FAIRBANKS SOIL & WATER CONSERVATION DISTRICT

Large Deep Water Culture Hydroponic System

Materials Needed: (specific recommendations at end)

- Large Metal Shelf
- 2 Heavy Duty Sleds or large 6-10 ”deep bins to fit on shelf
- Closed Styrofoam sheet (2ft x 8ft, 1 inch thick)
- Power drill with ¼ drill bit and hole saw bits 1/2” and 1 5/8” sizes and screwdriver bits
- Rain barrel Bulkhead Kit and ¾ barb hose connector
- Metal hose clamps and Screwdriver
- Heavy duty Scissors and Box Cutter
- 1”(3/4” inside dimension) Flexible hose – drinking water s
- 4 large cylindrical fish tank air stones
- 4-Port Air Stone Pump
- ¼ inch air stone tubing
- 1 Submersible pump – 480 gpm
- Sharpie
- Zip Ties
- Grow lights: 8-12 four-foot LED Lights
- 20-30 feet of 1” PVC Pipe for Light Structures
- 8-12 1” 90° PVC Elbows
- Small link Chain for Light Structure
- 16-24 metal S hooks
- Power Strip and 1-2 Extension Cord
- 1” Rockwool cubes
- 1” Net Pots
- Plant seeds
- Hydroponic nutrients

Net pots

Rockwool

Air Stones

Air Stone Pump

Hose

Submersible Pump

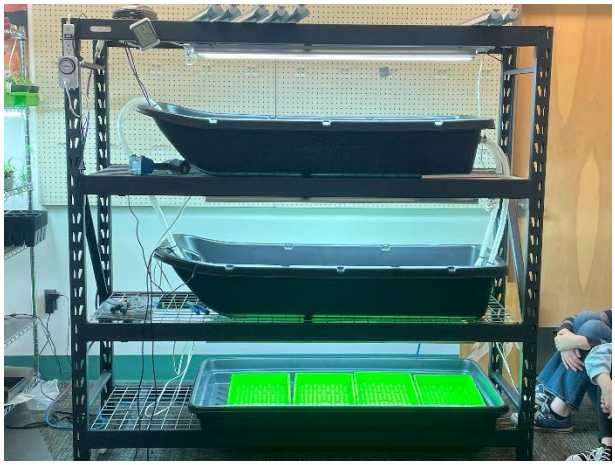
How Deep Water Culture Hydroponics works:

This type of hydroponics is known as deep water culture hydroponics. This hydroponic method of plant production is done by means of suspending the plant roots in a solution of nutrient-rich, oxygenated water. Traditional methods favor the use of plastic buckets and large containers with the plant contained in a net pot suspended from the center of the lid and the roots suspended in the nutrient solution. The solution is oxygen saturated by an air pump combined with porous stones. With this method, the plants grow much faster because of the high amount of oxygen that the roots receive. – Wikipedia

Procedure:

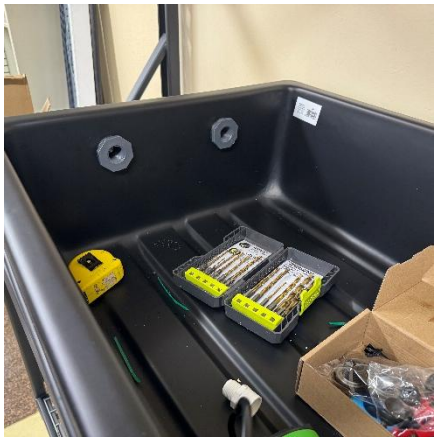
1. Gather all supplies and lay them out.

2. Assemble the metal shelf, use only 3 shelves for adequate spacing. Be sure to give two of the shelves (the ones the sleds will go on) larger spaces, have one shelf on top. You can chose to add a 4th shelf to have a seedling shelf, spaced around 10 inches either on the top or on the bottom.



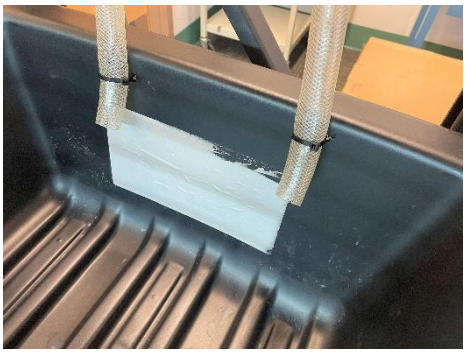
3. Place the sleds on the shelves. We have found that having the sleds facing opposite directions is optimal for placing the plumbing parts for adequate water movement.

4. Mark and drill 2 holes along the flat side of **one** sled (the one on top) for the rain barrel bulkhead plumbing parts with the 1 5/8" hole saw. Attach the plumbing parts.

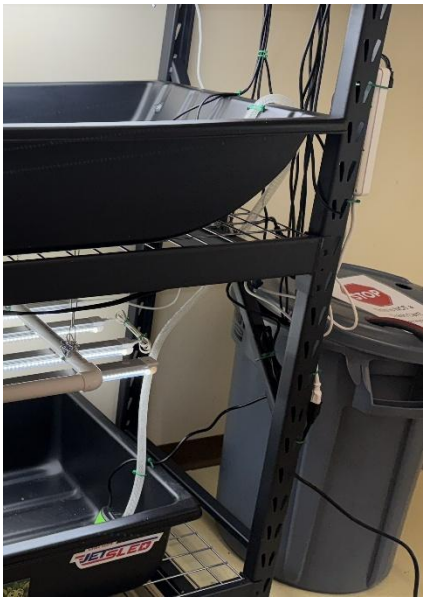


5. Attach the 1” flexible hose to the bulkheads using the ¾ barb connector and the metal hose clamps. Guide the tubing around the edge of the shelf to the bottom sled. Using the ¼” drill bit, drill holes in bottom sled or tote 1” below the top edge and attach hoses with zip ties. Cut excess hose to 1” below the zip ties. (see photo on the right)

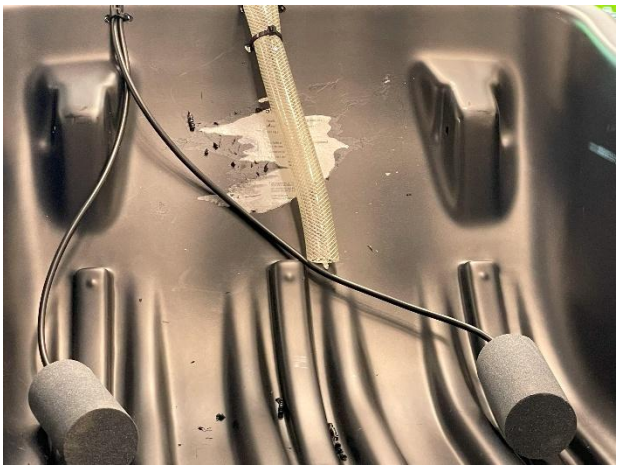




6. Attach a 5 foot length of the 1” hose to the submersible pump using the adapters that come with the pump. Place the pump and hose in the bottom sled. Feed the hose to the top shelf. Attach to both the sleds using Zip Ties.

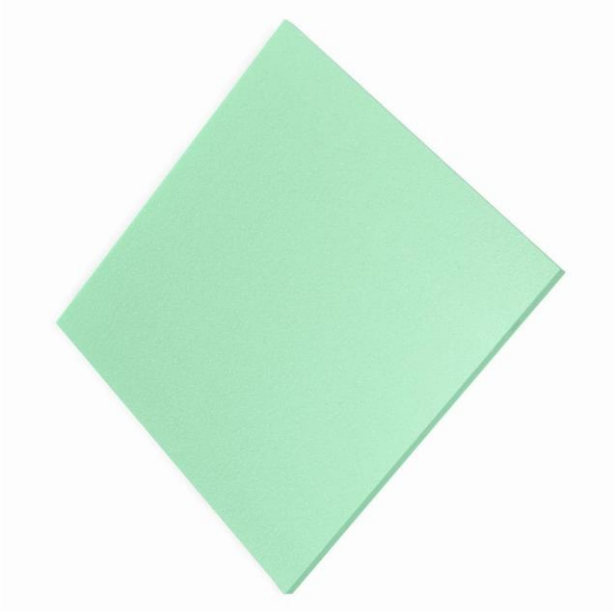



7. Rinse the air stones in a separate bucket. Cut four lengths of 4-5 feet of ¼” tubing. Attach one end of tubing to each one of the 4 ports on the 4-port air pump and attach the other end to the stones. plug in the air pump to outlet, make sure that there are bubbles coming from the airstone. Note: **NEVER submerge the 4-port air pump in water as electrical shock will occur.** Lay two in the top sled and two in the bottom sled. Attach the hose to the sled with a zip tie.

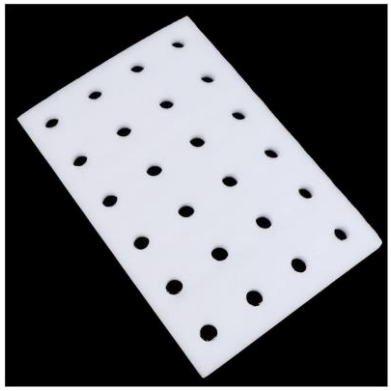


8. Cut the Styrofoam board to fit the opening of the sled or tote using a box cutter. Cut the foam a ½ inch smaller than the opening of the sled or tote so that it can float free as the water level changes.

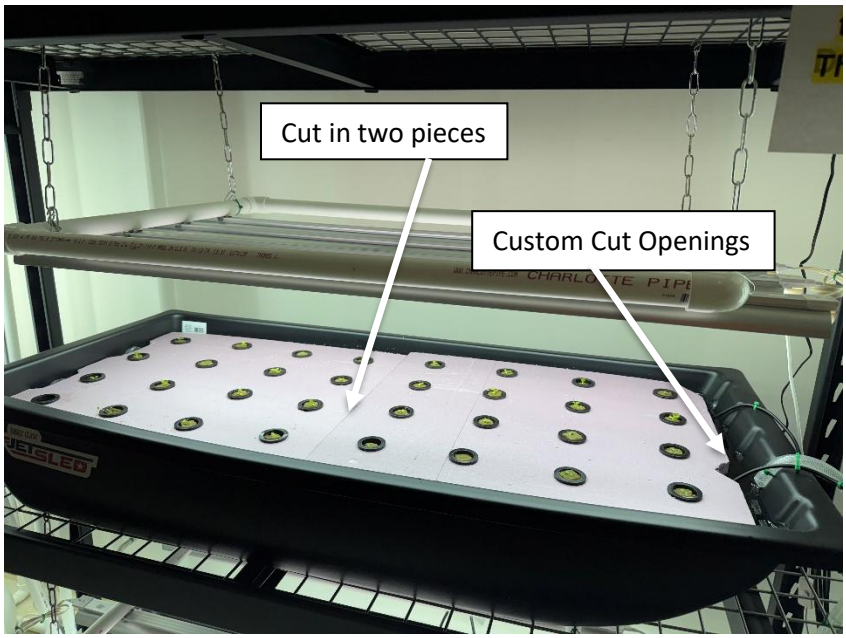
9. Trace the net pot opening diameter on to the Styrofoam panel by placing top side down and trace with the sharpie.



10. Cut the holes in the Styrofoam panel to the proper size for the plastic cups or net pots using with the 1/2” hole saw drill bit (pic is not 1/2” hole saw). Use a grid pattern where the holes are 5 inches apart from each other.



11. Cut the larger panel in two down the middle so it is easier to pull out the panels with plants in them. Fill the sleds or totes with room temperature de-chlorinated water to 3 inches below the rim. Place the panels in the sleds to check the water level. You will also want to cut out custom openings where the hoses are.



12. Turn on the airstone and submersible pumps. See how the circulation is working. Adjust the position of the hoses or water level if necessary. Run the system for at least 24 hours to aerate the water and allow you to see if you need to adjust water levels.

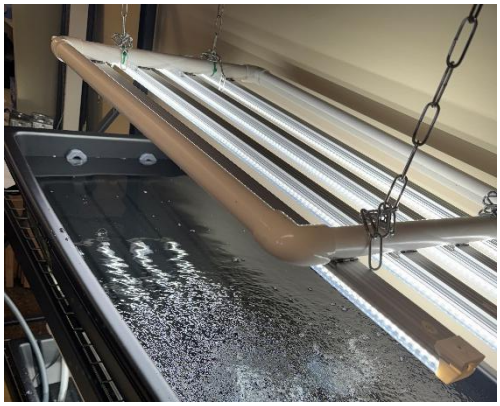
13. Once the system is ready, add the light structures to the shelves above the tanks. See assembly instructions below. Add a timer and set the timer so the cycle of light is 12 hours on and 12 hours off. (DO NOT use a timer for any of the pumps) Turn on lights and check timer to make sure it is set correctly.

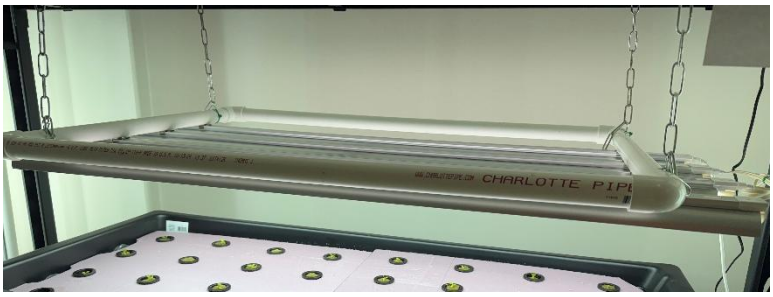
14. Add nutrient mixture to water in the bottom sled or tote. Read directions on the nutrient container for exact amounts to add based on the gallons of the tanks.

15. Place the net pots into the holes on the styrofoam panel. Add seedlings you have started ahead of time.

16. Weekly maintenance will be required may include adding water and monitoring plants for obvious stress signs (yellowing leaves, curling leaves, brown edges) and adjust nutrients as necessary.

Building the Light Structure





You can build two or three light structures depending on if you want to have a seedling shelf in the system.

PVC Pipe Light Structure for each lighting unit (1 per shelf):

1. Cut two 3 foot lengths of 1” PVC pipe. Then cut two 2ft lengths of PVC pipe.
2. Connect all the pipe using 90° elbows.
3. Assemble the 4 foot lights. If your lights come with side diffusers, you don’t need to use them.
4. Lay 4 lights down on the PVC structure you just assembled so that they are equidistant Using a sharpie, mark where each light sits.
5. Using the drillable brackets and screws that come with the lights, attach two brackets per light to the PVC structure.
6. Connect the lights using the cords with just one outlet cord on the last light. Connect cords should come with your lights.

7. Attach 4 lenghts of the chain to the light structure. Suspend the lights above the plants from the shelf above using S hooks. Raise the lights as the plants grow.
8. Plug the lights into a timer. Set the timer to 12 hours on and 12 hours off.

Seedling Preparation:

Start seeds in the rockwool or rapid rooters before you put together the system. Start your seeds in rockwool sheet in a 10-20 planting tray. Place them under lights on a shelf for 2-3 weeks before you intend to put them into your system. Plants should be grown on a shelf with lights at most 3" from the container they are grown in. Wait until they have sprouted their second set of leaves before adding them to the system. Be sure to label your plants.

Maintenance and Feeding Instructions

1. When you notice the water level going down significantly, add more water. Add nutrients but only about half of the recommended nutrient per gallon of water to prevent overload of nutrients which will affect your plants negatively.
2. Monitor plant growth and harvest when the plants are big enough.
3. When you are ready to start a new batch of plants: remove the water out of the system using a pitcher or cup. Wash the foam boards to remove algae growth before starting again. Wipe algae off the walls of the sleds. Wipe down the lights with a rag to remove any residue. Refill the tubs with fresh water. Let the new water and nutrients run for at least 24 hours before adding the plants.

Links to Recommended Supplies on Amazon

Flexible Hose and Clamps
¾" ID X 1" OD- 50 Ft High Pressure Braided Clear PVC Vinyl Tubing Flexible Tube, Heavy Duty Reinforced Hose Tubing, BPA Free and Non Toxic

Rainbarrel Bulkhead Kit
2 PCS Rain Barrel Bulkhead Fitting kit with Plugs and Hole Saw Tool, ¾ Inch PVC Spigot Connector Kit for Rain Barrels Water Tanks Pools Aquariums Tubs (Bulkhead ¾ Inch)

¾" Barb Connector
3/4" Barb x 3/4" NPT Male Connector, Plastic Hose Barb Fitting, Adapter, Industrial Hose Barb to Pipe Fittings Connect

Lights
Barrina LED Shop Light 4FT, 40W 5500LM 6500K, Clear Cover Linkable Tube, Integrated T8 Fixture, V Shape Ceiling Light for Garage, Warehouse, Workshop, 10 Packs

Submersible Pump
VIVOSUN 480GPH Submersible Pump(1800L/H, 25W), Ultra Quiet Water Pump with 7.2ft High Lift, Fountain Pump with 5ft Power Cord, 3 Nozzles for Fish Tank, Aquarium, Statuary, Hydroponics Black
4-port Aquarium Air Pump
YT-304 18 LPM Aquarium Air Pump with 4 Outlets, 8.5W, 120 Gallon Grey

Air Stones
AQUANEAT Aquarium Air Stone 4x2 inch 2 Pack, Large Airstone, Aerator Bubble Diffuser, Air Pump Accessories for Aquariums, Hydroponic, Ponds and Fish Tanks