

Monarch Zones

User's Manual



Compiled by Cam Watts and Mike Martin
Monarch Research Project
Linn County, Iowa
2018



Spring 2018
Monarch Research Station
Marion, Iowa

Web: monarchzones.com
Email: monarchzones@gmail.com

Edited by Carol Gorman
Layout by Lisa Wiebenga

Table of Contents

Gather together your supplies	6
Raising Butterflies	7
Choose Butterfly Species.....	7
Enclosures	7
Decide on Locations	7
Pollinator Garden	8
Plants, Enclosures, Eggs, and Blueprints.....	9
Pots	9
Two Sites Recommended	9
Supplementation a Must!	9
6x6 MONARCH BIOTENT USER GUIDE	10
PRIOR TO PLANTNG	10
LANDSCAPE FABRIC	10
PLANTING INSTRUCTIONS	11
9x9 MONARCH BIOTENT USER GUIDE	13
PRIOR TO PLANTING	13
LANDSCAPE FABRIC	13
PLANTING INSTRUCTIONS	13
REARING BUTTERFLIES IN THE MONARCH BIOTENTS	15
SEASONAL MAINTENANCE	15
END OF THE SEASON MAINTENANCE	15
MONARCH BIOTENT REMOVAL FROM SITE AND YEAR-END SANITATION	16
MONARCH BIOTENT STORAGE	16
How to Get Milkweed.....	17
Milkweed Spreads	17
Milkweed Pruning.....	17
Caring for Plants and Eggs.....	18
Aphid Control	18
Plant Size for Monarch Caterpillars	18
Plant Size for Black Swallowtails	18
Fertilizer for Your Plants	18
Before Your Eggs Arrive	18
Getting Your Eggs.....	18
Handling Eggs	18
Butterfly release:	20
Record-Keeping:	21
Additional Resources	21
Butterfly Life Cycles	22
Egg.....	22

Caterpillar	22
Prechrysalis	23
Chrysalis	23
Adult.....	24
LEGACY ENCLOSURES (2016 & 2017)	26
Gardener's 4'x4'x4'	26
Opening the Package	27
Site Preparation	27
Enclosure Installation	27
Wind Protection	27
Proper Door Use.....	28
When the Season Ends, Remove all Plant Material	28
Enclosure Removal	28
Flowerhouse SpringHouse - Vinyl, 6'x6'x6.5'	29
Unpacking the Tent	29
Site Preparation	30
Enclosure Setup and Installation	30
Wind Stability	30
Temperature Control	30
Watering	31
Door Use	31
When the Season Ends, Remove all Plant Material	31
Enclosure Removal	31
Monarch Zones' Custom 8'x8' Hoop Enclosure	33
Delivery	33
Site Preparation	33
Enclosure Installation	34
Watering	34
Proper Door Use.....	34
When the Season Ends, Remove all Plant Material	34
Prepare Enclosure for Winter	35
Enclosure Covers in the Winter	35
Monarch Zones' Custom 12'x12' Hoop Enclosure	36
Delivery	36
Site Preparation	36
Enclosure Installation	37
Watering	37
Proper Door Use.....	37
When the Season Ends, Remove all Plant Material	37
Prepare Enclosure for Winter	38
Enclosure Covers in the Winter	38

Introduction

User's Manual

Is there anything lovelier than a butterfly flitting from flower to flower in the garden or floating on a breath of air over a meadow? People have been fascinated with butterflies for centuries—for their beauty, their thousand-mile migration, and their miraculous metamorphosis. Sadly, butterfly populations have dramatically declined. In fact, in recent years, the once-familiar black and orange monarch butterfly populations have declined by 90%, according to *Newsweek* magazine. Tierra Curry, a senior scientist at the Center for Biological Diversity compared this staggering loss to human decline: It would be the same as “losing every living person in the United States except those in Florida and Ohio.”

This is where Monarch Zones comes in. We raise thousands of monarchs every year at the Monarch Research Station, here in Cedar Rapids, Iowa. In our first two years, we raised and released over 30,000 monarchs. (We also support black swallowtails, but this year we're focusing on monarchs.) Our goal is to begin the restoration of monarch populations.

You can help us by becoming your own Monarch Zone! Raising monarch butterflies in your yard or garden is fun and easy, as long as you have plenty of sun. You will prepare a space; set up an enclosure that protects the insects; and plant milkweed, which we provide along with monarch eggs. Then you will have the pleasure of watching the caterpillars hatch, form a chrysalis, and emerge as one of nature's most beautiful insects. All the steps for success are contained in this small book you hold in your hand.

Get ready for fun and fascinating summer!

Gather together your supplies

- Pruning shears
- Scissors
- Handheld vacuum (the Black and Decker Pivot Lithium 20 volt max gets high ratings)
- Paper towel
- Duct tape
- Cotton balls
- Disinfecting bleach in one-gallon jugs (use only pure bleach—with no other added cleaners). Keep bleach inside; sunlight ruins bleach.
- Disinfecting spray bottles for bleach solution
- Disinfecting alcohol gel. This can be used if you let it evaporate on your hands.
- Small, soft paint brushes (#4 or #5 are best, camel-hair preferred)
- Plastic spoons
- Stanley Pump Sprayers (available at Menard's) if you have larger enclosures for fall bleaching
- Visqueen Polyethylene clear plastic. Menard's has 4 mil 8'x25' rolls and other sizes

Raising Butterflies

Choose Butterfly Species

Before planning the space where you'll raise your butterflies, decide which species you want to raise. Monarchs use milkweed for host food, and black swallowtails use parsley and fennel. (We support Monarchs and Black Swallowtails, but we're focusing on Monarchs in 2018.)

Enclosures

We support the 6'x6' and the 9'x9' Monarch BioTents; manufactured exclusively for Monarch Zones for the purpose of rearing Monarch Butterflies. The MRP sells the 6'x6' enclosures for \$230 and the 9'x9' enclosures for \$417. Some MZs have legacy 4'x4', 6'x6', 8'x8', and 12'x12' enclosures from our first two years in operation. While we will continue to support all tent sizes, starting in 2018, all new MZs are encouraged to use the 6'x6' or 9'x9' Monarch BioTent. Find additional information at MonarchZones.com.

Decide on Locations

All of our host plants require a minimum of six hours a day of sunlight, so we recommend choosing a site for your Monarch Zone with sun most of the day. It should be flat or nearly flat. Good air movement is another important consideration.

Pollinator Garden

It's important to plant an area of your garden where butterflies and other pollinators can find nectar near your Monarch Zone. You will also need to have potted nectar plants you can move into your enclosure so new monarchs can find nourishment. You may contact Master Gardeners who will come out to your site and help you design gardens for your property. Contact: Linn County Master Gardeners on Facebook or at 319-377-9839.



Plants, Enclosures, Eggs, and Blueprints

In this section, we provide information about the different enclosures, set-up information, and basic planting blueprints for each enclosure size. Our plans provide walking space between plant groups. These spaces are generally 2' wide and can be designated with pavers or gravel. Our designs also provide room to grow and mix in supplemental pots or plants for extra host food. Don't feel that you must follow our designs exactly, though. Feel free to experiment.

Pots

If you plan to grow the milkweed in pots, rather than planting them directly in the ground, we recommend buying 2-3-gallon plastic pots. We order Pro Cal pots online but most Menard's or Lowe's (or other big-box stores) have many types of pots.

Two Sites Recommended

If users have the time and space, we recommend that two sites be set up and readied to raise monarchs. The second site provides a backup space if the plants fail in the first site, the enclosure can simply be moved to the second space. It also allows your Monarch Zone to raise a second generation of butterflies after the first generation is released.

Measure two areas, one foot larger—on all sides—than the footprint of the enclosure. It's best if these two areas are a good distance apart to avoid attracting predators. If you have a small backyard operation, do the best you can. Larger properties will have more flexibility. Too far apart could be inconvenient for maintenance. Check with Monarch Research Project if you have questions.

Supplementation a Must!

As of 2018, the MRS is promoting mixing in Tropical Milkweed in with the Common Milkweed established in your enclosure. Note the planting diagrams in this manual; these diagrams are enclosure specific and show the recommended ratio of Tropical to Common Milkweed. We encourage all MZs to follow this mixture of milkweed each year. Tropical Milkweed is fast growing and blooms 24/7.

6x6 MONARCH BIOTENT USER GUIDE

PRIOR TO PLANTING

Select either one or two 7' x 7' planting sites for your Milkweed plot, preferably with 6-8 hours of full sun. A level site can prove beneficial when watering your milkweed and working within your BioTent. If you have a choice, light, well-drained soils are better than heavy clay.

The existing plant material must be removed (chemically or manually) to reduce competition for moisture, nutrients and light, as well as future concerns associated with other insects, pests and/or predators.

LANDSCAPE FABRIC

A 8' x 8' piece of landscape fabric, placed on the planting site, should be buried (knifed) 6-inches into the ground, around the perimeter of a 7' x 7' foot print, helping to eliminate movement, as well as creating a barrier for weed competition.

Thirty-four 2 1/2 inch circles, on ten-inch centers, need to be cut into the landscape fabric. Cutting an "X" in the fabric will work too, folding the excess material under exposing the planting location. These should be spaced according to the diagram to the right, allowing adequate space for plant growth within the BioTent.

*All 6x6 Monarch Biotents purchased through the MRS include an 8x8 landscape fabric with 34 pre-drilled holes.

PLANTING INSTRUCTIONS

The blueprint for your 6'x6' Monarch BioTent shows 34 specific planting locations for your milkweed in your landscape fabric.

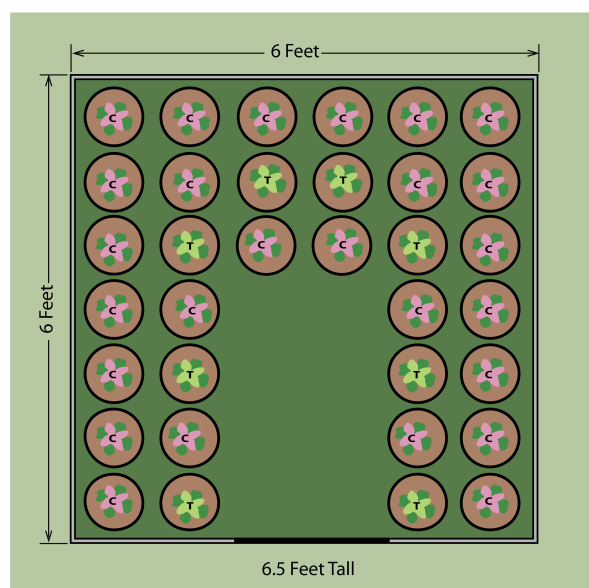
We recommend: **8 Tropical** (*light green on diagram*) and **26 Common** (*pink on diagram*) **Milkweed Plants**.

Tropical Milkweed (*Asclepias curassavica*) is a non-native, annual in the Midwest. It grows fast, providing your Monarch caterpillars with a quick, reliable food source and your adult butterflies a nectar source, as it blooms all summer.

Common Milkweed (*Asclepias syriaca*) is a native perennial to North America, hardy in zones 4-9. It will grow in a variety of soils and is a good food choice for early generations of Monarch caterpillars because of its large, thick leaves.

After the danger of frost has passed, plant 8 Tropical and 26 Common Milkweed plugs directly into the ground. Once planted, slowly water-in allowing the water to soak in around the roots. Avoid overwatering during the planting process, which can push (float) plants out of soil. If needed, add additional soil to fill low areas around the plants, gently tamping to remove any air pockets. Sweep up and remove any excess soil.

BIOTENT ENCLOSURE 6' X6' 34 Plants in the Ground



Newly planted milkweed plugs should be watered frequently during the first couple weeks, preferably in the morning. Increase the days between watering the longer they've been in the ground. The first year, we highly recommend fertilizing 2-3 times during the growing season, if using water-soluble fertilizer or once a season, if you utilize a granulated, time-release formulation.

If you have concerns with rabbits eating your tender, young milkweed, you have a few options out there. Repellants, such as Liquid Fence, Plantskydd, Nature's Defense Animal Repellent, Critter Ridder, Defense Rabbit Repellent (to name a few) and several "online" home remedies are out there for you to try. If you choose to use a Hardware Cloth-like fence material, we suggest burying a portion at least 3 inches, with an overall height around 24 inches.

After your 1st year as a Monarch Zone, you have the option to continue to plant Tropical Milkweed in the selected planting locations or replace these with additional Common Milkweed.

It's your Monarch Zone, so it's your choice!

9x9 MONARCH BIOTENT USER GUIDE

PRIOR TO PLANTING

Select either one or two 11' x 11' planting sites for your Milkweed plot, preferably with 6-8 hours of full sun. A level site can prove beneficial when watering your milkweed and working within your BioTent. If you have a choice, light, well-drained soils are better than heavy clay.

The existing plant material must be removed (chemically or manually) to reduce competition for moisture, nutrients and light, as well as future concerns associated with other insects, pests and/or predators.

LANDSCAPE FABRIC

A 12' x 12' piece of landscape fabric, placed on the planting site, should be buried (knifed) 6-inches into the ground, around the perimeter of a 11' x 11' foot print, helping to eliminate movement, as well as creating a barrier for weed competition.

Seventy-two 2 1/2 inch circles are pre-drilled into the landscape fabric for planting of milkweed.

PLANTING INSTRUCTIONS

The blueprint for your 9'x9' Monarch BioTent shows 72 specific planting locations for your milkweed in your landscape fabric.

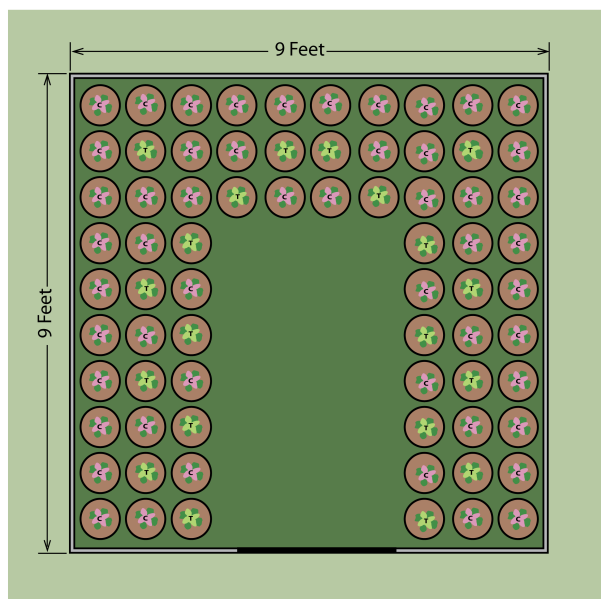
We recommend: 20 Tropical (**light green on diagram**) and 52 Common (**pink on diagram**) Milkweed Plants.

Tropical Milkweed (*Asclepias curassavica*) is a non-native annual in the Midwest. It grows fast, providing your Monarch caterpillars with a quick, reliable food source and your adult butterflies a nectar source, as it blooms all summer.

Common Milkweed (*Asclepias syriaca*) is a native perennial to North America, hardy in zones 4-9. It will grow in a variety of soils and is a good food choice for early generations of Monarch caterpillars because of its large, thick leaves.

BIOTENT ENCLOSURE 9' X9'

72 Plants in the Ground



After the danger of frost has passed, plant 20 Tropical and 52 Common Milkweed plugs directly into the ground. Once planted, slowly water-in allowing the water to soak in around the roots. Avoid overwatering during the planting process, which can push (float) plants out of soil. If needed, add additional soil to fill low areas around the plants, gently tamping to remove any air pockets. Sweep up and remove any excess soil.

Newly planted milkweed plugs should be watered frequently during the first couple weeks, preferably in the morning. Increase the days between watering the longer they've been in the ground. The first year, we highly recommend fertilizing 2-3 times during the growing season, if using water-soluble fertilizer or once a season, if you utilize a granulated, time-release formulation.

If you have concerns with rabbits eating your tender, young milkweed, you have a few options out there. Repellants, such as Liquid Fence, Plantskydd, Nature's Defense Animal Repellant, Critter Ridder, Defense Rabbit Repellant (to name a few) and several "online" home remedies are out there for you to try. If you choose to use a Hardware Cloth-like fence material, we suggest burying a portion at least 3 inches, with an overall height around 24 inches.

After your 1st year as a Monarch Zone, you have the option to continue to plant Tropical Milkweed in the selected planting locations or replace these with additional Common Milkweed.

It's your Monarch Zone, so it's your choice!

REARING BUTTERFLIES IN THE MONARCH BIOTENTS

Once your plants are established in the Monarch BioTent you are ready to rear butterflies. There are a couple ways you could begin this process. You could examine the milkweed around your property or other natural areas containing milkweed plants, searching for monarch eggs or caterpillars. When found, you would place the eggs or caterpillars on the milkweed plants within your Monarch BioTent. If you're fortunate to capture male and female monarch butterflies from the wild, they could be released within your Monarch BioTent, for a few days only, in order to control the number of eggs laid, all the while providing a source of nectar (flowers or liquid feeders).

Almost all wild female Monarchs you find in the wild are gravid. This means they have paired with a male Monarch and can lay up to 200 to 500 eggs. Normally in the wild a Monarch will live for around 2 weeks. In the Monarch BioTent this could be extended to 3 to 4 weeks. If you choose to use gravid females you will have to closely monitor the egg laying. The plant material layout was engineered for 2 caterpillars per medium sized plants. That would be milkweed that is 1.5 to 2 feet tall. If you have very mature common milkweed you may get up to 4 caterpillars per plant. The key is to manage food with tent size and number of eggs or caterpillars. After about 31 days the caterpillars will crawl up the sides of the Monarch BioTent mesh cage and form a pupa. They usually will go all the way to the peak of the roof area. After 12 days or so you will have a Monarch eclose.

SEASONAL MAINTENANCE

Once again, watering your milkweed will be a priority during the first year of growth. Once established, occasional watering will be necessary, especially during drought conditions.

Though not necessary, cutting back your Common Milkweed during the first year can promote stronger, healthier roots, as well as provide tender shoots for young caterpillars. Allow your plants to grow to approximately 18-inches in height, then cutting them back to any overall height of 12-inches. Removing weeds throughout the year is important for reducing potential weed pressure in the future.

END OF THE SEASON MAINTENANCE

Wipe down your pruning shears with a cloth soaked in rubbing alcohol to disinfect them before you prune your milkweed, as well as when you move from one plant to the next. It is HIGHLY RECOMMENDED that you wear disposable gloves to protect your hands from the milky sap, which may cause a skin irritation. As a caution, do NOT get the milkweed sap into your eyes. If you do,

thoroughly flush sap from your eyes for approximately 15 minutes with running water. This will remove the irritant, but not the pain associated. If the pain intensifies, a visit to a medical facility would be recommended.

Prune back your remaining milkweed stems to approximately 6-inches above the ground. This plant material should be composed or placed in a green material recyclable waste container. If this isn't possible, put all plant material, as well as old pupa shells, into plastic bags and remove it from your property. If burning is allowed, this is a good way to dispose of the plant material. What's important is to get rid of any remaining predator insects and pathogens that have entered your property.

Once all the plants are cut and removed, only the landscaping fabric should be left on your Monarch Zone BioTent site.

MONARCH BIOTENT REMOVAL FROM SITE AND YEAR-END SANITATION

Once you've moved your BioTent to another location for cleaning, prior to winter storage, remove all of the remaining pupa chrysalis, casings and other concerns, from both the inside and outside of your BioTent. Thoroughly wash using hot, soapy water, then rinse completely, verifying that all corners are clear of concerns. Be sure to check and clean both sides of the BioTent Ground Flap. Allow a short period of time for drying, and then re-check the BioTent cleanliness. When you feel confident that both the interior and exterior are clean, mix a solution of 5% bleach and water in a tank sprayer, spraying all areas thoroughly. (The yellow Stanley sprayer, we recommend, is an excellent tool for this purpose.)

After 10 minutes, thoroughly rinse the bleach solution from both the inside and outside of the BioTent, allowing it to completely dry in the sun. (Sunlight is an effective disinfectant.)

MONARCH BIOTENT STORAGE

When completely dry, remove the fiberglass support rods from the BioTent and store in the original BioTent case. Lubricate the entire zipper with a zipper lubricant found online or at your local hardware store. Something as simple as Lip Balm will work too!

Follow the instructions included with your Monarch BioTent for complete setup and teardown for storage. A video is available on Youtube, [<https://www.youtube.com/watch?v=7nstqesdxQM>] for setup and storage.

How to Get Milkweed

Monarch Zones provides host plants for caterpillars. We offer Tropical and Common milkweed, all of which arrives after May 15. You will get plugs for planting in 2-3-gallon pots or directly in the ground. The tropical variety grows quickly, so use them to give your early operation a jump-start.

If you have an existing monarch operation: Replace any common milkweed that isn't doing well with new plugs that we provide. Come pick them up after May 15. Add supplemental tropical milkweed. To determine how many you need, check on the page of this booklet that describes enclosure you're using.

For new monarch operations: Check on the page in this booklet with the planting blueprint for the enclosure you're using. After you have prepared your site by killing the grass and spreading landscape fabric, the enclosure should be set on the site before you plant your plugs. This will ensure that rabbits won't eat your milkweed plants.

When to pick up your plants: We'll have plants ready mid-May. Cold weather may delay the date. We'll have your contact information and will let you know.

Milkweed Spreads

No matter what type of ground covering you use under the enclosures, most milkweed plants have the capability of sending new roots out to grow new plants. This is especially true when you use wood chips. You will need to pull out what you think is too many host plants. On the other hand, if some plants don't come up in the spring, you may need to add plants. It is up to you, the operator, to monitor the situation and make sure insects have enough food.

Milkweed Pruning

Milkweed varieties love to be trimmed back during the summer growing season. It is best to find a time when you do not have much stock on the plants. Angle cut the stems at a mid way point on the plants stem right above a node. The plant will recover with a new growth often more like a small bush. We like to see the Milkweed plants not get taller than 3.5 feet. Note: if you have an 8x8 or 12x12 tent, milkweed should not get taller than your chrysalis rails.

Caring for Plants and Eggs

Aphid Control

If you raise milkweed, you'll eventually get Oleander Aphids. The later you are in the season, the more you will see. We like to use a safe mix of 1 ounce alcohol, 1 ounce vinegar, 1 ounce Dawn dish soap, and 1 gallon water. It's best to spray this on plants that don't have eggs or caterpillars, so this should be done before your stock arrives. Before eggs are brought into the enclosure, you should rinse plants with clean water to wash off any chemicals.

Plant Size for Monarch Caterpillars

Before you get your plants with eggs from Monarch Zones, we recommend that your milkweed be 1.5 feet or taller. If you have concerns, contact Monarch Zones.

Plant Size for Black Swallowtails

Some operators choose to raise swallowtails, too. (We're currently focusing on monarchs.) If you're raising swallowtails, your parsley or fennel should look lush and full, like a small bush.

Fertilizer for Your Plants

Master gardeners have told us that most milkweed is an Iowa native plant, and after it has been established, it should not need fertilizer. However, it would be fine to apply Peters 20/20 or Miracle Grow to insure that you have viable plants for the season. Follow their directions.

Before Your Eggs Arrive

Be sure to wash all plant leaves. This year, instead of giving you caterpillars, we will likely supply you with plants that have eggs.

Getting Your Eggs

We anticipate that we'll have the eggs near the middle of June. We'll contact Monarch Zone operators to let you know the pickup schedule. The number of eggs you receive will depend on your enclosure size.

Handling Eggs

After picking up the plants with eggs, move them right away into your enclosure, among your milkweed plants. In a few days, after the heads of the eggs turn black, the first small instar caterpillars will hatch. Some will naturally move from its

overcrowded plant to your plants. We're recommending that you also cut leaves from the plants that have caterpillars on them and spread them out to other plants.

If you receive eggs on small plants in cell trays, feel free to move them around your enclosure to help disperse the caterpillars. Place the cell trays with the plant material touching the larger ground host plants.

If you find many caterpillars on one leaf, we recommend cutting it into smaller sections and spreading these to other plants. We like using a small pin or clip and attaching these leaf parts to a vacant plant leaf. They should be attached rather than simply laid on top of a growing leaf. We want to make sure the small caterpillars don't fall off and are unable to find their way back to fresh leaves. Pins, paper clips, spring clips work well for attaching leaves to new plants. You can also find a low-pressure stapler, available at Office Max, Target, or on Amazon.

It's important not to shake or move plants around too much. We may provide boxes or bags to insure safe travel. **Plants with eggs must go into the enclosure immediately. If not, the car heat or delayed time may result in egg fatality.**

It's also very important to wash your hands before doing anything with the plants, eggs, caterpillars, or butterflies. Just touching a pet with flea liquid on the neck can be toxic to insects.

Additional points:

- Frass (caterpillar droppings) should be self-absorbed, but if you see it piling up, it can be easily cleaned up with a small shop vacuum. Clean the tip of the vacuum with alcohol when reusing it to reduce the chance of contamination.
- It's okay if the caterpillars move around. They may wander from side to side on a plant or even onto the floor of the enclosure. Leave them alone.
- If it looks as if a caterpillar is about to exit the enclosure, use a plastic spoon and small paintbrush to move the caterpillar back onto the milkweed.
- Check for predators every day:
 - Spiders or daddy long legs
 - Stink bugs
 - Assassin bugs
 - Wasps
 - Tachinid Flies



Stink Bug



Assassin Bug



Chalcid Wasp



Tachinid Fly

- If you find what you think is a dead caterpillar, first make sure it's dead. A dead caterpillar will be curled up on its side and not moving. Pick it up with a plastic spoon and discard it. Then be sure to bleach the spoon or discard it. If you have more than two dead caterpillars, please contact us. Send a picture, if possible to monarchzones@gmail.com or to our Facebook group page.
- Sometimes caterpillars may become infected with parasites or fungi. It's important to keep your caterpillars healthy and to take notice if any are sick or infected. A caterpillar is most likely sick if it's discolored (a dull color compared to the others), blackened, or oozing liquid. If you see this in one of your caterpillars, remove it from the enclosure immediately and wash the area with soap and water. Be sure to dry it, as well.
- If your plants are getting eaten and you're in danger or running out of food, please contact us. We can help restock the milkweed.
- After about 20 days, your caterpillars will crawl to the top of the enclosure and start to pupate, or form a chrysalis. **It's important to inspect the chrysalis daily for the 12-day period of metamorphosis to become a butterfly. Watch for any small wasps on pupa, change in the color patterns or threads coming out of the chrysalis. If it doesn't look exactly like pictures in this booklet, contact Monarch Zones immediately.**
- **In 10-12 days, your monarch butterfly will emerge.**

Butterfly release:

- Keep the butterfly in the enclosure for a day, and **do not touch it during its first 24 hours.**
- **Make sure you have potted nectar flowers or nectar feeders inside the enclosure.**
- Hold the butterfly and use a magic marker to mark a wing so you can recognize it if you see it outside again.
- Release in the morning. Ideal temperatures are 70 degrees F or above. If it's raining or poor weather, keep the butterfly in the enclosure and add more nectar plants until the weather is more cooperative.
- Once all butterflies have emerged, remove all chrysalises, including any nonviable chrysalises, and discard them.

- Take the enclosure down and clean it with a 10% bleach/water solution. Use a small spray bottle to rinse it. Repeat this procedure twice.

Record-Keeping:

Keep track of:

- How many butterflies were released and the approximate date (week range)

In August we will send out a form and post it on our website and Facebook group. This is for you to enter your recorded information later this summer.

Additional Resources

Mr. Lund Science: Raising monarchs Instructional Video Series:

tinyurl.com/lundcats.

This is a five-part video series starting with finding eggs and ending with butterfly release. It covers everything you need to know about caring for your caterpillars and butterflies.

MonarchWatch—Raising Monarchs:

<http://www.monarchwatch.org/rear/index.htm>

A simple, illustrated guide to raising monarchs.

It's very important for all Monarch Zone members to view the Mr. Lund video series. We work closely with Monarch Watch. All Monarch Zone members should become familiar with monarchwatch.org. It's an all-inclusive site that covers every facet of the monarch butterfly.

Bring Back Butterflies

By Tony Gomez

Free download can be found at <https://monarchbutterflygarden.net/bring-home-the-butterflies-ebook/>

Butterfly Life Cycles

The life cycle of a butterfly consists of four stages: egg (ovum), caterpillar (larva), chrysalis (pupa), and adult (imago).

Egg



A monarch lays her egg only on milkweed. The egg is as tiny as a pinhead, creamy white, and oval-shaped, with longitudinal ridges. She will lay between 200-500 eggs over a period of two to five weeks. The egg stage lasts 3-8 days, depending on the temperature.

Caterpillar

A caterpillar's body has three parts: head, thorax, and abdomen. The head has six pairs of eyes that detect changes in light but can't see clearly. Underneath the head is an organ called a spinneret, which spins silk. The thorax is made up of thirteen segments, which support three pairs of jointed true legs. The



abdomen consists of ten segments and supports five pairs of prolegs. Tiny hooks on these prolegs allow the caterpillar to hold onto a leaf or stem or even climb up glass windows. The insect takes in oxygen through tiny holes on the side of its body called spiracles. If these openings become clogged with anything like with soap or oils, the caterpillar will suffocate and die.

A caterpillar's job is to eat and grow. This little eating machine goes through five periods of growth called instars. When it eats and grows too large for its skin at the end of each instar, its spinneret makes silk which allows the caterpillar to attach itself to something—say, a leaf or tree bark—so it can crawl out of its skin. This shedding of skin is called molting. The molting process takes a day, and

during this time, the caterpillar stops eating and remains motionless. It's important not to disturb a caterpillar during this time.

Prechrysalis

When the caterpillar gets ready for its final molt—the fifth instar—it looks for a safe place to make its chrysalis. The caterpillar spins a silk button from its spinneret, then turns around and attaches its rear prolegs to the silk. Most hang downward in a J formation.



Chrysalis

After about eight hours in the J formation, the caterpillar molts for the last time. This happens quickly and is amazing to watch. The caterpillar seems to unzip its skin. And there, inside its skin, appears the green chrysalis. After about 12 days the chrysalis turns dark, and within 24 hours, the chrysalis breaks open to reveal the monarch butterfly.



Adult

At this point, the body is large, and the wings are small. But for several hours, the monarch pumps fluid from its abdomen into the wings. The body decreases in size, and the wings harden. It's important not to disturb the butterfly during this time. If this process goes poorly, the butterfly won't form properly. When the wings are dry and hard, the butterfly is ready for flight.

Like the caterpillar, butterflies have three main body parts: the head, thorax, and abdomen. The head has two large compound eyes; a proboscis, which is a feeding tube for drinking nectar and other fluids; and two antennae. Their antennae are used to feel, smell, and balance. Some scientists think the antennae assist in navigation. The legs and feet also aid in tasting and smelling.

The butterfly has two pairs of scaled wings and three pairs of jointed legs. Like the caterpillar, it breathes through spiracles on the side of its thorax and abdomen. Reproductive organs are at the end of the abdomen, and males have claspers that grasp the female during mating.



Male Monarchⁱ



Female Monarch

ⁱ

^{1 1} Monarch images on page 26 courtesy of Wikipedia; Creative Commons Attribution – Share Alike

~~~

Raising monarch butterflies is a fun and fascinating experience. You are helping restore the population of an important pollinator and of one of the world's most beautiful insects. We'll look forward to hearing about your Monarch Zone experience!

## LEGACY ENCLOSURES (2016 & 2017)

### Gardener's 4'x4'x4'

- **Plant in 2-3-gallon pots or directly in the ground**
- **Use 12 common and 8 tropical milkweed plants. For existing operations, replace common as needed, and add 4 tropical milkweed plants.**
- **The fast-growing tropical milkweed plants should be mixed between rows of slow-growing common milkweed so monarchs that emerge earlier will have food readily available.**

The 4'x4'x4' cube from the Gardener's Supply Company is a low-cost simple-entry enclosure that's great for learning how to raise butterflies. It's easy to set up and features the finest mesh screen that we have used for raising butterflies. It needs no shade cloth and allows rain to move through the screen to water the plants.



Tall Pest Control Pop-Up  
Gardener's Supply Company  
4'x4'x4'  
Item#8587859  
Gardeners.com

## Opening the Package

This enclosure arrives in a folded circle, but when it springs up, it opens into a 4'x4'x4' cube. You will also find stakes for fastening the enclosure to the ground.

## Site Preparation

Whether you decide to grow your plants in pots or plant them in the ground, we recommend only the use of landscape fabric for the floors of all enclosures. Be sure you have access to water; a hose with a wand attachment works very well for watering plants.

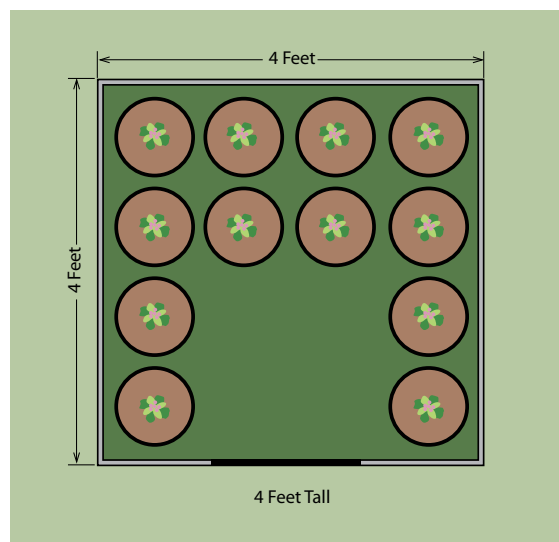
Landscape material should be 1" wider than the footprint of the enclosure. Dig a shallow trough to secure the edge of the fabric in the ground. This will provide a locked in edge for the fabric that will last for many years.

## Enclosure Installation

Once you have placed the cube cage on the prepared site, you need to secure the edges. We recommend buying 4 mil (thickness) sheeting, 8'x25'. Cut four strips, 6' long and 2' wide. Each strip should be placed outside the enclosure so that its long edge forms a 90-degree angle running along the ground and up the side. The ends should extend one foot beyond the corners on each side. Then pack wood chips against this plastic barrier. If you like, for extra protection, you can perform the same procedure inside the cube. Some people have tried using boards, bricks, or sand tubes along the outside of the enclosure, but we prefer the plastic and chip method because it's so effective at keeping destructive insects out and the insects we're raising inside the cage.

## GARDEN CUBE 4' X4' X4'

12 Pots or Plants in the Ground



## Wind Protection

Place the included stakes in the group loops of the enclosure. We also recommend that you use corner cords to secure the structure against higher



winds. You can poke a zip tie through the fabric in the upper corner and make a loop to tie a cord to the ground. This procedure is similar to staking a tent to the ground for camping.

### Proper Door Use

The Gardener enclosure has 2 doors, but we recommend that you use only one. Make sure to get the Velcro tight to the bottom of the door before you zip it up. If you have problems zipping up the side, take tension off the side cords that go from the top corner to the ground.

### When the Season Ends, Remove all Plant Material

You might want to take a picture of the inside set-up for reference next spring.

It's important to cut back all plants in your enclosure at the end of the season. This plant material should be placed in a waste container, like the "Yardy" used in the Cedar Rapids area. If this isn't possible, put all plant material, as well as old pupa shells, into plastic bags and remove it from your property.

If you live in the country and burning is allowed, this is a good way of disposing of the plant material.

What's important is to get rid of any remaining predator insects and pathogens that have entered your Monarch Zone.

### Enclosure Removal

After all plant material and pupa shells have been removed, wash the enclosure, using soap and water. Rinse using water from the hose. Mix a solution of 10% bleach and water and spray the inside and outside of the enclosure. (The yellow Stanley sprayer from Menard's is an excellent tool for this purpose.) After 10 minutes, rinse off the bleach solution, and allow the enclosure to dry in the sun. (Sunlight is an effective disinfectant.) When fully dry, fold the enclosure and store flat in a dry place. Bundle up the ground stakes and place them in a bag for future use.

After all the plants and enclosure are removed, the landscaping fabric should be left on your Monarch Zone site.



## Flowerhouse SpringHouse - Vinyl, 6'x6'x6.5'

(Original 2016 Model)

For the Flowerhouse SpringHouse (Vinyl) we recommend We recommend: **8 Tropical** (*light green on diagram*) and **26 Common** (*pink on diagram*) **Milkweed Plants.**

**Tropical Milkweed** (*Asclepias curassavica*) is a non-native, considered annual in the Midwest. It grow fast, providing your Monarch caterpillars with a quick, reliable food source and your adult butterflies a nectar source, as it blooms all summer.

**Common Milkweed** (*Asclepias syriaca*) is a native perennial to North America, hardy in zones 4-9. It will grow in a variety of soils and is a good food choice for early generations of Monarch caterpillars because of it's large, thick leaves.

In 2016 Monarch Zones experimented with a 6'x6'x6.5' greenhouse design



called SpringHouse to raise butterflies, and it went well. The Monarch Research Station has a small inventory of the Flowerhouse Springhouse for sale at \$89 each. These make excellent green houses, but we no longer recommend them for rearing Monarchs.

This enclosure is one of the first tents that we used to produce monarchs. Many people like it because it allows you to walk inside to observe the life cycle up close. Caterpillars crawl up its sides and form their pupas on high parts of the tent. You will need to check the roof for unwanted insects and remove them

using a small hand-held shop vac.

### Unpacking the Tent

The enclosure is shipped in a large round package, and it springs open to form a tent-like structure. Poles and ground stakes are included.

## Site Preparation

Make sure that your ground site is a foot larger on all sides than the tent's floor, so 8'x8'. We recommend only the use of landscape fabric for the floors of all enclosures. We like to leave an open section or small walkway in front of the door for easy access.

## Enclosure Setup and Installation

We find that it's best to set up this enclosure with doors facing west and east, which promotes the best airflow.

Landscape material should be 1" wider than the footprint of the enclosure. Dig a shallow trough to secure the edge of the fabric in the ground. This will provide a locked in edge for the fabric that will last for many years.

After setting up the enclosure, you need to secure the edges. We recommend buying two packages of 4 mil (thickness) sheeting, 8'x25'. Cut four strips, 8' long and 2' wide. Each strip should be placed outside the enclosure so that its long edge forms a 90-degree angle running along the ground and up the side. The ends should extend one foot beyond the corners on each side. Then pack wood chips against this plastic barrier. If you like, for extra protection, you can perform the same procedure inside the cube. Some people have tried using boards, bricks, or sand tubes along the outside of the enclosure, but we prefer the plastic and chip method because it's so effective at keeping destructive insects out and the insects we're raising inside the cage.

## Wind Stability

Secure all ground stakes on the outside ground flap of the tent. We also recommend using the angle corner cords, which will stake to the group, for added wind protection.

## Temperature Control

The Flowerhouse SpringHouse comes with a net shade cloth. We have tested the best shade materials on the market and discovered that a simple white sheet works better. If you still think it should be cooler inside, try using two sheets. It's best if the enclosure is 95 degrees or cooler.

## Watering

This structure's roof does not allow rain to reach the plants, so watering is necessary. We suggest you slightly crack the door and carefully water using a hose with a wand. Another method is to buy a Menards Stanley sprayer (yellow) and go into the tent to water. Shut the door behind you to limit opportunities for predator insects to enter.

## Door Use

This enclosure has two doors, one at each end of the tent. It's best to use only one door to cut down on ways that predators can enter. After you have set up the tent, roll back the rain guard on each door and fasten the roll with the Velcro. It's best to use the cross strap on the side of each door that pulls the sides of the tent inward and allows for easy zipper use.

## When the Season Ends, Remove all Plant Material

You might want to take a picture of the inside set-up for reference next spring.

It's important to cut back all plants in your enclosure at the end of the season. This plant material should be placed in a waste container, like the "Yardy" used in the Cedar Rapids area. If this isn't possible, put all plant material, as well as old pupa shells, into plastic bags and remove it from your property.

If you live in the country and burning is allowed, this is a good way to dispose of the plant material.

What's important is to get rid of any remaining predator insects and pathogens that have entered your Monarch Zone. Once all the plants are cut and removed, only the wood chips or landscaping fabric should be left on your Monarch Zone site.

## Enclosure Removal

After all plant material and pupa shells have been removed, wash the enclosure, using soap and water. Rinse using water from the hose. Lay the enclosure on its side to make sure the ground flap is clean. Mix a solution of 10% bleach and water and spray the inside and outside of the enclosure. (The yellow Stanley sprayer from Menard's is an excellent tool for this purpose.) After 10 minutes, rinse off the bleach solution, and allow the enclosure to dry in the sun. (Sunlight is an effective disinfectant.) When fully dry, remove the fiberglass rods and store in the enclosure's original case. Flatten the enclosure so the doors are

opposite each other and you can store flat in a dry place. Tie a rope to the D ring above each door and fasten to a wall in your garage.

After all the plants and enclosure are removed, only the landscaping fabric should be left on your Monarch Zone site.

## Monarch Zones' Custom 8'x8' Hoop Enclosure

*(no longer available from Monarch Zones)*

**The blueprint for your 8x8 Hoop Enclosure shows 63 specific planting locations for your milkweed in the landscape fabric.**

We recommend: **17 Tropical** (*light green on diagram*) and **46 Common** (*pink on diagram*) **Milkweed Plants**.

**Tropical Milkweed** (*Asclepias curassavica*) is a non-native, annual in the Midwest. It grows fast, providing your Monarch caterpillars with a quick, reliable food source and your adult butterflies a nectar source, as it blooms all summer.

**Common Milkweed** (*Asclepias syriaca*) is a native perennial to North America, hardy in zones 4-9. It will grow in a variety of soils and is a good food choice for early generations of Monarch caterpillars because of its large, thick leaves.

This beautiful hoop design is our midsized enclosure. We manufactured it in our production shop in 2017, and have a very small inventory available. It boasts an aluminum frame covered with the strongest fine-mesh screen on the market, Super Screen. It's light enough for two strong people to move it, and it can be moved, fully assembled. It has one zippered entrance.

### Delivery

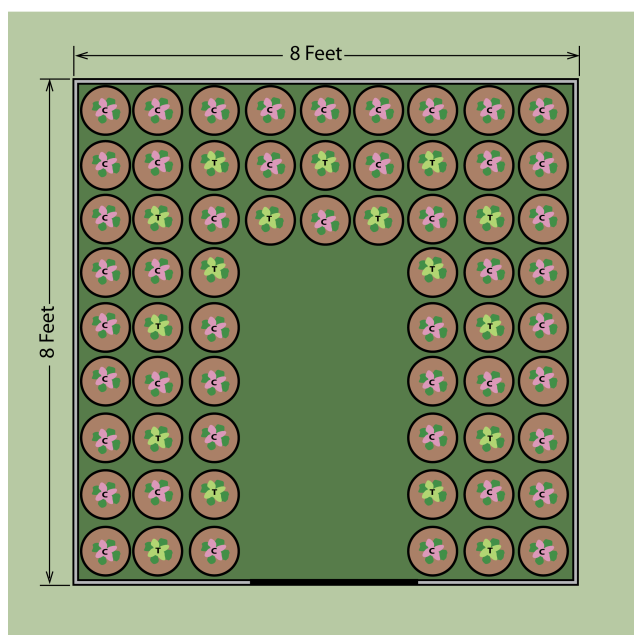
This enclosure will be delivered and set up by our Monarch Zone staff. Unlike the smaller enclosures, it will not be dismantled at the end of the season.

### Site Preparation

You will need to prepare a 10'x10' ground area for this hoop structure. We recommend only the use of landscape fabric for the floors of all enclosures. You

## HOOP ENCLOSURE 8' X8'

63 Plants in the Ground



will find planting diagrams on our website and in this operator's manual. We like an open walkway that's 24" down the center.

### Enclosure Installation

After the hoop is delivered, the Monarch Zones crew will stake down the enclosure. The front door is zippered and should face east, if possible. For edge control, we think the best option is a combination of plastic sheeting and wood chips around the outside 2" x 6" ground frame boards. Cut four 10' x 2' plastic strips and place them around the edge that's created by the frame. The ends should extend one foot beyond each corner. Make a fold that has 1' running alongside the frame on the ground and the other 1' up the side of the frame. Place wood chips in this pocket, creating an angle from the ground to the top of the 2"x 6" frame boards. It's best to press these chips in with your foot to ensure a tight seal. Some Monarch Zones have done this same edge control on the inside of the enclosure for extra protection.

### Watering

This enclosure allows rain to go through its covering. When the weather is dry and the plants inside need a drink, you can water using a hose over the enclosure, keeping the door closed.

### Proper Door Use

The more the door remains closed, the more secure your operation will be against predator insects. We know you may need to go inside to manage the rearing operation, but make sure your trips through the door are quick and the door is closed immediately.

### When the Season Ends, Remove all Plant Material

You might want to take a picture of the inside set-up for reference next spring.

It's important to cut back all plants in your enclosure at the end of the season. This plant material should be placed in a waste container, like the "Yardy" used in the Cedar Rapids area. If this isn't possible, put all plant material, as well as old pupa shells, into plastic bags and remove it from your property.

If you live in the country and burning is allowed, this is a good way to dispose of the plant material.

What's important is to get rid of any remaining predator insects and pathogens that have entered your Monarch Zone. Once all the plants are cut and removed, only the landscaping fabric should be left on your Monarch Zone site.

### Prepare Enclosure for Winter

After all plant material and pupa shells have been removed, wash the enclosure, inside and out, using soap and water. Rinse using water from the hose. (The yellow Stanley sprayer from Menard's is an excellent tool for this purpose.) Mix a solution of 10% bleach and water and spray the inside and outside of the enclosure. After 10 minutes, rinse off the bleach solution, and allow the enclosure to dry in the sun. (Sunlight is an effective disinfectant.) Monarch Zones will contact you about removing the fabric.

### Enclosure Covers in the Winter

The 8x8 custom-made hoop enclosure will stay on for all seasons. It is sturdy enough for snow loads, however we recommend using a push broom to move heavy snow from the top of these enclosures. All of our covers include UV protection.

## Monarch Zones' Custom 12'x12' Hoop Enclosure

*(no longer available from Monarch Zones)*

The blueprint for your 12x12 shows 97 specific planting locations for milkweed in your landscape fabric.

We recommend: **27 Tropical** (*light green on diagram*) and **70 Common** (*pink on diagram*) **Milkweed Plants**.

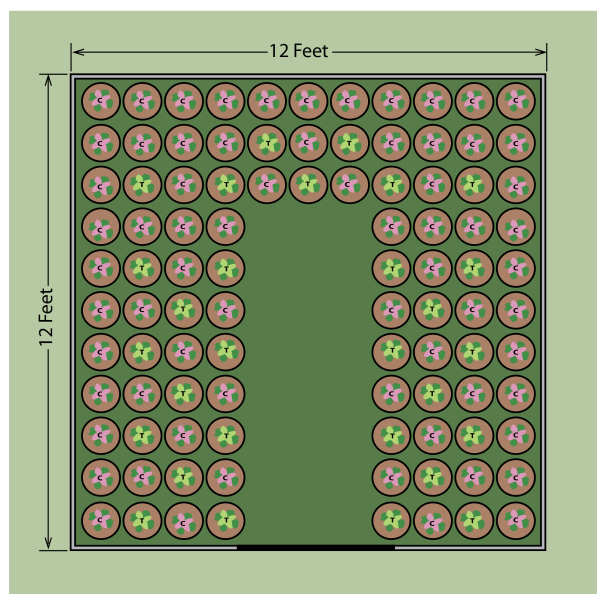
**Tropical Milkweed** (*Asclepias curassavica*) is a non-native, annual in the Midwest. It grows fast, providing your Monarch caterpillars with a quick, reliable food source and your adult butterflies a nectar source, as it blooms all summer.

**Common Milkweed** (*Asclepias syriaca*) is a native perennial to North America, hardy in zones 4-9. It will grow in a variety of soils and is a good food choice for early generations of Monarch caterpillars because of its large, thick leaves.

This hoop enclosure is our largest space for rearing monarchs, and its size allows you to observe butterflies as they fly in a natural setting. It can very easily accommodate the raising of 300 butterflies for release. We manufacture the enclosure here in our shop. Aluminum hoops provide support for the structure and are covered with fine mesh Super Screen, the most predator-proof screen on the market. Included with this one-door enclosure is an insect trap, a capture case, and butterfly net.

## HOOP ENCLOSURE 12' X 12'

97 Plants in the Ground



## Delivery

This enclosure will be delivered and set up by our Monarch Zones staff. These are produced in limited numbers each year.

## Site Preparation

Make sure that your ground site is a foot larger on all sides than the enclosure's footprint, so 14'x14'. We recommend only the use of landscape fabric for the



floors of all enclosures. Planting diagrams are on our website and in this operator's manual. We like to have an open walkway that is 24' wide down through the center.

### Enclosure Installation

After the Monarch Zones crew delivers this hoop enclosure, we will stake it down and secure the edges. The front door should face east, if possible. Edge control as a barrier against predatory insects is important. We recommend buying two packages of 4 mil (thickness) sheeting, 8'x25'. Cut four strips, 14' long and 2' wide. Each strip should be placed outside the enclosure so that its long edge forms a 90-degree angle running along the ground and up the sides of its 2"x6" frame boards. The ends should extend one foot beyond the corners on each side. Then pack wood chips against this plastic barrier. If you like, for extra protection, you can perform the same procedure inside the cube. Some people have tried using boards, bricks, or sand tubes along the outside of the enclosure, but we prefer the plastic and chip method because it's so effective at keeping destructive insects out and the insects we're raising inside the cage.

### Watering

The 12'x12' enclosure allows rain to go through the shade cloth covering. If you think the plants inside need more water, we suggest you slightly open the door and use a hose with a wand attachment.

### Proper Door Use

The more the door remains closed, the fewer opportunities that predatory insects will find their way inside. We know you may need to go in to manage your operation, but make sure your trips are quick and the door is closed immediately.

### When the Season Ends, Remove all Plant Material

You might want to take a picture of the inside set-up for reference next spring.

It's important to cut back all plants in your enclosure at the end of the season. This plant material should be placed in a waste container, like the "Yardy" used in the Cedar Rapids area. If this isn't possible, put all plant material, as well as old pupa shells, into plastic bags and remove it from your property.

If you live in the country and burning is allowed, this is a good way to dispose of the plant material.

What's important is to get rid of any remaining predator insects and pathogens that have entered your Monarch Zone. Once all the plants are cut and removed, only the landscaping fabric should be left on your Monarch Zone site.

### Prepare Enclosure for Winter

After all plant material and pupa shells have been removed, wash the enclosure, inside and out, using soap and water. Rinse using water from the hose. (The yellow Stanley sprayer from Menard's is an excellent tool for this purpose.) Mix a solution of 10% bleach and water and spray the inside and outside of the enclosure. After 10 minutes, rinse off the bleach solution, and allow the enclosure to dry in the sun. (Sunlight is an effective disinfectant.) Monarch Zones will contact you about removing the fabric.

### Enclosure Covers in the Winter

The 12x12 custom-made hoop enclosure will stay on for all seasons. It is sturdy enough for snow loads, however we recommend using a push broom to move heavy snow from the top of these enclosures. All of our covers include UV protection.

---