

Hydroponics





FAIRBANKS SOIL & WATER
CONSERVATION DISTRICT

Fairbanks Soil & Water Conservation District promotes sustainable land development and works with private landowners to address their natural resource concerns. By partnering with local, state and federal organizations, the FSWCD provides education and technical assistance to private landowners with issues related to soil, agriculture, water, invasive species, forestry, land development, and other related natural resource issues.



Part of the National Agriculture in the Classroom Organization whose mission is to assist teachers in making students aware of the role of agriculture in our lives. Funded in part by the U.S. Department of Agriculture and each respective state, Agriculture in the Classroom programs serves students in grades K-12. Each program presents factual information about farming in their state.

Hydroponics

Hydroponics is a method of growing plants in water without soil.

The water must be enriched with nutrients and the plants need some type of inert medium to support the root system.

The essential ingredient is an oxygenated mineral-nutrient water solution that's circulated through plant roots.



Hydroponics works by providing a consistent complete nutrient mixture and water to the roots.



Large Scale Hydroponic Farming

Climate Controlled Agriculture

Large scale hydroponic farming is in use around the world to grow the produce that we eat.



Anchorage Greens



Chena Hot Springs Hydroponics

Small Scale Hydroponic Gardening

Small scale hydroponic gardens can provide folks with year-round food readily available in your home.



Hydroponic Grow Tower



Deep Water Culture Hydroponics

Advantages – Why Use Hydroponics?

Faster Growth

Plants get everything they need all the time, so they do not waste time or energy growing a lot of roots or searching for nutrients and can grow faster.



No Weeds/Reduced Pests

Gardening without soil eliminates the weeds so you do not need weed sprays.

Since most pests live and breed in the soil, there's usually no need to use pesticides or other toxic pest control chemicals.



Faster Growth More Harvest



February 4



February 17



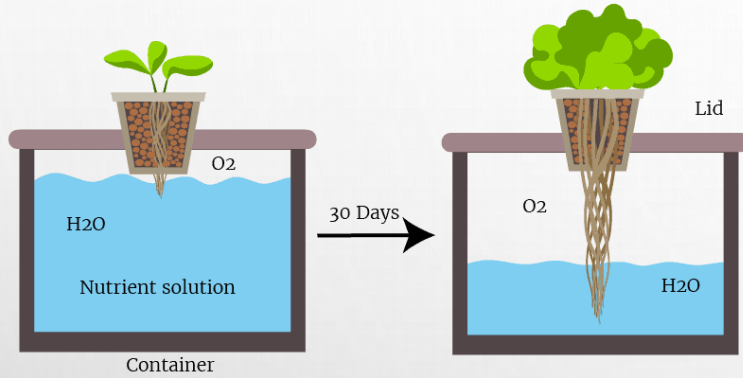
February 24

Disadvantages

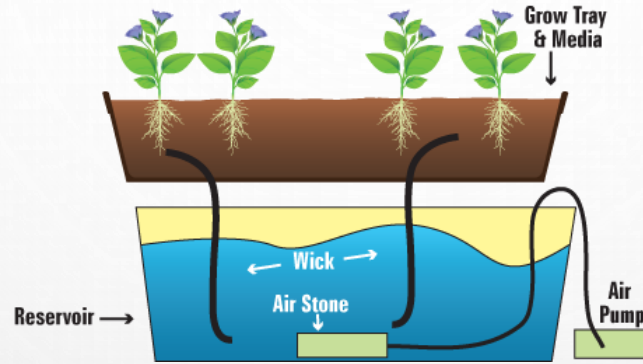
- Large system high energy costs can be prohibitive.
- Moisture from systems can cause damage to buildings. Fish tanks do this also. Mold, moisture spots, leaking systems onto floor.
- Specially formulated, soluble nutrients are needed in most systems.
- Pests and diseases can remain a big risk. Indoor plants can get aphids which transfer easily.
- Some water born diseases can spread rapidly in recirculation system if not monitored correctly.

Types of Hydroponic Systems

Kratky



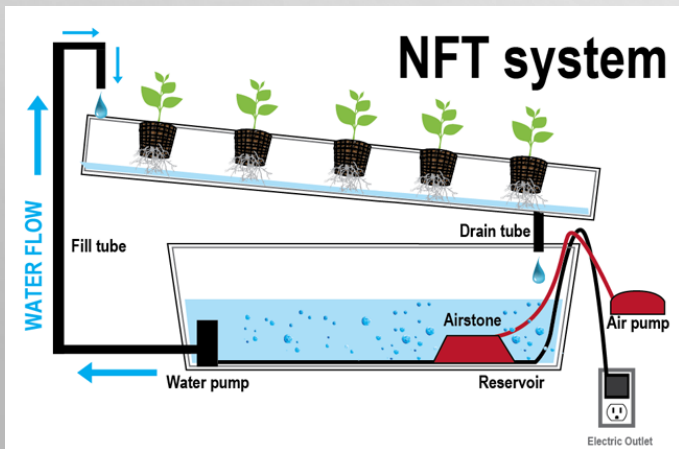
Wicking



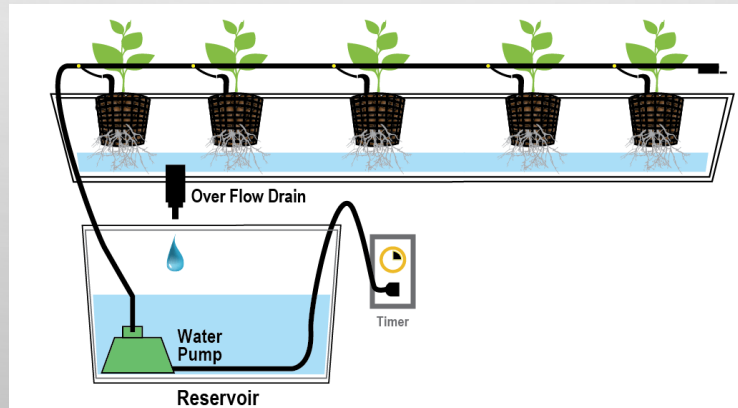
Deep Water Culture



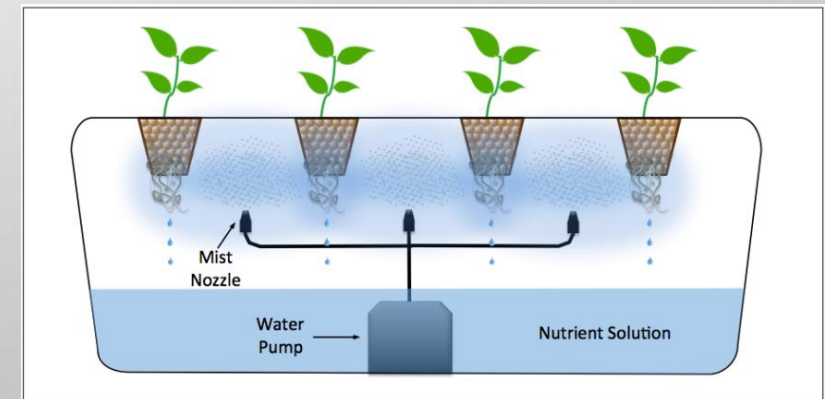
Nutrient Film Transfer - NFT



Continuous Drip



Aeroponic



Passive vs. Active

- **Passive systems** (no moving parts) are great for beginning hydroponics gardeners because they are inexpensive, portable, and simple to set up.
- **Active systems** employ pumps to move water and deliver nutrient solutions to plant roots.

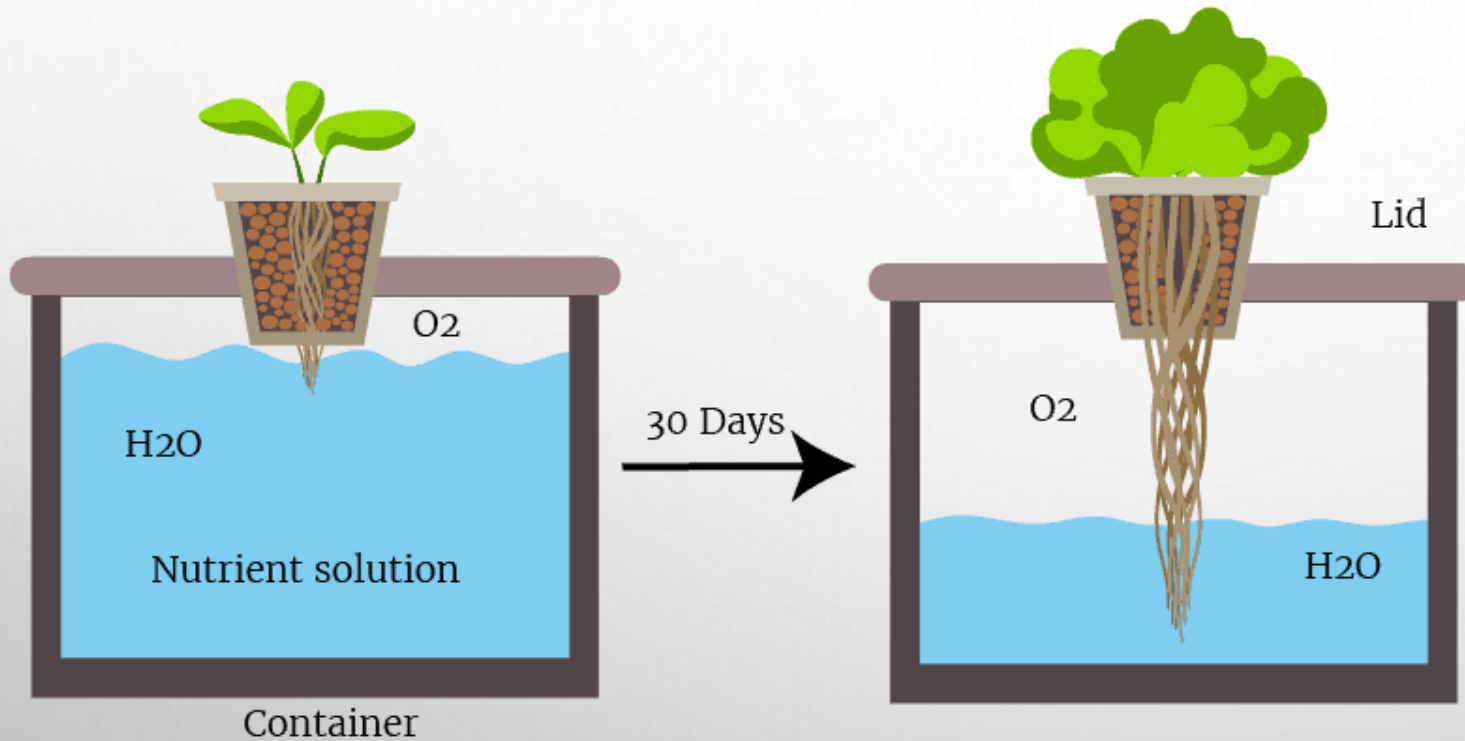


vermontpassive.com



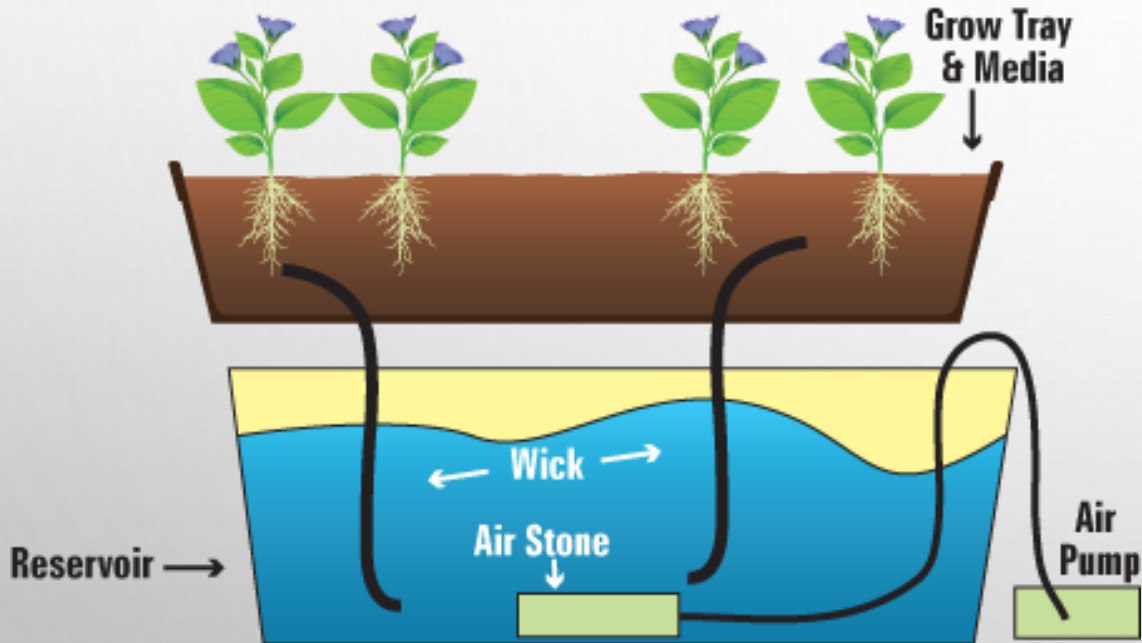
basichydroponicsystems.files.wordpress.com

Kratky System

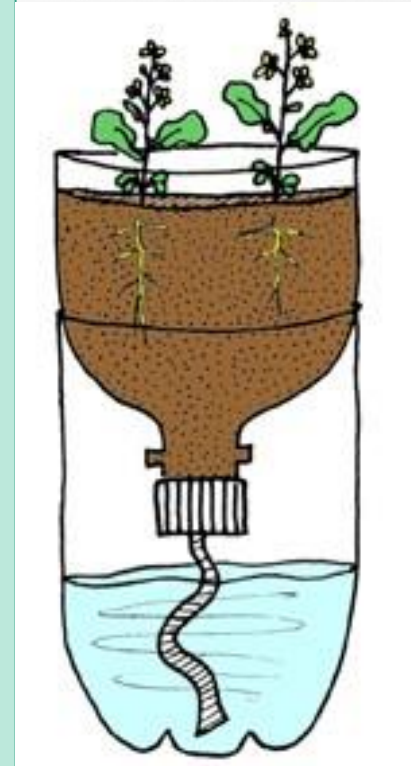


- Simple Passive System
- No Moving Parts
- No pump or moving water
- Nutrient Solution Delivered directly to roots

Passive Wick System



- Simple System
- No Moving Parts
- Nutrient Solution Delivered with a Wick
- Plants may use the water and nutrients faster than the wick can supply it.



Deep Water Culture Systems

- Plants grow on platform with roots suspended into solution
- Air bubbled into nutrient solution to provide oxygen for roots



Deep Water Culture in a Fish Tank



Deep Water Culture System In a Plastic Storage Tub



Foam and Net Pots

- Net cups are perfect for starting seeds, cuttings and are used in many hydroponic systems.
- Cut the styrofoam sheet in a rectangle $\frac{1}{2}$ less than the size of the opening all around to allow for the platform to float freely and not bind with the sides of the aquarium.
- Cut holes in the foam the size of the net pots.
- Place net pot in hole to make sure that it fits snugly.



Air Pump

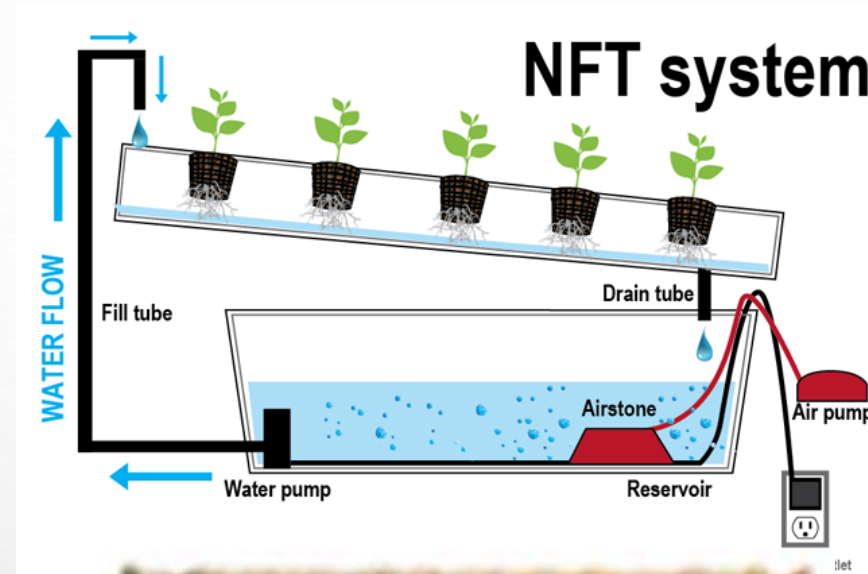
Air movement is vital to root development!

Set up your air pump, line and air stone in the bottom of the aquarium or tank.



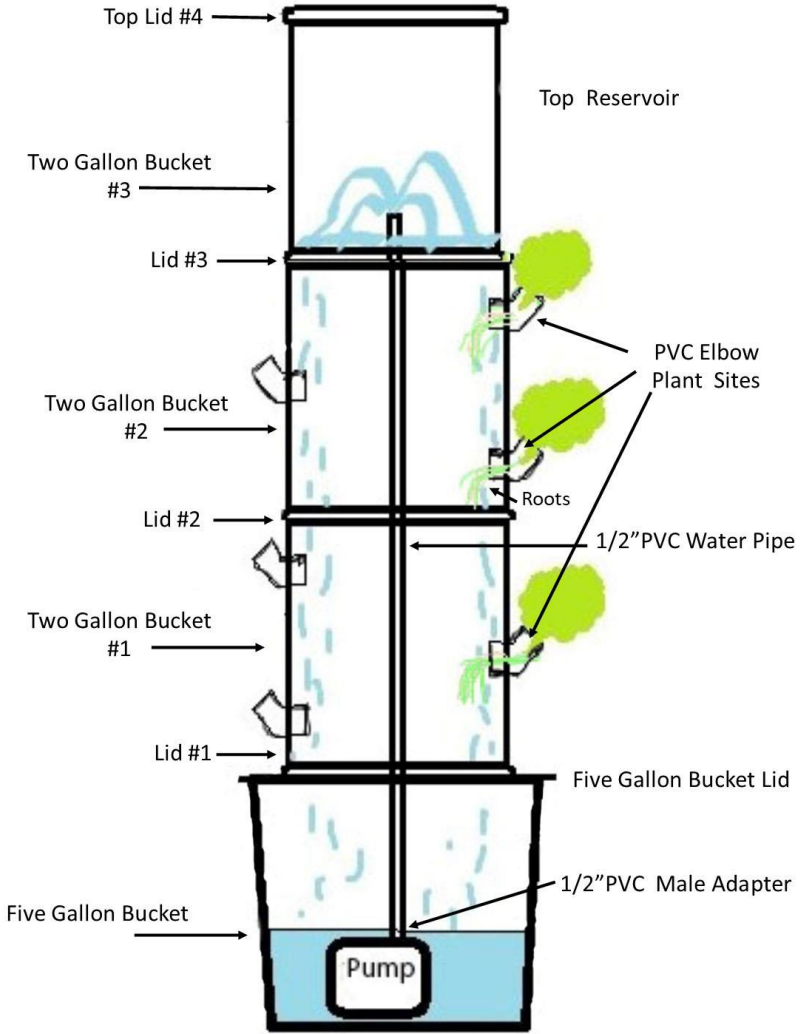
Nutrient Film Technique Systems -NFT

- Also known as gutter hydroponics.
- Nutrient solution washed onto plant roots.
- Reservoir contains nutrient solution which is pumped through system using a water pump.





Small Hydroponic Grow Tower – Vertical NFT

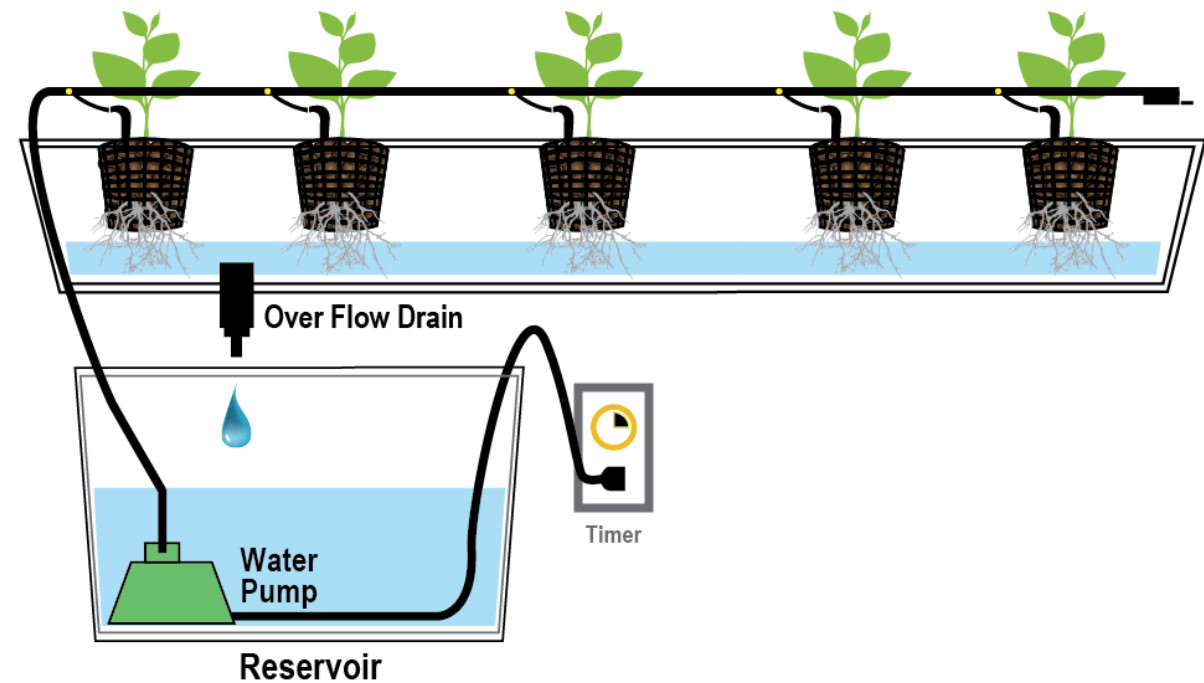


Continuous Drip Systems

- Nutrient solution dripped onto plant from a line either above the plant or sitting on the grow medium.
- Water and nutrients in separate tank pumped through system.



Drip System



Aeroponic systems

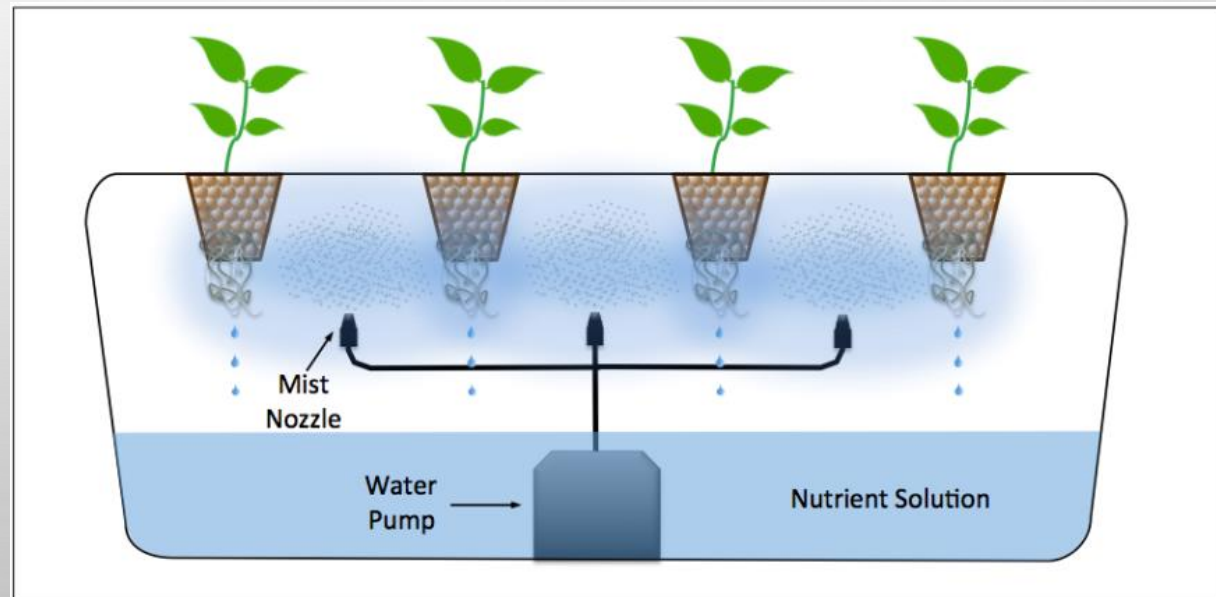
- Nutrient solution sprayed or misted onto roots in growing chambers where roots are suspended in air.
- Used in many grow tower commercial systems.
- Nutrient solution can be in a grow chamber or outside.



icangarden.com

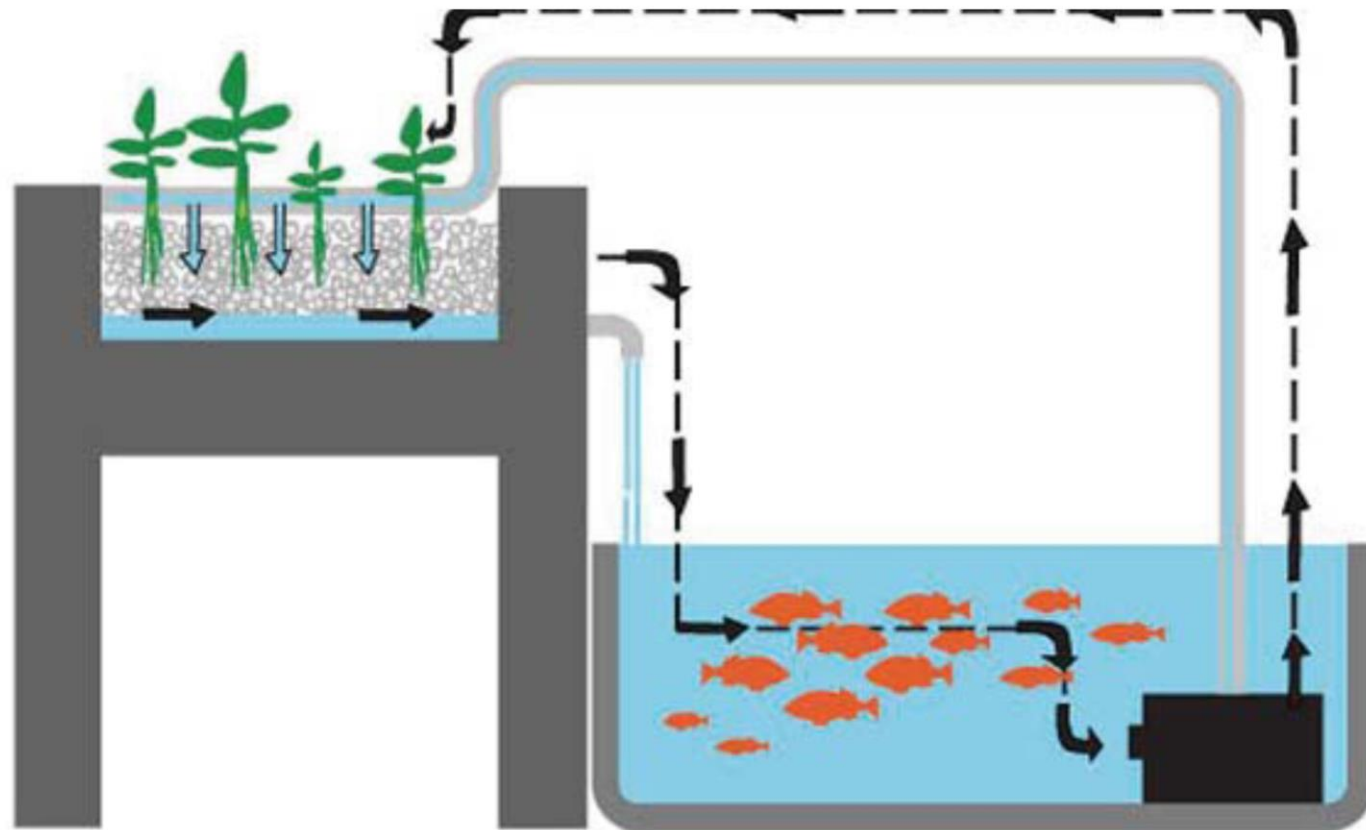


aerogarden.com



Aquaponics System

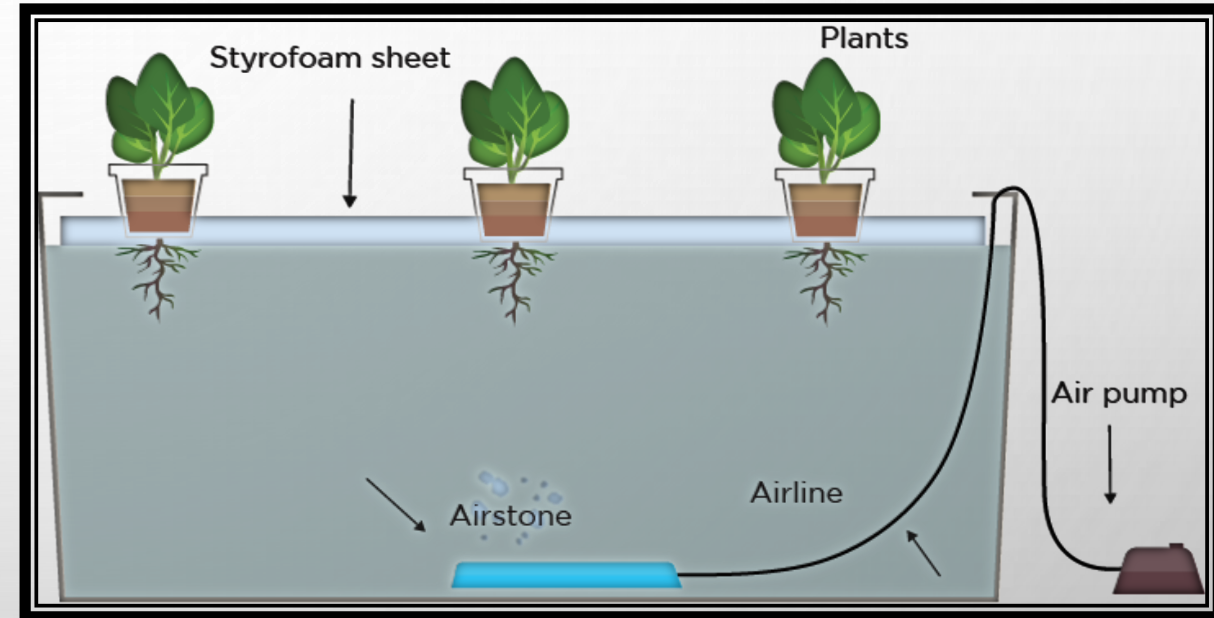
Aquaponics is a method of growing fish and plants in a recirculating, symbiotic, constructed system.



Plant Needs – What to Consider When Growing

What is needed for a plant to survive? Think **LAWNSS**




- Light – sunlight or equivalent
- Air – CO₂ and Nitrogen and Oxygen
- Water
- Nutrients –NPK and Micro
- Space
- Support – Media for stability



Nutrients

- N- Nitrogen for the production of leaves, stem growth, and building plant cells.
- P – Phosphorus for the development of flowers, fruits, and healthy root growth.
- K – Potassium for photosynthesis



HEALTHY FOLIAGE	N	
STRONG ROOTS	P	
HEARTY GROWTH	K	

Important Micro Nutrients

- Sulphur to heighten the effectiveness of phosphorus and for plant energy.
- Iron for the production of chlorophyll.
- Manganese for the absorption of nitrogen and energy transference.
- Zinc for energy transference.
- Copper for producing chlorophyll.
- Boron for cell wall stability.
- Magnesium for producing chlorophyll and distributing phosphorous.
- Calcium for root growth and the absorption of potassium.
- Chlorine for photosynthesis.
- Molybdenum for assistance in chemical reactions.

Different Types of Lighting

1. Fluorescent somewhat energy inefficient, must be kept close to the plants. Not the best option but in a pinch they will work.

2. LED Lights – Energy efficient, low heat output, long lasting, low cost. Look for lights that say Plant Light. Absolutely recommended for optimal successful growing.

Lights must be kept on a consistent schedule. A timer is a very good idea. 12 hours on and 12 hours off for leafy greens is optimal.



Why Can't I Use Just Sunlight?

- You could place plants in direct sun in a window, but unfortunately that often isn't enough for proper growth especially in the winter/early spring months in Alaska.
- It isn't a good idea to rely just on sunlight for any kind of indoor gardening because it causes unusual plant growth. It causes leggy plants that reach for the sunlight to survive and waste energy.
- Window light is inconsistent.



Lighting for Grow Towers



Lighting for Deep Water Culture Systems



Constructed using PVC Pipe and Chains

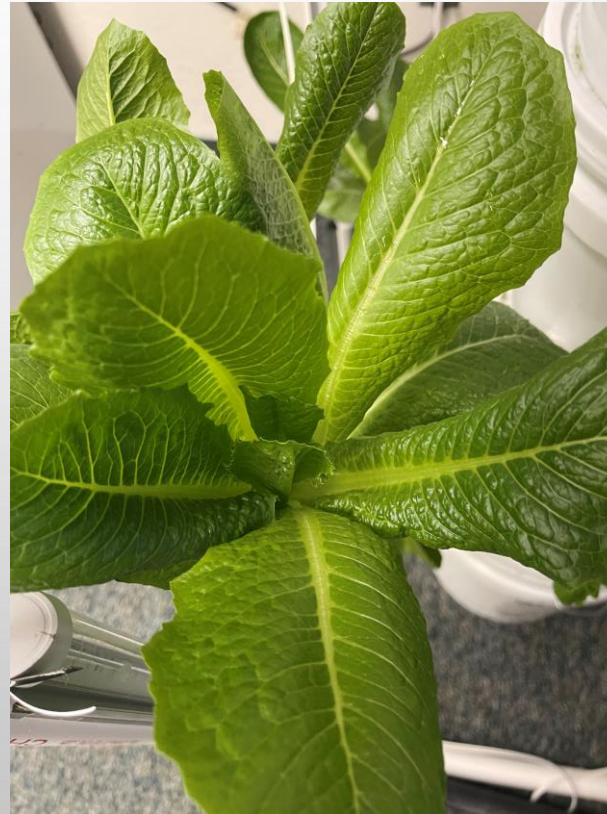


Using a fish tank light

Plants – What Should I Grow?

- Lettuce is easiest
- Kale, other leafy veggies
- Leafy Herbs
- Cucumbers
- Strawberries
- Peppers and Tomatoes (expert, DO NOT start with them)

Grow what you want to eat!



Starting Seedlings



Start seeds in a tray before placing into any system.

Peat plugs and rock-wool are the most popular mediums for germinating seeds.

Keep media moist by adding water to tray or lightly spraying from above daily.

Hydroponic Grow Media

Media: substance or material in which something exists or grows, from the soils and other materials for plant growth.

Rooting Plugs



Hydroclay Stones



Rock Wool



What is Rockwool?

- Rockwool is made from rock which has been melted and spun into fibrous cubes.
- Rockwool is a form of Perlite in which the pebbles or rocks anchor the plant down so they don't just float up above the water.
- Rockwool is the most popular medium for germination seeds hydroponically.



Rooting Plugs



Made with fine sphagnum peat moss with a compostable glue.

Starting Seedlings on Shelves



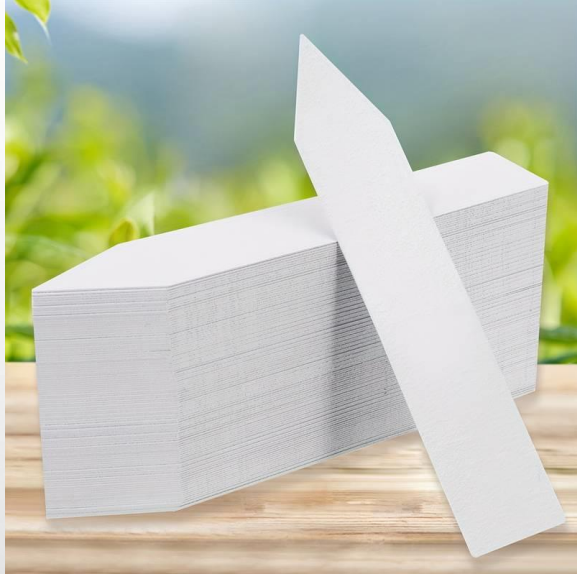
Lighting for Seedlings

Have lights on a chain with S-hooks to keep lights within 4" of plants.



Biggest mistake new gardeners make is not having the lights close enough to the seedlings.

Other Items You'll Need



1. Labels and Label Maker
2. Timer for Lights
3. Water Pitcher
4. Trays and Six Pack Containers
5. Mister



Maintenance

- Monitor Water Levels DAILY!!!! For the tower, look in the hole for the plug or take the bottom lid off.
- Check your pH levels at least once a month to maintain proper growing environments for your plant.
- Watch plants for changes. If leaves turn yellow, adjust/ increase fertilizer.
- Watch for pests.
- Keep lights in good working order. Keep clean as possible.
- Clean tank/bottom bucket at least once every 3-4 weeks, to keep algae growth to a minimum.
- Keep heat consistent as possible. Don't put near a window if possible.



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