The Nature Conservancy
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Brush Mountain Initiative

- Preserve Boundary
- Management Units
- Interstates
- Local Roads
- Streams
- Fencing Area
- Proposed Burn Units
- Treatment Zones
- Scrub Oak Restoration Site
- Streamside Management Zone

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Feet

April 2013

Brush Mountain Woodlands

Located in Blair County, Pennsylvania

Brush Mountain Initiative

(Anchor Point to the Central Appalachians, Ridge and Valley Region)

Volunteer Public Access Habitat Incentive Program Partnership

Investing $71,000 in this project to treat nearly 200 acres over a 2 year period

- Tree Planting
- Fireline Construction
- Vegetation Management
- Tree Cutting
- Prescribed Burning

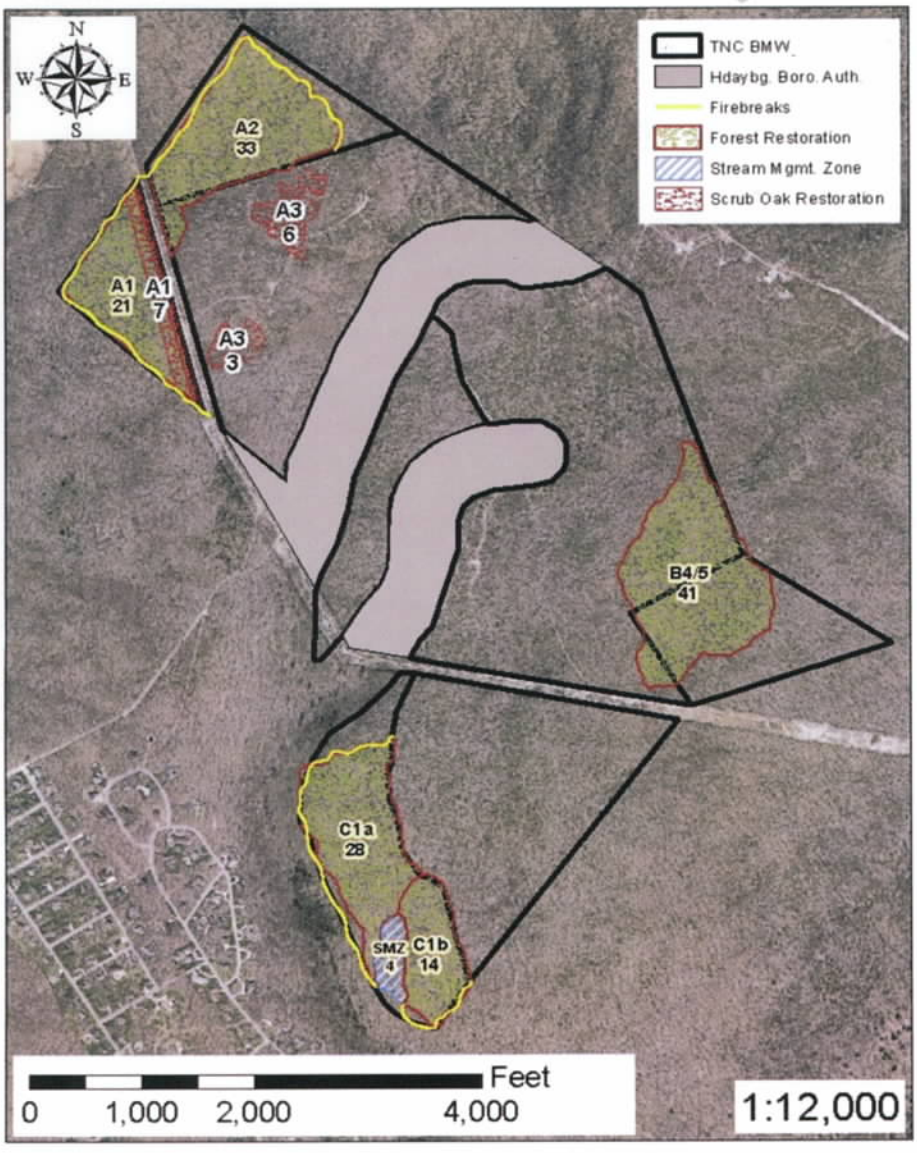
FSC Forest Management Plan

- Plan approved in 2010
- Guides location & sequence of treatments
- In compliance w/ Indiana Bat Management Guidelines

Habitat Management Team

Investing $30,000 in this project to fence approximately 60 acres and rallying volunteers and donors to contribute to on-the-ground activities

- Deer Fencing
- Tree Planting
- Prescribed Burning
- Trail Construction
- Signage



Key Project Partners

TNC:	PGC:	Am. Chestnut
Liz Johnson	Justin Vreeland	Sara Fitzsimmons
Molly Anderson	Clay Lutz	Dr. Leila Pinchot
Mike Eckley	Ben Jones	
Fire Team	Mike Pruss	

Private Forest Landowner Conference: Featured Field Tour May 2013

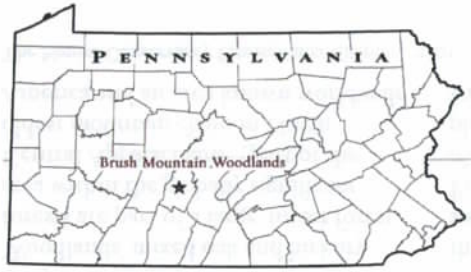
Blair County Convention Center

Volunteer Groups:

Juniata Valley Audubon Society
State College Leadership Circle
Brush Mountain Sportsmen Assoc.

American Chestnut Restoration

Outplantings of Improved Chestnut stock
Outreach, Education & Volunteerism
Research through Pinchot Institute



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Pennsylvania BRUSH MOUNTAIN WOODLANDS PRESERVE

It's April at The Nature Conservancy's Brush Mountain Woodlands Preserve and several thousand federally endangered Indiana bats have just emerged from their nearby roost to forage in the preserve's forests.

Located in one of Earth's healthiest and most biologically diverse temperate broadleaf forests, the 650-acre Brush Mountain Woodlands, overlooking Altoona, offers the Indiana bat and other wildlife the kind of habitat they need to thrive. With its mixed oak and hickory forests, and continuity with surrounding forestland, the preserve is part of the Conservancy's ambitious forest protection plan in Pennsylvania.

brush mountain © George C. Gress

Brush Mountain Field Guide: What You'll See

Timber Rattlesnake *Crotalus horridus:* One of the largest snakes in Pennsylvania forests, these "rattlers" play an important ecological role, preying on rodents throughout their long lifespan. Development of Pennsylvania's forests has greatly reduced habitat for this snake.

Indiana Bat *Myotis sodalis:* Weighing just a quarter-ounce, this tiny bat faces huge challenges. Habitat loss reduced this species' numbers to federal endangered species recognition in 1967, but in recent years a mysterious ailment called white-nose syndrome has reduced the population by at least fifty percent, making protected areas like Brush Mountain Woodlands all the more important.

Allegheny woodrat *Neotoma magister:* This squirrel-sized furry 'pack rat' builds an impressive football-shaped nest on the forest floor that can be as large as nine feet in diameter. Both the loss of chestnuts for food and a parasite have led to population declines.

Golden eagle *Aquila chrysaetos:* This raptor, with a wingspan averaging seven feet, is an important predator, feeding on other birds, small mammals and even deer. The ridge that includes Brush Mountain is part of a key migratory corridor for thousands of golden eagles and other birds of prey each fall.

Wood Thrush *Hylocichla mustelina:* This cinnamon-colored thrush relies on shady forests where its ground nest is protected by vegetation. Lumbering caused a significant decline a century ago, and acid rain and habitat loss have led to alarming reports of a 40 percent decline since the 1960s.

American chestnut *Castanea dentata:* Historically one of the most valuable trees in Pennsylvania's forests, the chestnut provided timber, nuts and habitat. Since 1904, a disease called chestnut blight has decimated populations, and at Brush Mountain unsustainable logging eliminated the survivors. But today, a few sturdy American chestnuts persist in the wild and reintroduction efforts could soon restore this stately tree to Penn's Woods.

Wild turkey *Meleagris gallopavo:* Proposed by Pennsylvanian Ben Franklin for America's national symbol, the native turkey has been making a comeback. Populations statewide have grown from just a few thousand in 1900 to more than 300,000 today, due in part to state restoration efforts.

Black bear *Ursus americanus:* Some of the region's biggest bears live in Pennsylvania's forests, where they grow as large as 800 pounds. Bear populations are on the rise, and as human settlements encroach on habitat, complaints are rising—making contiguous forest habitat like that at Brush Mountain Woodlands more important.

Both ecologically and economically speaking, Pennsylvania's hardwoods are renowned around the world. But Penn's Woods are badly stressed by too many deer, not enough fire, acidic rain and snow, pests, poor forestry practices, energy and housing development, roads and more. Diversity is being lost as valuable oak, hickory and sugar maple are replaced by species like black birch and red maple. Holes are being cut into the forests, and remaining blocks are disconnected, reducing their value to people and wildlife.

In the face of these growing threats, the Conservancy has identified an essential forest network throughout the state which, if conserved, will sustain all of Pennsylvania's forest types and the species that depend upon them. Brush Mountain Woodlands is an important part of this network.

Why Brush Mountain Woodlands?

In addition to the Indiana bat, Brush Mountain Woodlands harbors other state rarities like the Allegheny woodrat and timber rattlesnake, plus more common species like black bear, wild turkey, white-tailed deer and more. The site is also the southern terminus of the Bald Eagle Ridge Important Bird Area, a significant migratory route for raptors and neotropical songbirds.

Why the diversity? Brush Mountain Woodlands' mixed oak and hickory forests are part of a large, intact forest area within the globally significant Central Appalachians—part of the oldest mountain chain in North America and an area known worldwide for its rich species diversity. In fact, only China's temperate forests rival those of the Central Appalachians' in biodiversity.

Brush Mountain is significant not only for the species it harbors, but also because of the benefits it, and other forestlands like it, provide to humans. Forests filter pollutants from air and water, reduce the severity of floods, lock up carbon dioxide emissions and provide abundant outdoor recreational opportunities.

What's Ahead?

Brush Mountain Woodlands is an important building block for the Conservancy's innovative Working Woodlands forest conservation program. The program promotes sustainable management on a network of private forestlands that provide important wildlife habitat, watershed protection and carbon sequestration capacity. Through the Working Woodlands program, the Conservancy offers financial incentives and expert forest management support to owners who agree to the long-term conservation of their forests.

Brush Mountain's woodlands are helping us refine this strategy. Here, the Conservancy is creating a Forest Stewardship Council (FSC)-certified forest management plan that will guide our efforts to restore the woodlands to the robust and diverse composition and structure that characterize a healthy Pennsylvania forest. For instance, some old logging roads are being reforested or planted in grasses that are beneficial to wildlife. By restoring these woodlands, we not only protect foraging grounds for the endangered Indiana bat, but also develop tools to help forest owners throughout Pennsylvania manage their forests sustainably.

Other old logging trails, however, are being made into trails for the public to enjoy. The Conservancy encourages public visitation at Brush Mountain for hiking, birding and hunting—managed through cooperation with the Pennsylvania Game Commission.

Protecting Brush Mountain Woodlands is a critical part of the Conservancy's strategy to save Pennsylvania's valuable woodlands—and the wildlife, jobs, forest products and recreation linked to them.

Learn more at nature.org/Pennsylvania

We Need Your Help

The Nature Conservancy purchased 640 acres on Brush Mountain in 2008. We are working to raise $750,000 to complete this project.

Please contact us to find out how you can help:

The Nature Conservancy
Pennsylvania Chapter

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hybernating Indiana bat © USFWS

RESTORING THE AMERICAN CHESTNUT TREE

Background: Early research

Beginning in the 1920s and for decades thereafter, the U.S. Department of Agriculture and the Connecticut Agricultural Experiment Station (CAES) attempted to breed blight-resistant chestnuts by crossing Chinese and Japanese chestnuts, with the American species. Their efforts were unsuccessful: none of their crosses were fully blight-resistant while having characteristics closely resembling American chestnut in nut or timber quality.

TACF's early efforts

In the late 1970s, TACF's founder Dr. Charles Burnham proposed a methodology of breeding to incorporate blight resistance into the American chestnut tree. By using a well-established plant breeding technique known as "backcrossing," Dr. Burnham hypothesized that one could marry the best characteristics of both the American and Asiatic species.

Biology of the Tree: Controlled Pollination

The first step to making TACF's breeding stock is to find American chestnuts with which to cross Chinese and advanced backcross pollen. Whenever a proper tree is found, great efforts are made to incorporate that tree into TACF's national breeding program through the process of controlled pollination. Pollen from the male flower (called a catkin) of one tree is crossed with the female flower (called a bur) of another tree.

A large surviving American chestnut tree is covered in bags during the controlled pollination process. Some of the larger trees can produce several hundred nuts in a season.

THE AMERICAN CHESTNUT FOUNDATION

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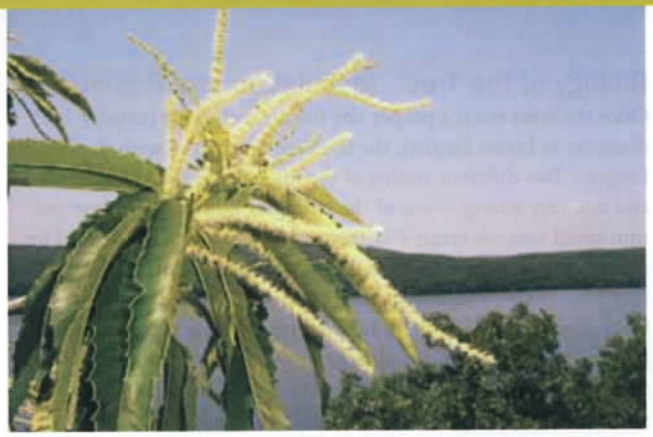


Massachusetts members of TACF not only discovered, but arranged and performed the pollination of this 65-foot tall tree on the Prescot Peninsula of the Quabbin Reservoir. Shown here are the male flowers known as catkins.

Biology of the Tree: Genetics and Incorporating Native Diversity

Based on the work of the early researchers at CAES, it was determined that blight resistance was controlled by two or three genes acting in an incompletely dominant fashion. This means that when a fully-resistant Chinese tree (RRRRRR) is crossed with a fully susceptible American chestnut (rrrrrr), the resulting F_1 progeny would be moderately resistant to the blight (RrRrRr). With the exception of the intercross *(BC_3F_2 and BC_3F_3)* generations, the most resistance possible is moderate resistance. In order to select which trees have the best resistance of those planted, TACF grows the trees for about 5-8 years and then challenges (inoculates) the trees with the blight fungus.

In order to avoid inbreeding over the long term, TACF seeks to perform the backcrossing process with as many surviving native American chestnut parents as possible. To date, over 500 American chestnuts have been incorporated into various generations and more are added to that tally every year.

Biology of the Tree: Planting and Growing

TACF has been able to make great advances in the standardization of planting and growing all matter of chestnut stock. After pollination in the summer, the resulting nuts are ready for harvest in the fall.

Chestnut nuts require a period of dormancy of approximately 1-3 months. Seed are refrigerated until planting time. The seed are typically planted directly in the ground and protected from rodents and deer using several methods, depending on the site and resources available. The trees are grown for about 5-8 years until they are inoculated and selected for resistance and American character.

This 65-foot specimen grows in one of the outermost parts of the natural range of the American chestnut – Talladega National Forest in Alabama. The tree is now used in TACF's national breeding program and will help increase regional adaptability for the American chestnut.

Biology of the Tree: Inoculation and Resistance

Once the trees reach a proper size for the technique (usually 1.5" diameter at breast height), the trees are inoculated with the blight fungus. Two different strains of the fungus, one relatively weak and one very strong -- one of the strongest known -- are inserted into small wounds created in the tree. The trees are then rated for resistance after five months and again after 11 months. Those trees that have little to no resistance are removed from the planting. Only those that have the highest degree of resistance of those planted will be bred into subsequent generations. This continues for a minimum of six generations. With excellent care, TACF is able to complete a generation in six years or less.

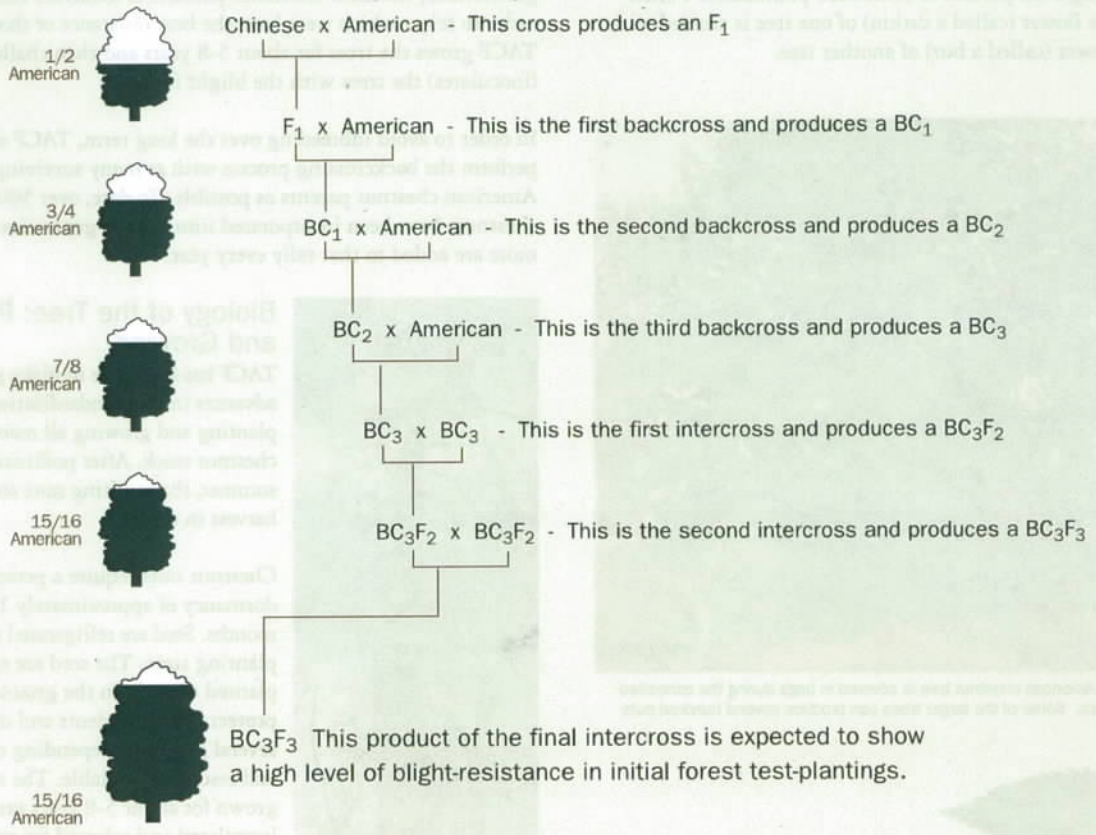
Testing Ourselves

By consulting with a diverse network of colleagues, TACF increases the strength of its scientific focus and methodologies as part of its overall mission and enhances its ability to partner with high-profile organizations throughout the country. In 1999, and again in 2006, TACF contracted with nationally and internationally-recognized scientists for an independent audit of its science program. In each of these years, TACF's national breeding program received high marks indicating an excellence in scientific procedures.

Figure 1.

THE AMERICAN CHESTNUT FOUNDATION BACKCROSS BREEDING PROGRAM

With each cross, additional American chestnut characteristics are regained. Only at the final cross, however, does blight resistance approach that of the Chinese parent



Note: In each step, the Backcross is selected for resistance through the process of inoculation and for American charcteristics by visual observation.

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EXTENSION SERVICE
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UNIVERSITY OF WISCONSIN

Collecting & Planting Seeds of Cone-Bearing Trees

William H. Brener, Wisconsin Conservation Department
Gordon R. Cunningham, Extension Forester

• Raising coniferous trees from seed is an exacting job. It requires special knowledge and equipment and is not recommended for the amateur. Furthermore, it is usually more economical to buy seedlings and transplants from state and commercial nurseries than to grow your own trees from seed. However, most nurseries depend on private sources for seed, providing a source of income for tree seed collectors. Also, some landowners may wish to raise trees from a specific source, or just for the experience of growing their own planting stock.

COLLECTING CONES FOR SEED

Seeds are found inside the cone on the upper surfaces of the cone scales. Open cones have dropped their seed; so collect closed cones only, preferably by picking them from trees. Collect cones from well-formed, vigorous trees. When collecting cones, remember to:

1. Collect ripe cones. Cones will ripen at different times, depending on the species and on the part of the state. Generally balsam fir, spruces and tamarack cones ripen from late August to early September; white cedar from August to October; jack pine during September; red and white pine and hemlock during September and October, and Scotch pine from October to March.

Each variety of ripe cone looks different. However, usually all ripe cones are brown or purplish. The best test of ripeness is to examine the individual seeds. If a seed is full, plump and white -- but not milky -- the cones are ready to pick.

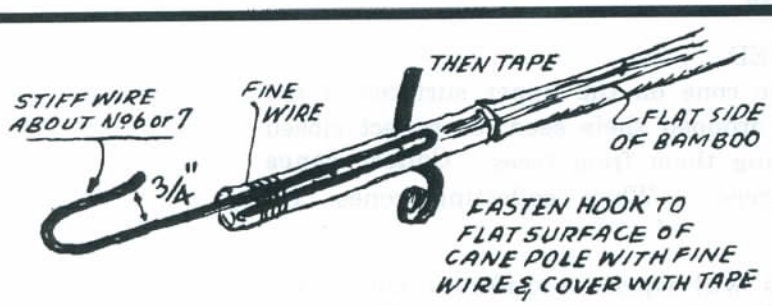
2. Squirrels often cut down ripe cones. These can be picked up from the ground. However, be sure to check ripeness.

3. A step ladder will help you reach cones on the tops of smaller trees.

4. If seed-bearing trees are harvested for lumber, pulpwood, or other purpose, during the period when cones are ripe, cones can be collected from the tops.

5. When picking cones by hand, bend the needles back and twist off the cone.

6. To pick cones with a <u>cone hook</u>, fasten a stout wire (in the shape of a hook) on the end of a pole. Cones, which would otherwise be out of reach, can be pulled from the trees with this hook.



SELLING RIPE CONES

Ripe cones are usually purchased by the standard bushel measure (quantity not weight). After you've collected the cones, empty them into a gunny sack or bushel basket and deliver them promptly. The Wisconsin Conservation Department usually buys cones in the fall. Private cone dealers also purchase cones. For the current state price lists, contact the Superintendent of Nurseries, Griffith State Nursery, Wisconsin Rapids, Wisconsin.

RAISING YOUR OWN TREES FROM SEED

Every year many millions of trees are produced by state and commercial forest nurseries for forest plantings, shelterbelts and

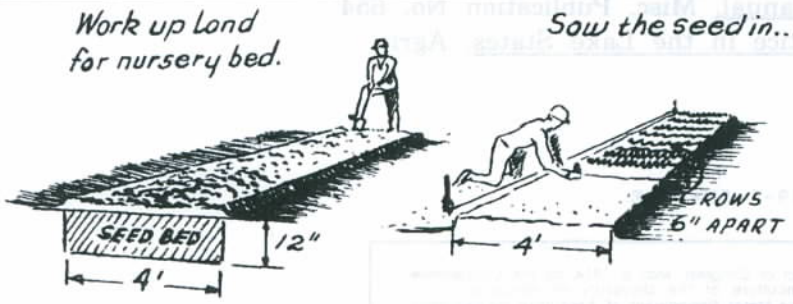
windbreaks. Trees for reforestation can be purchased at near the cost of production from the state forest nurseries. The state puts some restrictions on the uses of these trees. For example, a certain number of trees must be left per acre to grow into sawtimber, and trees cannot be harvested with roots attached. Commercial nurseries produce a wide variety of species and sizes. No restrictions are placed on trees purchased from commercial nurseries. Purchasing planting stock is usually cheaper than raising your own trees from seed. However, if you decide to raise your own trees, follow these five steps:

1. Dry the cones. Spread them on a dry surface in direct sunlight so they will dry out and the scales will open. A hard surface or a tarpaulin works well for this purpose. You can apply artificial heat (not over 120° F) such as from an oven.

2. Next, take out the seed from the dry cones when the scales open. Use a box or tray with the bottom made of half-inch hardware cloth. Half-fill the box with open cones and shake vigorously. The seed will fall through the bottom. Seed for home production of trees does not have to be cleaned.

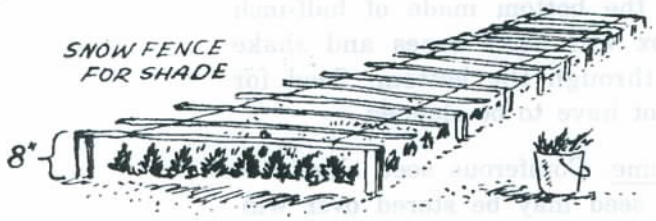
3. Store the seed until planting time. Coniferous seed should be sown in the fall. However, the seed may be stored over winter for spring planting. Red and jack pine, hemlock and white cedar seed should be in a dry, air-tight container and kept in a cool place (40-50° F). Balsam fir, white pine and spruce seed should be mixed with moist -- not wet -- sand at the rate of 3 parts sand to 1 part seed and kept at a temperature of 36 to 38° F.

4. Plant the seed in a nursery bed. A loamy sand or sandy loam is the best kind of soil for this purpose. Spade the ground to a depth of one foot and remove all trash, rock and litter. Pulverize the soil thoroughly.



Sow the seed broadcast or in drills 4 to 6 inches apart to a depth of four times the size of the seed. Plan to raise about 50 seedlings per square foot of seed bed. On the average, to raise 50 seedlings per square foot, the following quantities (in ounces) of uncleaned seed will be needed for every 100 square feet of bed:

Tree	Seed	Tree	Seed
Balsam fir	10 ounces	White pine	7 ounces
Hemlock	4	Norway spruce	3
Jack pine	3	White spruce	3
Red pine	3	Tamarack	5
Scotch pine	2	White cedar	3



5. After the seeds germinate, you will need to shade, weed and water them. Fungicides for control of "damping off" disease may be needed. Weeds can now be controlled with chemicals, saving much hand labor. Thinning the seedlings to 50 per square foot may be necessary. For details on fungicides, herbicides and thinning operations, consult publications such as these published by the Forest Service, U. S. Department of Agriculture:

Woody-Plant Seed Manual, Misc. Publication No. 654
Forest Nursery Practice in the Lake States, Agric. Handbook No. 110

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