Home Hydroponic Systems
Sarah Denkler, MU Extension Horticulture Specialist

Hydroponics is the process of growing plants in a sterile substrate or liquid, with added nutrients. This system is soilless. The immediate advantage is ‘no soil’ however this may not be less expensive depending on what media you use to support the plant. The basic plant needs still have to be met; air, light, water, nutrients and support. An aggregate system is useful for meeting these requirements and a good place to start for the beginner.

If you are starting seeds then you will need some type of media for them to germinate. This could be peat moss, sterilized potting mix in a mesh bag (panty hose) or you can splurge for oasis foam. If you are using transplants then you can use a plastic aquatic basket filled with coconut coir, oasis cubes, clay pebbles or peat moss.

The system will be based on the materials you have access to, what you want to spend, the number of plants you want to grow and where you want to grow them. Chambers can be set up outside where light and air are better available however temperature and weather patterns will vary as well as disease pressure. If the hydroponic chamber is inside where temperature (60-70°F) and light (6-8 hours sunlight per day) can be controlled, an ideal environment can be created to grow plants for a longer period of time than might be capable outdoors.

A chamber includes a container that must support water, the support system for the plant, including support media, a system to introduce nutrients (this could be your hand and a spoon) and a means of providing oxygen to the water. On a home system this could be accomplished with a pump that is used in a fish tank. Oxygen is required by roots to live and roots are required so that plants can take up nutrients and water. Your system will not function,
even when all material and nutrients are available, if the roots are not healthy.

The simplest system could be a Styrofoam cooler or Rubbermaid container with holes cut in the top, fitted with a container that allows water to penetrate from beneath. A support media will still be needed for plants that will allow for air and moisture to be available to plants. An oxygen pump (fish tank air pump) will be needed to provide oxygen to water. Another system could use either large diameter PVC pipe or gutters as the chamber with sterile potting media or oasis cubes as the support media. When placed on a slight decline, water containing nutrients, can be pumped by a submersible pump from a holding cell on the ground to the top of the incline where it will trickle through the media and back to the hold cell for recirculation.

Another option is to use a flood chamber. Plants are placed in a large tray using a supporting media. A water holding chamber is located below or to the side with a pump to move the water containing nutrients. The pump is on a timer and floods the flood chamber at regular intervals and the water drains back into the holding chamber. This system may not be right for the beginner but is a great way to do a higher number of plants. Because you are not using soil, it is important that you provide all necessary nutrients for plants. Most who study these nutrients agree there are at least 16 necessary. Fertilizer from a local box store will not be formulated for hydroponics, so another supply source will be needed.

As you can see, starting a system can be expensive. Costs are relative to the number of chambers created, their size and the type used. The time commitment and knowledge on nutrient deficiency symptoms can also be detrimental for some who wish to try this system of growth. Start with a small system and grow lettuce or herbs. As you gain experience, move to a larger system with a greater variety of plants. What you grow depends on what your goal is. Many people will grow vegetables because they are generally annuals (short lived) providing time for the system to be thoroughly cleaned before the beginning of the next season. Disease can be the biggest enemy in a hydroponic system so it is important to scout for fungal pathogens daily. This short lived cycle also helps with any changes in water pH. As nutrients are added, the pH will change and must be monitored, much like that in a fish tank. The longer the system is in place the more important it will be to monitor pH.

Sources for Aquaponics Materials:
American Plant Products and Services: www.americanplant.com
Horizon Hydroponics: www.hhydro.com
American Hydroponics: www.amhydro.com
Eco Enterprises: www.ecogrow.com
bettergrowHYDRO: www.bghydro.com
Worm's Way www.wormsway.com  800-274-9676
Crop King www.cropking.com  330-769-2002
Johnny's Selected Seeds  www.johnnyseeds.com  877 564-6697
Flowers and Ornamentals
♦ Watch for Frost heaving.
♦ Gently brush off heavy snows from tree and shrub branches.
♦ Limbs damaged by ice or snow should be pruned off promptly to prevent bark from tearing.
♦ On warm days, check to see if any perennials have been heaved by freezing and thawing of soil. Firmly press down any that have lifted and cover with at least 2 inches of organic mulch.
♦ Plan herbaceous flower beds now. Changes can be made early in the spring.

Vegetable Gardens
♦ Finish Keeping up the winter garden.
♦ Review your vegetable garden plans. Perhaps a smaller garden with fewer weeds and insects will give you more produce.
♦ As seed and nursery catalogs arrive, think of crops and varieties that you want for the upcoming garden season.
♦ Analyze last year’s planting, fertilizing and spraying records. Make notations to reorder successful varieties, as well as those you wish to try again.
♦ Before ordering new seed, do germination tests on seeds to see if the seeds are still viable.

Indoor Plantings
♦ Wash the dust off of house plant leaves on a regular basis. This allows the leaves to gather light more efficiently and will result in better growth.
♦ Start new plants from cuttings to revive overgrown plants.
♦ Try not to over-water plants during the winter months. Always check the soil for dryness before watering.
♦ If plants seem to dry out too fast, make sure they are sitting away from areas near heat vents or draftier areas.

Miscellaneous
♦ Take time now to relax and read all of those horticultural magazines and garden books that were put aside during the busy holiday season.
♦ Draw a map of your garden and make copies of it. Beds usually stay in the same place year after year, but the crops rotate each year. Each year, take a clean copy of the plan and fill it in and use the back of the plan to record notes. Keep each year’s plan in a three-ring binder for easy cross-checking of varieties, rotations, etc.
♦ It is time to start thinking FRUIT TREE MAINTENANCE. Plan to prune your trees and apply dormant oil in the next couple of months.
♦ When spraying fruit trees, make sure that you spray the whole tree and not just the part that you can reach.

My Toast For Your Garden in the New Year:
A garden that’s green,
Plant diseases unseen.
Weeds that don’t grow,
Only plants that you sow....
Seeds that grow true,
Insect pests few.
Gentle winds,
Gardening friends.
A garden that bears,
Healthy harvests to share.
This is my wish for you.
~Mother of a Hubbard (Cathy Rehmeyer)
Pruning is the judicious removal of shoots or branches of a plant to increase its economic value. Pruning plants allows you to:

- Improve survival chances at planting time
- Control size and shape, remove dead, diseased, weak or broken branches
- Sun and air penetration
- Maintain natural beauty
- Direct growth to utilize space efficiently
- Rejuvenate old plants
- Control flowering, fruiting, or colored twig effect in certain plants

The best time to prune is during the late winter or early spring, just before active growth begins. This is the best time to prune for several reasons:

- Wounds heal quickly when growth starts
- Undesirable branches can be seen easily without leaves to cover them
- The bark is less likely to tear when cuts are made
- The exception to this rule is spring flowering shrubs, because pruning can remove the flower buds. Prune these plants after flowering.

The following types of growth should be removed when pruning:

- Water sprouts and other vertical growing shoots
- Branches growing in toward the center of the tree
- The weakest of branches that cross over or rub other branches
- Downward growing or drooping branches
- Weakest of closely parallel growing branches
- Long slender growth in the inner part of the tree

There are many options for pruning tools. Use the one that is best suited to the branch you are pruning. The key is to make sure your tools are sharp so you can make clean cuts. Cuts that result in bark tears, stubs, or a jagged surface are slow to heal, or they may not completely heal over.

This is just an overview of basic pruning. Ornamental trees and shrubs are pruned a little differently than fruit trees, grapes and brambles. If you have questions on pruning a specific plant, contact your local extension specialist.
A Monarch (*Danaus plexippus*) floating on a summer breeze brings a smile to our face and joy to our heart. They are so beautiful and graceful as they glide and flutter. They are inspiring as symbols of rebirth and travelers on a great migration, but many are concerned about the Monarch’s future since reports began to indicate populations at their overwintering sites in Mexico are dropping. Estimates on the reduction average between 80 and 90% from populations 20 years ago.

The decrease in Monarchs is probably not due to a single issue but a combination of many including: use of herbicides on farms and roadsides reducing butterfly habitat, logging and industry in Mexico reducing habitat, and climate changes including severe weather. The 2012 winter in Mexico destroyed 500 million butterflies. Use of pesticides certainly has an effect also.

Loss of habitat really means loss of Milkweed which is the only host plant used by Monarchs. Host plants serve as a nursery for butterfly eggs and a food source for the caterpillars after they hatch. The female butterfly lays one egg on one Milkweed. She may lay over 400 eggs so she has to find 400 Milkweeds! Good thing she can find them from over a mile away. She can use her vision to locate the plants but also uses receptors in her antennae and feet. So, as you can see, without Milkweed we will have no Monarch butterflies.

After hatching on the Milkweed, the caterpillar will eat and grow, molting a few times, the last of which starts the chrysalis or pupa stage. The adult butterfly emerges from the chrysalis and after a few hours of drying, it unfurls its wings and begins to search for food. After a few weeks the cycle begins all over again with the laying of eggs on Milkweed. Only about 1% of those eggs will actually become an adult butterfly.

The Monarch selects Milkweed for a very special reason. In addition to being a good food source Milkweed offers extra protection. One of the chemicals in the white, sticky Milkweed sap is a glycoside that is safe for the caterpillar to eat, but a toxin to any bird that may eat the caterpillar. Birds quickly learn to avoid that caterpillar.

There are over 70 species of Milkweed and Missouri has several of these. The most prevalent are Common Milkweed (*Asclepias syriaca*), Swamp Milkweed (*Asclepias incarnate*) and Butterflyweed (*Asclepias turberosa*). Milkweed has adapted to a wide range of habitats from swamps to sunny prairies. Like many native plants its’ amazing root system enables it to survive in many different environments and weather conditions. Milkweed has a pretty remarkable way of spreading its’ seed. Each plant will grow pods which eventually dry and split open. Each seed inside is attached to a little fuzzy fluff which catches a ride on the wind until it falls to the ground and the seed starts its lifecycle all over again.

So, what can you do to help the Monarch? Include native plants like the Milkweed in your gardens and landscapes. There are so many reasons to do so besides helping the Monarchs and other pollinators. Native plants are hardy, require less care, less water, and last for years. Usually because of their hardy nature you use less chemicals which is good for the environment and us. Native plants help
Growing Winter Onions
Rennie Phillips, Scott County Master Gardener

As a boy growing up in Nebraska most everyone had a small patch of “winter onions” and rhubarb growing by the side of their garden. The winter onions are a subject unto themselves. The tops look a lot like your normal onion but they also resemble the tops of burn plants with a kind of thick hollow stem. When we moved here from Nebraska we picked the seed pods off the tops of a number of the onions and started a bed of winter onions here in Missouri.

You can virtually plant the winter onions at any time during the year with fall being the best time. You plant the onion bulbs about an inch or so deep and then mulch them with straw, say 3 inches of straw. They are cold hardy so all the straw is for is ground cover and a weed deterrent. I’d probably leave them for the first year to allow them to establish themselves. Then early in the spring (early March here in Missouri) you can begin to pull a few for green onions. You can use them to season soups or scrambled eggs just as you would green onions.

As the summer progresses they will grow 2 to 3 feet tall and a small set of onions will form on the tops of many of the onion stalks. These onions sets will contain many small onion bulbs from about the size of the eraser on a pencil up to dime or nickel size. Each onion set or top may contain 10 to 15 small onion bulbs. You can use these onion sets to season with or to plant more onions. I have mine in an 8 foot by 4 foot raised bed so they reseed themselves.

Late in the fall, say October or November, there will be a new growth of green onion plants. My winter onion bed is just full of green onions which are about the right size for green onions. These winter onions are very tough when it comes to cold weather.

Winter onions are much stronger then normal onions except in the spring and fall when they are real small. Green winter onions in the spring or fall are very similar in taste to normal green onions. But as they mature they become very pungent and very strong. About the only time I use my winter onions is early in the spring (March and April) and then in the Fall (October and November).

Plant Milkweed and Build a Village for Monarchs
Jamie Koehler, Cape County Master Gardener

...Continued from page 5 control erosion with their deep root system. The beauty they bring to the garden is many-fold as they are pretty on their own but they also attract colorful birds and insects. Many people will complain that native plants are invasive. Most, however, are easy to control with some effort.

Plant other varieties of native plants to serve as nectar or food sources for the adult butterflies. They love Purple Coneflowers, Black Eyed Susan, Blazing Star, and Buttonbush. Add a water source and you have created a haven for Monarchs. You can enjoy both the flowers and the knowledge that you are helping the Monarch.

For additional information about native plants check out http://grownative.org/.

For additional information about Monarchs check out http://www.monarchwatch.org/ OR http://missouriansformonarchs.blogspot
Upcoming Events

The following Master Gardener meetings are held each month. All are welcome to attend. Please contact your local extension office to confirm location if you did not attend the previous meeting.

- **Parkland MGs** - 1st Monday at 6:30pm, Horticulture Classroom at MAC, Park Hills
- **Poplar Bluff MGs** - 1st Tuesday at 6:00pm at Fist Episcopal Church in Poplar Bluff, MO (Do not meet in January)
- **Ste. Genevieve MGs** - 2nd Thursday, at 6:30pm, Ste. Gen. County Extension Center
- **Cape Girardeau MGs** - 3rd Thursday at 7:00pm, Cape County Extension Center
- **Perry MGs** - 4th Monday at 6:30pm, Perry County Extension Center

**January**

- 7-9  Great Plains Growers Conference in St. Joseph, MO
- 22  Hands-On Tree Pruning Workshop, Beggs Berry World, 190 Hwy 332 in Benton, MO (Bring Own Pruning Tools)
- 15-16  Ag Expo at Black River Coliseum in Poplar Bluff
- 23  Beginning and Experienced Beekeepers Class, 8:30 a.m. to 3 p.m., Mineral Area College, North College Center

**February**

- 7  Beginning Beekeeping Workshop, 8 am to 4 pm at the Butler County Extension Center in Poplar Bluff
- 9-10  Gateway Small Fruit and Vegetable Conf., O’Fallon, IL
- 13  Perryville Garden Symposium, Perry Higher Ed Center in Perryville, MO
- 13-15  Midwestern Herb and Garden Show at the Times Square Mall in Mt. Vernon Illinois
- 16  Master Gardener Training begins in Rolla, MO
- 24  Master Gardener Core Training at Butler County Extension Center in Poplar Bluff, MO

**March**

- 5  Parkland Garden Symposium, Mineral Area College
- 10  Farmers’ Market Workshop in Jackson, MO
- 12  Cape Girardeau Master Gardener Spring Seminar

Time to Turn in Master Gardener Hours
Donna Aufdenberg, MU Extension Horticulture Specialist

It is time to turn in your Master Gardener Volunteer Hours! If you have already completed your volunteer hours for the year, please get them reported online or send to your local Master Gardener Coordinator (addresses are located on the back of this newsletter).

- If you need a new copy of hour record sheet, you can find it at [http://mg.missouri.edu/mg forms.htm](http://mg.missouri.edu/mg forms.htm) or contact your local coordinator and they will send you one.

- **We are really encouraging the online reporting system this year. Check out:** [http://report.missourimastergardener.com/](http://report.missourimastergardener.com/)

- Every year we update the Master Gardener Directory. If you have not turned in Master Gardener Hours for 3 years, you will be moved to the inactive list.

- If you have not turned in hours in previous years and want to be active again, contact us!

- If any of your information has changed (address, phone, or email), please let us know.

These hours are important to us! They help ensure the continuance of the program.

If you have problems reporting hours, let one of us know...we are here to help!
African Violets come in many colors and varieties. They are very adaptable to most growing conditions which makes them a wise choice for novice and beginning gardeners.

They grow best when placed in bright, indirect light from a southeast or west facing window. While you can expect reasonable success if you grow African Violets in natural light, artificial light provides more better growing conditions. The most common cause of bloom failure is insufficient light. Thin, dark green leaves with long petioles indicates too little light whereas stunted plants with short petioles and small leathery leaves indicates too much light.

Violets grow best between 65 to 70 degrees F night temperature with a 10 degree increase during the day. Keep them away from chilly windows. Cold with cause them to turn dark, appear water soaked, and withered. If plants are placed in temperatures above 80 degrees F and sunrays are strong, leaves can scorch. Humidity is beneficial for growth.

Proper watering is one of the most important requirements for growing beautiful plants. Over watering can cause root rot and crown rot. Under watering can cause withering, browning and death. Watering methods differ from gardener to gardener. The main thing is to water thoroughly, and then allow the soil to dry slightly between waterings. Avoid getting water on the leaves and crowns.

Most water violets from the bottom because they believe the water damages the leaves. It is not the water itself but the temperature of the water that causes the damage. If you water with luke-warm water, there is no danger of damaging the leaves. Regardless of how you water, allow the plant to sit in the water of the saucer for no longer than 30 minutes to an hour...or however long it takes for the soil to completely moisten. Discard any excess water that remains in the saucer.

It is recommended to feed plants with a dilute fertilizer solution at each watering, however, over fertilization tends to be a problem with African Violets. A well balanced formula such as 20-20-20 is adequate for most growing conditions if the plants are actively growing.