Michigan Technical Note
USDA-Natural Resources Conservation Service

FORESTRY #28

Subject: FIELD TRANSPLANTING OF TREES

Date: May, 2009

BACKGROUND AND PURPOSE

Trees and shrubs can be transplanted from nearby locations for use in savanna restorations, riparian forest buffers, windbreak/shelterbelt restorations, landscaping or other applications where larger initial tree stock is desired. One common application is savanna establishment where larger trees are preferred to reduce the risk of damage from fire where it may be used as a management tool.

The trees and shrubs can be transplanted from nearby woodlots, idle fields, or other suitable upland areas. Plants should not be transplanted from wetland areas.

TRANSPLANTING PROCEDURE

1. Plan Your Transplanting Project

Be sure to allow ample time – 6 to 12 months – to collect information and materials needed to complete the transplanting. Enlist the assistance of a forester, arborist, or other knowledgeable people to assist with the planning of the project. Be sure all necessary equipment and labor will be available when it's needed for all phases of the project.

It is strongly encouraged to try a "practice run" on one or two trees to determine the best size stock that you will be able to comfortably handle, and a reasonable time allotment. Transplanting native or naturalized trees is time consuming and labor intensive. Even small trees with a 12" diameter root ball take over an hour per tree to fully relocate. An 18" root ball can weigh over 160 pounds (Anderson, et al, 1984). Trees larger than 1" caliper may require a mechanical tree spade to move.

Be sure to consider the limitations of your planting site as well. Avoid planting trees near power lines, sewer lines, tile drains, buried pipes or cables, etc. Typically trees should not be planted within 1 to 1.5 times the mature height of the tree from these obstacles.

If the source trees and planting site are not owned by the same person, written permission to remove and transplant the trees should always be obtained in advance.

If trees or other plants are to be transported on public roads, a Michigan Department of Agriculture inspection and permit may be required. Contact MDA at 1-800-292-3939 for more information.

Sidebar 1 - Collection Site Suggestions:

• Where possible, avoid collecting trees from natural woodlands. Instead, consider collecting trees from fencerows or potential "salvage" sites that are scheduled for development or clearing, where trees would otherwise be destroyed.

• If trees are removed from a woodlot, ensure that an adequate stocking level is maintained within the woodlot. Consult with a forester.

• If trees are to be planted in full sunlight, select a collection site where trees are acclimated to light exposure, e.g. sparse field-grown trees or those from the edge of a woodlot.

2. Select Stock to be Transplanted

A suitable collection site:

- has an adequate quantity of trees of the appropriate size, species, and condition (see below).
- provides good access to trucks and other equipment
- is near the planting site
- contains few invasive plants
- contains soil similar to the planting site
- will not be adversely affected by the tree removal (see sidebar 1)
- is not a wetland (consult with Farm Service Agency wetland determination records as well as state and local wetland records and ordinances)
- is owned by the person doing the work (or written permission has been obtained well in advance)

Suitable trees:

- are safely and easily accessible to the types of equipment needed to remove and transport them
- are species that are desired to accomplish the landowners objective at the planting site
- do not have disease, insect, or other pest concerns
- are not stressed or suppressed
- have well developed, healthy crowns
- have single stemmed trunks rather than clumps (except for some trees and shrubs that naturally occur this way)
- are of a size that is appropriate for the intended transplanting equipment

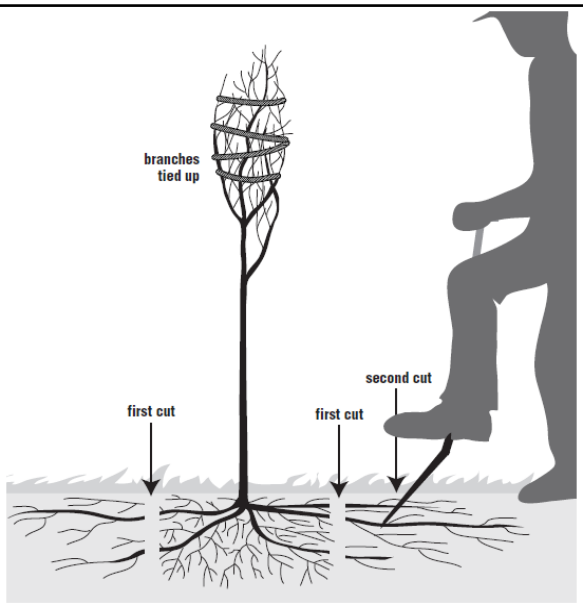

Figure 1. On trees taller than 5', make the first cut 6 to 12 months in advance. The second cut, made just prior to transplanting, should be 2 to 3" outside the first cut. *(source: Ontario Ministry of Natural Resources, © 2000, Queens Printer, Ontario)*

3. Prune the Roots of Larger Stock in Advance

Inventory and mark trees to be transplanted with colored flagging, ensuring adequate residual stock will be left at the source site. Consider marking south side of trees with paint or flagging and aligning during planting.

Important! Prior to any digging, call Miss Dig at 1-800-482-7171 three full working days before you dig to have the location of underground utilities identified. (visit http://missdig.net for more information)

Trees taller than 5' should be partially root-pruned 6 to 12 months in advance, ideally in fall or spring. This will help stimulate fine root development close to the trunk, as well as help the tree acclimate to the reduced root mass. Use a spade shovel to sever half of the roots in a circle around the tree, at least 12" deep. The size of the circle should follow the root ball size specifications is Table 1 below (see Figure 1).

4. Dig Up Your Trees

Transplanting in early spring (April) or late autumn (October) while the trees are dormant will provide the best success. Hot, dry days should be avoided as the trees' roots can dry out very quickly.

If trees are to be transported by vehicle or they have particularly large crowns, you may wish to gently tie up the crown with twine temporarily to facilitate handling and transporting.

Cut the roots with a sharp spade and remove the tree from the hole, carefully following the specifications in Table 1 below. For trees with a tap root such as oaks and other nut trees, you may be required to sever it, but you should make that cut as deep as possible, ideally 16" or more. For these tap rooted species, smaller trees are more desirable to minimize the damage to the tap root.

If the roots were pruned 6 to 12 months earlier, this final dig should occur two to three inches outside that initial cut to prevent damage to fine roots that may have grown into that area following the initial root pruning.

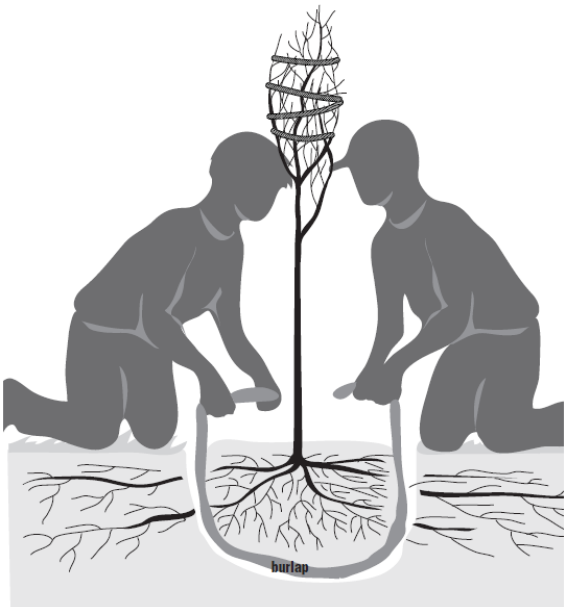

Figure 2. To remove the soil ball from the hole, a piece of burlap is rolled or tucked under the ball and the ball removed by two people. This burlap should be removed when the tree or shrub is replanted. *(source: Ontario Ministry of Natural Resources, © 2000, Queens Printer, Ontario)*

Care should be taken to ensure all roots are cut cleanly. Keep the soil around the roots, if possible. Wrap the root ball with burlap, or place in a suitable sized pot or other container to transport the trees (see Figure 2).

Lift the tree with shovels and by the roots, not by the trunk. On larger trees, use shovels to lift the tree enough to roll burlap under the root ball. Tie twine around the root ball to hold the burlap and soil in place. You can then use the burlap to help lift the tree from the hole. If the twine is tied around the stem of the tree, be careful not to damage the bark when moving the tree.

Table 1 – Caliper/height/root spread relationship for collected deciduous broadleaf trees*
The following table represents the approved minimum root ball dimension for collected trees:

Caliper	Average height range	Minimum root ball diameter	Minimum root ball depth
½ in.	4 to 5 ft.	14 in.	10
¾ in.	6 to 8 ft.	16 in.	12
1 in.	8 to 10 ft.	18 in.	14
1 ¼ in.	8 to 10 ft.	20 in.	14
1 ½ in.	10 to 12 ft.	22 in.	15
1 ¾ in.	10 to 12 ft.	24 in.	16
2 in.	12 to 14 ft.	28 in.	19
2 ½ in.	12 to 14 ft.	32 in.	19
3 in.	14 to 16 ft.	38 in.	23

** This table can be applied to most upright broadleaf deciduous trees, capable of reaching large sizes, such as oaks, sugar maple, hickory species, black cherry, etc. For other types of woody plants (small trees, shrubs, coniferous evergreens, etc.), refer to the ANLA American Standard for Nursery Stock at http://agri.nv.gov/Brochures/ANLAStandard2004.pdf.* (Anderson, et al, 1984 and ANLA, 2004)

5. Storing and Transporting Trees

It is best to plant the trees immediately after they have been lifted from their original site. If they can't be planted immediately, store the trees in a cool, shady location, and ensure the root balls stay moist with frequent watering. Covering with a few inches of mulch will help retain moisture.

If the trees need to be transported offsite, cover the roots with a tarp and drive slowly to prevent drying out and wind damage.

Sidebar 2 - Recommended Tools:

The following tools are commonly required for a transplanting project:

- Spade shovels, with clean sharp blades
- Pruning shears
- Colored flagging
- Burlap bags, buckets, pots, etc. for transport trees
- Twine and rope
- Leather gloves
- Wheelbarrows, or other equipment to move plants
- Water (both for trees and people)

6. Plant the Trees

Trees that are transplanted into a site with similar soils, sunlight, wind exposure, slope and aspect to the collection site will do best.

Dig a hole large enough to easily accommodate the root mass of the trees. A hole diameter 1.5 times the width of the root ball is recommended. In clay soils, rough up the edges of the planting hole with a shovel or other suitable tool. This will help the roots to better penetrate the soil.

Remove all root containers, including burlap, and place the tree upright in the hole and at a depth such that the root collar is at grade (or just slightly above grade in heavy textured soils).

Backfill soil around the root ball, and with no more than one inch on top of the root ball, taking care to eliminate air pockets. Soil can be gently, but firmly tamped down with your foot around

the perimeter of the root ball. Alternating between backfilling layers and watering the newly placed soil is a good way to ensure proper soil placement and density.

Water the site well, particularly around the base of the tree, to ensure good soil settling and saturation. If drier than normal conditions exist or leaves have emerged, it may be necessary to water for several days until suitable soil moisture returns or until leaves cease to wilt.

In exposed areas, support tall trees with temporary stakes for two to three years. Stakes should be driven into the ground outside the root ball. One stake on the windward side, or two stakes on opposite sides of the tree, is typically adequate. Guy lines anchored to stakes should be attached to the tree at 2/3rds of its height. Soft ties, wide ribbons, or short pieces of hose or cloth should be used where the lines attach to the trees to avoid damage. In most applications, staking is not necessary, and can have detrimental effects: trees can produce smaller caliper and trunk taper, develop smaller root systems, and are more subject to breaking or tipping after stakes are removed. (Blair, 2001)

Prune off any dead or broken branches, but do not prune live healthy branches for at least two years.

7. Follow-up Maintenance

Collection site: Reshape holes resulting from tree removal to decrease abrupt side slopes and reduce the chances of injury in the event somebody or something steps in the hole. If available, stones can be placed in the hole to reduce its volume.

Consider seeding any disturbed soil with native species to facilitate the recovery of the collection site. If appropriate, seed propagules of the species that was collected.

Monitor collection site for the presence of undesirable vegetation or invasive plant species. If found, control or remove with appropriate methods.

Establishment site: Control vegetation in a 3 to 4 foot diameter area around trees with one to three inches of mulch, fabric barriers, or herbicides for 2 to 3 years. Refer to Michigan NRCS Practice Standard Tree/Shrub Establishment (612) and Conservation Design Sheet "Weed Control for Tree and Shrub Establishment" found in section IV of the NRCS Field Office Technical Guide (eFOTG), http://www.nrcs.usda.gov/technical/efotg/ for more information.

Monitor the trees for signs of deer damage, rodent damage, or other stressors, and take corrective actions as needed.

Pay careful attention to the weather for the first 2 to 3 growing seasons. Collected trees often have a higher demand for water than nursery grown stock, particularly if the root ball is not cut properly and to the proper size. Supplemental watering of the trees for one to three years following transplanting is often required. If there has been no rain for more than two weeks and none is forecast, trees should receive a thorough supplemental watering. On coarse soils and in the first growing season, you may need to water sooner and more frequently.

Important! Be sure to remove support material (stakes, etc.) after two years.

REFERENCES

American Nursery and Landscape Association. 2004. Standard for Nursery Stock (ANSI Z60.1–2004). ANLA. Washington, D.C.

Anderson, L.M., C.W. Berisford, Y.C. Berisford, L. Biles, P.E. Black, H.K. Cordell, R.M. Degraaf, F. Deneke, R. Dewers, G.E. Gallaher, G.W. Grey, D.L. Ham, L. Herrington, J.J. Kielbaso, G. Moll, B.E. Mulligan. 1984. Forestry Handbook. 2nd ed. Section 16. Pub. No. SAF 84-01. Wenger, Karl F. (editor). John Wiley & Sons, New York, NY.

Blair, D.F., J.R. Clark, K.D. Coder, D.C. Froehlich, D.L. Ham, and S.J. Lilly. 2001. Arborists' Certification Study Guide. Chapter 7. International Society of Arboriculture. Champaign, IL.

LandOwner Resource Centre. 2000. Successful Transplanting of Woodland Vegetation for Plant Salvage or Habitat Restoration Projects. Queen's Printer for Ontario, Ontario, Canada (http://www.lrconline.com)

NRCS Field Office Technical Guide (eFOTG), http://www.nrcs.usda.gov/technical/efotg/