ESCS Engineered Media for Sustainable Soil and Healthy Roots
Healthy soils are the foundation for all successful landscapes. They are generally composed of 25% pore space for air, 25% pore space for water, 45% mineral content and 5% organics, roots, and microbes. Healthy soils are often found in undisturbed forests whereas urban soils are the most problematic. In undisturbed areas, the soils maintain their essential porous structure. Soils that have been disturbed or are in high-use areas lose their structure and proper porosity. Soils are also compromised by leaching, flooding, fires, construction activities and compaction. When this occurs one often considers soil amendments and turf maintenance practices to restore soil structure.

ESCS engineered media is best known as a lightweight component in green roof media. Since ESCS is structurally sound it is perfect for many engineered soil applications, providing beneficial moisture as the soil dries out and essential porosity for infiltration, deep aeration and nutrient holding capacity. It has proven itself under harsh conditions- high, hot and windy rooftops and has become a standard in many landscape practices.
ESCS Engineered Media

The parent material of ESCS engineered media is special formations of clay, shale or slate. It is the intense firing process in a rotary kiln that produces a ceramic that is light in weight, durable, porous and absorbent. The characteristics that make ESCS (engineered media expanded shale, expanded clay or expanded slate) ideally suited to soil amending and designer soils include the following:

- **Network of pores** - Roughly half of the ceramic aggregate is made up of pore space. That is why it is so lightweight and easy to work with.
- **Ability to hold water/nutrients** - ESCS engineered media can retain water and nutrients and slowly release them back into the soil as it dries out, providing extra benefits for your turf. ESCS does not replace the need for organics- it provides the porosity for air and water movement required by microbes that break down the organics into plant usable forms.
- **One time application** - ESCS engineered media is stable and continues to add benefits to the soil long after they are applied. There is no need to reapply as you would compost or other amendments.
- **Aggregates lock together into an open gapped configuration** - Higher percentages of ESCS engineered media in the soil will provide structure thereby reducing compaction while providing excellent internal drainage.
- **Many gradations** - Typical gradations for soil amending are in the 1/4” -3/8” range but smaller gradations can be supplied for lawn topdressing or aeration practices.

ESCS aggregate (microscopic view) shows the network of pores available for water and nutrient absorption and desorption. The large surface area contributes to enhanced stormwater filtering.
Everyone knows that a healthy lawn is easier to maintain. A good dense cover of turfgrass out-competes weeds and is better protected against disease and pests. Here are some ways ESCS engineered media can help improve your soil and turfgrass.

**Soil Amending & New Lawns**

Compared to sand and silt, clay soil particles are the smallest of all. They are good for growing turf but are easily compacted, reducing the available pore spaces that transfer air, water and nutrients to developing roots. Compaction is often the most significant factor in soil health, leading to shallow turfgrass roots that are more prone to decline from drought and disease. One way to combat this is to amend clay soils with ESCS engineered media and compost. Simply mix ESCS engineered media with mature compost at a 50%/50% ratio by volume. Till the soil to a depth of 4-6” and add the blended mixture at a 50% rate. If tilling to a depth of 6 inches, incorporate the ESCS engineered media and compost mix at a depth of 3” then till the soil and blended materials thoroughly. This process is a one-time application that will improve internal drainage, oxygen and microbial activity. Incorporating ESCS into fine textured soils restores and maintains the porosity needed for air and water movement and therefore deeper root establishment. This practice will reduce evaporation loss since water penetrates deeper into the soil profile. It is simply the best insurance you can have for a healthy lawn.

The gardens at Paul J Ciener Botanical Gardens in Kernersville, NC (left) and the renovated lawn at the Carolina Inn (right) utilized ESCS engineered media to improve the porosity, drainage and moisture retention of the soil.

**Turf Aeration**

Turf aeration practices strive to relieve compaction, promote better drainage and introduce more oxygen into the soil. It is a maintenance procedure for established lawns and begins with mechanical aeration machines that pull hollow cores from the soil measuring anywhere from 2-4” deep. After these cores are removed a layer of ESCS engineered media is applied over the closely cropped turf and raked into the open holes. The turf will eventually grow over the holes as the turfgrass spreads. The ESCS engineered media will hold onto water as the surrounding soil dries out and release the moisture back into the soil. This benefits the root system and also promotes microbial action that breaks down thatch and organic matter for improved nutrient availability. ESCS engineered media comes in a range of sizes and gradations, less than 1/4” works well in this application.
**Compaction Relief Beneath Trees**

Compaction beneath the dripline of trees is frequently seen in parks and residential properties as people seek comfort in the shade. Picnic tables, trees swings and lawn furniture are often placed there and over time foot traffic causes compacted, weak turf. Arborists will frequently employ the use of an air spade to break up the compacted soil without damaging tree roots. This is often done to a depth of 2-3” and replaced with a blend of ESCS engineered media and compost before being re-sodded or converted to mulch. Additional arboricultural methods for tree root therapy include vertical mulching and radial trenching with a blend of ESCS and compost.

**Isolated Wet Spots**

This problem is often encountered in clay soils as they shrink and swell or as a result of compaction during construction activities. ESCS engineered media can drain approximately 1200+ inches an hour and may contain up to 62 percent void space which is effective for drainage applications. Mixing two parts ESCS engineered media with one part compost provides enough pore space to drain nuisance areas. Simply use a post hole digger or auger to dig holes about 18”-24” in depth and fill the holes with the blended media. Turf will grow over the holes and in no time the isolated wet spots will be gone. For large non-draining areas more holes at deeper depths may be needed.

**Event Lawns**

Event lawns can be created with ESCS engineered media to provide a structural, well-draining turf area that reduces compaction and allows for quicker recovery. Under this approach a high percentage of ESCS engineered media is blended with a sandy soil mix to create a structural soil with the interlocking aggregates providing the structural integrity. Clients have used this approach at turf areas utilized for outdoor events like weddings, car shows, festivals, concerts or spaces for large gatherings. It is also used for temporary overflow parking and emergency access.

ESCS engineered media was used to produce vehicular load bearing soils for event parking at the Chancellors Residence at NC State University (left) and for overflow parking at AT&T Stadium in Arlington, Texas.
Designer soils blended with lightweight aggregates leads to greater pore space, enhanced water storage capacity for stormwater management.

### Green Roofs & On-Structure Media

Soils for green roofs are typically sourced and produced locally to reduce transportation cost. ESCS engineered media including expanded shale, clay and slate have been used for decades not only in green roofs but also deck parks and above subsurface parking structures. Rooftops can be unbearably hot and windy, ESCS engineered media provides a reduction in weight, improved anchoring of root systems and an overall moderation of soil temperature due to the capture and release of moisture.

![Green roofs and on-structure soils](image)

Green roofs and on-structure soils have a large percentage of ESCS engineered media in the mix. The best results are seen with deeper soil profiles and ESCS engineered media helps reduce the weight. The diversity and range of landscape plants can be seen in the photos at a green roof in Durham, NC (left) and at the Kimbell Art Museum in Fort Worth, TX where media was placed over a parking structure (right).

### Bioswales & Infiltration Media

Bioswales and bioretention basins serve an important stormwater function by improving filtration and infiltration which recharges groundwater, protects sensitive watersheds, and reduces the burden on infrastructure. ESCS engineered media is versatile and can be tilled into existing clay soil to create bioswales or blended with washed sand and compost for rain gardens and bioretention media. The major benefits ESCS engineered media has over sand and compost systems are better filtration with higher infiltration rates, quicker re-aeration plus greater water/nutrient storage capacity during severe weather events, and less crusting for more uniform infiltration. Bioswales incorporating 50%+ ESCS engineered media can be mowed without the fear of damaging turf or causing ruts from prolonged wet conditions. It is an economical approach that can be designed into every type of new development or renovation project.
Structural Soil for Urban Trees

Current trends in urban tree planting utilize cells filled with planting media to create the best growing environment for trees and a reduction in stormwater runoff. ESCS Engineered Media has been used in these systems to provide essential porosity for air, water and root growth. Due to the expense of this method, landscape architects are searching for alternate methods for soils beneath pavements. The shape and interlocking nature of ESCS Engineered Media combined with a clay loam provides the structural integrity and available pore space required. The media is easily placed and compacted around utilities with virtually no settlement. This type of planting has been in place for decades.

Structural soils were created for the Federal Courthouse trees in Salt Lake City using ESCS Engineered media (left). New permeable paving was installed above the ESCS Engineered media at the University of Texas in Austin where it was easily compacted around utilities and root systems (right).

The plant growth in a bioretention cell at the North Carolina Arboretum (left) has flourished while adding beauty and pollutant removal. The bioswale at the DFW Logistics Center specified ESCS engineered media to enhance infiltration and treatment on-site, saving the cost of connection to a municipal conveyance system.