

DEATH OF NEWLY PLANTED TREES AND SHRUBS

Why do so many landscape plants die within the first three years after planting? Although insects and or diseases may be to blame in a few cases, many of the problems are related to the roots. This fact sheet highlights some of the root problems experienced from landscape plants dug from a nursery and replanted in a homeowner's yard, especially those sold as "balled and burlapped" (B & B).

The act of digging a landscape plant puts the plant under a great deal of stress due to root loss. When a plant of any size is dug for transplanting, up to 98% of the root system may be left behind. The roots of most trees and shrubs, independent of size or age of the plant, grow about 18 inches per year. This means that the root-to-shoot ratio of a large tree will be out of balance for a longer period of time than for a small tree. Hence, a small tree will recover from transplanting quicker than a large tree. This is not to say that large trees cannot be transplanted. Landscape plants of many sizes and species have been successfully transplanted for hundreds of years, so the practice, if done properly, should give positive results.

Transplanting problems may occur within the nursery, during transportation, and after replanting. Plants exhibiting signs of stress may have one or more of the following problems.

PROBLEMS IN THE NURSERY

1. Small seedlings ("liners") may be planted in nursery fields too deeply with the modern equipment used today. Additionally, cultivation practices may pile soil against the trunk of the plant, above the root zone. This begins a series of problems which may end up as a dead plant in a homeowner's yard.
2. The small seedlings grow into sizable landscape plants after several seasons. Large mechanical digging machines, called tree spades, are often used in nurseries to dig the plants which are ready for sale. The root balls dug by tree spades are measured from the soil surface, not the top of the root mass. If loose soil has been piled against the plant, a root ball may be dug that contains roots only at the very bottom of the ball. The fewer roots the plant has, the more difficult it will be for it to survive. Plants dug by hand may also have the same problem if loose soil is not cleared away before digging begins, or if loose soil is intentionally piled on top to make a rounder ball.
3. Guidelines have been established which correlate the size of the top of the plant with the size of the root ball which should be dug for that plant. Some nurseries do not follow the suggested guidelines for the size of the root ball (see Table 1). In general, the larger the root ball, the larger the root system and the better the chances are for the survival of the plant.

TABLE 1. RECOMMENDED MINIMUM SIZE OF SOIL BALL FOR DECIDUOUS AND EVERGREEN TREES AND SHRUBS

Large deciduous shade trees		Deciduous shrubs and Small tree species		Coniferous and broad-leaved evergreen trees		Spreading coniferous and broad-leaved evergreen shrubs	
Diameter of tree (inches)	Minimum diameter of ball (inches)	Height of plant	Minimum diameter of ball (inches)	Height of Plant	Minimum diameter of ball (inches)	Spread of Plant	Minimum diameter of ball (inches)
½-1	16	18-24"	10	18-24"	12	18-24"	12
1-1½	18	2-3'	12	2-3'	14	2-3'	15
1½-2	22	3-4'	14	3-4'	16	3-4'	20
2-2½	24	4-5'	16	4-5'	18	4-5'	26
2½-3	28	5-6'	20	5-6'	20	5-6'	30
3-3½	32	6-7'	24	6-7'	24	6-7'	36
3½-4	38	7-8'	28	7-8'	28	7-8'	42
4-4½	42	8-9'	32	8-9'	32	8-9'	48
4½-5	48	9-10'	36	9-10'	36		
5-5½	54	10-12'	40	10-12'	40		
5½ and larger ²		12-14'	44	12-14'	44		
		14-16'	48	14-16'	48		
				16-18'	54		
				18-20'	60		

¹Diameter of trunk taken 6 inches above ground level up to and including 4-inch diameter trees and 12 inches above ground level for larger sizes.

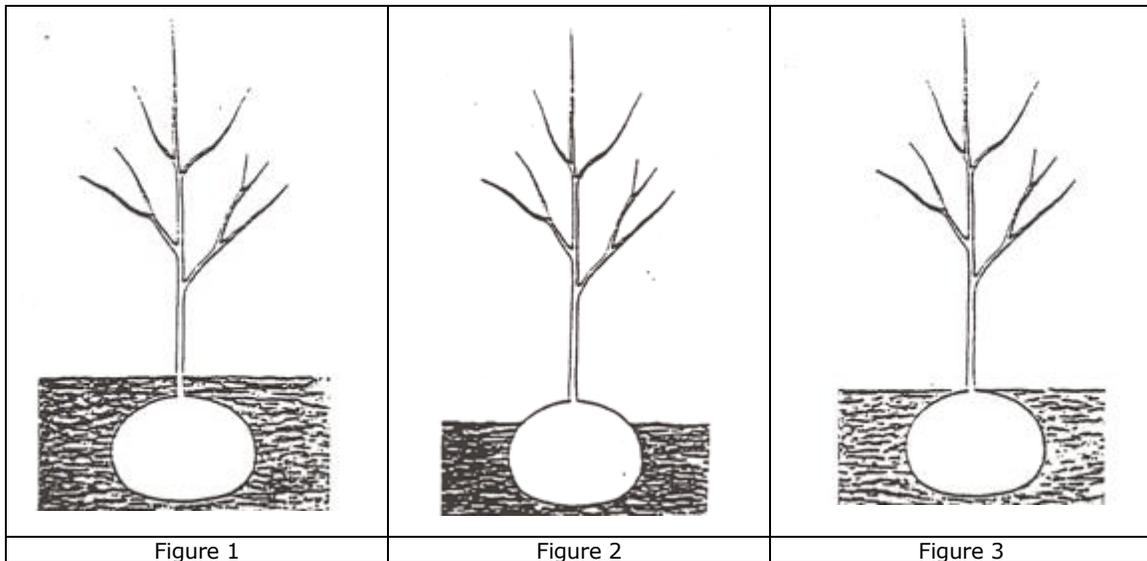
²Trees over 5½ in trunk diameter measured 12 inches above ground level should have a 10-inch diameter ball per inch of trunk diameter. e.g., 7-inch diameter tree with 70-inch soil ball.

PROBLEMS PRIOR TO REPLANTING AND DURING TRANSPORTATION:

1. Plants may be stressed in many ways during transportation and prior to replanting. B & B plants in a storage yard may dry out quickly if not checked for water frequently. Plants moved in or out of a storage building or greenhouse may be subject to rapid temperature and light level changes, resulting in foliar damage. If plants are dropped or handled roughly, the soil ball may crack, severing delicate roots.
2. During transportation in open vehicles, deciduous plants in leaf (not dormant) and evergreens not covered with tarps or blankets may be subjected to severe winds, leading to the desiccation (drying out) of leaves and shoots. It is difficult for a plant with a limited root system to recover from this type of injury.

PROBLEMS DURING AND AFTER REPLANTING:

1. Plants are often replanted at an improper depth. A plant should never be planted deeper than it grew at its original site, because very little oxygen and/or water will be able to reach the roots, especially if the soil ball has roots only at the bottom (Figure 1). High planting is not so severe a mistake as low planting, but should be avoided. Plants are often planted high because the area is a wet site, the soil is of poor quality, or the landscaper wants the plants to appear bigger and taller. An unmulched, uncovered, high root ball will dry out quickly and lead to drought stress (Figure 2). If the area is a wet site, raised berms may be constructed. If the soil is of poor quality (compacted, high clay content, or with a hardpan), remedial steps should be taken to improve the soil rather than putting the plant on top of it. Plants should be replanted at the same level at which they were originally growing in the nursery (Figure 3).



2. Burlap is often not loosened after the plant is set in the hole. Burlap exposed above the soil surface will allow the root ball to dry by wicking away moisture. Chemically treated burlap, designed to resist rot and decay, may remain on the root ball for many years, prohibiting roots from growing out into the soil. Twine or wire tied around the trunk of the plant may cause constriction if it is not removed. Rotting of the twine should not be relied upon to prevent constriction. A surprisingly large number of plants are killed in this manner.
3. A smooth, slick root ball may not encourage the development of roots out into the native soil. A root ball of heavy clay/loam type soil may shed water and allow the roots to dry out if planted in a lighter or sandier soil. The opposite situation can occur, where the planting hole does not drain well and becomes a "bath tub," drowning the roots. Ideally, the planting hole should drain well and the surrounding soil and that of the root ball should be close enough in composition to allow for expansive root growth. The root ball should be carefully scored with a shovel to encourage roots to leave the ball and grow into the surrounding soil.
4. Surprisingly, many landscape plants are not adequately watered after being planted. Supplemental water after planting is almost always necessary to maximize the chances of survival. This is probably the most often neglected step in establishing a new landscape plant, yet it should cost very little money (probably a fraction of the purchase price of the plant). Supplemental watering is especially important during the dry periods which may occur for several weeks to several months in this part of the country, and to prepare the plant for the stresses of winter. During the period from mid-August through September, it is especially important that plants receive adequate water. Once the ground freezes, water lost through transpiration due to wind and sun exposure cannot be replaced. This is the cause of much of what is commonly referred to as "winter injury."

Water provided must penetrate the soil as to reach the roots. One inch of water applied to a sandy soil will penetrate to a depth of 10 to 12 inches while in a heavy clay soil will only penetrate 6 to 8 inches. As a general rule, 1 inch of water should be applied every 5 to 7 days during the first growing season. Table 2 shows the frequency of water needed during extended dry periods.

TABLE 2. FREQUENCY OF WATERING DURING EXTENDED DRY PERIODS

Water Needed Once Every WEEK	1 st Year After Planting			2 nd Year After Planting			3 rd Year After Planting		
	Spring	Summer 	Autumn	Spring	Summer 	Autumn	Spring	Summer	Autumn
2 Weeks									
3 Weeks									
4 Weeks									
5 Weeks									
6 Weeks									
7 Weeks									
8 Weeks									

PROPER PLANTING FOR BALLED AND BURLAPPED PLANTS

1. Handle the root ball carefully to avoid cracking.
2. Dig a hole deep enough and twice the width of the root ball.
3. Set the plant in place in the hole. Make sure the plant is at the proper level (i.e. soil will come up to the level of the root ball once planting is complete).
4. Loosen burlap and cut and remove string or rope at the trunk. Regular burlap may be folded down into the bottom of the hole. Plastic burlap should be removed completely. Wire baskets should be loosened as much as possible if not removed completely. If the root ball has no roots in the upper 2 or more inches, the plant will have to be lifted and reset higher (see step 2).
5. Score the root ball lightly to encourage the roots to grow out into the surrounding soil.
6. Fill the hole approximately half full with soil. Tamp carefully or add water to settle the soil.
7. Add the rest of the soil. Build a ridge around the outside of the planting hole to retain water. Water well.
8. Apply mulch 3 inches deep.
9. Stake or guy only if planted in a windy area. Remove wires after one year.

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REFERENCES:

- Table 1 from "Tree and Shrub Transplanting Manual" by H.B. Himelick, the International Society of Arboriculture, 1981, p.16.
- Table 2 and other material from "Suggested Practices for Planting and Maintaining Trees and Shrubs" by Arthur S. Lieberman and Richard Weir III, Cornell Cooperative Extension Information Bulletin 24, 1989.
- Other information adapted from "Fatal Flaws" by Susan McClure in "American Nurseryman," November 1, 1991, and from "Flawed in the Northeast," a letter to the editor by Jim Cross in "American Nurseryman," March 15, 1992