# Home Hydro Systems

## In ground (Geothermal Energy) nutrient reservoir

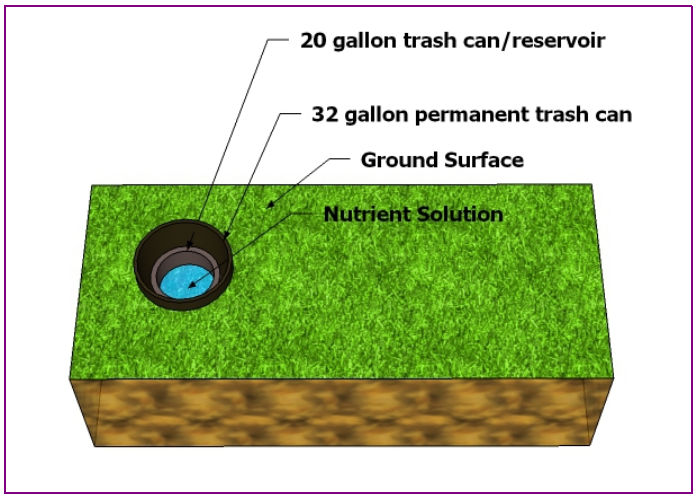
Geothermal Energy is free energy. Meaning the exchange of heat that's provided by the earths soil, is free. In hydroponics it's common to keep the nutrient reservoir underground, and has been done for years to help keep the nutrients cool. In order to get the full effects of Geothermal Energy there are a few things to consider.

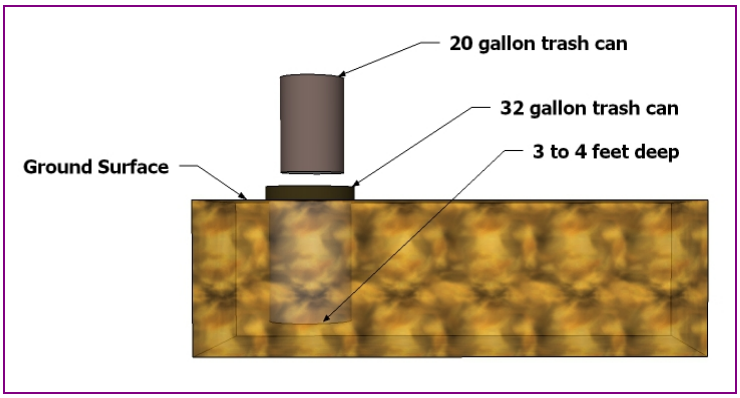
1. There should be no air between the sidewall of the reservoir and the ground. Air is an insulator and will insulate the reservoir from the ground therefor insulating it from the Geothermal Energy. Basically the heat wont be able to be extracted from the reservoir into the ground efficiently.
2. For best effects it should be at least 3 feet deep. The underground temperature of the earth remains constant thought the year. The underground temperature is insulated from the above ground temperatures by the Earth's crust. Typically 3-5 feet is enough, although in places of permafrost, it should be placed deeper than the deepest permafrost.
3. Everything above ground should be insulated to prevent the absorption of heat when you pump the nutrient solution through the system. You don't want the above ground tubing/piping that the nutrients are flowing through to get hot and allowing the nutrients to heat up on its way to and from the plants. That would defeat the purpose of keeping them underground in the first place.

## In ground Reservoir

With hydroponics it is important to design things so they are easy to use and easy to clean when needed. This is one example of a nutrient reservoir that addresses the issues above, but allows for easy access and cleaning.

Dig a hole large enough to to place a 32 gallon trash can in the ground at least 3 feet deep. Fill in the sides around the 32 gallon trash can with soil. This container/trash can will be permanently in the ground and makes direct contact with the earth (no air gaps). The 20 gallon (smaller) trash can will sit inside the larger one and will be the nutrient reservoir.




The smaller 20 gallon container/trash can will allow you to easily take it out for cleaning while leaving the larger container in direct contact with the ground.

(**Note:** these container sizes are not set in stone. The idea is to have one that is permanently in the ground, and another one that will fit inside of it that can be easily pulled out for maintenance.)

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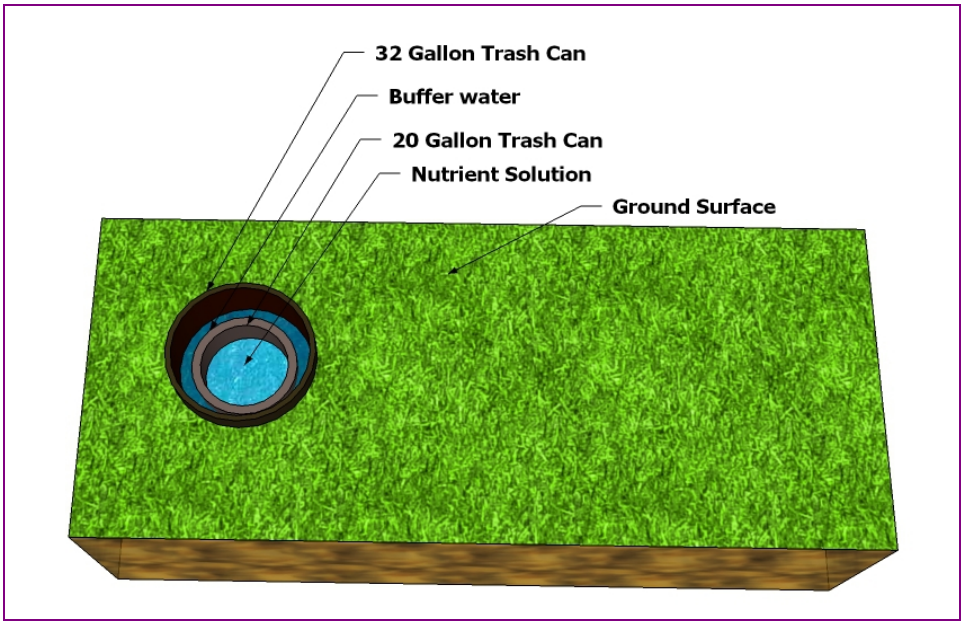
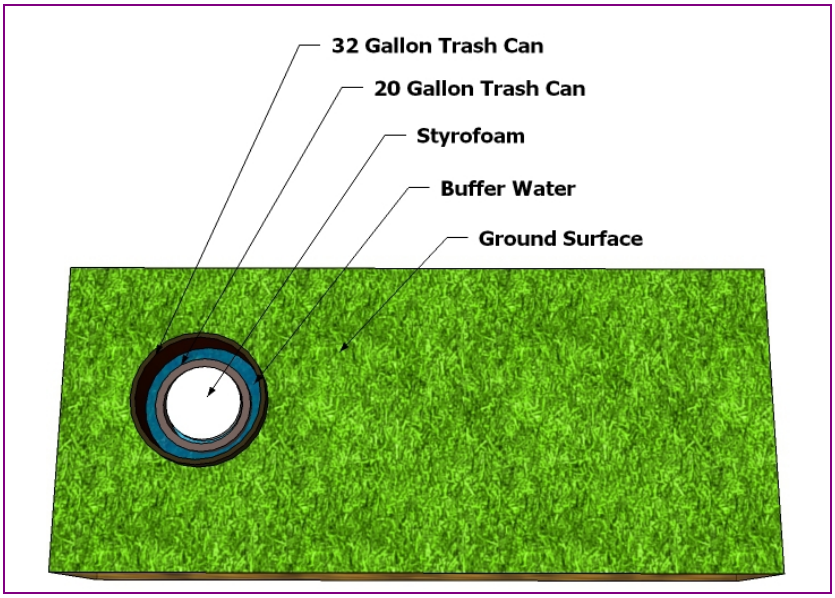



Once you have placed the reservoir inside the larger container, fill the reservoir with nutrient solution (or water to pre-test the setup). Then fill the larger 32 gallon container with water (buffer water) at least half way or just past where the water level in the reservoir (20 gallon trash can) is. You may need to place a heavy rock in the reservoir (20 gallon trash can), because if the water level is higher in the 32 gallon trash can the 20 gallon one might want to float a little.

The water in the 32 gallon trash can (buffer water) takes up the air space between the two containers, effectively continuing direct contact between the ground and the nutrient reservoir. This will allow the heat from the nutrient reservoir to be absorbed into the ground cooling the nutrients. Now, to clean the reservoir all you need to do is simply empty some of the nutrient solution out, then lift it out to clean it.

(**Note:** It would be advisable to add some bleach or chlorine to the buffer water to keep it clean and to keep anything from growing in it. But make sure that surface water like excess rain water run off wont be able to get inside, otherwise the buffer water could overflow into the nutrient reservoir and it could kill your plants)

## Insulating the top with Styrofoam inserts




Insulating the top with Styrofoam inserts is quite simple. Cut a circle in a 1 ½ to 2 inch thick sheet of Styrofoam to tightly fit in the 20 gallon reservoir. Then cut a hole or notch to run the cord and tube for the pump and cord.

(**Note:** You can find Styrofoam sheets of different thicknesses in any home improvement store with the home insulation products.)

The easiest way to cut the Styrofoam is to burn it. I like to use a inexpensive Soldering iron. You can also heat on end of a metal coat hanger. The Styrofoam will cut like butter and the heat will leave a sealed clean edge on the Styrofoam all at the same time.

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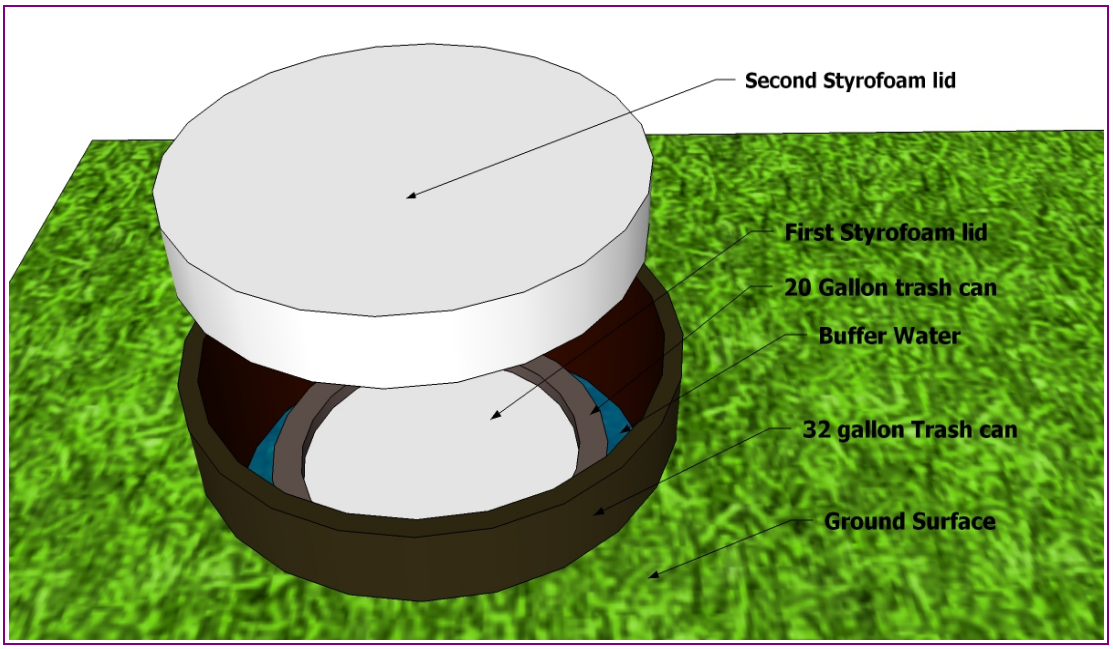
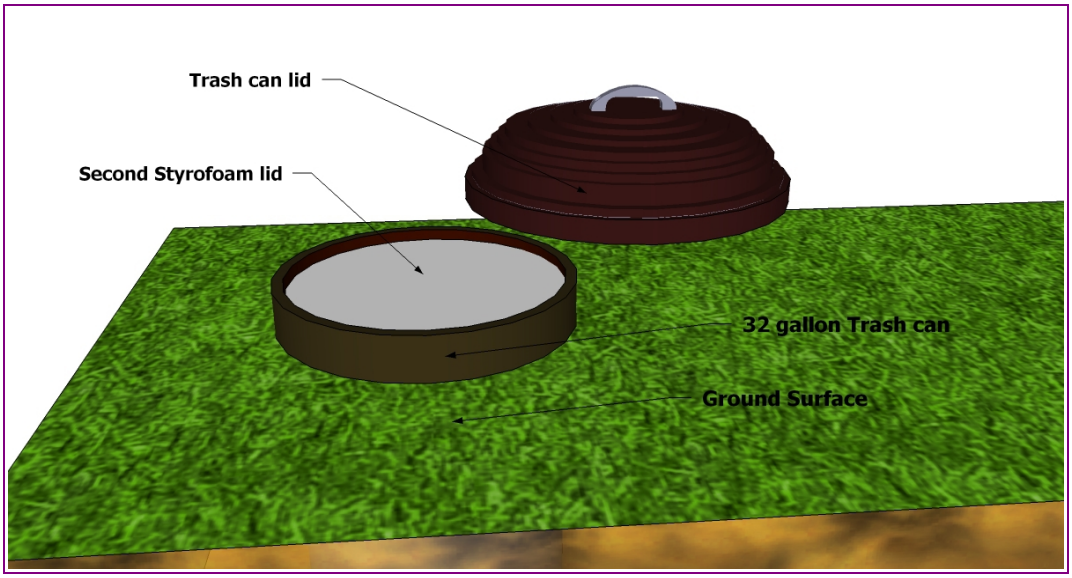
Now cut a second piece of the same 1 ½ to 2 inch sheet of Styrofoam in a circle. This time cut it to tightly fit the larger 32 gallon trash can. This will help insulate the nutrient solution, but more importantly insulate the buffer water from surface heat.

(**Note:** cutting a notch at the edge of the Styrofoam inserts instead of a hole will make maintenance easier)




Now, cut a hole or notch for the pump tube and cord in the second Styrofoam insert. Place the second Styrofoam insert in and push it all the way down to the top of the 20 gallon trash can.

(**Note:** You may also want to add a handle to the Styrofoam inserts to make taking them out easier.)

Now that you have the Styrofoam inserts in place you can mark then cut where you want to place the nutrient solution return line/tube. Then mark and make the necessary feed and return line holes/notches in the 32 gallon trash can lid. Place the trash can lid on top and run the feed and return lines to your Hydroponic system.

(**Note:** Make sure you insulate all tubes and hoses that are above ground to keep them from getting hot and heating your nutrient solution as it flows through them. If at all possible you should insulate the growing chambers (plants root zone) to keep them from heating up also.)

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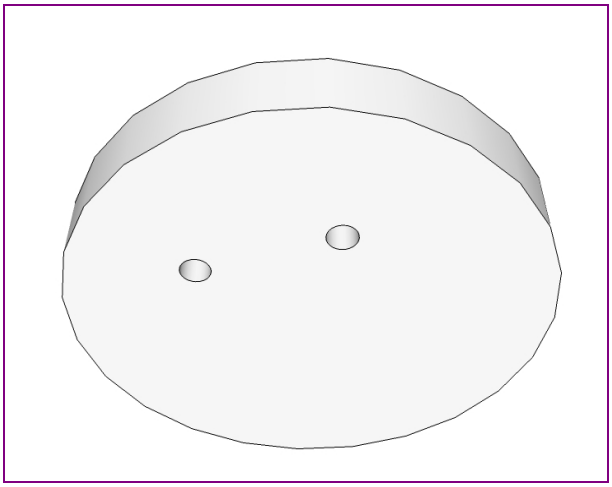
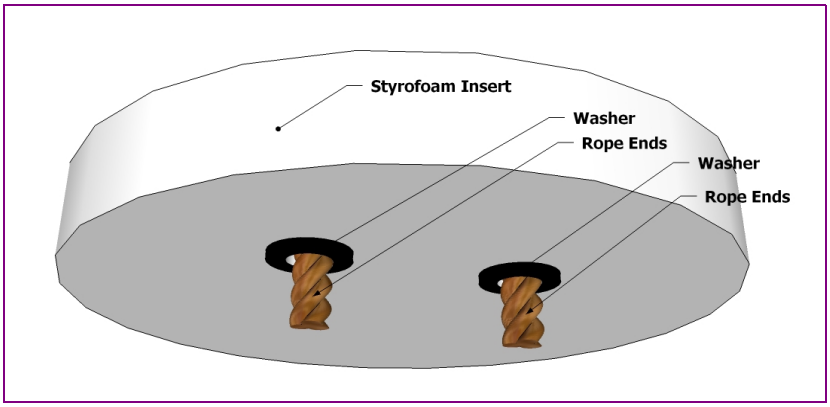
### Styrofoam insert handle

From my own experience making a handle for the Styrofoam inserts will make taking them out much easier, in turn making the maintenance of your hydroponic systems much easier. Styrofoam is a week material so you wont be able to screw a handle into it, and gluing one to it wont last long either. I wanted to add this page about adding a handle to your Styrofoam inserts to give you some ideas on how to do this.



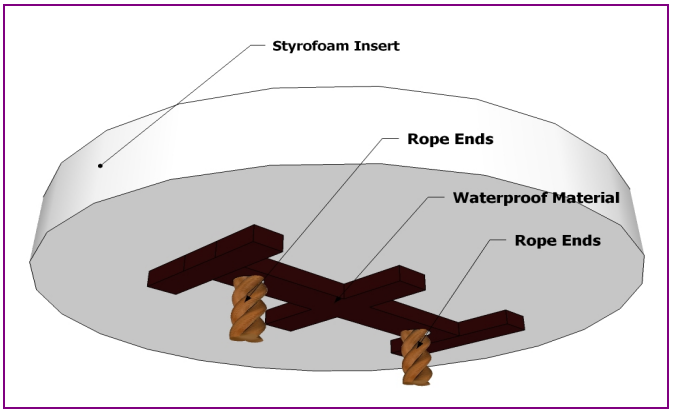
Because the Styrofoam is a week material you should not try to attach anything to the top of it, because it will just tear off and not last. The best way to attach the handle is through the Styrofoam inserts and from the bottom. This way the piece is lifted from the thickest part of the Styrofoam all at the same time.

First find a piece of rope to use as the handle then make 2 holes in the Styrofoam inserts, barley large enough to fit the rope through. Once the rope is through the holes you will need a support for the rope or it will just tear through the Styrofoam as you pull it up.




One way to create the support for the rope is to use large washers (the larger the more support). Simply place the washers in place over the holes and glue to the Styrofoam using a waterproof glue, then thread one end of the rope through each hole and tie both ends of the rope in a knot to keep it from coming back out. If the holes in the Styrofoam are not tight agents the rope fill the space with silicone or waterproof glue to make it stronger and keep any air from going through the open space.

Another even more sturdy support is pictured to the right. It consists of the same basic idea, but offers more surface area contact with the Styrofoam for more support while lifting it. Like with the example pictured above glue the support to the Styrofoam using a waterproof glue. Then thread one end of the rope through one hole, and the other end through the other hole,  then tie a knot in both the ends of the rope.

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