INSIDE Forests
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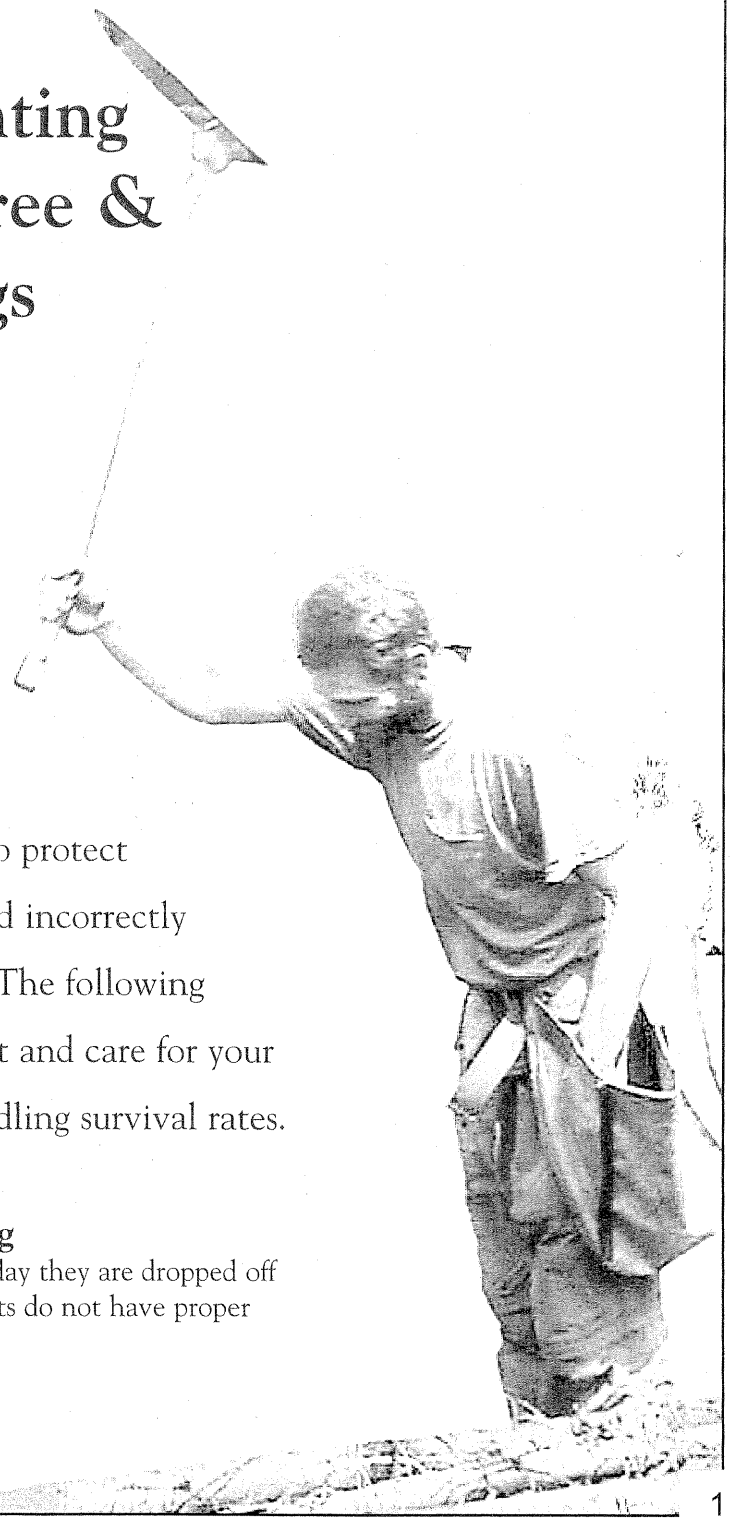
Handling, Planting and Care of Tree & Shrub Seedlings

by John Justin and Brian Quilter



Conservation plantings are successful if the site is properly prepared and healthy seedlings, adapted to the site are used. Transplanting is a great shock to live plants and great care must be taken to protect the seedlings. Seedlings planted incorrectly have little chance of survival. The following information will help you plant and care for your seedlings and achieve high seedling survival rates.

Pickup, Transport and Storing

Always pick up your seedlings the day they are dropped off in your county. Most remote drop points do not have proper

Reforestation plantings in Montana often require seedling protection from browse and weed competition.

seedling storage facilities and the quality of improperly stored seedlings deteriorates rapidly. The interval from seedling drop-off to planting should be minimized, ideally two to four days. Delivery dates are arranged in advance to allow you to organize your time and be ready to receive your seedlings. All site prep, equipment, supplies and labor should be ready by the pick-up date.

If possible, transport your seedlings in an enclosed vehicle. If the back of a pickup truck or an exposed trailer is your only option, be sure to cover the seedlings with a tarp. When transporting seedlings, never park in the direct sun. Even in the boxes or bails, seedlings can heat up to damaging temperatures. Do not throw or drop the boxes and bales. The seedlings can be damaged from bruising.

Be ready to plant when your seedlings arrive. You should not store seedlings for more than seven days unless you have access to refrigerated storage. The optimum short-term storage temperatures are 32 to 45 degrees. Never allow seedlings to freeze or expose seedlings to temperatures above 60 degrees unless they will be planted immediately. Store seedlings in a cool, humid location. Root cellars, crawl spaces, basements, and unheated barns work well for short time periods, although shelf-life and subsequent out-planting success depends on prevailing temperatures and humidity. At higher elevations, a snow cache works well for temporary storage.

Hoedad tree planting tool commonly used in reforestation plantings.

Store seedlings in their unopened boxes or bundles until they are planted. If you are forced to store your seedlings for extended periods check bareroot seedlings every 2 to 4 days to insure the roots and sphagnum moss packing material remain moist. Periodically check containerized seedlings to be sure the root plugs remain damp. If necessary, rewet the sphagnum or root plugs with light watering. Don't over water. Roots should be obviously moist with no standing water in the bottom of packages. Evergreen species usually require more frequent watering than deciduous plants with no leaves.

Planting Site Preparation

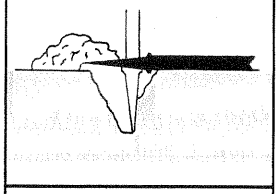
The goal of site prep is to create an area that is favorable for seedling survival and growth. Favorable seedling sites have: high soil moisture levels; little competing vegetation; some protection from direct sun and wind; and soils with high organic matter, proper pH, good aeration or texture, and the ability to catch and hold moisture. The best site preparation requires planning up to one year in advance. In the dry areas of Eastern Montana, early site prep is critical for high seedling survival.

Herbicide site prep treatment to control heavy grass competition.

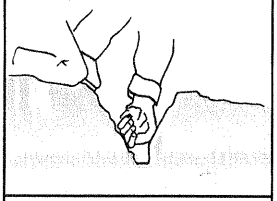
On most planting sites in Montana, water is the greatest limiting factor to survival. Reducing or eliminating weeds and grasses in your planting area is extremely important. Plowing and discing the site a year in advance and keeping it weed free for the entire growing season can greatly enhance soil moisture levels. This allows all precipitation to be stored in the soil. Organic mulches or compost can be worked into the soil the season prior to planting to increase organic matter. Be careful with uncomposted manures, as they can be too "hot" for

Hand planting with a planting bar

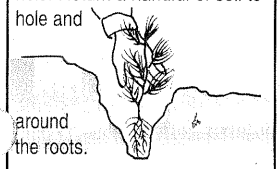
1. Dig hole 2" deeper than root length



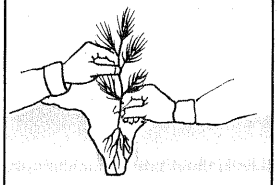
2. Remove loose soil from hole with hand.



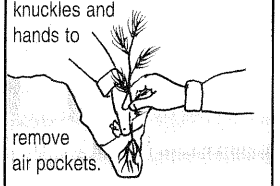
3. Planter removes only one seedling (to prevent drying of fine roots) and places it into the hole. Return a handful of soil to hole and around the roots.



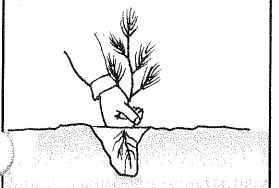
4. Raise seedling root collar to ground surface level and hold seedling in place.



5. Hand fill hole with soil in lifts and with firmness tamp down-ward with fingers. Then knuckles and hands to remove air pockets.



6. Continue filling and tamping until level with ground surface.



seedlings. If possible, irrigate the site in the fall to ensure good soil moisture the next spring.

Herbicides are also effective in controlling weeds. Glyphosate products kill all existing vegetation without leaving a herbicide residual in the soil. Be very careful when using any pre-emergent herbicides that will persist in the soil. Consult with a pesticide specialist to make certain these herbicides will not harm the seedlings. Follow label directions exactly with all pesticide products. As with cultivation, it is best to start chemical weed control a year in advance. If there are difficult to control weeds such as leafy spurge, knapweed, quackgrass or bindweed on the site, it is imperative that you control them well before planting.

In very dry areas, it is beneficial to create small water-catching areas in the fall to enhance early survival. Snow fences can be set up in rows to trap drifting snow on the planting site. Grading a wide and shallow V-shaped trench where seedling rows will be planted directs water to where it is most beneficial. Do not make water catchment basins too deep, as soil will slough in and bury seedling roots too deep.

Seedling Care at the Planting Site

During all seedling handling the roots must be protected from heat and drying. It is best to keep the seedlings inside the boxes and bundles in which they are shipped right up to the time of planting. Only take the seedlings that can be planted in one day to the site. At the planting site, locate a cool, shaded spot to cache the seedlings.

Root exposure to sun and drying is minimized with tree planting bags or a slurry bucket. A root dip of soil and water can be mixed for bareroot seedlings. The slurry should have the consistency of thick paint. Roots can also be wrapped in wet burlap. Only carry the seedlings that can be planted in one hour. Do not leave seedlings in the slurry mix longer than 2 hours or root death may occur.

Containerized trees can be kept in their polybags during planting, but do not allow direct sunlight to heat up the roots in the bags. Wet the plugs if necessary.

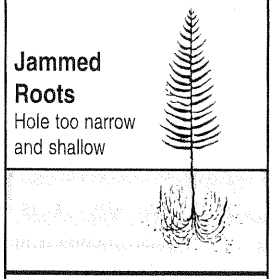
Planting

In Montana the best time to plant is early spring to take advantage of high soil moisture levels and cool temperatures. Planting can begin soon after the ground has thawed. The ideal temperature range to plant is 33 to 50 degrees. Freezing temperatures can damage exposed plant roots. If it is warmer than 60 degrees or becomes windy, it is usually best to stop planting and wait for conditions to improve. Fall planting is also an option with container stock, but only if rains have rewetted the soil profile. We do not recommend fall planting after the soil temperature drops below 40 degrees.

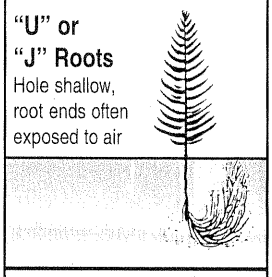
Many types of planting tools are available. A sharp shooter type shovel works well for digging narrow deep holes. Each planting hole must be large enough to accommodate the root system in a natural form. Holes should be six to 12 inches in diameter and at least two

Various ways that trees should *not* be planted.

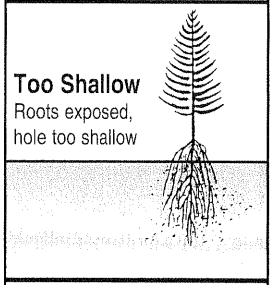
Jammed Roots
Hole too narrow and shallow



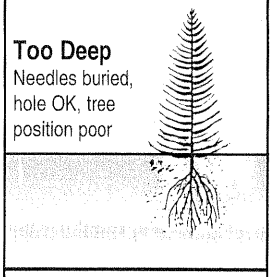
"U" or "J" Roots
Hole shallow, root ends often exposed to air



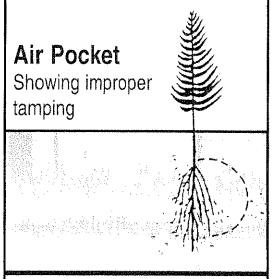
Too Shallow
Roots exposed, hole too shallow



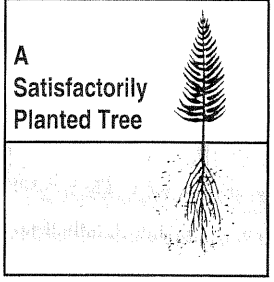
Too Deep
Needles buried, hole OK, tree position poor



Air Pocket
Showing improper tamping



A Satisfactorily Planted Tree

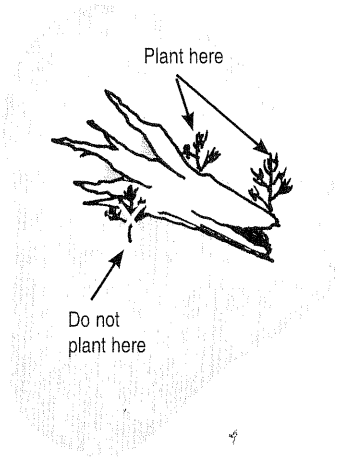


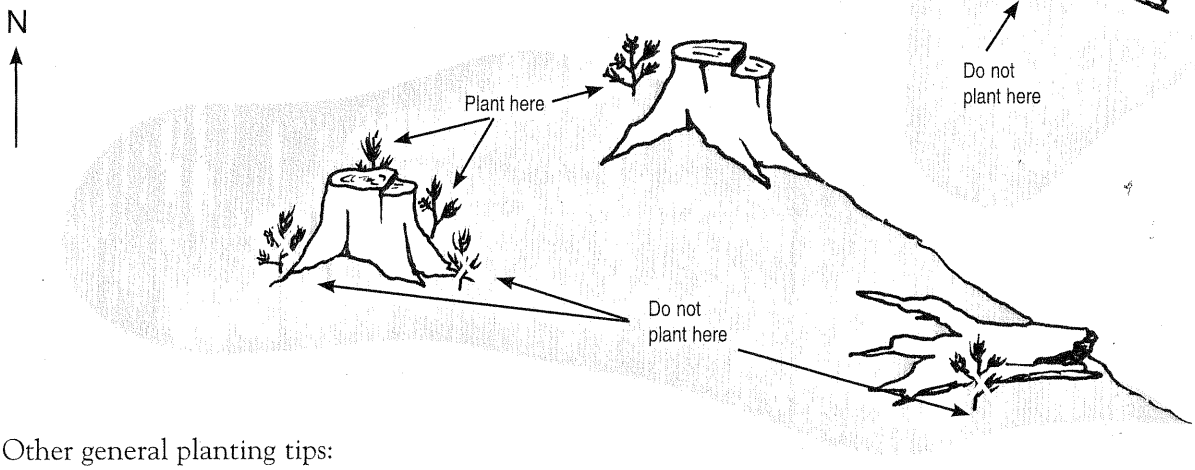
inches deeper than the seedling root system. Place the seedling in the hole, spreading the roots downward and horizontally. Do not bunch roots at the bottom of the hole or fold them so that the roots ends are directed toward the surface. This is called j-rooting and is a frequent cause of seedling mortality.

Incorrect planting depth is another primary cause of poor seedling survival. For bareroot seedlings, the root collar (soil surface line when the seedling was in the nursery beds) must be located at the soil surface when finished. Fill the hole halfway with soil and tamp around the roots with your hand. Then, backfill the rest of the hole quickly checking for correct root-collar depth and tamp the soil firmly around the roots. Correct backfilling will create good contact between the roots and the soil and remove all air pockets without excessive compacting.

Containerized seedlings are planted the same way with one exception. Containerized seedlings are grown in a peat moss soil mix that dries rapidly. We recommend planting these seedlings so the surface of the plug soil is a half-inch below final grade. Capping the peat soil with native soil will prevent rapid drying of the plug.

Seek good microsites for planting. Use stumps and debris to shade seedling.





Other general planting tips:

- Select good microsites for the seedlings. Plant on the north and east side of downed logs or stumps to shade the seedling. Avoid areas of dense sod.
- Dig holes the same day you plant so the holes do not dry out.
- Don't put water in the planting holes immediately prior to planting. This can lead to excessive compaction when the soil is tamped around the roots.
- Remove all weeds and grass from an 18-inch area around each planting hole by scalping with a hoe.
- Woven weed fabric is recommended as the best method for conserving water around the plant roots and controlling weeds. Studies have shown that weed fabric greatly increases survival and growth rates.
- If you use a mechanical tree planter, have someone follow behind the planter to adjust root collar depth and tamp out air pockets. The Nursery and many Conservation Districts rent mechanical tree planters.

Spruce seedling planted in excellent microsite on north side of log.

Post-Planting Seedling Care

WATERING: If possible, give each seedling one to two gallons of water immediately after planting. This will settle the soil around the roots and make any air pockets apparent.

Seedlings generally require two to three years to become well established. Regular irrigation during this time can increase survival and greatly increase growth rates. Periodic deep watering is better than frequent light watering. Irrigate each plant with one to two gallons of water every one to two weeks during the summer. Irrigating more than once a week is usually not necessary and can suffocate roots and slow growth, especially on conifers in heavy soils.

Gradually reduce irrigation in late summer to allow the seedlings to harden off for winter. In areas subject to Chinook winds, a final irrigation right before freeze-up can help winter survival. Do not water if the ground is frozen! After two to three years, the seedlings should not require supplemental watering unless fast growth is desired.

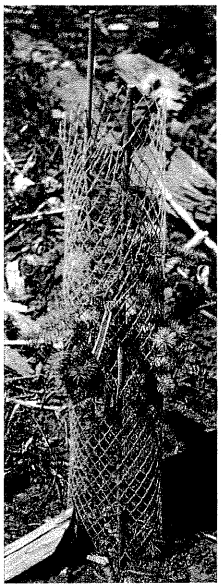
Woven weed fabric will control weeds and conserve soil moisture in this shrub windrow.

FERTILIZATION: Fertilizer use on first-year seedlings is generally not recommended. Slow-release fertilizers in teabag-type packets are available. These can be placed in the bottom of the planting hole, may increase growth slightly, and are some benefit on infertile soils. Do not place slow release fertilizers in direct contact with roots. Do not apply any other type of fertilizer in the first year! Fast release fertilizers can cause excessive top growth before the roots are established and kill your seedlings. After the first year, small applications of slow-release fertilizers with equal parts nitrogen, potassium, and phosphorus will aid plant growth. Follow recommended rates carefully.

Using manure or compost as a fertilizer is risky. Never place these materials in the planting hole. Manure is usually far too "hot" for use on seedlings.

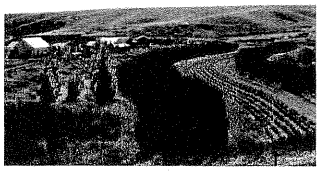
MULCH: Woven weed fabric is the best mulch for seedlings. It controls all weeds, reduces evaporation from the soil around the roots, and allows water and air to pass through. Other good mulch materials are wood chips, bark chips, straw, and composted sawdust. Mulch should be no deeper than three inches. Grass clippings seem to attract rodents and are not recommended.

WILDLIFE DAMAGE: Restricting access to the seedlings or applying repellents can control deer and elk browse. An eight-foot fence will keep them away from your seedlings but is expensive. Rigid net-like tubes are available from many reforestation suppliers. These are effective at discouraging browse of the terminal bud, but require annual maintenance. Contact the nursery for sources. Solid tubes can create a greenhouse effect and are not recommended. Stretchable hairnet-type netting is not recommended, as the terminal leader can become tangled and distorted in this material.



Rigid net tubes will protect the terminal leader from browse damage.

Repellents have given variable and inconsistent results over the years. Many are only effective for short periods of time, if at all. There are several spray on repellants that appear to be effective with several



Farmstead shelterbelts reduce soil erosion, protect buildings and livestock and trap snow.

applications a year. Contact the nursery for sources.

In areas with high deer populations, planting unpalatable species is the best way to limit damage. For example, you can plant spruce and juniper instead of pine.

Rodent damage to stems will increase if weeds are not controlled around the base of seedlings. Shallow, clean cultivation around the seedlings can discourage rodents. Pocket gophers feed on seedling roots and are very difficult to control. When their populations are low, trapping is the best option.

Most Common Causes of Seedling Mortality During Handling and Planting

- Seedlings not picked up promptly.
- Improper storage of seedlings.
- Planting when weather conditions are too hot or windy.
- Roots drying during planting.
- Roots j-rooted in the planting hole.
- Seedlings planted to the wrong depth.
- Air pockets left in planting hole or soil over-compacted.
- Planting too late in the spring.

Selecting the right species for the site, good site prep, protecting the seedlings from heat and drying during all handling, planting promptly after receipt of seedlings, and following planting instructions will result in a successful conservation planting.

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Montana Conservation Seedling Nursery
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