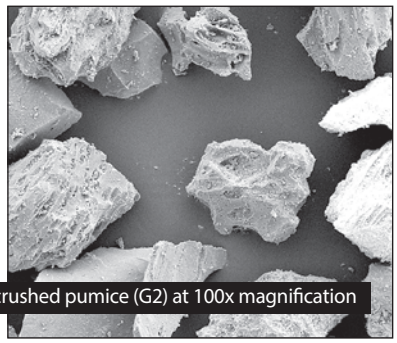
Conditioning Soil with Pumice

Pumice, by virtue of its natural structure (best described as a foamed stone), makes an ideal soil conditioner for those looking to permanently improve root zone structure, mitigate compaction, and retain moisture and nutrients.


close-up of a 1-inch pumice stone


crushed pumice (G2) at 100x magnification

SOILRX™ HORTICULTURAL PUMICE

FOR AS LONG as man has been cultivating and planting, he has understood the importance of conditioning the soil—either by adding needed nutrients, by improving poor native structure, or both. Organic composts work wonderfully, but for poor soils that need to be structurally amended, organics are not a long-term solution. Instead, a class of inorganic amendments can be used to engineer permanent performance structure into soils. Pumice, by virtue of its naturally-occurring, foamed-stone structure, makes an ideal, long-lived soil amendment. Even crushed to soil-blending particle size, pumice retains its light, frothy, functional character, contributing to soil performance in the following ways:

IMPROVES SOIL STRUCTURE. A functional root zone is critical to support vibrant, deep-rooted plants. For example, heavy clay soils, consisting of a tight matrix of plate-like particles, offer a poor growing medium if not amended. The fertility may be there, but the structure is wrong. Adding pumice physically disrupts clay's tendency for compaction, forcing apart the dense, sticky particles and improving the soil's ability to breath, absorb and drain water, filter runoff, and support lush vegetation.

A study[1] published in the *Journal of Central European Agriculture* (2005) measured strawberry seedling growth in pumice-amended soil (at 15, 30, and 45% amendment levels) and determined "important level" increase in growth, attributed to the studied enhanced moisture retention and pore size distribution factors contributed by the pumice amendment, especially at 45% amendment ratio.

Another study[2] concluded "that pumice may be effectively used in specific amounts for improving aeration and bulk density conditions of poorly structured soils."

IMPROVE SOIL SUBSTRUCTURE. Creating or repairing compacted subsoil structure is as essential to crop productivity as is amending the upper soil area. Opening up subsoil pore space means vegetative vitality is not restricted by poor aeration and drainage. Working pumice into the subsoil lightens soil density, allowing deeper aeration and microbial action, which in turn brings greater root mass and depth.

KEY CHARACTERISTICS *of* HESS PUMICE:

- Specific gravity weight of 2.35
- Low unit weight: 40 - 50 lbs cubic foot (depending on grade)
- MOHS-scale hardness: 6
- pH neutral: 7.2
- Due to its amorphous characteristics, pumice is not considered a health risk to the workers who handle it.
- Chemically, pumice is primarily Silicon Dioxide (Amorphous Aluminum Silicate), some Aluminum Oxide, and trace amounts of other oxides.

Hess PUMICE IDAHO USA

(208) 766-4777 x111
email: **rd@hesspumice.com**
www.hesspumice.com

[1] **Effect Of Pumice Amendment On Physical Soil Properties and Strawberry Plant Growth.**
Ustun SAHIN, Selda ORS, Sezai ERCISLI, Omer ANAPALI, Ahmet ESITKEN; Atatürk University, Department of Agricultural Structures and Irrigation, Erzurum-Turkey

[2] **Addition of Pumice Affects Physical Properties of Soil Used for Container Grown Plants.**
Ustun SAHIN, Omer ANAPALI; *Agriculturae Conspectus Scientificus* (ACS) 01/2006; 71(2)

MITIGATES COMPACTION. Because the foamy, pore-rich nature of pumice is inherently structural, much of the compaction resistant benefit of pumice-blended soils comes from the matrix of tiny pumice stones themselves. That means desirable factors like root zone air exchange capacity and moisture retention are not wholly reliant on the spaces between soil particles. And the grippy nature of the pumice granules stabilizes surrounding soil particles, greatly increasing resistance to the compressive forces of cultivation, watering, harvesting and, in the case of turf, foot and cart traffic.

RETAINS WATER AND NUTRIENTS. Frothy pumice granules grab and hold water and nutrients and then give them back to the soil (and roots) over time.

The *Australian Journal of Crop Science* published a study[3] that looked at adding pumice to achieve gains in soil moisture absorption and retention for maize (corn) crops. The results showed that "pumice significantly ($p > 0.05$) increased the amount of soil moisture retention compared to control. Growth characteristics of maize (vegetative growth and yield) were significantly improved with increasing amount of pumice concentration" with the max results obtained with the 30% pumice application.

CREATES ELEMENTAL TILTH. Mixing pumice into poor native soils transforms the soil structure on an elemental level, restructuring the soil matrix and diversifying the pore sizes to create more favorable conditions for seed germination and root proliferation. This type of tilth is elemental and enduring, unlike the temporary, unstable tilth created solely by tillage practices.

ENGINEERED SOILS

Engineered landscapes—reclamation projects, runoff-filtering ecology embankments, drainage and stormwater controlling contours, constructed wetlands, high-traffic parks and sports fields—demand fine-tuned soils designed to optimize performance. These projects are, of necessity, fix-and-forget projects, and if the soil profile is not improved in the long-term,[4] most fail in sustaining the plant life that is seeded in them. Engineering proper long-term soil structure and water-holding and/or drainage capacity increases the odds of success significantly. Pumice is the ideal inorganic foundation amendment upon which to build these types of large-scale constructs, as the soil-enhancing benefits of pumice can be realized with a little as a 10% pumice-to-soil ratio.

A LIGHTWEIGHT SOIL AMENDMENT. The frothy-stone character of pumice makes it an ideal lightweight amendment for roof-gardens and other weight-sensitive grow-bed applications like large pots and raised planter beds. In greenhouse culture, a lower bulk density is desirable due to easier handling and less root loss during pick up and transportation.

PUMICE-BLENDED COMPOST

The beauty of pumice-blended compost is that long after the organic matter is consumed, the pumice remains, a functional, physical presence improving the soil profile.

In large-scale fix-and-forget revegetation projects like those mentioned above, repeat compost applications are not possible or feasible. That becomes especially problematic when the compost was used as a restructuring agent in the soil and not solely to provide a kick-starting nutrient and microbial charge.

Pumice-enhanced compost provides revegetation contractors with a viable, cost-effective pre-seeding solution to both enrich the soil and amend structurally poor or damaged soils to achieve long-term, self-sustaining vegetative cover.

Pumice-blended compost is a value-added product for regions with poor or problematic native soils—as the pumice-enhanced compost is applied, a residual, cumulative improvement is taking place indefinitely—an improvement that continues to build cycle after cycle. When the physical soil structure is finally deemed ideal, the pumice-enhanced formulation can be discontinued.

---

[3] **Soil Water Retention and Maize (Zea mays L.) Growth as Effected by Different Amounts of Pumice.**
Ashraf Malekian, Einollah Valizadeh, Mona Dastoori, Sohaila Samadi, Vahid Bayat; Department of Agriculture, Payame Noor University, PO Box 19395-3697, Tehran, Iran

[4] **Shortcomingsof Native Seeding Project Implementation**; Western Chapter of IECA Newsletter, Spring 2006

OTHER CONSIDERATIONS

BLENDING. The uniformity of the pumice soil-amendment grades makes quality control easy during the blending operation, as pumice is dry and flowable.

TOP DRESSING FOR TURF. As a topdressing for existing turf lawns and playing surfaces, pumice out-performs sand for enhancing air and water movement in the root zone, holding onto moisture and nutrients, resisting compaction forces, and supporting beneficial soil microorganisms that break down thatch and enrich the soil. Pumice also readily mixes with compost, peat moss, sand, and soils in blended topdressing applications.

PUMICE VS. MANUFACTURED SOIL AMENDMENTS. The practice of blending bits of light, frothy rock with growing soils is already a well-established practice in the marketplace. There are several products on the market designed to mimic the structural character and in-soil performance of pumice—materials such as expanded perlite, expanded vermiculite, expanded clays (like Hydrock™) and expanded shale (such as Perma-Till™ and Utelite™). Note the use of the word "expanded" with each. The ores for these products have to undergo an energy-intensive superheating process that expands or puffs the ore to its useful, pumice-like state. Pumice, on the other hand, was superheated in a volcano and foamed when ejected into the atomsphere.

Pumice, in its natural mined state, improves soil structure without the environmental impact/fuel burn and processing costs of the expanded products. This fact not only makes pumice the green choice but also makes pumice the economical choice—bringing it in at a quarter-to-half the price of expanded perlite, for example. That yields significant value, especially in large-scale applications.

PUMICE AND PERLITE: PHYSIOCHEMICAL TWINS. Perlite is widely used in horticulture, especially in potting and garden soils. It is valued for its contribution to desirable soil structure and water and nutrient retention. But the process of flash-heating perlite ore to expand it adds to the cost and the carbon footprint of perlite.

A University of Illinois study[5] evaluated pumice as a perlite substitute for amending soil. Specifically, chemical properties and surface characteristics were compared and proved analogous, with pumice exhibiting a greater pore size span. From the report summary: "Pumice and perlite were shown to have similar physicochemical properties which subsequently translated into similar behavior in blended soil mixtures. It proved equally, if not even more effective in some ways, than perlite. A subsequent companion plant growth study (not reported herein) further confirmed the suitability of pumice as a soil amendment. Plants grew equally well in pumice and perlite media."

HESS PUMICE PRODUCTS

Pumice is found all over the world, but the quality, physical characteristics and chemical composition vary from deposit to deposit. The Hess pumice deposit in southeast Idaho is recognized as the purest commercial deposit of pumice on the planet, and Hess refines and ships that pumice world-wide for use in various industrial and agricultural processes. Hess Pumice Products has been mining and refining this choice pumice deposit since 1958 and enjoys a well-earned reputation for getting it where it needs to be on-time and on-spec.

SoilRox Horticultural Pumice is available in 2.5 lb. bags, 20lb. boxes, supersacks or shipped in bulk via truck or train cars.

SOILROX™

www.soilrox.com

[5] **Evaluation of Pumice as a Perlite Substitute for Container Soil Physical Amendment.**
Dianne A. Noland , L. Art Spomer & David J. Williams; Department of Horticulture, University of Illinois, 1201 South Dorner Drive, Urbana, 61801–4720