides detailed instructions on seed mix development for general pollinator habitat.

For NRCS funded monarch habitat there are additional requirements listed below.

- All projects must be at 6,000 feet elevation or less. Additional core and facilitative practices are located on page 7 of the Monarch Habitat Assessment Guide.
- Monarch habitat projects must use the most recent PNW Monarch Habitat Evaluation Guide and supporting documentation located on the Idaho Sharepoint site under Technical Services_Biology_Monarch folder.
- The planned cumulative score on the Habitat Evaluation Guide must be “Excellent” to meet planning criteria AND neither the breeding nor nectaring score can be less than “Good” to meet planning criteria.
- Management activities should correspond to the Western Monarch Management Window identified on the Sharepoint.
- All monarch habitat planting must include:
 - At minimum of one species of milkweed for reproductive habitat. Milkweed species planted must be either showy milkweed (*Asclepias speciosa*), narrowleaf milkweed (*Asclepias fascicularis*), or swamp milkweed (*Asclepias incarnata*). Species selected should be identified on the Western Monarch and Milkweed Habitat Suitability Modeling Project found in the Monarch folder on the SharePoint site. Milkweed will comprise of a minimum of 1.5% of the mix.
 - At minimum, 45% of the seed mix will include forbs or shrubs from “Good nectar providing plants for adult monarch butterflies in Idaho” (located on the SharePoint site and in the Appendix below) or identified on the Xerces Monarch Nectar Guide (<https://xerces.org/monarch-nectar-plants/>) appropriate for the planning area. Increased percent of nectar plants including milkweed is encouraged.
 - Three flowering species per bloom period are required for monarch plantings. Bloom Periods (early, mid, late season) should coincide with monarch presence, which is typically May through October in Idaho.
 - Grasses and grass-like species will not comprise of more than 25% of seed mix. A grass component of the mix is important to provide ecological stability,

competition for undesirable plants, and create fuel continuity for prescribed burning. An example of a seeding recommendation is posted on the Sharepoint site.

Seed can be planted either with a drill seeder or by broadcast seeding. Most of the forb species native to the Intermountain West are very small seeded with weak seedling vigor and should be planted near the surface. Drill seeding should be very shallow, no more than ¼ inch. Broadcast seeding followed by a light harrowing and packing with a roller is very effective.

Successfully establishing milkweed as a component of a larger seed mix can be challenging. Supplementing the seeding with milkweed rhizomes or containerized plants can help ensure adequate establishment. To achieve a target density of 2,000 milkweed stems per acre, planting 400 to 500 rhizomes or plants is recommended. Concentrating milkweed plantings into groups or islands can make it easier to provide special management or irrigation during the establishment period if needed.

If the site can be irrigated, the planting can occur practically any time during the growing season provided there is enough time (6 to 8 weeks) for sufficient establishment before going into winter. Planting during extremely hot spells should also be avoided. If no irrigation is available, the seeding should be done late in the fall as a dormant seeding. This is generally after about the middle of October in Idaho. See the FOTG or [Plant Materials TN 24: Conservation Plant Species for the Intermountain West](#) for specific dates by MLRA for NRCS programs.

Depending on weed pressure, it may be advisable to mow the site one or more times during the growing season of the establishment year. This can be used to prevent competing annual weeds from setting seed; however, if there are annual forbs in the seed mix (e.g. sunflower or spiderflower) mowing will likely prevent them from successfully flowering as well.

Management

With proper species selection and adequate management, monarch and other pollinator friendly habitat can be functional and aesthetically attractive for many years, eventually becoming self-sustaining. However, inputs will be required. Pollinator habitat requires two things to remain healthy and attractive. The first is annual residue removal, and the second is on-going spot weed control.

Fall or early spring mowing or grazing is the best option for removing dead foliage and for keeping the area neat. Mow or graze to a height of 4 to 6 inches late in the fall when all plants have finished dispersing seed, or leave standing residue over winter for wildlife habitat and mow early in the spring.

Considerations when developing a prescribed grazing plan for Monarchs

- Collect detailed inventory and analysis – species composition, production, cover, invasive species, infrastructure, livestock type and number, management skill of the operator.

- Identify period of use and reproductive stage of monarchs in your area – This can help with timing and intensity of grazing to optimize suitable conditions for reproduction and feeding.
- Manage grazing periods to facilitate increased diversity and increase health and vigor of the vegetation. Varying stocking rates, residual material, recovery times, and species of grazing animals can alter composition of pastures. Milkweed responds to disturbance by releasing new tillers, and many pollinator plants are early successional species that take advantage of disturbance.
- Monitor...Monitor....Monitor – Monitor changes in composition, timing of monarch use, animal health, pasture condition or range health. The purpose of monitoring is to identify if current management is meeting the landowner objectives. Make adjustments to plans as necessary.
- Consider additional plantings or reseeding to increase diversity and abundance of milkweeds and desirable nectar plants.

Even after significant effort to reduce weeds prior to seeding, some weeds will inevitably find their way back into the site. Annual weeds such as prickly lettuce, mustards, and cheatgrass will likely spread into the habitat. These weeds can be controlled by hand-pulling or roguing. Persistent perennial weeds such as dandelions, Canada thistle, and a few others will re-establish over time. No chemical controls are available to broadcast over the site to prevent broadleaf weeds without damaging some of the desired species, so these should be controlled by digging out the invading plants or spot spraying with glyphosate.

Good nectar producing plants for monarch butterfly habitat in Idaho

Latin Name	Common Name	Life Span	Flower Color	Plant Form	Bloom Period	Precip. Range (in)
<i>Agastache urticifolia</i>	nettleleaf giant hyssop	perennial	purple/red	forb	June—July	18-36
<i>Asclepias speciosa</i> *	showy milkweed	perennial	pink	forb	May —Aug	16-30
<i>Asclepias fascicularis</i> *	Mexican whorled milkweed	perennial	pink	forb	June—Aug	16-30
<i>Asclepias incarnata</i> *	swamp milkweed	perennial	pink/purple/white	forb	July—Sept	15-40
<i>Clematis ligusticifolia</i>	western white clematis	perennial	white	vine	May—July	10-20
<i>Cleome lutea</i>	yellow spiderflower	annual	yellow	forb	May—June	8-12
<i>Cleome serrulata</i>	Rocky Mountain beeplant	annual	purple/pink	forb	July—Sept	13-20
<i>Dasiphora fruticosa</i>	shrubby cinquefoil	perennial	yellow	shrub	May—June	18-25
<i>Ericameria and Chrysothamnus</i> spp.	rabbitbrush	perennial	yellow	shrub	Aug—Oct	7-24
<i>Eriogonum umbellatum</i>	sulphur-flower buckwheat	perennial	white/yellow	forb	July—Sept	8-18
<i>Euthamia occidentalis</i>	western goldentop	perennial	yellow	forb	Sept—Nov	16-32
<i>Gaillardia aristata</i>	blanketflower	perennial	red/yellow	forb	July—Sept	12-18
<i>Helianthus annuus</i>	common sunflower	annual	yellow	forb	July—Sept	8-15
<i>Helianthus maximiliani</i>	Maximilian sunflower	perennial	yellow/brown	forb	July—Sept	18-25
<i>Helianthus nuttallii</i>	Nuttall's sunflower	perennial	yellow	forb	July—Sept	12-20
<i>Monardella odoratissima</i>	mountain monardella	perennial	white/blue/purple	forb	June—Aug	16-25
<i>Penstemon speciosus</i>	royal penstemon	perennial	blue	forb	July—Aug	12-18
<i>Prunus virginiana</i>	chokecherry	perennial	white	shrub/tree	Apr—May	16-60
<i>Rosa woodsii</i>	Woods' rose	perennial	pink	shrub	June—July	12-40
<i>Rudbeckia</i> spp.	coneflower	perennial	yellow/green	forb	June—July	16-25
<i>Salix</i> spp.	willow	perennial	yellow/purple	shrub/tree	April—July	18-40
<i>Salvia dorrii</i>	purple sage	perennial	blue/purple	shrub	May—June	8-14
<i>Solidago</i> spp.	goldenrod	perennial	yellow	forb	July—Oct	16-40
<i>Sphaeralcea</i> spp.	globemallow	perennial	orange	forb	April—June	7-15
<i>Symphotrichum</i> spp.	aster	perennial	white/pink/purple	forb	July—Sept	14-60

*these species are toxic to livestock and should be used with caution

This list was developed in collaboration with Xerces Society and is not exhaustive. Please work with your local NRCS Field Office or Plant Material Center to determine the species composition that is best adapted to your area or visit <http://xerces.org/monarch-nectar-plants/>.