

Monarch Zones

User's Manual



Compiled by Cam Watts and Mike Martin
Monarch Research Project
Linn County, Iowa
2017



Spring 2017
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
Select Enclosure Size	7
Decide on Locations	7
Preparing the Biotent Area	7
Pollinator Garden	8
Plants, Enclosures, Eggs, and Blueprints.....	9
Pots	9
Two Sites Recommended	9
Supplementation a Must!	9
ENCLOSURES FOR YOUR MONARCH ZONE	10
Gardener’s 4’x4’x4’	10
Opening the Package	11
Site Preparation.....	11
Enclosure Installation.....	11
Wind Protection	11
Proper Door Use	12
When the Season Ends, Remove all Plant Material	12
Enclosure Removal.....	12
Flowerhouse SpringHouse, 6’x6’x6.5’	14
Unpacking the Tent.....	14
Site Preparation.....	15
Enclosure Setup and Installation	15
Wind Stability	15
Temperature Control	15
Watering.....	15
Door Use.....	16
When the Season Ends, Remove all Plant Material	16
Enclosure Removal.....	16
Monarch Zones’ New Custom 6’x6’x6.5’ Enclosure	17
What is the difference between the two 6’x6’x6.5’ enclosures for	18
Monarch Zones operations?.....	18
When the Season Ends, Remove all Plant Material	18
Enclosure Removal.....	18
Monarch Zones’ New Custom 8’x8’ Hoop Enclosure.....	20
Delivery	21
Site Preparation.....	21
Enclosure Installation.....	21
Watering.....	21

Proper Door Use	21
When the Season Ends, Remove all Plant Material	21
Prepare Enclosure for Winter	22
Monarch Zones' Custom 12'x12' Hoop Enclosure	24
Delivery	24
Site Preparation	24
Enclosure Installation.....	25
Watering.....	25
Proper Door Use	25
When the Season Ends, Remove all Plant Material	25
Prepare Enclosure for Winter	26
How to Get Milkweed	28
Milkweed Spreads	28
Caring for Plants and Eggs.....	28
Aphid Control	28
Plant Size for Monarch Caterpillars	29
Plant Size for Black Swallowtails	29
Fertilizer for Your Plants	29
Before Your Eggs Arrive	29
Getting Your Eggs.....	29
Handling Eggs	29
Butterfly release:	31
Record-Keeping:	31
Additional Resources	33
Butterfly Life Cycles	34
Egg.....	34
Caterpillar.....	34
Prechrysalis	35
Chrysalis	35
Adult	36

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 Butterfly Ranch, here in Cedar Rapids, Iowa. In 2016, we raised and released over 13,000 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)
- Large roofing nails
- 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
- Natural (non-dyed) wood chips. Coco mulch also works.

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 2017.)

Select Enclosure Size

We offer 4'x4', 6'x6', 8'x8', and 12'x12' enclosures. The 4'x4' size is a cube made by Gardeners Company. Our new, custom-made 6'x6'x6.5' enclosure resembles a small tent with a peak roof. The 8'x8' and 12'x12' hoop enclosures are manufactured by Monarch Zones, made with lightweight aluminum and very fine screening. Check on costs and learn more about the enclosures, starting on page 10. You will also find information at MonarchZones.com.

Decide on Locations

All our host caterpillar plants require plenty 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.

Preparing the Biotent Area

Measure an area, a foot larger—on all sides—than the footprint of the enclosure. Remove grass and weeds in the area, either with glyphosate (Round-Up) or by using newspaper and mulch. (You can watch the newspaper/mulch process online at youtube.com: *Easy Organic Weed Control with Newspaper & Mulch - AnOregonCottage.com*) This preparation can be done in spring or fall. Use either method, but be sure that your plot is ready for plants by mid-May.

Cover the area with wood chips or landscape fabric. We prefer non-dyed, natural wood chips. This allows water to get into the soil easily, and the wood will decompose naturally. If you prefer using fabric, you can cut openings where the plants will be grown. Whichever you decide to use, make sure the area extends one foot beyond the enclosure's outside dimensions.

Be sure you have access to water for watering the plants. A hose with a wand attachment works very well.

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!

It's necessary to mix in tropical milkweed plants, which are annuals, so you will have fast-growing food (with attractive flowers) for your operation. Common milkweed grows much more slowly. The extra tropical plants can be mixed in between rows of common milkweed. Monarch Zones will provide you with tropical milkweed plants, as well as common milkweed.

ENCLOSURES FOR YOUR MONARCH ZONE

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

See "Preparing the Biotent Area" on page 6. Whether you decide to grow your plants in pots or plant them in the ground, we recommend you use a ground cover, either wood chips or landscape fabric. This will help keep the inside of your enclosure clean and free of weeds. Be sure you have access to water; a hose with a wand attachment works very well for watering plants.

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.

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.

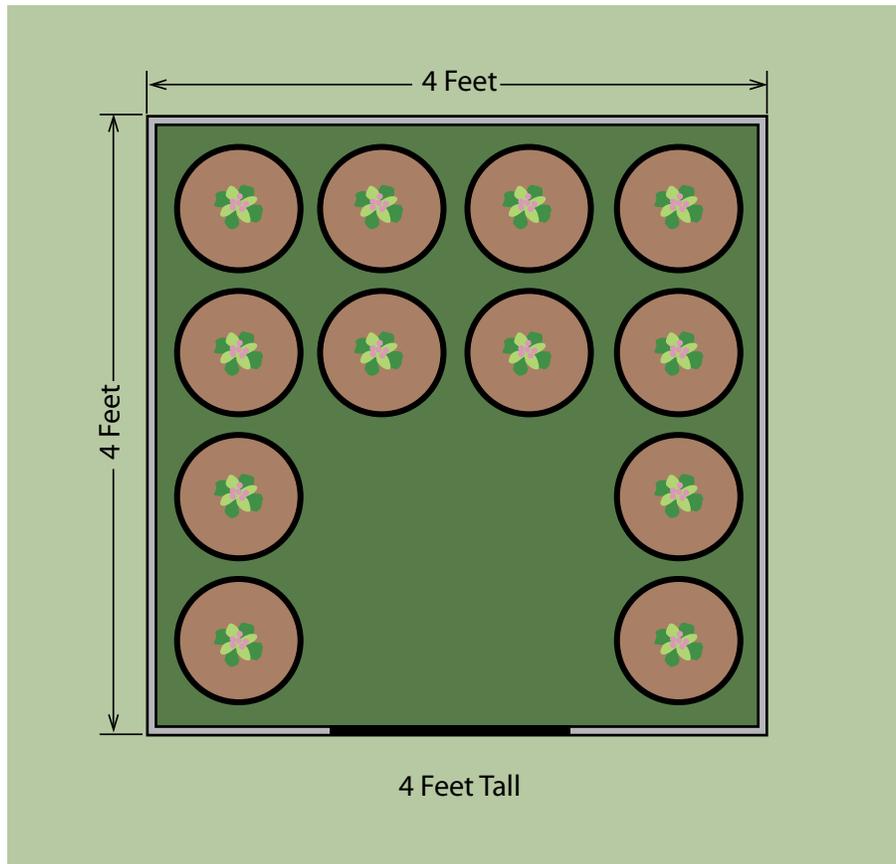
Enclosure Removal

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, only the wood chips or landscaping fabric should be left on your Monarch Zone site.

GARDEN CUBE 4' X4'X4'

12 Pots or Plants in the Ground



The blueprint shows 12 common milkweed plants, but you will add an additional 8 more tropical milkweed plants among them.

Flowerhouse SpringHouse, 6'x6'x6.5'

(Original 2016 Model)

- **Plant in 2-3-gallon pots or directly in the ground**
- **Use 32 common and 22 tropical milkweed plants. For existing operations, replace common milkweed as needed, and add 11 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.**

In 2016 Monarch Zones experimented with a 6'x6'x6.5' greenhouse design called SpringHouse to raise butterflies, and it went well. The SpringHouse model can be purchased online from dealers listed on our website:



MonarchZones.com. Home Depot and Wal-Mart also stock it online. In addition, the Monarch Research Station has a small inventory of the Flowerhouse Springhouse for sale at \$89 each.

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

Read "Preparing the Biotent Area" on page 6. Make sure that your ground site is a foot larger on all sides than the tent's floor, so 8'x8'. You can use either wood chips or landscaping cloth as a ground cover to prevent weed growth and make insect control easier. 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. See instructions that come with this enclosure.

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. For the best insect control, use large roofing nails to tack the inside ground flap to the ground.

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 wood chips or landscaping fabric should be left on your Monarch Zone site.

NOTE: This Custom Enclosure Is Not Available in 2017

Monarch Zones' New Custom 6'x6'x6.5' Enclosure

- **Plant in 2-3-gallon pots or plant directly in the ground.**
- **Use 32 common and 22 tropical milkweed plants. For existing operations, replace common as needed, and add 11 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.**

Because of some problems with heat buildup on hot days with the original design, we approached Flowerhouse about building a custom enclosure to our specifications, and they agreed. This new enclosure has the same design as the original, but this 2017 model is entirely covered in Super Screen, a very fine, strong mesh screen.

Monarch Zones is the exclusive dealer for this enclosure, and we'll keep it at a fair price. As a non-profit organization, we charge only for the basic production costs.



6'x6'x6.5' made with Super Screen

Super Screen is the strongest fine-mesh screen on the market

Difference between the two 6'x6'x6.5' enclosures for Monarch Zones operations?

With the new design, no added shade cloth is needed. With natural airflow and screen covering, it should stay at a comfortable temperature for Monarch Zones operators. And this model has only one door.

Watering will now be assisted by nature's rainfall. But all Monarch Zone operators need to check on plant water needs. Some additional water may be required for any outside enclosure.

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.

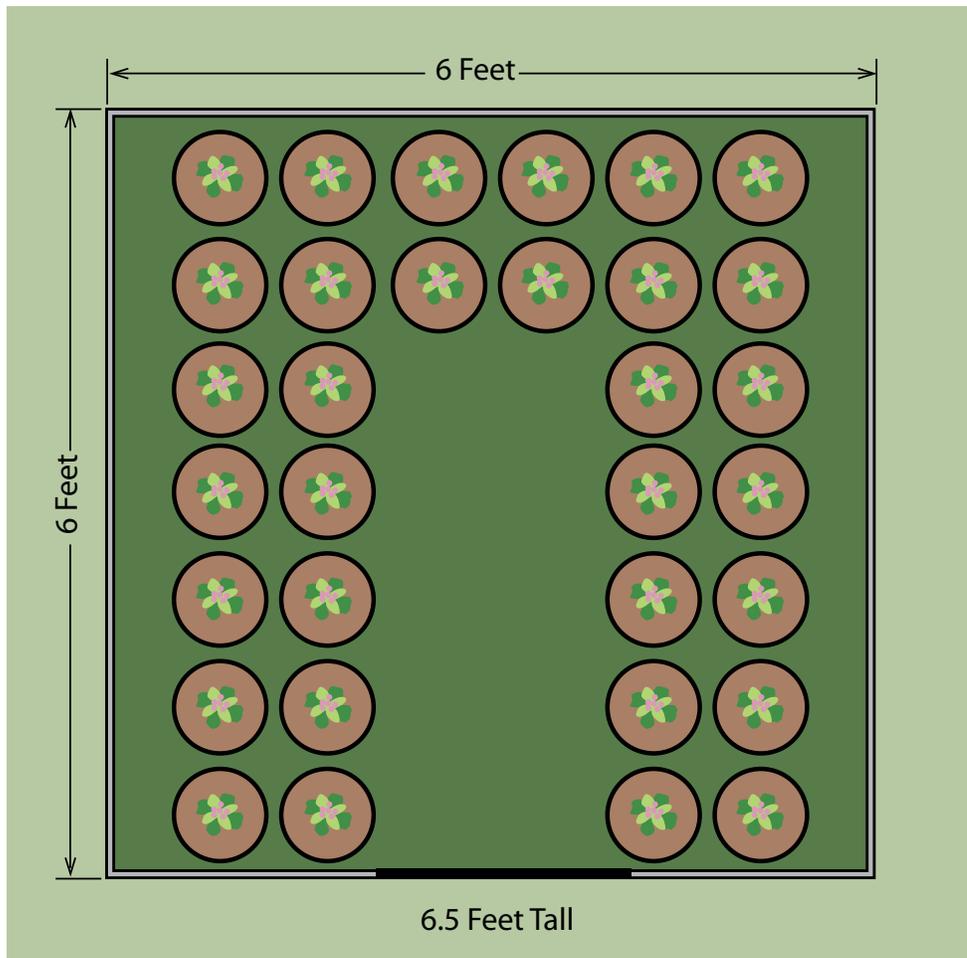
Enclosure Removal

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 wood chips or landscaping fabric should be left on your Monarch Zone site.

SPRING HOUSE 6' X6'X6.5'

32 Pots or Plants in the Ground



The blueprint shows 32 common milkweed plants, but you will add an additional 22 more tropical milkweed plants among them.

Monarch Zones' New Custom 8'x8' Hoop Enclosure

- **Plant in 2-3-gallon pots or plant directly in the ground**
- **Use 60 common and 34 tropical milkweed plants. For existing operations, replace common as necessary, and add 15 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.**

This beautiful hoop design is our mid-sized enclosure. We manufacture it in our production shop, and we will have 20 to sell. 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

Be sure to read "Preparing the Biotent Area" in this booklet on page 6. You will need to prepare a 10'x10' ground area for this hoop structure. You may use landscape cloth, but we prefer the use of wood chips for a weed barrier. You 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 wood chips or landscaping fabric should be left on your Monarch Zone site.

Prepare Enclosure for Winter

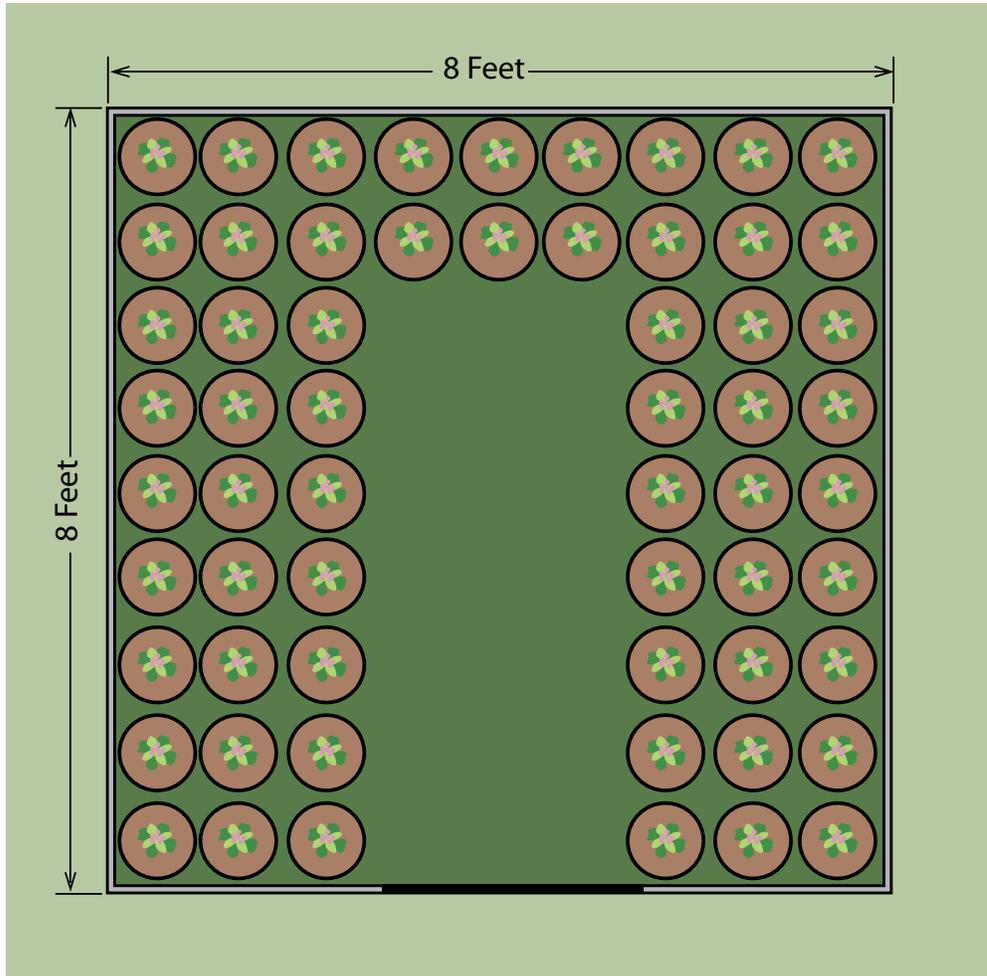
After all plant material and pupa shells have been removed, wash the enclosure, inside and out, using soap and water. Rinse using water from the hose. (The yellow Stanley sprayer from Menard's is an excellent tool for this purpose.) Mix a solution of 10% bleach and water and spray the inside and outside 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.

HOOP ENCLOSURE 8' X 8'

60 Pots or Plants in the Ground



The blueprint shows 60 common milkweed plants, but you will add an additional 34 more tropical milkweed plants among them.

Monarch Zones' Custom 12'x12' Hoop Enclosure

- **Plant in 2-3-gallon pots or plant directly in ground.**
- **Use 136 common and 85 tropical milkweed plants. For existing operations, replace common as necessary, and add 40 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.**

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.



Delivery

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

Site Preparation

Be sure to read "Preparing the Biotent Area" on page 6. Make sure that your ground site is a foot larger on all sides than the enclosure's footprint, so 14'x14'.

You may use landscaping fabric, but we prefer wood chips as a weed barrier. 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 wood chips or landscaping fabric should be left on your Monarch Zone site.

Prepare Enclosure for Winter

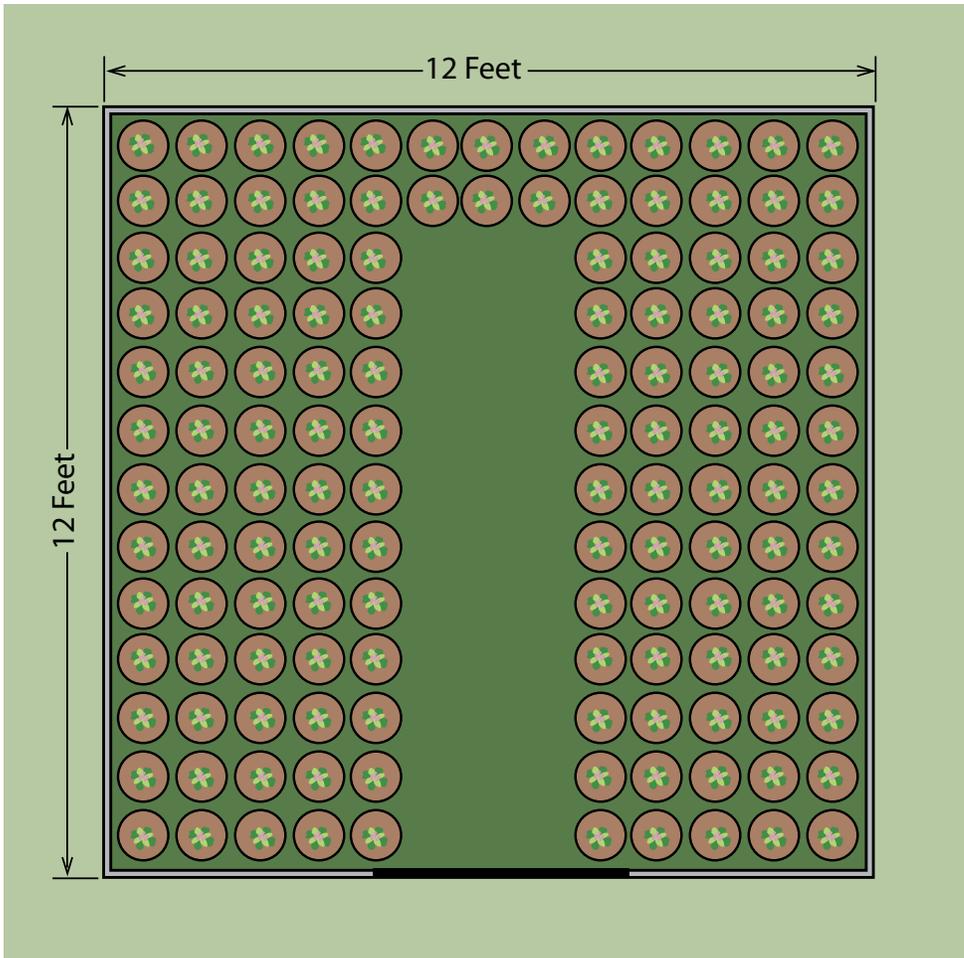
After all plant material and pupa shells have been removed, wash the enclosure, inside and out, using soap and water. Rinse using water from the hose. (The yellow Stanley sprayer from Menard's is an excellent tool for this purpose.) Mix a solution of 10% bleach and water and spray the inside and outside 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.

HOOP ENCLOSURE 12' X12'

136 Pots or Plants in the Ground



The blueprint shows 136 common milkweed plants, but you will add an additional 40 more tropical milkweed plants among them

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 a ground cover of natural woods chips, 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.

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 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 a leaf or plant 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 nectar flowers 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 eggs you received and the date you received them
- How many caterpillars formed chrysalises
- How many chrysalises died
- How many butterflies were released and the approximate date (week range)

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](http://www.monarchwatch.org). It's an all-inclusive site that covers every facet of the monarch butterfly.

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 Monarch



Female Monarch

~~~

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!

---

<sup>i</sup> Monarch images on page 36 courtesy of Wikipedia; Creative Commons Attribution – Share