



Can Urban Soil Compaction Be Reversed?

Soil compaction appears to be an inevitable result of current construction practices (see article 36). The key question is whether it is possible to reverse soil compaction. Numerous soil scientists have evaluated practices that can avoid compaction during construction or reverse it after it occurs (Table 1). These practices include selective grading, special construction equipment, reforestation, mechanical loosening, and the use of soil amendments. This note reviews what is currently known about how well these practices work and evaluates their potential as a stormwater management strategy in urban watersheds. The consensus among soil scientists is that alleviating urban soil compaction is a very hard job. Indeed, Randrup (1998) notes that once a soil is compacted, it is extremely difficult to restore its original structure, particularly if the compaction extends several feet below the surface.

Techniques to Avoid Compaction During Construction

The traditional remedy for soil compaction has been to require contractors to loosen soil by tillage, ripping or other techniques before lawns are established (much as a farmer plows a field). However, Randrup (1998) could find no significant difference in soil bulk density between Danish construction sites that had been loosened and those that had not. Similarly, Pater-

son and Bates (1994) found that tilling resulted in only a minor improvement in compaction in urban soils in Washington, D.C. (see Table 1).

Another common technique for avoiding soil compaction is the practice of selective grading, where only the most critical portions of the site are mass graded, and the remainder of the site is cleared but not graded. Again, neither Randrup (1998) nor Lichter and Lindsay (1994) were able to detect any improvement in soil bulk density in the selectively graded construction sites. These soils still experienced extensive compaction by construction equipment, stockpiling and vehicle traffic. The only soils where compaction was prevented were areas that were fenced to exclude all construction activity.

In the past several decades, specialized equipment has been developed to minimize compaction (e.g., terralifts, and subsoil excavators). Rolf (1994) detected a modest improvement in bulk density (0.05 to 0.15 gm/cc) when this specialized equipment was used at several Swedish construction sites, compared to traditional construction equipment. Even so, the specialized construction equipment still resulted in soil compaction at the site. Based on current research, it appears that the best construction techniques are only capable of preventing about a third of the expected increase in bulk density during construction.

Table 1: Reported Activities That Restore or Decrease Soil Bulk Density

Land Use or Activity	Decrease in Bulk Density (gms/cc)	Source:
Tilling of Soil	0.00 to 0.02	Randrup, 1998, Patterson and Bates, 1994
Specialized Soil Loosening	0.05 to 0.15	Rolf, 1998
Selective Grading	0.00	Randrup, 1998 and Lichter and Lindsey, 1994
Soil Amendments	0.17	Patterson and Bates, 1994
Compost Amendment	0.25 to 0.35	Kolsti <i>et al.</i> , 1995
Time	0.20	Legg <i>et al.</i> , 1996
Reforestation	0.25 to 0.35	Article 36