

# Technical Notes

Periodic Updates on Current Technology  
From [Urban Forestry South](#)

**Subject:** Gravel Bed Tree Planting Series — Construction

**Executive Summary:** Growing small, bare-root trees in gravel beds for less than one year allows them to form the abundant root systems they need to survive and grow quickly after being out-planted. Constructing a gravel bed is not complicated and can be relatively inexpensive. This document provides instructions for designing, constructing, and maintaining a gravel bed for growing bare-root trees in the South.

**Introduction:** Tree planting budgets for smaller municipalities can be small or non-existent. Larger ball and burlap (B&B) trees can be expensive, and the equipment and personnel needed to plant these trees can add to those expenses, quickly consuming a small budget. Planting smaller bare-root trees is an inexpensive alternative. In the southern United States there is typically a small window of opportunity during the winter months to plant bare-root trees from the nursery, but using gravel beds provides a solution to this deterrent.

Gravel beds use hydroponics to grow fibrous root systems. Temporarily growing bare-root trees from a nursery in a gravel bed allows them to develop abundant, fibrous roots over the course of a growing season. This helps reduce transplant shock at the time of planting and extends the tree planting window for bare-root trees to virtually any time of year.

## Gravel Bed Construction

**Design and materials:** Any design that provides the volume of gravel in which water can flow and tree roots can expand is adequate. Gravel beds can be constructed above- or belowground. In Athens, GA, a simple 24'x16'x1.5' wooden frame was built using treated 2'x10' boards stacked on edge (fig. 1). To retain water, the bottom and sides of the bed were lined with heavy plastic sheeting before adding gravel. Thirty tons of crushed granite gravel (#67) and 10 tons of washed sand were mixed and evenly distributed in the lined form. One hundred, two-year-old trees (liner stock) were planted in the gravel mix and staked. Soaker hose (375 feet) was laid on top of the gravel mix and spaced to ensure even watering throughout the bed. A simple timer was used to provide 3 to 4 minutes of watering four times per day. A slow-release, complete fertilizer was also applied to provide nutrients to the trees. The total cost for this bed, with planting materials, was less than \$2,100, not including labor (see table below).



Figure 1—Constructed gravel bed wooden frame.

Material Type	Details	Cost
<b>Framing and Bed</b>	Treated lumber: 2'x10'x12' (8), 2'x10'x16' (4), 4'x6'x12' (1) 4" galvanized lag bolts, plastic barrier sheeting – 6 mil (10'x100') Soaker hose (1/2" – 375 feet), water timer, slow-release fertilizer (14-14-14)	\$523.50
<b>Fill</b>	~30 tons crushed granite (#67) @ \$17.28 per ton ~10 tons washed sand (#10 screen) @ \$11.56 per ton	\$633.29
<b>Plant</b>	100, two-year-old liner stock (~0.75" caliper)	\$900.00
<b>Total</b>		\$2056.79



Eric A. Kuehler  
Science Delivery/Technology Specialist  
Urban Forestry South  
320 Green St., Athens, GA 30602  
706-559-4268  
ekuehler@fs.fed.us

Page 1 of 2  
January 26, 2018



Figure 2—Completed, functioning gravel bed in Athens, GA.

planted in the gravel bed 12" to 18" apart with their root collars at ground level (fig. 2). This caused many trees to lean due to lack of stability, so the trees needed to be staked. Because of the abundant macropore space in the gravel, it may be better to set the trees deeper in the bed profile to prevent leaning.

**Maintenance:** Gravel beds require frequent watering. A series of 1/2" soaker hoses were laid between rows of trees and connected to a simple water timer on a spigot (fig. 2). The bed was watered four times a day for three to four minutes per cycle after the leaves of the trees began expanding. Periodic monitoring is needed to ensure the trees are getting adequate water especially during the heat of the summer. Placing a shade cloth over the bed or constructing the bed under a larger tree could help to reduce evaporation of water from the gravel as well as protect trees from water stress. A slow-release, complete fertilizer was also applied evenly in the spring to the bed at the rate of three pounds of N per 1000 square feet to help with nutrient needs.

**Lifting Trees:** When ready to be out-planted, trees must be carefully lifted from the gravel bed to avoid damage to the root system. Because of the trees' prolific root growth (fig. 3), a heavy-duty broadfork or front-end loader with forklift tines may be needed to lift trees from the bed. It is important to keep the exposed roots moist after lifting and when transporting to the planting site. Cover the roots with moist compost and the foliage with cloth to reduce desiccation from wind during transport.

**Additional Resources:** University of Minnesota, Department of Forest Resources. 2013. All you need to know about community gravel beds. 16. p.

[http://www.mntreesource.com/uploads/2/0/7/0/20706756/all\\_you\\_need\\_to\\_know\\_about\\_community\\_gravel\\_beds\\_2013\\_edition.pdf](http://www.mntreesource.com/uploads/2/0/7/0/20706756/all_you_need_to_know_about_community_gravel_beds_2013_edition.pdf)



Figure 3—Prolific root growth of 'Princeton' American elm lifted from gravel bed after seven months of growth.

## Contact List of Municipalities that have used Gravel Beds in the Southeast

Name	Municipality	Email	Telephone
Andrew Saunders	Athens, GA	<a href="mailto:Andrew.Saunders@athensclarkecounty.com">Andrew.Saunders@athensclarkecounty.com</a>	706-613-3838
Billy Paugh	Athens, GA	<a href="mailto:Billy.Paugh@athensclarkecounty.com">Billy.Paugh@athensclarkecounty.com</a>	706-613-3561
Kasey Krouse	Knoxville, TN	<a href="mailto:KKrouse@knoxvilletn.gov">KKrouse@knoxvilletn.gov</a>	865-215-6113
Roy Kibler	North Augusta, SC	<a href="mailto:rkibler@northaugusta.net">rkibler@northaugusta.net</a>	803-441-4243