



rocks and gravel

tales
from the
FIELD

Back when our now Construction Services Manager, Brian Helfrich, started at Aquascape, he was working in the warehouse and was really anxious to get out on the construction crew. So one day, we gave in and brought him along with us on an installation.

Putting Up a Struggle

We were actually working on a job fairly close to his parent's house, when I asked him to pick up this relatively small (maybe 60 or 70 lbs.) rock and he proceeded to try and wrestle it into position ... and I emphasize the word "try." I mean, he was struggling with all his might and was having the hardest time.

So, after getting a laugh or two at Brian's expense, I went over, picked the rock up, and tossed it into position. At that point, Brian thought that he was never going to make it on the construction crew.

Now, years later, Brian is running the construction division. Every once in a while we have an occasion to go back over to that original job site, and when we do, Brian can still point out the exact rock that got his career in pond building started. This time we both laugh.

Ed Beaulieu

Vice President of Field Research





Rockin' in the Pond

The main component in a well designed water feature, other than the water, is rock and gravel. They're used to naturalize the feature, create waterfalls, and increase the biological activity of the entire pond.

The rock sets the tone for the entire project. Not only should the material be of high quality, but the craftsmanship should match. Yes, anybody can place rock in the bottom of a pond and it will look and function better than a pond with a bare liner. But a good rock artist (a "rock" star) will really stand out as a superior pond builder. That's how important stone is. It can make or break the project, and possibly the pond builder.

Smart stone usage not only makes the project look better, but it will save you, the builder, time and money.



Starting at the bottom, set the largest character boulders first then fill in between with smaller stones.

The Types of Stone Available

Let's start out with a general understanding of the many types of stone available to contractors.

Granite ▶

This is a common stone which we use in the Midwest for all types of construction—from home building to landscaping and water features. Granite is a hard, crystalline rock that consists of feldspar and quartz. It's found in two forms—rounded cobblestones or boulders, and quarried chunks and pieces blasted out of large granite deposits. Granite is inert, meaning it will not leach any minerals into the water. This, of course, means it's beneficial to pond building. These boulders come in a wide range of sizes and colors, making them easy to work with. They look best when set in a random, naturalistic manner.



◀ Aqua-Blue Boulders

These are our personal favorite for water features. We prefer them because of their rustic beauty and character. Aqua-Blues are a gneiss based stone, meaning they're very similar to granite but they have a bluish gray coloring and they're considerably heavier than regular granite. These stones can be harvested from natural hillsides, or quarried. The harvested stones are more interesting because they've been weathered and may have mosses and lichens growing on them. Their rustic character allows them to be placed as accents throughout a property, or used as focal points in a pond or waterfall.

Fieldstone ►

This type of stone is found in local fields. The term describes many different types of rock, depending on what part of the country you're in. This is typically an inexpensive stone because of its local availability. In many instances, it may be the material of choice and it makes a good filler stone on the bottom of large ponds where it will never be seen. Be careful with fieldstone, however, because it may be a soft limestone-based stone that can alter the water chemistry. If you're not sure, you can test the stone by pouring vinegar over it. If it foams and bubbles, it's limestone.



◀ Moss Rock

This is an aged and weathered stone of different origins that has mosses and lichens growing on it. It's typically a sedimentary stone, and somewhat porous. It's considered to be a character stone and can be quite expensive, depending on your location. This is a highly sought after stone, because when it's used in and around a pond or stream, it will give the pond a sense of age, even though it may be a new pond.



Limestone ▶

Limestone is a sedimentary rock composed mainly of calcium carbonate. Typically, it's a flat stone that's used in patios and walls. Larger pieces are used as landscape outcroppings. For many years it has been a staple of waterfall construction because of its availability and ease of installation. You basically stack it up like a staircase. It requires very little imagination, and will still usually look nice. This type of stone should be used sparingly around a pond because the calcium carbonate will alter the water chemistry, which can lead to problems such as increased algae growth.



Ed believes each rock has its own personality. Here he is involved in a deep conversation with a rock that wants to become a waterfall when it grows up.



▼ Basalt

Basalt is a heavy, dark, volcanic rock. It is relatively easy to use and when obtained locally, it can be inexpensive. The broken pieces can be fit together like a giant puzzle. The dark color hides water stains and it leaches no minerals into the water.



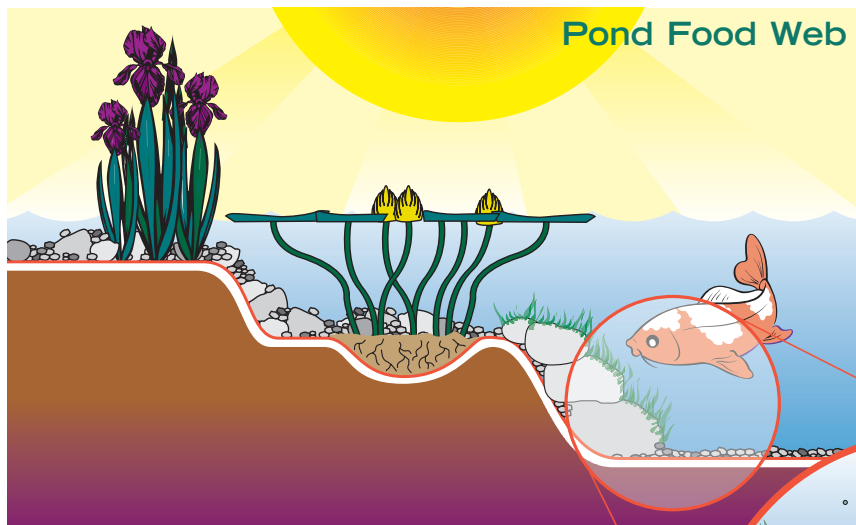
Gravel

The main purpose of gravel is to cost-effectively cover the liner, while providing a habitat for beneficial microorganisms. The gravel also lends structural stability to the pond. To achieve this, gravel is placed in between and behind the boulders. This eliminates spaces between them, which keeps them from shifting around. The gravel becomes a free-floating mortar, naturally locking the boulders into place. If you've ever dismantled a pond that's been built this way, you'll know what we mean. The rocks literally have to be pried out of position.

The gravel we use is similar in character and color to the granite boulders, only smaller. The gravel is smooth, giving it a water-worn feeling that's easy on the feet, for those who venture into their pond.



When constructing a water feature, you should use various sizes of boulders. (It's a mistake to use only one size.) Because your rocks vary in size, just like in nature, you should fill the spaces between with various sized gravel. When the cracks are filled, the gravel acts as a dry mortar, locking everything in place.



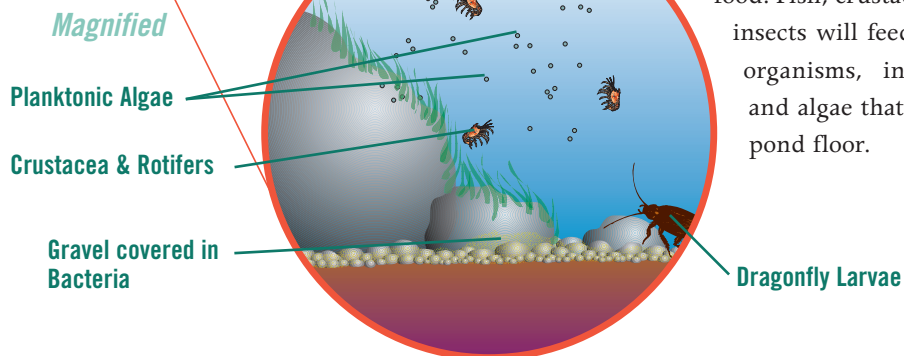
Pond Food Web

How the Gravel Helps the Ecosystem

The rocky bottom is totally alive and brimming with activity, covered in algae, microscopic invertebrates, and bacteria. This section of the pond is basically a compost pile. When organic debris falls to the pond's bottom, it's broken down by the benthic (bottom) inhabitants. These organic recyclers will live off of uneaten fish food, decaying plant matter, and nitrogenous fish wastes. If this substrate was not present, the pond would quickly die, effectively being suffocated by toxic fish waste and organic build-up.

Fortunately, nature has given us a way to solve this problem. Organisms have evolved to use practically every bit of available food. Fish, crustaceans, and aquatic insects will feed on these minute organisms, including bacteria and algae that live on the rocky pond floor.

For more information on the Pond Food Web or Ecology see chapter 2.



Magnified

Planktonic Algae

Crustacea & Rotifers

Gravel covered in Bacteria

Dragonfly Larvae



TIP from TEAM AQUASCAPE

The gravel should vary in sizes to create a more natural appearance. We have our gravel mixed at the stone yard. They mix three sizes for us, ranging from $\frac{3}{8}$ " up to 3". The larger pieces give mass to the gravel bed, and act as a nice transition to the larger boulders. The smaller sizes give us lots of surface area, which is key for the pond's biological activity.



Rock Calculations



Rock Calculation for a POND

Length x Width ÷ 40 = Tons of boulders

****Using a 1:2:1 ratio****

For every (1 TON) of 6"–12" rock, Get (2 TON) of 12 - 18" and (1 TON) of 18 - 24"

Quantity of Boulders used in a STREAM

For Every 10' of STREAM = (1½ TON) using 1:2:1 RATIO from above

Quantity of GRAVEL Used in a POND

Pond Gravel = 30% total tons of pond boulders

Quantity of GRAVEL Used in a STREAM

Stream Gravel = 30% total tons of STREAM Boulders

Small MicroPond/ D.I.Y. Rock Calculation for a POND

Length x Width ÷ 65 = Tons of boulders

Small MicroPond / D.I.Y. Quantity of Boulders used in a STREAM

For Every 10' of STREAM = (½ TON) 6 - 12" & (½ TON) 12 - 18"

Quantity of Boulders Used for the FACE of a BIOFALLS®

Mini / Signature BIOFALLS® filter = (1 TON) will cover the face of the falls

Standard BIOFALL® filter = (1½ TON) will cover the face of the falls

Grande BIOFALLS® filter = (3 TON) will cover the face of the falls

Quantity of Stone Used in a Aquascape PONDLESS BASIN

Length x Width x Depth = CUBIC FT.

- 90 lbs. of rock per (1) cubic foot (4 - 6" and/or 1½ - 2" rock)
- Minimum 40% of 4 - 6" rock, 60% of 1½ - 2" and then any additional decorative gravel for on top

Quantity of Stone Used in a MICRO PONDLESS BASIN

Length x Width x Depth = CUBIC FT.

- 90 lbs. of rock per (1) cubic foot (1½ - 2" only)

Quantity of Boulders to use around the perimeter of a BASIN

(½ TON) 6 - 12" Stone will cover 20 linear feet of edge

(½ TON) 12 - 18" Stone will cover 5 linear feet of edge

Quantity of Stone Used in a WETLAND FILTER (PER 10ft.²)

750 lbs. 4 - 6" River Gravel

900 lbs. 1½ - 2" River Gravel

900 lbs. ½ - ¾" River Gravel

Quantity of Boulders Used for a RETAINING WALL

(1 TON) of 12 - 18" size rock will cover 10 linear feet

(1 TON) of 18 - 24" size rock will cover 5 linear feet

Rock Calculations for Large Ponds

Rock Calculation For Large Ponds

1. Get a scaled drawing of your pond with shelves included.
2. Measure out the linear feet and the height of every shelf in your pond.
3. Add up your linear feet and height of each shelf then calculate how much rock you will need for your large pond.
4. Keep in mind, that if you have to stack one rock on top of the other, you will need to double your quantity for that shelf.

Boulders

Size of rock	Length Per Ton
6 - 12"	25 linear ft
12"	20 linear ft
12 - 18"	10 linear ft
18 - 24"	5 linear ft

Gravel

(Wash river stone)

Size	Per Ton
¾ - 3"	90 sq. ft.

(Gravel thickness should be just enough to cover the liner)

Note: These calculations are based from Wisconsin Granite; therefore the calculation may need to be adjusted for your type of stone.



Getting to Know the Stone

There are many other types of stone, but most of them can fit into one of the above categories. Talk to your local supplier for more information. If there is a certain stone you would like to use, let your dealer know and, depending on the quantities, he may be able to get it for you. Remember, our goal at Aquascape is to create naturalistic ponds and waterfalls, and we have a couple of tricks to help us.

- We use only two main types of stone for 98% of our jobs. This allows us to get to know the characteristics of that particular stone, making it easier to place.
- Since we only use two main types of stone, if we have extra stone from one project, we can use it on the next job.
- We can bid the job more accurately because we know how far a given amount of this “familiar stone” will go, and how much it will cost.
- Our supplier never runs out.
- Because of their rustic beauty and character, the Aquascape Blues have become our trademark waterfall stone.

We find that by following these guidelines, we increase our efficiency during construction. When ordering stone for a standard project, we use a ratio of 1:2:1; in other words, we order one part small (6 - 12”, see A), two parts medium (12 - 18”, see B), and one part large (18 - 24” see C) stone. This gives us a good mix to work with for the job.



Ed loves rocks that look like him.



During the Parade of Ponds, Ed's head gets this big.



Ed's OSHA approved sandals.

CONSTRUCTION GUIDELINES

esp *Nuestro Sistema Sencillo de Poner la Piedra*

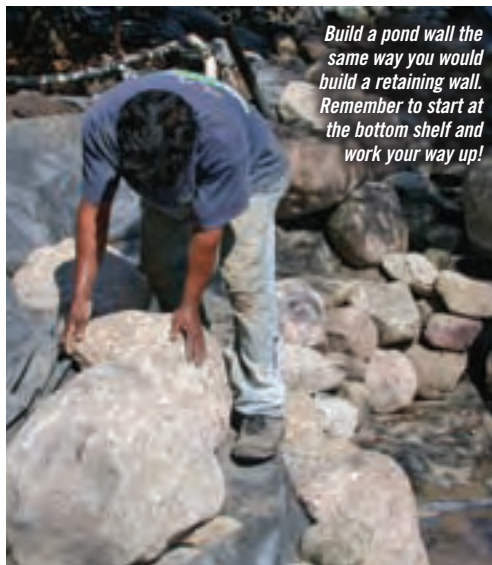
Our Simple Stone Setting System

Starting With the Lower Shelf

- Always start on the bottom with some extra slack in the liner. This keeps the liner from being stretched too tightly as you work your way through the pond.
- Set the larger character stones first, then fill between them with medium and small stones.
- Unless the pond is large, we rarely use the large 18"+ stones because they take up too much room.

esp Comenzar con el estante más bajo

- *Siempre comience en el fondo con algún pedazo extra de la capa protectora. Esto hace que la misma no sea estirado demásiadamente mientras Ud. trabaja en el estanque.*



Build a pond wall the same way you would build a retaining wall. Remember to start at the bottom shelf and work your way up!

- *Posicione las piedras más grandes primero, y después llene entre ellas con piedras medianas y pequeñas.*
- *A menos que el estanque sea grande, muy raramente usamos piedras de 18 pulgadas o más porque toman mucho espacio.*

For the Middle Shelf

- We use a good mix of rock, with one or two large stones possibly sticking up out of the water, creating a rocky island.

esp Para el estante del medio

- *Usamos una combinación buena de piedras, con uno o dos piedras grandes que posiblemente la parte superior están fuera del agua, creando una isla rocosa.*

And on the Top Ledge

- This is where we spend the most time because it represents the greatest amount of shoreline, which equates to the greatest amount of stone, and therefore time.
- The top ledge is the area that everyone will be looking at, so we want to be sure it looks good.
- Accentuate curves that have been excavated into the top ledge by placing larger stones on the inside curves of the pond, or where a peninsula juts into the water.
- The outside curves, or coves of the pond, are lined with smaller stones. This is also where the aquatic plants will be placed.
- The key is to spread the stone out, giving it a balanced, free-flowing feeling.

esp Y en la parte superior de la capa

- *Esto es donde gastamos la mayoría del tiempo porque representa la cantidad más grande de*



orilla, que iguala a la cantidad más grande de piedras, y por lo tanto tiempo.

- *Es también el área que todos estarán mirando, así que queremos estar seguros que se vea bien.*
- *Acentúe las curvas que han sido excavados en la parte superior de la capa de arriba, posicionando piedras más grandes en las curvas interiores del estanque, o en donde una península resalta en el agua.*
- *Las curvas del exterior, o las ensenadas del estanque, están alineadas con piedras más pequeñas. Esto es también donde las plantas acuáticas se colocarán.*
- *La clave es esparcir la piedra fuera, dándole una corriente balanceada.*



What if a Stone Doesn't Fit?

If a large stone doesn't fit where we want it to, we'll adjust the excavation. That's the beauty of using a liner instead of concrete. We can easily make a change or adjustment, even after the liner has been installed.

To Make an Adjustment:

- Set the desired rock in place. (A)
- Mark the area behind the rock with a shovel.
- Move the rock out of the way. (B)
- Dig the area out according to the shape of the rock. (C & D)
- Put the liner, underlayment, and rock back in position. (E & F)

It's that easy, and it gives the pond edge a clean, customized look. The entire pond perimeter can be done this way, but it's very time consuming and it should always be treated as an upgrade.

esp Si una piedra grande no queda donde nosotros lo queremos, ajustaremos la excavación. Eso es la belleza de usar una capa protectora en vez de cemento. Podemos hacer fácilmente un cambio o ajuste, aún después que la capa protectora ha sido instalado.

Para hacer un ajuste:

- Posicione la piedra deseada en su lugar. (A)
- Marque el área atrás de la piedra con una pala.
- Mueva la piedra fuera del camino. (B)
- Excave el área de acuerdo a la forma de la piedra. (C & D)
- Ponga la capa protectora, underlayment, y la piedra en posición otra vez. (E & F)

Es así de fácil, y le da al estanque una orilla limpia y una apariencia única. El perímetro entero del estanque se puede hacer de esta manera, pero consume mucho tiempo y siempre debe ser tratado como un proceso de mejoramiento.

For more information on pond edges, please see chapter 13.