



Expand your woods for the future

Tree planting is one of the best ways to renew or expand your backyard woods. Trees will grow into open fields if there is sufficient rain, and naturally reproduce after tree harvests, storms, and wildfires. Tree planting speeds up the process and allows you to select the types of trees in your new woods. Tree planting is a long-term investment. Not only will you benefit, but your children, grandchildren, and possibly their children will enjoy and use the trees you plant.

Why do I want to plant trees?

With the help of your family take time to determine what you want to accomplish by planting trees. Be specific. Most tree plantings can have more than one objective, but try to focus on a central objective and then add plants to meet secondary ones. Be creative. The following examples of planting objectives and design considerations are not mutually exclusive.

If your objective is attracting wildlife, consider doing the following:

- Increasing plant diversity that complements the surrounding landscape.
- Developing habitats that are in short supply in the area.
- Choosing trees and shrubs that are preferred food for various species, or providing cover (nesting habitat and winter thermal cover), or both.
- Establishing travel corridors to connect separated woods.
- Creating areas of differing tree size and age.
- Planting around existing old trees with large crowns.
- See the Backyard Woods Tip Sheet on Attract Wildlife for more information.

If your objective is enhancing aesthetics, consider doing the following:

- Planting species with desirable spring and fall colors or attractive fruit and seeds.

- Varying the layout and location of plantings.
- Using a wide variety of species, including shrubs used by wildlife.
- Planting along any hillsides.
- Randomly planting trees or using curved rows.
- Creating irregular planting edges.
- Leaving openings within the planting.
- Creating areas of differing tree size and age.
- Retaining landmarks and distinct features (old trees with large crowns)

If your objective is to protect or improve water quality, consider doing the following:

- Planting trees with long life expectancy in buffer zones near streams, lakes, and wetlands, to trap sediment and remove nutrients.
- Plant trees near streams and lakes that hold their leaves over winter (oaks and beech) so that they feed the aquatic insects during the winter.
- Plant trees near streams and lakes that tolerate periodic wet soils.
- Plant along contours on slopes to prevent soil erosion.
- Avoiding site preparation that might increase erosion.
- See the Backyard Woods Tip Sheet on Protect Clean Water for more information.

What are the site conditions?

Trees grow best on sites that meet their needs. Climate, soil, moisture, and amount of sunlight are primary factors. Get some basic information on the area you are planting.

Is the soil sandy (coarse), loamy (medium), or clayey (fine) texture?

Is the site wet at various times of the year or does precipitation enter the soil readily?

Does the area receive full, partial, or very little sunlight?

Armed with this information you should be able to select from a list of trees at your local nursery that will meet your objectives and grow well on your site.

What can I plant?

Plant native species. Native species are adapted to site conditions in your part of the country. Matching a tree with a planting site becomes much more important when the species is not native. One of the best ways to check how trees will do on your land is to observe species growing naturally in the vicinity.

State and private nurseries within your state are good sources of planting stock to match your local climate. Be careful when ordering trees from out-of-state nurseries. Be sure to check the seed source. The source of seed used to grow the trees should not be more than 100 miles north or south or east or west of your state border. This “rule of thumb” works well in the eastern United States. In western States, however, elevation is an additional factor to consider. The seed source should be near the same elevation as the planting site.

How do I prepare the site?

Controlling competition from grasses, weeds, and existing woody cover is the reason for site preparation. Soil type, soil moisture, and geographic location are also important considerations. For example, highly productive loamy soils require more intensive site preparation than do less productive sandy soils.

Site preparation methods that can be used are mechanical, manual, chemical, and fire. Rototilling, plowing, disking, or all of these in a 6-foot wide strip in the fall before spring planting will set back grass sod, and minimize erosion and weed seed invasion. A machete, hoe, shovel, and brush-ax can be used to remove vegetation in the area around where a seedling will be planted.

Herbicides can be a safe and economical alternative to hand tools and power equipment methods. They also provide the least amount of soil disturbance and allow you to leave the surface layer of soil, which has the most nutrients for the new trees. Success depends on timing of application, herbicide selected, weather conditions, and application rate. Always follow herbicide label directions.

Fire can be used alone or in combination with other site preparation methods. It is simple and inexpensive, but should be done only by trained personnel under carefully controlled conditions.

How should I space trees?

Whether you plant trees in rows or place them randomly, you need to give them room to grow. The spacing you select depends on your objectives.

Height growth is reduced at extremely close spacing. Diameter growth begins decreasing when tree branches touch. Spacing determines when growth will slow.

At close spacing trees will grow straight and tall with smaller and fewer branches on the lower main stem. Close spacing enables trees to outgrow the competition and dominate the site, but it requires the removal of some trees when their crowns begin to touch, much like thinning carrot seedlings from a garden. (See the Backyard Woods Tip Sheet on Help Your Preferred Trees Grow for more information.)

Wide spacing reduces the number of trees to buy and plant, but it may increase the length of time weed control is needed. Tree crowns will be larger with more branches on the main stem. Trees may produce seed sooner, and undergrowth (associated shrubs and other plants) will provide wildlife food, but undergrowth may also increase fire hazards.

How do I handle bare rootstock?

Bare rootstock is the most economical way to purchase trees and it can be used to meet nearly all your planting objectives. Bare rootstock is obtained as 1-to 3-year-old trees, either as seedlings or transplants. Seedlings grow in the nursery in the same bed they were planted.

To calculate the number of trees per acre for any spacing, divide the number of square feet in an acre (43,560 square feet) by the growth area for each tree.

Example: For an 8 feet by 8 feet spacing each tree is in the center of an 8-foot square, and has 64 square feet of growing space before it touches another tree’s branches.

Therefore, 43,560 divided by 64 equals about 681 trees per acre.

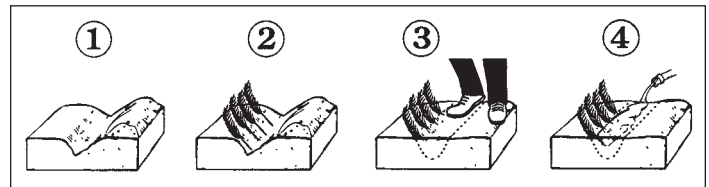
Transplants were removed from the seedbed and replanted (transplanting improves root development).

Bare rootstock is susceptible to root drying and physical damage. Stock is packed at the nursery in a bag and wrapped in moss to keep the roots moist. Keep stock at a constant low temperature (33-40 degrees Fahrenheit) and the roots moist but not soggy. They must remain dormant from the time they are removed from the nursery bed until they are planted.

Transportation is an important consideration for orders of all sizes. For orders over 1,000 trees, a refrigerated truck is the preferred method of transportation. If you transport them in a pickup truck, keep bags separated for ventilation, cover with a moist tarp, and protect from the sun with a solar reflective tarp. If seedlings will fit in your car, keep them inside with insulation, ice packs, and air conditioning on maximum. Only a few minutes in a hot trunk can permanently damage seedlings.



Bare-root trees need special care to survive the transition from the nursery to your backyard woods.



To store bare rootstock for more than a few days, use this method: In a cool shady location dig a V-shaped trench deep enough to hold the entire root system and part of the lower stem, fill with soil, and water.

After stock arrives at your property, keep the bags in deep shade and protect them from freezing. Separate the bags to prevent overheating. Plant the trees as soon as you can.

If you must store trees for longer than a few days, open the bags and place the trees in a trench. Dig a trench deep and wide enough for the whole root system and part of the stem to be covered with soil. Lay the seedlings next to each other in the trench and fill with soil and water. The length of time seedlings can be stored varies by region of the country. Check with Cooperative Extension Service or state forestry offices for local recommendations.

How do I prepare seedlings?

Before you plant, grade the seedlings and discard those of poor quality. Poor-quality seedlings will have excessive mortality and poor early growth. They can be identified by these criteria:

- Broken, skinned, or weak stems.
- Fermented odor or mold on needles.
- Slippery bark on root or stem.
- Diameter of root collar (junction between root and stem) smaller than 1/8 inch or larger than 3/8 inch.
- Root systems less than 4 inches long.
- Root systems more than 12 inches long if more than 50 percent of the fine roots must be pruned to reduce the length and width of the root system for planting.
- A dry root system resulting from improper storage, exposure to sun and air for over 10 minutes on a cool humid day, or for 5 minutes on a warm windy or dry day. Bitter cold dry winds can be equally destructive.

If possible, prune roots and grade seedlings at the same time. Long fibrous root systems require pruning to avoid bent or "J" roots in the planting hole. Root pruning should be done in a cool controlled environment where the root system will not dry out. Have water available. The worst place to prune roots is at the planting site. Prune with a sharp knife, machete, ax, or hatchet. Never break or twist roots off by hand.

Broadleaf trees need large vigorous root systems to survive. They can be pruned to 8 to 10 inches long with at least 4-inch long lateral roots. Needleleaf trees can be pruned to 5 to 8 inches long, but never remove more than 50 percent of the lateral roots.

Recommendations vary for different regions of the country, so be sure to check on local guidelines.

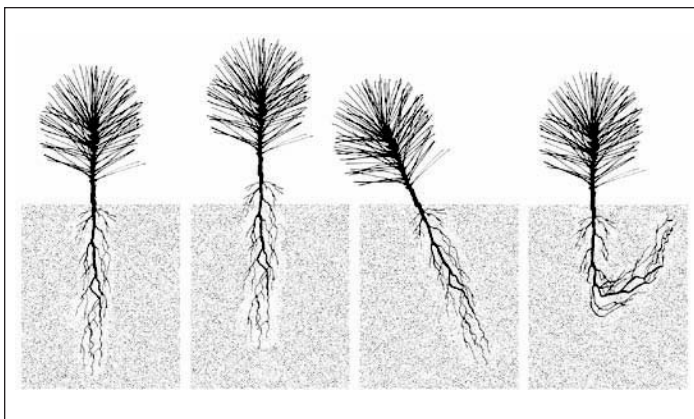
Keep the seedlings in the shade and cool until planted. The seedlings should be carried in a bucket or planting bag with wet burlap or something similar to keep the roots moist at all times. Never carry seedlings exposed to the air or immersed in water.

What is the best way to plant?

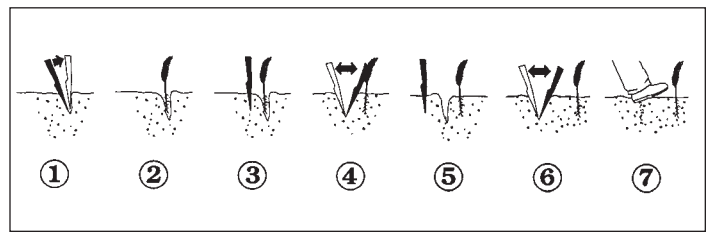
Hand planting is the best method for planting a small number of trees. The hole or a slit method can be used to hand plant trees. No matter what method you use follow these steps:

- Plant the tree at the same depth that it grew in the nursery. Error on the side of planting a little deeper rather than exposing roots.
- Plant the tree in a vertical position to avoid a crooked stem.
- Place roots in the planting hole without bending them.
- Carefully firm the soil around the roots to eliminate air pockets.

With a shovel dig a hole deep enough to plant the tree roots without bending them, and pack the soil firmly around the roots. This hole method usually results in a high rate of survival, but it is slow and not practical for planting a large number of trees.



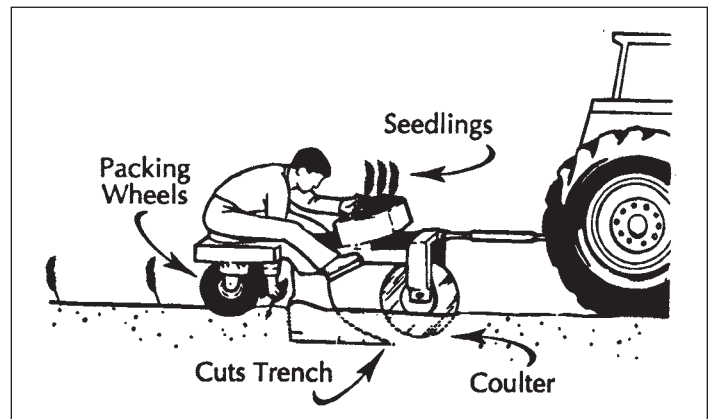
Plant trees upright, at about the same depth they grew in the nursery, as shown in the first diagram on the left. Don't expose or bend the roots.



Using the slit or bar method, you can plant about 1,000 seedlings a day.

The slit or bar method is faster. A rough estimate is that an inexperienced, but physically fit, tree planter can plant 1,000 to 3,000 seedlings per day.

If you want to plant more than 1,000 trees, you may want to consider using a planting machine. It is suitable for use on level terrain that is free of stumps, rocks, wet areas, and brush or tree cover. Generally a 30-50 horsepower tractor and a crew of three are sufficient. Experience in operation of planting machines comes quickly, and a crew can plant about 10,000 seedlings a day.



There are many types of tree-planting machines, but generally they have a coultter that breaks through the soil surface, a V-shaped blade that opens a trench into which the trees are placed, and packing wheels that firm the soil around the tree.

How do I maintain new plantings?

Maintaining moisture and nutrients is critical for tree survival during the first 3 to 5 years. Grass, weeds, and animal pests are the culprits you need to control. The amount of maintenance needed varies by region of the country. Grass and weed control methods include these:

- Shallow mechanical cultivation (2 to 4 inches) two to three times during the growing season controls weeds on sites with no erosion problems.
- Herbicides are an effective and economical grass and weed control method. They are especially useful in

controlling weeds within rows, where cultivation is more difficult, or in plantings designed without rows.

- A mulch such as woodchips can reduce weed competition, moderate soil temperatures, and help retain soil moisture. Mulch is aesthetically more appealing than any of the other weed control methods. Place a 2- to 3-inch thick layer, and maintain it for 3 to 5 years. Keep the mulch 3 to 4 inches from tree stems to prevent damage by small rodents. Avoid using grass clippings, hay, or straw mulch because they attract rodents.
- Landscape fabrics are effective in reducing soil moisture loss and weed growth, especially in low rainfall areas. Small squares (3 feet square) and continuous strips (6 to 8 feet wide), when properly installed, can control weeds for 5 to 10 years. Installing individual squares is fairly easy, but the continuous sheets require a machine and experienced installers. Landscape fabric is more expensive than other weed control methods, but its long life makes it cost-effective. Landscape fabric can attract rodents in some areas. Check with the Cooperative Extension Service or county Conservation District for local recommendations before applying fabric.

Old grass fields, pastures, and openings in the woods are ideal places to plant trees. They are also “buffets” for deer and rodents. Deer will feed on needleleaf trees in fall and winter when preferred food is limited and in spring when buds are most succulent. Deer can kill seedlings or severely stunt their growth. Rodents can kill seedlings up to 2 inches in diameter by girdling them as they eat the bark near the ground. Fencing, physical barriers, repellents, and habitat manipulation are deer protection methods.



- Electric and standard fences are effective, but construction and maintenance costs are high.
- Physical barriers protect individual trees or parts of trees. Tree shelters (polypropylene tubes) are used to protect entire seedlings or the seedling terminal bud (bud at the top of the tree), however many of the tubes are photodegradable and break down in 2 to 5 years. A paper bud cap, a rectangular piece of paper stapled around the terminal bud, is another physical barrier to protect the terminal bud. Bud caps need to be replaced annually.
- Repellents include bone meal and putrefied fish or egg solids. Repellents need to be periodically reapplied as the vegetation grows.
- Habitat manipulation includes planting preferred deer food with the seedlings, improving deer food away from the plantation, planting needleleaf trees less palatable to deer, and leaving brush as a physical barrier to deer movement.

Manipulating habitat, encouraging predation, and protecting seedlings are ways to control rodent damage.

- Removing grassy habitat by using fire, herbicides, or clearing debris reduces rodent protective cover.
- Hawks and owls are rodent predators. You can encourage them by leaving dead trees or providing artificial perches. Predation is more effective if rodent protective cover is removed by one of the above methods.
- Tree shelters can also be used to protect seedlings from rodents.



Bud caps and tree tubes are physical barriers that protect young trees from deer and other animals.

Do I have any options?

If all this seems like too much work, you can contract with a vendor to do everything from site preparation to maintenance or any of the steps in between. The information in this tip sheet will help you write a contract and monitor its implementation to be sure you have a successful tree planting operation.

In the Forest

Tree planting in public and private forests is very similar to the tree planting you are doing in your backyard woods. Planting trees renews forests, replacing trees that have been removed by fires, insect and disease outbreaks, storms, or harvests. While none of these events destroys forests, it can take a long time for trees to grow back. Planting seedlings decreases the amount of time needed for a forest to become lush again.



Pesticide Precautionary Statement:

Pesticides used improperly can be injurious to humans, animals, and plants. Follow label directions and heed all precautions on the label. Store all pesticides in original containers and out of reach of children. Apply pesticides selectively and carefully. Do not apply a pesticide when there is danger of drift to other areas. After handling a pesticide, do not eat, drink, or smoke until you have washed. Dispose of empty pesticide containers properly.

NOTE: Registrations of pesticides are under constant review by the Federal Environmental Protection Agency. Consult your local county agricultural agent or Cooperative Extension Service about restrictions and registered uses of particular pesticides.

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www.fnr.purdue.edu/inwood/ifwoa%20home.htm



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