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## SPECIAL TUFA EDITION

Bill Stark has been experimenting with tufa in his own garden, which led him to research local, inexpensive sources of this ideal rock garden medium. Since his article was so extensive, we've published it as its own special issue of the newsletter.

## TUFA FROM THE ILION GORGE

*Bill Stark*

### INTRODUCTION

Tufa is an ideal growth medium, better than soil, for many rock garden plants. After seeing Jerry Krall's striking use of tufa in his Rochester garden this spring, I jumped at the chance to buy about a ton of tufa from an Ithaca gardener who was leaving NY. Having never worked with tufa before, I decided to experiment with different construction styles on three small gardens. I used mostly small 5 to 15 lb stones to build a **traditional rockery**, larger 100 lb + stones for a **Zen garden** and up to 250 lb stones for a **tufa planting bed**. I ran out of tufa and went hunting for more in the Ilion gorge. I found a huge source of tufa, but also found that acquiring the stone is complicated. I'm writing this article to pass on what I've learned so far and to **organize a group purchase** of tufa next spring.

### BUILDING THE ROCKERY

The rockery is a 5 ft by 6 1/2 ft oval built onto the side of a 3 ft high berm. A 250 lb limestone block at the base of the berm supports the rockery. Structurally, the garden is a series of arches that bear against the neighboring downhill stones. On the left side of the garden, the arches are mostly tight 6" stones creating lots of crevices for plants, while on the right side I used a 15"

long keystone to create a large recessed terrace. As I worked up the hill I started using a few taller 8" to 12" high tower stones. The use of positive space (towers), negative space (recessed terraces) and neutral space (close packed crevices) created more visual interest than a pure crevice design. I was surprised by how well eight dwarf trees blended into the tufa stonework. Potted plants were planted between the stones while seedlings and rooted cuttings were planted in the stones. The garden is much cuter than my photograph.



I discovered that building with tufa is easier and much faster than building with the limestone that I normally use. Tufa and our local limestone are both calcium carbonate, but for a given size the tufa is about one third the weight of the limestone because it's so porous. While I moved the base limestone block with our backhoe, the large 100 lb tufa stone next to the limestone was easy to move with a hand truck and the rest of the tufa was so light that I could easily pick it up by hand. The tufa didn't have striations like sedimentary rock so you can orient the stones in any direction – making it much easier to find good fits. The roughness of the stone caused them to lock together easily compared to limestone. I was surprised to discover that tufa chinks between larger stones virtually disappeared - so I spent less time searching for the next “best-fit” stone. These tufa characteristics speed up construction - it took around 4 hours to place about 320 lbs of tufa (costing \$64) in the rockery. I was running short of tufa as I worked up the hill and would have preferred to use about 500 lbs. Jerry Krall's somewhat larger rockery used at least a ton of tufa.

Another lesson learned was that I could add character to a bland stone group with the addition of a surprisingly small but interesting stone (with see-through holes, animal shapes or miniature caverns with stalactites). Because of its irregularity and texture, tufa integrates (reads as one outcrop) far better than limestone. This ability to visually fuse together suggests that tufa could be amalgamated into larger stones, sculptures or scholar stones using pins, mortar and/or epoxy.

## BUILDING THE ZEN GARDEN

The tufa Zen garden is a 10 ½ ft by 14 ft oval with seven stone groups and a tall trough. It contains a few plants and gravel but it's mostly 940 lbs of tufa (costing \$188). The tufa looks ancient compared to our 375 million year old Devonian limestone, even though it could have been formed only decades ago from spring water that precipitates calcium carbonate among organic materials such as moss. You can choose irregular shapes that look like the mountains in a Chinese scroll painting or an animal or a sculpture. Next to the 39" high pinnacle are stone groups that suggest a whale and a sitting lion. Tall stones were placed in the foreground and background so that they move relative to each other as the viewer walks by. When I relocate these stones to our entry garden, I'll space them further apart.



The 24" high disk shaped stone at the front left of the garden has an exquisite through-hole at its top and a smaller through-hole below its center. Through-holes in tufa are typically created when tufa forms around roots or branches that then rot out. Japanese frowned at modifying stones, but since I'm an American barbarian, I grabbed a hammer and chisel to enlarge the smaller hole. This often ends in disaster when I'm working with our limestone, but with the tufa, I was able to knock out small chips in a very controlled manner. If you're working with old tufa, the darker surface won't match the lighter interior, so I'd recommend using freshly dug tufa for sculptures and scholar stones. New tufa is also soft until it hardens after exposure to the air.

We used a rental truck and had no trouble moving the stones up its ramp with a hand truck. We laid the large tufa on bags of mulch to prevent them from rolling and being damaged. This worked well, but the plastic bags were cut up by the tufa and had to be repaired with duct tape. Overall, the Zen garden was easier to build than the rockery, but that wouldn't be true if the stones were as large as I would like.

## BUILDING THE TUFU PLANTING BED

The planting bed is a 6 ft by 10 ft triangle built on a limestone base on an east-facing slope. The large tufa stones in front have their sides exposed so that they can be drilled and planted with seedlings and rooted cuttings. Planting on the sides of tufa provides the ultimate in sharp drainage and keeps the crowns dry while the porous stone supplies the roots with air and moisture. There's a crevice area built with small stones on the right side. The rear row of tufa comes from our Ilion trip – some of these stones are very dark and aren't very attractive.



So far, I've planted directly into the tufa using naturally occurring holes. During our last meeting, Jerry Krall recommended drilling through the tufa to make deep planting pockets so that plants could send their roots directly down into the soil. At

<http://www.wrightmanalpines.com/video>, Harvey Wrightman recommends drilling a ½" hole only 1 ½" into the tufa. The video shows how a plant's roots go through undrilled tufa and then into the soil. I recommend that you watch the video to decide this point.

There's about 985 lb of tufa (costing about \$200) in this garden with the heaviest stone weighing around 250 lb. I moved these stones with a hand truck with Mary helping to stabilize and push the load over obstacles. Loading these stones into a station wagon with two people was difficult. The roughness of the tufa works against you. If you try to slide the tufa up two wood 2x4s, it won't slide – the 2x4s are dragged into the car with the tufa. This is actually a good thing because the tufa will destroy any upholstery it's dragged across. You should wear gloves when moving heavy tufa. On our 2<sup>nd</sup> large stone, we connected a come-along to a 2x4 that went thru the passenger doors. The other end of the come-along was connected to a chain wrapped around the tufa (a nylon strap would be better). The tufa sat on a piece of ¾" plywood that slid up the 2x4 inclined plane and into the wagon. Using pipes as rollers between the plywood and the 2x4s dramatically reduces the force required.

I discovered a serious problem with this garden once I started to plant it. I can tap dance on our local limestone all day without hurting it, so I planned to use the larger tufa stones as stepping stones to access the garden. Unfortunately, tufa can crunch when you step on it. I've also broken delicate tufa features by just brushing against them with my foot as I moved inside the garden. I should have built a maintenance pathway through the upper part of the garden.

## FUTURE TUFA GARDENS

The first ton of tufa went really fast and I've started thinking about what else I can use this remarkable stone for. I'm definitely going to need at least another ton next spring. Here are some additional tufa projects I'm considering:



1) After seeing the lava “Garden of the Gods” exhibit at the 2012 Philadelphia Flower Show, I considered reproducing it along a path in our pine woods. But drilling our local stones to make the cairns would be difficult. Tufa is easy to drill and has the added advantage that it can be planted like one of Harry Jans’ tufa walls if the central rebar is replaced with an irrigation water pipe. See <http://www.jansalpines.com/> for incredible photos of plants growing in tufa. I estimate that one 6’8” cairn would use about 300lbs of tufa.

*Photo courtesy Julie Hancher, Green Philly Blog,*

<http://www.greenphillyblog.com>

2) The hypertufa stones that I've built for my troughs are a pale reflection of the real thing. I plan to use tufa in my troughs from now on. Tufa for a large 3ft trough would weigh 25 to 50lbs.



3) I've admired Chinese scholar stones for many years but I've never thought I could own one – collecting them bankrupted at least one Chinese emperor. I intend to make scholar stones by sculpting large tufa stones or pining/mortaring together smaller stones. This photo (left) is of a limestone scholar stone. I estimate that a 60” by 20” by 8” slab of tufa would weigh about 420lbs.



4) We've seen grottos made with tufa all over Europe. The photo (above) shows a close-up of an Italian grotto wall. 2" stones have been pushed into a thick mortar base. I estimate that tufa usage would be about 9 lbs/sqft in this case. Lowes carries a mortar for attaching manufactured stone veneer that would probably work well for a tufa grotto.

Larger pieces of tufa have been mortared together in this grotto at Stourhead in England (left). We've visited walk-in grottos where the tufa was all about 10" in diameter.

## HUNTING FOR TUFA

I knew that my tufa came from somewhere in the Ilion Gorge and that Stonecrop Gardens had used Ilion tufa. Google searches pointed to the area between Cedarville and Ilion along Rt 51. I then used satellite images to locate the creeks and gravel pits in the area. I called the Chamber of Commerce and the Ilion Town Hall. On our Thanksgiving trip, we stopped at the general store in Cedarville and had a lengthy conversation about tufa sites and who might call the police or shoot if we trespassed on their property. (I'd call 911 if someone took my limestone in Lansing.) We drove out of Cedarville on Rt 51 North and turned left on Holcomb Rd which parallels a creek that the locals had assured us was a good tufa collecting site. Most of the creek was posted, but driven by a lust for tufa we looked at numerous sites – but we didn't see any tufa. We went on to the west end of Jerusalem Hill Rd which all of the web and local sources said was the prime collecting site. The road is blocked because the parallel stream is the local water source. I carefully checked out the stream bed, ravine walls and a large gravel pit along a quarter mile of the road and found no tufa. On the way back to the car, I found a posted sign that someone had thrown on the ground.

We then drove to the quarry that is just east of the intersection of Rt 51 and Jerusalem Hill Road and found Joseph Ferdula, (315) 868 5309, working inside a 75 foot long rock crusher. After 15 minutes, he managed to repair the machine, crawled out and showed us tufa at three sites in the quarry. The first was near the main gate and consisted of very dark washed tufa. Ilion tufa is pale when it's first dug and becomes dark after years of exposure to the sun. The pile appeared to have been picked over because most of the stones did not have the character of the Ilion tufa

that I had purchased in Ithaca. The second site was in the upper part of the quarry where the tufa was being dug from a bank.



The tufa was mixed in with soil and gravel that was frozen on this late November day, but we dislodged a few interesting pieces. I realized that I could have been walking on tufa earlier and I wouldn't have known it. Finally, Joe showed us some large pieces near an abandoned house on the property. These stones were in some shade, had a light moss cover and had numerous cedars growing out of their tops.



*Photo of 24" seedling in 6ft x 6ft x 4ft tufa*

Joe told us that this pile had supplied the Brooklyn Botanical Garden with tufa and that every once in a while a wealthy gardener would buy these large stones. You could plant an entire rock garden with many microclimates and a dwarf forest on one of these stones. I imagined

plumbing the stone so that a small water rill curved down its surface and fell into a pool in our entry garden. Joe said he could deliver stones of this size to Ithaca. Then he said it would only cost \$5,000. End of dream. Joe never gave me a price per pound. He appears to treat every stone as a piece of art that has to be individually priced. I selected 67 lb of tufa from the first 2 piles and after I loaded them into our car, Joe decided it was worth \$25 - which works out to \$.37/lb. Joe had waited to set the price until he had maximum leverage – but then he gave me a fair price. I noticed a very nice piece of tufa in the roadbed. Joe said that the whole hill above us was tufa. It's a big hill.

Leaving the Ferdula pit, we drove north and met with Patrick Samson of Mr.P's Natural Stone & Landscaping Materials at 2308 Higby Rd., Frankfort, NY 13340, (315) 894-2553. I had contacted him through the Herkimer County Chamber of Commerce and was told that he had 3 tons of tufa that had been sitting there for 3 years. When we arrived, we discovered that his tufa had come from his friend, Joe Ferdula. Mr.P's had a small amount of washed tufa and a dump truck load of tufa & gravel that looked like the material from the upper bank of the quarry.



I picked out 57 lbs of tufa. Patrick initially quoted a price of \$.75/lb but quickly agreed to match Bristol's price of \$.69/lb. I argued that Bristol's tufa was being transported 3,000 miles while his tufa was being transported 10 miles. He gave it to me for free - I think because I had been telling him how I was using the stone and how I thought other chapter members would also be interested. They seem to be having difficulty selling their tufa. Patrick's reaction to Bristol's BC tufa was that it was a shame to be exporting jobs to Canada when a local product was just as good. Mr. P's is 6.9 miles from RT 90 exit 30. His washed tufa has developed a uniform shade of gray so I'd recommend selecting tufa from the interior of his tufa/gravel pile. I think that my much older tufa looks better because it's been in contact with moist garden soil and stayed hydrated, it's been in partial shade and it's had moss and plants growing on it.

After Thanksgiving, we returned to Ilion gorge to cover areas that we had missed. We drove South on 51 from Ilion toward Joseph Ferdula's quarry. At first, there were numerous parking areas where we pulled off to check the stream banks and ravine walls. We found nothing. As we got close to the quarry we starting seeing large tufa outcrops in the ravine walls right next to the highway. This section of 51 is a winding two lane road with nearly continuous guard rails and no parking areas. I had planned to walk up the east end of Jerusalem Hill Rd. but couldn't because of deer hunters. There appeared to be a logging operation nearby but because of the holiday



there was no one to talk to. Continuing South on 51 we saw a lot of tufa between Jerusalem Hill Rd. and Holcomb Rd. and then it petered out. Much of the tufa we saw would require heavy equipment to remove. We could probably contact one of the private landowners along this section of 51 and get a fair price for the tufa – but it's not clear how to get at the stone. The quarry appears to be in the center of the tufa rich area. After reaching Cedarville we drove back to 90 on Elizabeth Town Rd but it was getting dark and we saw no more tufa.

After returning to Ithaca I was still uncertain about how extensive the tufa deposits were, so I called an excavation company in Cedarville and asked how often they find tufa when they dig a foundation or septic system. They said they never find tufa and volunteered that the Ferdula quarry hadn't been selling very much gravel lately. Gravel is the quarry's main business, not tufa. A web search for Ferdula Gravel Products said that the quarry was abandoned. It wasn't abandoned when we were there, but it didn't look very busy either. When Joseph retires (he's 69), what will happen to the quarry?

## BUYING TUFA

If you need a small amount of tufa, if you need help loading the tufa into your car or if you want to pay with a credit card, consider Bristol's or Mr. P's. I don't know what the interior stones of the piles at Mr. P's are like because they were frozen when we visited. Always call and get a price first. I prefer to buy freshly dug tufa from the quarry for the following reasons;

- 1) It looks better than the gray or darkened tufa that has been dried out and exposed to the sun.
- 2) There won't be an interior/exterior color difference on cut or sculpted stones.
- 3) It should have more character than tufa from piles that have been picked over.
- 4) It will be softer so that it will be easier to drill or sculpt.
- 5) You can select different sizes of stones. At Bristol's, the tufa is all about 18" across. If you need a smaller piece, you have to break it off. I'll be looking for a variety of sizes from 1" wall chinks to 5' slabs for scholar stones.
- 6) Transporting stone adds to its cost – so buying at the source should save money.

I've already talked to several chapter members who are interested in buying tufa next spring. I believe that working together, we can negotiate better pricing, access higher quality stones and move larger stones into our truck(s). My goal is to negotiate a price similar to Rocky Mountain Tufa's at-the-quarry price and to ask Joe to use an excavator to dig and spread X tons of tufa before we arrive. We would pay a fixed price per ton weighed with our scales. **If you're interested in purchasing a large amount of tufa as part of a group, please contact me.** If you decide to go alone, set the price before driving to Ilion. Be aware that Joe has a history of raising his prices after your initial purchase – so plan your project and buy all the stone you'll need in one trip. Always be ready to walk away if the price or stone quality doesn't meet your expectations. Everyone we met was very nice, but there's something about heavy machinery, explosives, and a preference for cash deals that attracts a certain type of entrepreneur to the quarrying business. Think of them as being like investment bankers.

## TUFA PRICING

The tufa at Bristol's comes 2,373 miles from Rocky Mountain Tufa in Brisco B.C. ([info@tufa.bc.ca](mailto:info@tufa.bc.ca)). It costs \$.69/lb in small quantities and \$.53/lb by the pallet (about a ton) at Bristol's. Rocky Mountain tufa costs \$.24/lb by the pallet and \$.18/lb by the truckload at their quarry in Canada. I paid \$.37/lb for a small quantity (67 lbs) at Joseph Ferdula's quarry and approximately \$.20/lb for the ton of tufa I bought in Ithaca. Mr. P's has not responded to my repeated requests for their spring tufa pricing. This is very strange for a retail store and my sense is that they do not appreciate my efforts to organize a group purchase. Joseph Ferdula's pricing decision is complex. For decades, he has set a premium price and lost market share to Rocky Mountain Tufa. It doesn't make sense that Bristol's, which is right on Rt 90 like Ilion, isn't selling Ilion tufa. Joe is realizing that his lack of sales is going to depress the value of the quarry when he's ready to sell it. I've been trying to give him advice, but I have a clear conflict of

interest so I've recommended that he talk to the Herkimer County Industrial Development Agency for help in developing a business plan. Writing a plan would force him to consider a more competitive pricing strategy. I can clearly see how we could construct a win-win deal, but at this point, I don't know if he will move forward or revert to his old habits. Joe and I have agreed to talk again in a month. In the meantime, I'm looking at alternate sources of tufa. There's a lot of tufa in Ilion that's outside the quarry and there are tufa deposits North of Cazenovia and South of Rochester. **If you have any information on local tufa sources, please contact me.** I can talk about tufa at the 2/16 meeting if there's interest. I believe that we can use this local stone to create beautiful gardens that would give our chapter a special identity within the rock garden community.

You can reach Bill at 607-229-9924 or mes2@cornell.edu

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### GREEN DRAGON TALES

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