

Massachusetts Chapter of the American Chestnut Foundation
Policies and Procedures for Back Cross Orchards
January 23, 2002

Before any proposed Planting Site is approved as a TACF-MA Back Cross Orchard:

1. Establish a Proposed Map of Orchard site, and establish Randomized Planting Plan per TACF protocols. Site plan should be approved by Dr. Hebard, or his designee. Planting must be in well-drained open field setting with 30 ft from nearest woodland edges.

An On-Site Low Tech Randomization Method (as suggested by Mike Novack):

If randomizing two BC3 lines, and American, Chinese, and F1 controls (5 different types of nuts), then cut squares from 5 different colors of colored papers. Cut as many as there are germinated nuts of the BC3 lines, and as many as needed for each of the available controls. Place in a hat (or other receptacle) and draw one for each location, and label the site accordingly.

Although "low-tech", this is actually a more truly random process than any pseudo-random number generator can produce. But the main point in favor of the old fashioned method is that it is easy to adjust to the exact number of germinated nuts available at the time of planting.

2. There must be access to water, and a mowing plan defined.
3. An orchard manager to coordinate the site should be designated. The orchard manager is in charge of securing the germplasm agreement with the organization or owner that is making land available for planting. Orchard Germplasm agreements should be filed with the Secretary of the MA-TACF.
4. An estimated budget for planting materials and supplies should be defined. The plan should show how protection of the nut, sprout and sapling/apical bud will be achieved, and the cost of materials associated with the protection strategy. For one suggested approach, see attached "Suggested Planting Procedure for Advanced Breeding Lines (ABL) Orchard".
5. The Orchard Manager will be in charge of implementing the Orchard Maintenance protocol (see attached) and collecting data specified by the Orchard committee, in compliance with TACF requirements.

See Current Germplasm Agreement attached.

**THE AMERICAN CHESTNUT FOUNDATION
GERMPLASM AGREEMENT
Regional Adaptability Breeding Program**

This Agreement, dated and effective _____, 20____, is between The American Chestnut Foundation, a Virginia nonprofit corporation with its principal facility in the State of Virginia (hereinafter referred to as "TACF"), and the entity executing this Agreement at the foot hereof (hereinafter referred to as the "Recipient").

The Reasons for this Agreement: TACF is in the process of breeding hybrid chestnut trees for eventual release into the public domain closely resembling pure American chestnut trees but without susceptibility to the disease known as chestnut blight and with resistance to insect pests and other major pathogens of chestnuts. The method of plant breeding being used by TACF is commonly referred to as the "backcross method" wherein lines of American chestnut stock are outcrossed once to other species of chestnut carrying genetic resistance to chestnut blight, and successive generations of such outcrosses are then repeatedly backcrossed to American chestnut to recover the desirable characteristics of the American chestnut tree while incorporating blight resistance. It is in the interests of TACF and of the Recipient to be able to test and observe the characteristics of hybrids which are in the earlier stages of such backcrossing (i.e., the original outcross and first through third backcrosses [and intercrosses between individual trees of the same generation of backcrossing] since selected offspring of third backcross trees are considered to be genetically primarily an American chestnut type of tree). But the Recipient and TACF do not want the Recipient or others to use genetic material from such early stages for propagation purposes because: (1) the Recipient and TACF wish to preserve TACF's rights to such genetic material; and (2) the Recipient and TACF *most emphatically* do not want any person to take such material and market it, or to market any progeny from it; the material may not have the characteristics desired or have characteristics that are not consistent with the goal of TACF, namely "the Restoration of the *American Chestnut*", and not a Chinese or other type of tree; and (3) the Recipient and TACF do not want to be identified with the distribution, increase or marketing of material that has the potential of diluting the resident American chestnut population in the Appalachian mountains.

The Terms of this Agreement: This Agreement applies to all varieties of chestnut germplasm, and includes but is not limited to: pollen, nuts, scion wood, sprouted seeds, small chestnut plants, rooted cuttings, and all progeny thereof, all of which are owned by TACF and hereinafter referred to as the "germplasm."

TACF agrees to supply samples of germplasm to the Recipient. In consideration of this action by TACF, the Recipient agrees to abide by the following terms and conditions as to said germplasm and any other germplasm which has heretofore been received or will hereinafter be received from TACF which is not otherwise covered by a prior or subsequent agreement, UNLESS AND UNTIL TACF SPECIFICALLY RELEASES ANY CONDITION IMPOSED BY THIS OR ANY OTHER AGREEMENT ON THE CUSTODY AND USE OF ANY OF SAID GERMPLASM:

1. The Recipient understands and agrees that this Agreement conveys only a right to carry out research, evaluations and/or field testing on the germplasm on behalf of and in consultation with TACF. None of the germplasm (or any material resulting in any manner from the germplasm) may be sold, offered for sale, given (by gift or otherwise), or in any other manner transferred or distributed to any third party (that is, someone who has not signed a TACF Germplasm Agreement) whatsoever (except as provided in paragraph 7 below) without first being covered by a specific written consent from TACF describing the material sold or otherwise transferred, the conditions of the transfer, and other conditions acceptable to TACF in its sole discretion. TACF reserves the right to refuse transfer for any reason whatsoever. It is expressly understood that under this Agreement no implied or express license is granted by TACF to the Recipient for any transfer of the germplasm.
2. The sample of germplasm provided hereunder may be used for basic research, evaluation and/or field testing on behalf of TACF. However, no transformation techniques are permitted with the germplasm. No mutagenesis, tissue culture, or cellular techniques are permitted with any seeds, plants, or plant parts of the germplasm, or of any plant material resulting from the germplasm, including pollen. Selection may be conducted with the germplasm when done as a part of a cooperative agreement (or "Selection Agreement") between TACF and the recipient, with title and distribution rights to such selections being retained by TACF.
3. Seed stock increases for evaluation are permitted. However no seed, plants, plant parts, seed parts, callous tissue or DNA of or resulting from the germplasm may be transferred or distributed to any third party, except as otherwise provided herein.
4. The Recipient understands that the germplasm is being supplied to the Recipient solely to enable the Recipient to assist TACF in evaluating the germplasm and in furthering the breeding program of TACF. The Recipient agrees to take reasonable care of the germplasm, to make a commitment to the maintenance of the germplasm appropriate to the purposes for which the germplasm has been supplied (and insofar as the Recipient is reasonably able to do so), to cooperate with the State TACF Chapter and TACF so that they may carry out their responsibilities regarding the Regional Adaptability Breeding Program, and to do such other things as are reasonably necessary (and reasonably within the capabilities of the Recipient) to further TACF research projects by means of the germplasm being supplied to the Recipient.
5. The Recipient will permit scientists or other personnel of TACF to view and take samples of germplasm growing at such locations at reasonable times and after reasonable prior notice to the Recipient.
6. The germplasm is provided "as is." TACF MAKES NO WARRANTIES, EITHER EXPRESSED OR IMPLIED, AS TO ANY MATTER WHATSOEVER RELATED TO THE GERMPLASM INCLUDING WITHOUT LIMITATION THE CONDITION OF THE SAMPLE, ITS MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY WARRANTIES REGARDING INFRINGEMENT OF THIRD PARTY RIGHTS.
7. TACF retains ownership of all germplasm transferred to the Recipient and of all germplasm created therefrom, unless the parties negotiate a separate, joint-ownership agreement. The Recipient retains ownership of all real property on which germplasm is planted. Nothing in this Agreement shall restrict or impair the free transferability of the Recipient's real property, including that real property on which any trees produced from germplasm are located. In the case of a transfer of property interest by inheritance, the heirs of the Recipient shall be bound by the terms and conditions of this Agreement unless terminated by them as provided below. If the transferee of the real property interest has entered into its own agreement with TACF governing such trees, the Recipient will be under no further obligation. In all other instances of sale or other transfer of Recipient's interest in real property on which trees produced from germplasm are located, this Agreement shall automatically terminate upon such transfer and Recipient agrees to destroy all such trees prior to transfer.
8. The Recipient may terminate this Agreement at any time by destroying trees produced from germplasm or otherwise returning germplasm to TACF. The Recipient shall provide TACF with 60 days' written notice prior to destruction, in order to give TACF the opportunity to move the trees or otherwise preserve the germplasm.

This Agreement is non-assignable, is governed by the laws of the State of Virginia and may be amended only with the mutual written consent of both parties. This Agreement is effective when signed by the Recipient. Each individual signing for a corporate entity or any other entity hereby personally warrants his or her legal authority to bind that entity. If either party prevails in any litigation alleging violation of this Agreement, that party shall also be entitled to an award of attorneys' fees incurred in connection with such litigation to the extent permitted by the law of the State in which the germplasm is located.

THE AMERICAN CHESTNUT FOUNDATION

RECIPIENT:

BY: _____
TITLE: _____
DATE: _____

NAME: _____
BY: _____
TITLE: _____
DATE: _____

Suggested Planting Procedures for Advanced Breeding Line (ABL) Back Cross Orchards: This procedure is designed to give maximum efficiency in planting using a maximum of 4-5 people, taking about 40 total man-hours for an orchard with 200 sites. (This time estimate doesn't include time cost of mulching rows.)

Steps at Site:

1. KILL GRASS and ESTABLISH ROWS.

Three weeks before planting: 2-3 persons

Lay out rows of 100 to 400 ft in length, flag each planting site, and label each site, by continuous numbers or by row and number. Code each flag with identification of nut to be planted according to randomized plan. Space flags at 5-7 ft within rows, and rows 15-20 ft apart. Total sites desired: approximately 200.

Kill grass in a 4 ft wide swatch along the row with the flags at the center of the row, using RoundUp and backpack sprayer. **Note that spraying must be done on actively growing grass**, and therefore, for very early spring planting, it would be better to spray rows in the fall, in September & October, when grass resumes growth after summer dormancy. For May planting, with sprouted nuts, spraying 3-4 weeks prior to planting should be adequate.

2. MAKE PLANTING HOLES and ESTABLISH WATER SOURCE.

One week before planting: 2 persons

Using Echo Drill, make holes at each planting site, 3" wide x 6" deep. Place fertilizer packet in each hole, and partially fill with planting mix of 1/3 Vermiculite & 1/3 Perlite & 1/3 peat.

Re-spray and touch up any weed growth with RoundUp.

Construct 200 aluminum collars.

Establish hose hookup or watering plan.

3. PLANT NUTS OR SPROUTED SEEDLINGS

Day of planting: 4-6 persons.

Prepare additional planting mix of 1/3 Vermiculite & 1/3 Perlite & 1/3 peat in large 3 mil plastic bags.

Place nuts 1"-1 1/2" deep, within Aluminum collars, according to Flag codes and Randomized Plan.

Jam Aluminum collars at least 2" deep within hole, trying not to include field soil within the collar. Place 18-24" seedling browse protectors over each aluminum collar. Mound soil around the base of the collar, and make sure it sits securely.

Place down weed mats at each site with soil staples.

Water in the nuts.

Take pictures, chant incantations and prayers, and clean up.

4. MULCHING FOR ROW MAINTENANCE AND WEED CONTROL:

IF you have plentiful supply of free mulch, you may want to add wood chip mulch to the entire rows of planting to minimize need for weeding and RoundUp, but this will add 12-16 hours of labor to each orchard in the first year. Can be done in weeks following the initial planting. **This helps reduce watering needs, and keeps soil more evenly moist.**

5. FERTILIZING and WATERING (See Orchard Maintenance Schedule attached)

Begin fertilizing with Miracid from May 30th to June 15th, and continue on an every 2 week schedule.

6. SPRAYING

Spray with Plantskydd browse repellent as soon as sprouts emerge into seedling mesh. Or spray with egg based sprays *on a two weekly schedule* during active growth. (See formula for egg spray in "Planting Guidelines" attached.)

7. MOWING: as needed throughout growing season.

At every step, **record everything you did and who did it! Keep accurate record of time worked.**

Current Vendor List: Arborist, Nursery, and Forestry Suppliers for 2002.

- Cleaves Company, Inc., Arborist and Landscaper Supplies, 300 Reservoir Street, Needham, MA 02494, phone 781-449-0833. Source of orchard ladders and climbing equipment, and tools, backpack sprayers.
- Griffin Greenhouse and Nursery Supplies, 1619 Main St, PO Box 36, Tewksbury, MA 01876, Phone 978-851-4346. www.griffins.com. Source of fertilizers, RoundUp and planting supplies: vermiculite, perlite.
- Forestry Suppliers, Inc., 205 West Rankin St, PO Box 8397, Jackson, MS, 39284-8397, Phone: 601-354-3565 or 1-800-647-5368. www.forestry-suppliers.com. Source of equipment, pre-printed tree tags.
- Ben Meadows Company. 401 S. Wright Road, PO box 5277, Janesville, WI 53547-5277. Phone: 1-800-241-6401. Fax: 1-800-628-2068. www.benmeadows.com. Source of forestry and arboriculture supplies.
- Harris Seeds, 355 Paul Road, PO Box 24966, Rochester, NY 14624-0966, Phone: 1-800-514-4441. www.harriseseeds.com. Source of 3"x 4 1/2" deep peat pots, and other planting materials
- TreeEssentials Company, 2371 Waters Drive, Mendota Heights, MN 55120-1951, Phone 651-681-0011 or 1-800-248-8239, www.treessentials.com. Source of tree shelters, tree weed mats, stakes.
- Lawson Bags (Pollination bags #401 Tassel bags), 318 Happ Road, PO box 8577, Northfield, IL 60093, Phone: 847-446-8812.
- Hummert International Horticultural Supply, 4500 Earth City Expressway, Earth City, MO, 63045. Phone: 314-506-4500 or 1-800-325-3055. www.hummert.com.
- Stuewe & Sons, Inc., 2290 S. E. Kiger Island Drive, Corvallis, Oregon 97333-9461. Phone: 1-800-553-5331. Source of tree seedling and nursery containers.
- Milford 495 Rental Center, 189 Medway Rd., Rte 109, Milford, MA 01757. Phone: 1-800-244-5022, or 508-473-5022, www.495rental.com. Source of tillers and one-man post-hole diggers.
- Benner's Gardens, 6974 Upper York Rd., New Hope, PA 18938. Phone: 1-800-753-4660. www.bennersgardens.com. Source of plastic deer fencing.

MA-TACF Orchard Planting & Maintenance Schedule

Name of Orchard _____
 Type of Planting _____
 Nuts planted: _____
 Orchard manager _____ Phone No _____ E-mail _____

Procedure	Schedule Date	Date(s) Completed	By Whom
1. Plant nuts as early as you can work the soil.	March 15 - May 15		
2. Fertilize - First and second year. Use Miracid (30-10-10)@ 1 1/2 Tbsp/gal water, 1/2 gal /tree (Or dissolve 1 1/4 lb packet in 55 Gallon drum water.)	May 15		
First year - begin May 30	May 30		
Second year - begin May 15 (Don't fertilize after August 10 th)	June 15		
	June 29		
	July 13		
	July 27		
	Final		
Third year: continue to use Miracid as above.			
3. *Weed control - Spray with Roundup (systemic) when grass is actively growing, control by hand weeding and mulch. Weed a 3' diameter around each tree on new plantings and 1' beyond drip line on older trees.			
4. Record earliest flowering date, both male and female	June: Male		
	June/July: Female		
5. Monitor for Japanese beetles and seed germination	Mid July		
6. Protect trunks and apical bud from deer browse.	Late August-October		
7. Yearly report of orchard activities.	September 15		

Please record the dates that you complete a maintenance procedure. Not every procedure will be required for every orchard *Weed control - Use of herbicides requires protection of trees, including bark of trunks from the spray. Chestnut trees are quite susceptible to damage by herbicide.

MA Chapter of the American Chestnut Foundation
Spring Planting and Growing Instructions for Large Plantings of
Backcrossed American chestnut Seed
(100 or more seed)
(Adapted from PA Chapter Directions)
January 23, 2002

Step 1. Seed Care

- a. Store seed in cold moist place where it will not freeze in barely damp peat moss in perforated plastic vegetable bags. Unperforated bags may cause molding of nuts if the peat moss is too wet. The closer to 32°F the better.

Protecting nuts from weevil: Note that weevil damage doesn't necessarily kill the nut.

- Pick up fallen burs daily and keep area under tree clean. Prevents larva from burrowing into ground where they winter over.
 - A chemical treatment for chestnut weevil is Malathion 25% WP applied at rate of 6 lbs/100 gal water (1 oz/1.04 gal). The application dates are August 15, 23, and September 1. Hygiene is also important. All leaves, burs, twigs, and culled nuts should be collected and burned to reduce the recycling of weevils.
 - Spray trees with Sevin every 10-14 days beginning in August until 2 weeks before harvest. This prevents adult weevils from laying eggs in the nuts (TACF).
 - Follow the practice of squirrels as witnessed by some: nip off the blossom end of nut as soon as nuts are harvested to destroy eggs. Fingernails or toe clippers work well.
 - You can eliminate worms from nuts *for eating* by freezing them immediately after prompt harvest. This will, however, **kill** the embryo also, and the nut will not germinate if planted. Shelled nuts will keep for 12 months if held at 32 F or below.
 - *Nuts for planting or eating can be de-wormed by holding them in 120 F water bath for 20 minutes (not 122 F or above, not 116 F or below). The eggs will be killed and not hatch. Must be done immediately after harvest. Dry for a couple of days before refrigerating to avoid mold.*
- b. Handle nuts carefully. Sprouted nuts are fragile and the sprout (radical) will easily break off. If the radical breaks the seedling may grow and survive, but growth will be suppressed.
- c. Plant nuts as early in spring as possible, as soon as frost is out of the ground and soil can be worked. If potting nuts, they can be started in March in peat pots, in a mix of 1/3 vermiculite, 1/3 perlite, 1/3 peat moss. Potting also allows for later and more controlled planting, but also requires that seedlings be properly "hardened off" and that sunscald be prevented. (See attached: David Armstrong's Methods & Pictures.)

Step 2. Ideal Planting Site and Preparation

- a. **Soil** should be moist, loamy, well-drained, preferably sloped, and somewhat acid (pH 5.5 to 6.5). Heavy clay soils will benefit from deep plowing, adding sand and / or organic matter, then working with disk or tiller. Chestnut trees will not tolerate wet feet.
- b. **Exposure** - Full sun is best for growth, vigor and nut production. A sheltered north facing slope where drying winds and low sun of winter are excluded may be better for cold windy sites.

Step 3. Spacing and Randomization.

- a. B1 through B3 backcross breeding nurseries. Plant in rows 15' to 20' apart depending on your mowing equipment (20' is better if space allows) and trees 5-7' apart within the rows, with randomization of at least two BC3 lines, American controls (6-7 per 200 sites), Chinese controls (6-7 per 200 sites), and F1 controls (9-12 per 200 sites). Minimum controls ~ 21-24. A simple method of randomization, which can be done at the site, is attached.
- b. Pure American plantings. Plant in blocks of 10 trees of the same genotype, 2 rows 10' apart, trees 5' apart within the rows and blocks 20' apart.

Step 4. Protection

a. **Varmints** - Rabbits, deer, chipmunks, mice, voles, squirrels, ground hogs, blue jays, turkeys, and more, love chestnut seed and trees. Japanese beetles are also a nuisance. All plantings, either seed or seedlings, must be protected at each level.

1. Nut protection: (Voles, mice, birds, chipmunks, squirrels).

Aluminum collars: Buy 10" aluminum flashing in 50 ft rolls, and cut with heavy duty scissors or tin snips in 10" lengths (60 per roll) for 3" tubes, or 12" lengths (48 per roll) for 4" tubes. Using a napkin ring technique, hold the tube in a circle, and cinch with Avery Dennison cable ties to the appropriate diameter at the upper and lower ends, and then tape around the middle if desired.

Advantages: Cheap. You only use them one or two years so growing conditions are more natural perhaps. **Disadvantages:** Need to be monitored frequently; poor protection from herbicide spraying after 1st spray.

2. Sprout Protection: Low browsing of first year seedling from rabbits, ground hogs, deer results in multi-trunk trees.

Sprays:

Plantskydd: Highly effective blood based spray, but unpleasant to handle because of tendency to sludge. Lasts full season once applied. More difficult to apply as tree enters 3-4th year because of quantity and density of spraying.

Homemade Egg based sprays: Beat 4-6 eggs and a small amount of water in a blender for 2 minutes. Add to 2 1/2 gallons of water. Spray trees at bud swell (first part of May) and every two weeks until rapid new growth slows. Continue spraying as needed until August. Spray area about 2' around young trees as well as foliage. See attached description by Chandis Klinger (PA-TACF) as well.

Seedling tubes: the shorter the better. Tree shelters of >3 ft require a stake for stabilization

Types:

- Tubex shelters: Come in 4-5 ft lengths. (TreeEssentials)
- Green mesh shelters (TreeEssentials)
- Hardware cloth shelters, fabricated from 3 or 4 ft rolls, cut 18" wide, rolled into 6" diameter tubes.

Advantages: Provide good protection from animals. Solid Tubex shelters provide protection from herbicide sprays for 4-5 years. Encourages rapid upward growth. No lower branches on trunk, which makes inoculations easier. Easier maintenance. Some tubes are reusable indefinitely but need to be removed from trees early. **Disadvantages:** Costly: a minimum of \$3.00 each excluding stakes and shipping. Trunks may be spindly. Staking required both with tube and when tubes are removed. Some tubes disintegrate in 4-5 years.

Hardware Wire/Screen Tubes: Advantage: Somewhat cheaper and longer lasting than pre-manufactured tubes. Fabricated to size needed. **Disadvantages:** Requires cutting and fabrication. Not sufficiently tall to protect the apical bud from deer browsing. Requires stake.

- **Open Mesh tubes** (Ben Meadows): 18", 24": Cheap, less distortion of tree growth, with branching allowed above rabbit browse line at 18 to 24 inches. Growth of seedling readily observable. Provides protection only at sprout stage.

3. Apical Bud protection: The apical bud and tip of tree is browsed by taller animals, chiefly deer (and horses), and its loss significantly damages growth, since the American chestnut has strong apical dominance in its growth pattern. The tree requires apical bud protection until about 6-8 ft in height, e.g. from first year through 4th year.

Sprays (as above)

Bird netting over apical bud (method used by apple growers)

Deer Fencing: Electrical or plastic net. Note that deer fencing doesn't protect against rodent browsing (rabbits, ground hogs).

Step 4. (Continued)

- b. **Weed and grass competition:** Sod and weeds will significantly stunt the growth of trees. Keep area 3 ft in diameter (out to drip line as trees grow larger) free of grass and weeds around each tree. Use plastic mulch, tree mats and/or the herbicide RoundUp, and/or wood chip mulch. If using RoundUp, protect bark of trunk as well as leaves from spray.

APPENDIX:

Planting Supplies and Tools

a. Recommended Supplies & Tools

- 300' surveyors tape, preferably fiberglass, on reel and marked both sides in feet (Ben Meadows)
- Pencils, Black Sharpies
- Clipboard, pencil and paper, notebook for starting Orchard record.
- Numerical tags for numbering each site.
- Echo Drill with 3" x 6" heavy duty bit for holes. Additional gas/oil mix.
- Round pointed shovels and garden rakes
- 50-gallon plastic water barrel or 300-400 ft garden hose with shut-off nozzle
- 1 gallon measuring container (neoprene juice jug)
- Several 5-gallon plastic buckets (often thrown away at construction sites)
- Large wheelbarrow for mixing 1/3 peat moss, 1/3 perlite, 1/3 vermiculite
- Paper cutter or tin snips for cutting aluminum
- Clear packaging tape and plastic ties for aluminum cylinders
- Water jugs, drinks and cups
- First aid kit

Assembly of aluminum cylinders to protect chestnuts from squirrels, mice, voles and birds

Get 50' rolls of 10" aluminum flashing at any building supply store. Cut the aluminum with a level-action paper cutter or tin snips. Using defined "napkin ring" for 3" cylinder, roll into a cylinder which is slightly conical, one end having a slightly smaller diameter than the other end. Encircle the cylinder completely with tape to get a secure seal, or use plastic cable ties to secure cylinder at top and bottom.

Final manufacturing of the cylinders at the site may be recommended, because they are easier to transport when the pieces are flat, and bulky after assembly into cylinders.

MEADOWVIEW PLANTING METHOD:

TACF Aluminum Cylinder Method for Direct Nut planting.

1. Using Randomized Planting plan, establish rows with plowing & black plastic mulch. Make planting holes with bulb planters, after cutting through mulch.
2. Place stakes or surveyors flags pre-marked with planting code.
3. 1 part peat, 1 part vermiculite, 1 part perlite planting mix.
4. 50' rolls 10" aluminum flashing from building supply store.
5. Scotch 3750C 2-inch Premium Commercial Grade box sealing tape 1 roll / 160 cylinders
6. Scott brand 8 oz Styrofoam cups (1 cup per each cylinder)
7. 4' plastic mulch (1-2 mil) in rolls or 6 mil black plastic construction vapor barrier
8. 4 pencils or 4-20 common nails

At the time of planting nuts: Use of Styrofoam caps on aluminum cylinders.

If using aluminum cylinders alone: Place shade Styrofoam cup over aluminum cylinder for each nut. Punch nail or pencil through side of cup just above the bottom. Invert cup, compress cylinder diameter by squeezing, place cup firmly on cylinder and release cylinder. Beginning May 1st, check each cup every three days and remove when seedling is 2/3 way to top of cylinder. Remove all cups regardless of emergence by May 25th, unless cool and damp weather is likely in the next week. Note: Using aluminum cylinders with cups as lids has improved nut germination for Dr. Hebard particularly during rainy seasons. However, someone has to check cups and cylinders almost daily until the cups are removed.

Spraying With Eggs to Control Deer Browsing (Method of Chandis L. Klinger, PA-TACF)

Beat eggs in a blender for two minutes and mix with water. The egg/water ratio I use is four eggs to a gallon of water. There are times in the summer that the number of eggs is reduced to 3 or 2. This reduction is done when the leaves have matured and there is no or very little stem growth. The article [from which] I got this method said to strain the egg/water mix through cheesecloth to remove the egg globs. I have never used cheesecloth and I have never had the sprayer clog with the mix. In 2001, I began to mix/blend the eggs for 20 to 30 seconds and not strain the eggs. I have not had any trouble clogging the sprayer. In the 4/3/01 issue of Women's Day, there was a testimony of a person who uses 1 egg per quart of water.

An On-Site Low Tech Randomization Method (as suggested by Mike Novack, MA-TACF):

If randomizing two BC3 lines, and American, Chinese, and F1 controls (5 different types of nuts), then cut squares from 5 different colors of colored papers. Cut as many as there are germinated nuts of the BC3 lines, and as many as needed for each of the available controls. Place in a hat (or other receptacle) and draw one for each location, and label the site accordingly.

Although "low-tech", this is actually a more truly random process than any pseudo-random number generator can produce. But the main point in favor of the old fashioned method is that it is easy to adjust to the exact number of germinated nuts available at the time of planting.