Girdling Roots
by Kenneth Shaw

A problem now becoming apparent in many plantings and one that will be even more serious in the future is that of constricting and girdling roots. Girdling develops when the normal course of a root is deflected by a barrier, or when an unfavorable interface exists between the transplant's medium and the soil type at the planting site. A hyperplastic symptom termed sarcody, which is an abnormal swelling above or below a constricted organ, can be caused by girdling roots. When a root encircles the trunk above the soil's surface, the swelling usually occurs above the girdled area (Fig. 1 and 2). This type of damage is easily detected and corrected by cutting the girdling root cleanly, and dressing the exposed wounds with a tree paint.

In other cases, the restricting root may be forced out of the way by the swelling of the main roots (Fig. 3), or the tree may grow over the offending roots (Fig. 4). Occasionally, the entwining surface roots may be normal and require no corrective treatment (Fig. 5).

When a root encircles the main or tap root below the soil surface, the normal flaring of the trunk at ground level is checked; instead, the tree trunk rises straight up with no flare at the base. Girdling roots in this area can cause many problems. Plants become weak and have reduced vegetative growth due to restricted translocation of nutrients and water. Leaves are smaller, having a tendency to show nutrient deficiency symptoms and wilting during dry weather. Fruits are smaller and abscission is premature. The stability of the plant also may be affected.

Instability is often noted shortly after planting, as soon as the wind has had a chance to blow the plant around, and results from binding of the buttress roots by an encircling root (Fig. 6) so that support begins lower than normal. Thus, top-heavy plants sway back and forth, pushing the soil away from the tree base and forming air pockets. This type of air pocket and those present around twisted, encircled roots provide an excellent microclimate for pest organisms, a condition that should not be encouraged.

Container-grown plants probably offer the best example of girdling caused by deflection from a barrier, although the condition also is seen in street trees planted in compacted soil between the sidewalk and the road, and in forest trees growing over a hardpan.
Above: Fig. 1. Girdling of an ash’s buttress root.
Below: Fig. 2. Surface roots encircling a maple tree. Photos. K. Shaw.
Containerized plants have become very popular because they are easy to handle, extend the planting season, and reduce root loss at transplanting time. The last is important with plants like magnolias, dogwoods, and cytisus which have fragile, fleshy root systems easily damaged by balling and burlapping.

Girdling roots may also develop on bare-rooted transplants that have been crammed into a small hole, which results in twisted and circling roots. The proper method of handling plants is to dig a hole large enough to accommodate all roots after they have been straightened.

The composition of the transplant's medium and the soil at the planting site is usually dissimilar. When a plant is merely slipped into a hole, with no melding of the soils, an abrupt soil interface is created. At transplanting time the two soils should be blended together, so that no drastic change occurs from one type to the other.

Left above. Fig. 3. Surface root approaching a maple trunk; notice swelling over restricted portion.
Below: Fig. 4. This maple tree has overcome a restricting surface root.
Above: Fig. 5. Entwining surface roots of an American beech. Photos: K. Shaw.
The abrupt soil interface mainly affects the oxygen and water holding capacity of the soil, which has a primary influence on the developing roots.

A soil interface problem is created when planting is done in moist clay soils. As the shovel cuts through the clay it slicks the sides of the hole, thus creating an impenetrable surface similar to that of a container. This condition can be remedied by scratching the hole's surface before planting.

Grafted plants may suffer from being containerized because it is likely that the root stock was grown in a container for a year prior to grafting. When buying such plants, check to see if the plant material is pot bound; if it is, don’t purchase the plant unless there is no alternative.

Fig. 6. Pyracantha with support roots bound together by a girdling root that has sent up a shoot of its own. Photo K. Shaw.
If the encircling roots are not noticed until transplanting time, you may be able to exchange the plant at the place of purchase, or you can remedy the situation yourself. This is done in a shaded area to protect the roots from direct sunlight ("a minute in sun and the root's done"). The plant should be watered first so that the soil ball will hold together after removal from the pot. The spiralling roots can easily be stretched out and cut off (Fig. 7). Dense clusters or mats of entwining roots (Fig. 8) that occupy nearly all the soil mass can be handled by making three slices spaced equally around the soil ball to cut any looping or encircling roots that may cause girdling later. The plant is now under stress and needs after-planting care, which involves shading for at least two weeks, and keeping the plant watered well the first season.

Left: Fig. 7. Spiralling roots of a containerized seedling pine.
Right: Fig. 8. Shallow cuts are made through dense outer root mass to sever encircling roots. Photos P. Chvany.