



Gravel Bog Filter Construction

If a gravel bog filter had a mission statement this is what it would be:

To create an environment that maximizes organic decomposition and nutrient absorption thus starving the (always present) algae in the pond while looking gorgeous!

A Gravel Bog Filter can be constructed in any number of ways, examples of the most common configurations can be found on site at Nelson Water Gardens. At the end of this handout you will find a walking tour of our ponds that explains the following typical configurations of filters:

1. **Partition:** The filter is within the pond separated by a porous retaining wall.
2. **Raised:** The filter is built next to and higher than the pond; water flows back via a stream or spillway.
3. **Border:** A ledge 12" deep and as wide as it needs to be is constructed around the perimeter of the pond. At the edge of the ledge a porous wall is built to retain the gravel.
4. **Island:** Created by building a porous retaining wall on all sides in the middle of the pond.

*"Learn from the mistakes of others,
you can't live long enough to make them all yourself"*
—Eleanor Roosevelt

Directions

1. Follow the usual directions for building a liner pond. The size of the bog is determined by pond surface area: 10- 30% of the pond surface area should make up the bog. If you plan to stock a lot of fish or koi, go with a larger size.
2. Using Cinder Block, Stone, Bricks or any other stable building material, construct a dry wall (no mortar used) to section off the bog filter from the rest of the pond. We recommend using cinder blocks (painted black with exterior latex paint) and then "capping off" the blocks with a decorative stone of your choice.
3. Page 2 illustrates burying the pipe line from the pump to the bog. However, you may choose to lay flexible tubing in the bottom of the pond. Just run the tubing through the lower portion of the wall connecting the pump to the distribution pipes in the bog filter. Put a PVC female adapter fitted with the appropriate sized hose barb fitting to receive the flex hose from your pump.
4. Install the pump on the opposite side of the pond from where the bog filter is located. This is to facilitate good circulation of water throughout the pond. Select a pump that will turn the volume of the pond over every 1-2 hours. (You can go with a higher flow rate if you wish.)
5. Next, perforate the distribution pipe. The minimum pipe size recommended is 1 ½" diameter PVC to avoid the possibility of clogging. The pipe is perforated using a circular saw cutting partially into the pipe, approximately 1/4 - 1/3 of the way through. Make your cuts perpendicular to the flow of water through the pipe, and space them about 1 inch apart down the entire length of the pipe. The spacing of the slots is an estimate, if there is a long run of pipe; space the holes slightly further apart.
6. Attach a vertical stand pipe at the end of each distribution pipe under the gravel. Cut this pipe (now referred to as the "clean out pipe") to discreetly rise just above the gravel bed. Then attach a PVC Female Adapter (slip fitting on 1 end/threaded on other) to the clean out pipe, and thread your cap into the adapter. Spray paint the cap and PVC adapter black or brown and it will "disappear" from view.*
7. Next, lay the distribution pipe on top of the pond liner in the area partitioned off for the bog filter. Be sure to point the perforations facing up. We have found that in some instances, having the perforations facing down toward the liner can cause holes or tears in the liner over time. Gravel bogs that are 2-3 feet in width can be fed by a single line of pipe. Wider areas require additional lines spaced 2'-3' apart. This layout is similar to setting up a septic drain field.
8. A cleanout pipe should be placed at the end of each distribution pipe.
9. Once you are satisfied with your piping layout and location of the clean out pipe(s), glue all parts together.
10. Shovel 3/8" pea gravel into the Bog Filter area but only fill halfway (the rest of the gravel will be added during the planting). Most gravel is not very clean, wash it as best you can before adding to the filter but be aware it will muddy up the pond, do not worry, it will clear up. After all, that's what the filter is designed to do! The construction is finished, now it's time to plant your bog. Directions on page 3.

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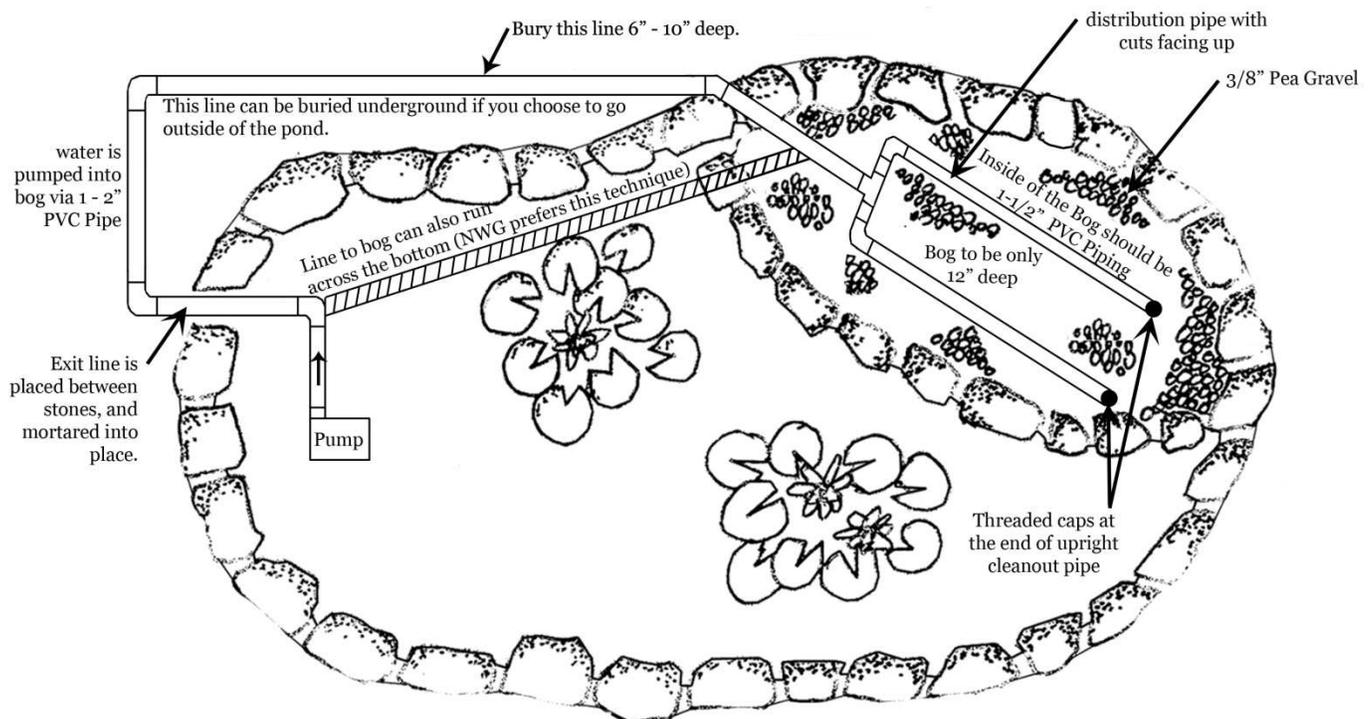
* The under gravel pipes can be cleaned out by simply removing the cap from the stand pipe; water pressure from the pump will help dislodge any debris that has collected in the pipes. A reverse flow can be achieved by turning off the pump and putting a garden hose, or if needed, a pressure washer down the stand pipe. This is where the 1 1/2" bog piping helps, because a garden hose fits nicely into that pipe leaving plenty of room to snake through 90° and 45° elbows.

Common Errors

1. The bog is too small: For water gardens 10 – 15% of surface area should be bog, and for koi ponds there should be 25 – 30%.
2. Too deep a bed of gravel - this is the most common mistake made. You need no more than 12" of gravel substrate. If you are adding a Gravel Bog to an existing deep pond area; you can construct a false bottom using grating available from us.
3. Wrong size gravel - use 3/8" pea gravel. **We repeat....3/8" pea gravel.**
4. Not enough plants- initially you should plant one plant per square foot.
5. Wrong plants – there are many aggressive species which can over grow your bog.
6. Washing the soil off the roots of the plants before planting in the gravel. **Don't do this!** There is not enough nutrition in a new bog to sustain new transplants. Just knock the pot off the plant and plant it with the soil, roots and all directly into the gravel. We promise the soil will not "contaminate" the bog or wash into your pond.
7. Not taking the plants out of their pots; this severely limits the plants ability to absorb nutrients and defeats the purpose of the gravel bog filter.
8. Starving the bog; this happens when a pre-filter* is placed on the intake of the pump, this not only stresses the pump but defeats the entire purpose of the bog by starving the plants of the nutrients that are being caught in the pre-filter.

*We are speaking of a true mechanical pre-filter (usually made from foam pads which need frequent cleanings) and not the pump protector or intake screen we recommend using.

Layout of Partition Bog Filter

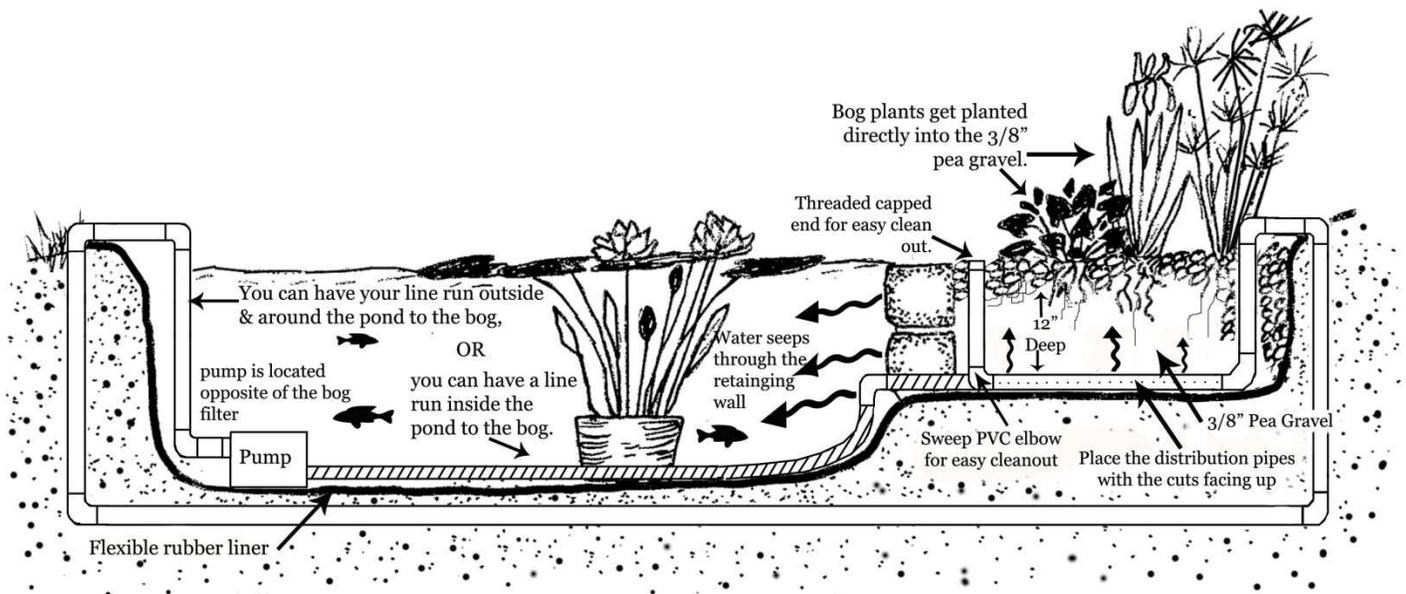


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Planting the Bog Filter

1. Select your bog plants and arrange them in the bog area that is half filled with gravel. Be sure you stay away from the plants in the middle list. It's best to plant the tall plants towards the back of the filter, and lower growing plants in front. Create interest by contrasting plants with different foliage colors or textures.
2. After you have arranged the plants to your satisfaction knock the pots off the plants and place the plant with the root ball intact with soil. **Do not remove the soil**—there is not enough nutrition in a brand new bog to sustain the plants. (Trust us the soil will not wash into your pond.)
3. After the plants have been placed, gently shovel in the remaining gravel. Your goal is to place the plants at the appropriate level so that when the rest of the gravel is added the gravel level will be above the water level. In other words, no standing water in the gravel filter area.
4. Turn on your pump and your bog filter is now off and running with years of clear water enjoyment to come.

Suggested Plants

Arrowhead	Creeping Jenny	Lemon Bacopa	Ruby Eye Arrowhead
Assorted Taros	Dwarf Cattail	Lizard's Tail	Sensitive Plant
Blue Carex	Dwarf Gold Sweetflag	Louisiana Iris	Siberian Iris
Blue Moneywort	Dwarf Horsetail	Melon Sword	Spider Lily
Blue Rush	Dwarf Papyrus	Pickerel Rush	Star Grass
Bog Lily	Dwarf Red Spiderlily	Rain Lilies	Variegated Spider Lily
Canna	Dwarf Variegated Sweetflag	Red Stemmed Sagittaria	Variegated Water Celery
Chinese Water Chestnut	Fuzzy Bacopa	Ribbon Grass	Water Purslane
Corkscrew Rush	Japanese Iris	Ruby Creeper	

Think twice before planting these – Some are very large and out of scale. Others should only be used if you want just a single plant variety in your bog.

Native Cattails	Gold Rush Reed	Parrot's Feather	Umbrella Palm
Aquatic Mint	Horsetail	Pennywort	Yellow Iris
Chameleon Plant	Mediterranean Reed	Red Stemmed Thalia	
Chocolate Mint	Mexican Papyrus	Thalia	

Other Plants (experiment!)

Astilbe	Coleus	Hosta	Potato Vine
Bergenia	Crocosmia	Impatiens	Society Garlic
Bishops Weed	Day Lilies	Joe Pye Weed	Tomatoes
Butterfly Gingers	Forget Me Not	Leopard Plant	Trilliums
Butterfly Weed	Fox Glove	Meadow Rue	Violas
Caladiums	Ground Orchids	Obedient Plant	Potato Vine
Calla Lily	Hibiscus (not Chinese)	Polygonums	Society Garlic

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Walking Tour of Nelson Water Gardens' Gravel Bog Filters

Front of Shop

Directly in front of Nelson's is the classic *Partition Gravel Bog Filter*. Facing the building the filter is located on the right. It was constructed by simply building a partition wall across the pond. If you look carefully at the wall you can see the bottom portion of the wall is constructed with cinder blocks and then capped with more attractive flag stone. The wall is permeable so that the pond water, after traveling through the gravel, seeps back into the pond through the partition wall. This type of construction can be used to retrofit an existing pond.

Koi Pond

This pond is located on the back right corner of the property. If ever there was a pond that is difficult to keep clear this is it! And yet it stays clear most of the time. This pond is overstocked with fish and overfed by customers. After a busy weekend it will often turn cloudy for 2-3 days but eventually the bog catches up to all the food thrown in over the weekend. This pond is an example of an *Island Gravel Bog Filter* which you can clearly see in the center of this pond. Pond water is pumped into the Island and then seeps back into the pond through the porous walls. We can hardly keep up with the plant growth in this pond after cutting it back it will grow back at the rate of 8" a week! The plants in this gravel bog are Yellow Water Iris and Variegated Dwarf Sweetflag.

Backyard Pond

Located at the rear-center of the property is the Backyard Pond. This pond is part of a project we call, "Your Backyard". It is a mock setup of what a typical Houston backyard could look like. It contains several featured amenities that one might aspire to have in their own backyard. One of those features is an 1,100 gallon pond which is fed by a 21' running stream and a 45 ft² Gravel Bog Filter serving as the headwaters. The construction of the pond is our preferred concrete collar method with a double stacked moss rock edge. This system again shows the versatility of the gravel bog as it can be used to keep the water from the stream and pond clean and healthy, but also serve as the perceived "source" of the flowing water.

Waterfall Pond

This pond is located on the back left corner of the property. The Gravel Bog Filter is incorporated into the border of the pond which is why we call it a *Border Gravel Bog Filter*. This pond was constructed with a ledge varying from 1' to 4' wide and 12" deep. Porous walls were built at the edge of the ledge; pipes were run through the "trench". Next the trench was filled with gravel. Here's where we made a mistake; originally the water entered the drilled pipes like arms on either side of the waterfall meeting at the middle on the other side of the pond opposite the waterfall. We found there was not enough water pressure through the pipes for the water to reach the far side of the filter and the plants there "starved". If you look carefully you will see pipes running across the bottom of the pond from the pumps by the waterfall to supply that section of pipes with water.

Contemporary Pond

Located on the left side of the greenhouse is the Contemporary Pond. This was our first foray into a more modern style of pond and was built at the end of 2009, and replaced the Sacred Pond which was originally built in 1997. The remodel was done to make the pond a bit smaller (we needed the room) but also to show the versatility of our design and construction abilities. The Contemporary Pond is an example of a *Raised Gravel Bog Filter*. It is a testament to the adaptability of the gravel bog technique. It shows that you can apply the concepts in almost any form imaginable, whatever visual style you are trying to achieve. The biggest constraint is your own creativity. We wanted the bog on this pond to be raised to give us the opportunity to have a nice tall spillway back into the pond. To achieve this, we built the structure of the bog up with cinder blocks, and then applied a façade of moss rock veneer stone, and mosaic glass tiles. We then capped it off with a matching empire slate stone which we hand-cut ourselves.

In addition to the examples mentioned above, there are numerous other displays of gravel bog filters located in our various waterlily sales tanks. In these smaller tanks, you will find examples of pottery bogs and spillway bogs. Either of these applications is perfect for smaller ponds and can be added to the water garden very easily.

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