

# Moving and Transplanting Trees with a Tree Spade

<http://www.sustland.umn.edu/implement/treespade.htm>

Tree spading is a common method for moving and transplanting large trees from one site to another. The following are some reasons for transplanting large trees vs. younger, smaller trees are:

- To prevent the loss of a tree due to building, roadway expansion or other construction;
- To create space for a new building addition;
- A particular mature tree has outgrown its present location;
- To alter the design of a landscape;
- To move a tree to a site better suited to its needs;
- To create a mature landscape quickly.

Initially, transplanting a tree with a tree spade may be more costly than purchasing container stock or B&B trees. However, the tree spade may be the best option if a tree will otherwise be lost or if the value of the tree outweighs the moving costs. Spading is also saves labor, planting time and years of maintenance of the juvenile tree. Spading also eliminates the possible risk of mower damage that commonly occurs on younger, smaller trees.

Tree spades are used in various ways throughout the green industry. Commercial nurseries use tree spades to lift large, field-grown trees out of the soil, and wrap the root ball in burlap and twine (termed "ball and burlap" or B&B) for retail sale or compact storage. Landscape companies and arborists use spades to plant large trees that are nursery-grown or have been moved from elsewhere in the landscape. Landscape professionals use a tree spade to create an "instant landscape" by digging and transplanting large trees from one location to another.

Homeowners can also use spades to locate trees on residential sites. Trailer-mounted spades that can hold a soil ball up to 44 inches in diameter are available at some rental centers. However, due to safety issues, and the complexity of the equipment and processes involved, it is strongly recommended that individuals hire an experienced contractor specializing in tree spading to transplant trees.

**Always contact the proper company or municipality for the location of underground utilities prior to digging. It is also important that you locate private lines such as irrigation systems, wiring for landscape lighting, water lines that serve water fountains and ponds, etc. In Minnesota, call GOPHER ONE at 651-454-0002 or contact a qualified professional contractor regarding the utility location prior to breaking ground. In North Dakota contact North Dakota One Call at 1-800-795-0555 or 811; online at <http://www.ndonecall.com> .**

## Supplies and Specifications:

Tree spades are available in a variety of types and sizes. Some spades have the capacity to move a tree with a maximum trunk diameter of eight to 10 inches, or a soil ball up to 90 inches in diameter. The size of the spade is critical. It must be large enough to accommodate a root ball that will sufficiently sustain the tree after planting. If a spade is too small, the root system will be too small to allow for long term establishment and the tree will die. When determining the spade size needed to move a tree, deciduous trees are measured by trunk diameter and evergreens are measured by tree height. A tree spade can be used to move one tree at a time or a pod trailer may be used to move as many as three trees at one time.



Tree spade size	Deciduous tree - trunk diameter	Evergreen tree - height
44 inches	2 to 3 inches	5 to 7 feet
66 inches	3 to 5 inches	7 to 10 feet
92 inches	6 to 8 inches	12 to 15 feet

*Trunk diameters are measured using a caliper, six inches above the ground for tree four inches in diameter or smaller and 12 inches above the ground for trees with a large diameter.*

Fig. 1 Tree spades according to tree sizes  
(Source: <http://hflp.sdstate.edu/exex6021.htm>)

Many trees can be moved any time of the year using a tree spade, providing the ground is not frozen. Certain species such as firs, maples, and spruce are best transplanted during the cooler months of spring and early fall. Plants moved in the summer and fall should be dug with an oversized root ball with special attention paid to the species of the tree, its condition and how it is transported. Reducing water loss as much as possible is important during transportation. Trees should not be moved on hot, windy days. The foliage may also be sprayed with an anti-transpirant prior to transplanting to reduce water loss.

As a general rule, deciduous trees transplant well if moved early in the spring before they leaf out, or in the fall after the leaves have begun to turn color. Evergreen trees should not be moved during the flush of new growth in the spring or late in the fall when it is too late for the roots to become established before winter. There are exceptions. For example, birch trees should not be moved until buds break in the spring, and trees with tap roots are difficult to move successfully regardless of the season. Some trees, such as Mountain Ash, do not transplant well when they are large plants. In this case, it is best to purchase a new, juvenile plant from a reputable grower.

There are differences between moving nursery-raised trees and trees grown in the wild or as windbreaks. Trees grown in nurseries are easier to move because they have been subject to maintenance practices such as root pruning. Root pruning promotes the growth and development of the most viable roots, resulting in maximum health and minimal stress. Trees grown in the wild are often difficult to transplant because they have grown in an understory environment that protected them from the wind. The results are large, shallow root systems and weakened trunks. Trees grown as windbreaks may be transplanted more easily if they were originally transplanted as container or B&B plants early in life. However, these trees do not make good transplants as they often suffer from poor structure due to tight plant spacing and environmental stress as well as insect and disease issues.

Understanding the root system - taproot or fibrous - will help determine the transplant capabilities of the tree, the spade size required and the success of the transplant. As a general rule, trees with tap roots will not transplant well. Most root systems develop within the upper three feet of soil with a majority of the absorbing roots in the top 6 inches. After transplanting, critical root regeneration occurs from behind the cut ends of the roots which are located close to the edge of the plug.

Soil type plays an important role in transplant success. The soil structure - clay, sand, loam, etc. - influences the tree's root extension and penetration. Roots typically extend past the crown of the tree. Clay soil will contribute to a smaller rootball while trees grown in sandy soil will have an extensive root system. Other soil factors include the level of soil compaction and moisture. Nursery-grown trees are subject to root pruning to promote fibrous root growth and thus have root systems that are denser, but typically not as extensive, as field-grown trees. Many native trees that have grown in the wild should not be transplanted to open, exposed locations. They may be structurally weak and have a shallow, spreading root system that extends well beyond the crown of the tree due to the fact they usually grow in a shaded, protected environment.

## Design:

Proper placement of trees is important to the design and sustainability of the landscape. It is important to select a location where the tree will not grow to interfere with structures, power lines, snow removal, roof lines, windows and other existing plants. The species of tree selected for a site will depend on space requirements, existing plants and structures, seasonal interest desired and the function the tree will serve in the landscape. Some common functions of trees in the landscape are:

- Trees may be used to soften the architectural lines of a building and transition the eye from the roofline to the soil;
- Trees may be used in a design to create shade and reduce summer cooling costs;
- Trees may protect a building from winter winds and thus reduce heating costs;
- Trees may act as a backdrop to a landscape;
- Trees may provide screening or a ceiling over an outdoor space.

## Site considerations:

- Individuals involved should have a general understanding of the tree spading process, and be familiar with the sites where the tree spade will be operated;
- There should be adequate access for the tree spade to the original site and the new site. Because the spade is in a fixed position, it is desirable to plan the move with access to the preferred side of the tree. Maintaining the same exposure is beneficial to tree establishment.
- Locate existing power lines, underground septic systems, grade changes and note any restrictions they present;
- There should be adequate space for the tree spade to operate safely. A 44-inch tree spade requires approximately six feet around the tree that is unobstructed. A 90-inch spade requires eight feet.
- Current soil conditions should be relatively dry. If the soil is too wet, the heavy machinery will damage the soil structure. Turf should be protected with 10-12 inches of wood mulch or  $\frac{3}{4}$ " plywood.

For more information about using trees in a landscape:

Fitting Trees and Shrubs into the Landscape <http://www.sustland.umn.edu/implement/treespade.htm>

Planting Trees in Minnesota <http://www.sustland.umn.edu/implement/treespade.htm>

When transplanting a large tree, it is important to duplicate the original conditions as closely as possible, therefore reducing stress on the tree. Soil type, planting depth, staking, watering and mulching are critical factors to the success of the transplant.

**Soil type:** If possible, the soil type of the new location should match the soil type, drainage and pH of the original site as closely as possible. For large projects with many trees to be moved and transplanted, a [soil analysis](#) is recommended to compare soil structure, porosity, and amendments required. Knowledge of these factors may favor one source of trees over another. Using a tree spade may also cause glazing, the compaction of the soil in the newly-dug hole, which will affect the lateral movement of soil moisture and root penetration. This can be resolved by roughing up the sides of the hole and the plug using a shovel, rake or fork.



**Planting depth:** The root ball of the tree should be watered thoroughly prior to digging to keep the ball intact and reduce as much soil loss as possible during transport. To allow the tree to become

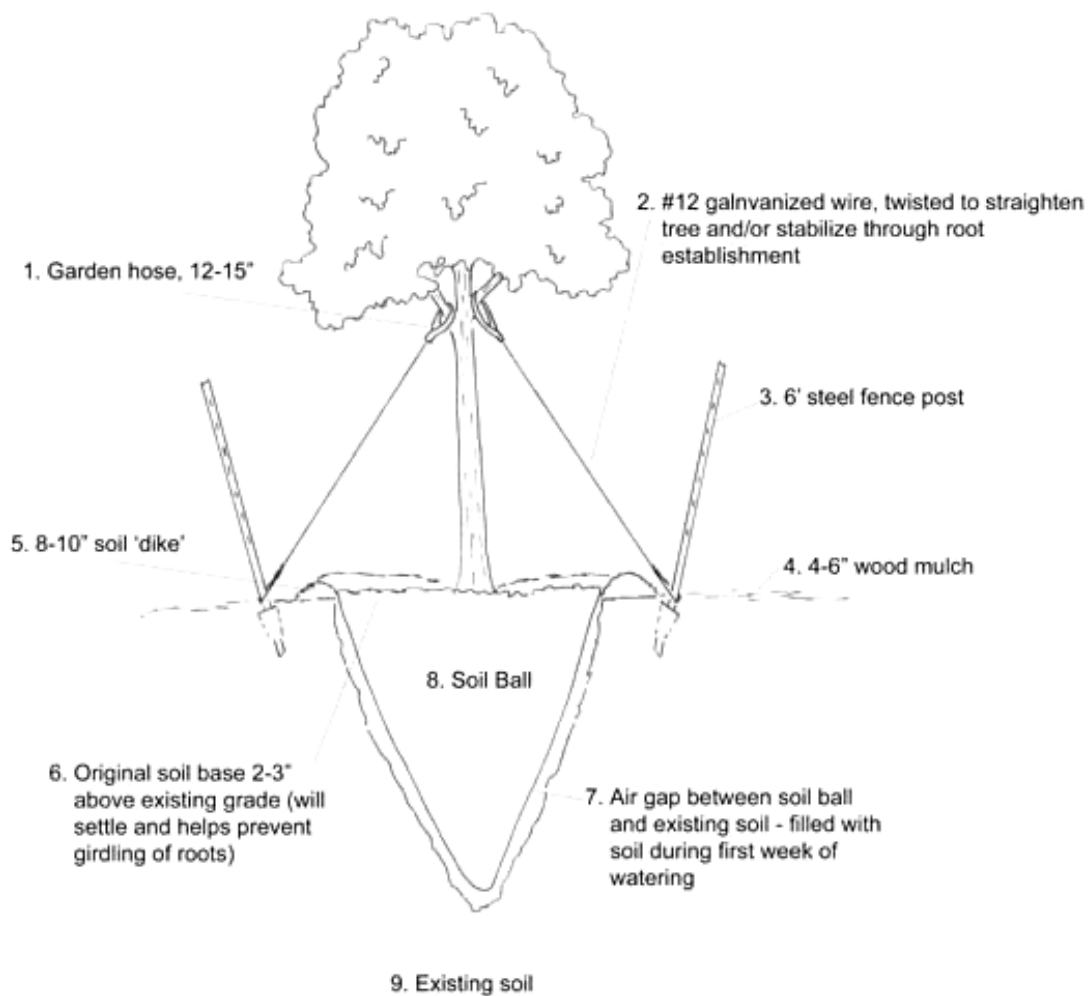
adequately hydrated, the tree should be watered 1-2 days prior to moving the tree. When positioning the tree in the new hole, it should be placed 2-3" higher than the original grade to allow for settling. If a tree is planted too shallow, the roots may be damaged by temperature fluctuations and lack of soil moisture. Planting a tree too deeply will result in girdling problems later. For more information:

Planting Bare Root, Containerized, and Balled and Burlapped Trees and Shrubs

<http://www.sustland.umn.edu/implement/treespade.htm>

Planting and Transplanting Trees and Shrubs <http://www.sustland.umn.edu/implement/treespade.htm>

**Staking:** An important function of the plant's root system is to anchor the plant, reducing the chance for a blow-over or uprooting by excess water or erosion. However, the roots of newly transplanted trees will not establish themselves securely in the ground for several weeks after planting. Thus they may require extra support through staking. It is important to remove the staking as soon as the tree is well-rooted as trunk strength can be weakened by long term staking.



**Watering:** Because newly planted trees do not have an extensive root system, it is important to deeply water transplants on a regular basis and especially throughout dry periods to reduce water stress. Prolonged water stress will cause a tree to become susceptible to insect damage and diseases, and cause limbing that greatly affects the tree aesthetics and value in the landscape. Likewise, overwatering or poorly drained soil may create an anaerobic environment (without air) around the root zone that is favorable to rot-causing fungi and bacteria, or may cause roots to suffocate.

It is important when watering newly transplanted trees that the original soil ball and surrounding soil is saturated to a depth of 12". Apply water slowly to entire area, allowing adequate penetration. Another option is to create a dike with soil around the outside edge of the soil ball. This dike will retain water applied in high volume, and allow it to slowly saturate the soil without erosion. This method works well when trees are watered using a watering truck or tank trailer. Watering is normally required weekly for the first month and twice a month for the rest of the first growing season. Watering should continue as needed for 2-3 seasons after transplanting. It is critical that evergreens be watered regularly and thoroughly until the soil freezes in order to prevent winter browning and needle desiccation due to dehydration by winter winds and sun exposure.

For more details about protecting trees and shrubs from winter damage:

Protecting Trees and Shrubs Against Winter Damage

<http://www.sustland.umn.edu/implement/treespade.htm>

**Mulch:** Newly planted trees as well as new shrubs and established woody plants benefit significantly from mulching. Some of these benefits include:

- More uniform soil temperature
- Reduced soil erosion
- Reduced weed competition
- Improved moisture retention
- Reduced damage to tree trunks and roots from mowers, weed whips, etc.
- Provides an attractive finish to shaded areas underneath trees where grass grows.

After transplanting a tree, apply a 4-6" layer of elongated wood mulch, shredded bark or other organic mulch around the base of the tree, pulling it away from the trunk to reduce damage from trapped moisture. The mulched area should ideally reach out 10-12" past the original root ball. Trees with dikes around the edge of the mulch ring are ideal for retaining mulch through the first growing season. The dikes can be removed after the first season, creating a clean transition between mulch and turf.



Too much of a good thing: Avoid mulching right up to the tree trunk as this will trap moisture and lead to insect and disease issues.



Proper application of mulch.

## Transplanting using a tree spade:



The site for the transplanted tree is prepared by tilling the soil and raking it smooth. Planting trees in established turf is also a common practice. All turf within the drip line of the tree should be removed and replaced with mulch. This will prevent competition as well as mower damage.



First, the hole must be dug to receive the new tree. The tree spade must be the proper size for the tree that will be dug and transplanted. This way, the hole will accommodate the a root ball substantial enough to support the tree. The same spade is used to dig the hole and dig the tree.



The operator controls the spade from the truck.



Hydraulic supports provide a stable foundation and prevents the spade from tipping over.



The spade blades are inserted into the soil ...



... and the blades are closed to contain the soil ball. The ball is positioned correctly for transport using the spade hydraulics loaded onto a truck and hauled away.



The tree spade is now used to dig the tree.



Before backing up, the frame and rear blades are opened to encircle the tree ...



... and the blades are positioned around the tree to insure the root ball is an equal distance on all sides of the trunk.



The frame and rear blades are driven down hydraulically into the soil. Each of the blades is moved several inches at one time until they are all as deep as possible. The blades are closed, and the tree is removed, root ball intact.



The operator does some root pruning ...



... and adjusts the tree spade for safe transport. Depending on the species of the tree, the time of year, and the travel distance, the tree canopy may be covered with a tarp. For highway transport, a special "diaper" is used to cover the spades to prevent soil loss.



The operator positions the spade over the new hole. Adjustments can be made at this time if the tree has not been growing straight. If possible, the tree should be oriented in the same direction as its original location.



The tree is lowered into the ground ...



... and the blades removed. When positioning the tree in the new hole, it should be placed 2-3" higher than the original grade to allow for settling. If a tree is planted to shallow, the roots may be damaged by temperature fluctuations and lack of soil moisture. Planting a tree too deeply will result in girdling problems later.



Once the transplanting operation is complete, the tree should be staked to provide support until the roots become established.



The arborist wraps rubber hose around #9 or #12 wire to support the tree to cushion the tree limbs and prevent girdling.



The wires are attached to metal stakes or fence posts which are set in the ground in a triangle to support the tree evenly.



A wooden dowel or screwdriver is inserted between the two wires and twisted to tighten the wire, ensuring the tree is planted and supported evenly. The root ball should be flooded with water during this process. Any final adjustment can be made to straighten the tree by tightening one side more than others. This staking method also allows the wires to be loosened and eventually removed as the root system becomes established.



After the tree is staked, continue to water the root ball slowly and thoroughly, allowing for the water to penetrate the soil ball and surround soil. If large air spaces are apparent between the soil ball and the surrounding soil, additional soil can be added during the initial watering. This will insure good soil contact with the newly developing roots.



Newly planted trees should be watered regularly and the root ball should be saturated to a depth of 12". The staking should be removed as soon as the tree is well-rooted. All new trees should also be mulched for moisture retention, to prevent damage from mowers, and to reduce weed competition.

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