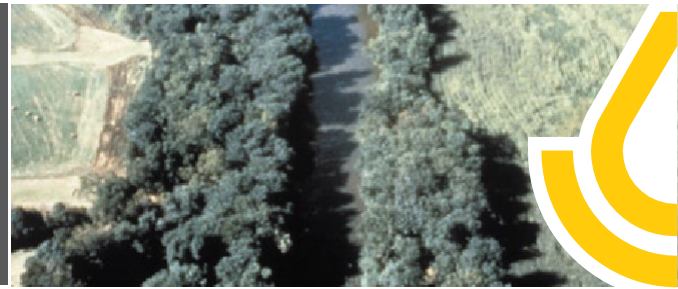


Tree/Shrub Establishment Protection

Wisconsin Guidance Document 612



DEFINITION

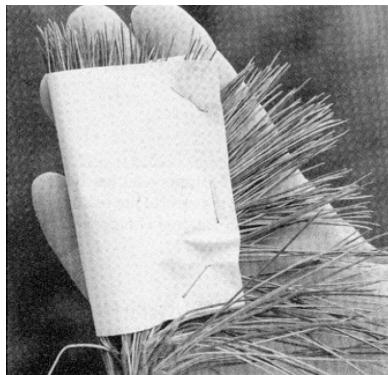
Protection of trees and/or shrubs is any material that is used to deter damage to newly established seedlings. The seedlings can be the result of either planting or from natural regeneration. Protection is often needed to deter herbivory by rodents or deer; however it may also be needed for protection from elements of the physical environment. The methods covered in detail in this guidance document are repellents, mesh tubes, solid tree tubes, tree cages, bud caps, and perimeter fencing.

PURPOSE

Protect seedlings from damage due to herbivory or elements of the physical environment.

PLANNING CONSIDERATIONS

Repellents: Repellents can be somewhat effective at browse prevention in certain situations. They are not as effective as shelters, caging, or fencing. The most effective repellents are manufactured from ammonium soap salts of higher fatty acids or from putrescent egg solids. Effectiveness depends on deer populations and availability of other food sources for deer. Where deer populations are at moderate levels and other food is available, repellents can be effective. Where deer populations are high and alternative food is limited, deer will browse palatable species regardless of repellent use. Repellents are short-lived and must be re-applied according to manufacturer's direction, especially in rainy weather. Repellents should be applied during periods of active growth in spring and summer, and in the fall to protect against winter browsing. They need to be applied until seedlings have grown above browse height. Application can be via hand sprayers, backpack sprayers, or larger equipment. Repellents are variable in cost. They may end up similar in cost to shelters and cages over the life of the treatment.



Bud Caps: Bud caps are paper or mesh that are attached to the terminal shoot of pine seedlings. Bud caps are typically attached by stapling the ends of the cap together and having some side needles in the staples to hold it in place. They are designed to provide protection for the terminal bud from deer browse over one winter. They are applied in the autumn after the terminal bud of the tree leader is set. The following spring the terminal bud will open and grow through the opening at the top of the bud cap. Bud caps are designed to break down within one year with exposure to light or other weather conditions. Bud caps need to be re-applied each autumn until seedlings are above browse height (6 – 8' tall, depending on typical snow levels). Bud caps work best where deer populations are at moderate levels (fewer than 18 deer/square mile). When deer populations are at high levels, the deer may browse the new leader in the spring as it emerges from the bud cap. In this case the bud caps may still significantly increase survival over unprotected seedlings, however overall survival may be low. Wire cages or mesh tubes may be better options for pine where deer populations are high. Bud caps are low in cost as compared to tubes or fencing.



Mesh Tubes: Mesh tubes are generally available in heights from 18” to 48”. Height needed should be determined by the potential herbivore. Deer will require at least a 48” tube, while a shorter tube is possible for rabbits (depending on typical snow levels in winter). Stakes should be used to support these tubes, attached with UV-resistant zip ties that have a suitable temperature range for site conditions. One stake can be used for tubes of 24” or less. Two stakes should be used on tubes taller than 24” to prevent folding over during wet snow events. Mesh tubes are more commonly used with conifer seedlings or shorter statured shrubs. Hardwood seedlings are not well protected by mesh tubes. Mesh tubes provide higher light transmission and ventilation than solid tubes, making them suitable for sites with overstory shade or sites with fungal disease concerns. The tubes should be removed once seedlings are taller than the height of the protection. Some mesh tubes are designed to naturally breakdown, but this may not occur as designed if light and weather conditions are not favorable. Mesh tubes are generally less expensive than solid tubes.



Solid Tubes: Solid tubes are generally available in heights from 18” to 60”. As with mesh tubes, the height needed should be determined by the potential damage agent. The 60” tube is optimal to prevent deer damage. Shorter heights can be used for other herbivores such as rabbits, although typical snow level should also be factored into this decision. Stakes should be used to support these tubes as recommended by the manufacturer (note that untreated wood stakes may fail due to rot before seedlings emerge from tubes). Solid tubes are commonly used

with hardwood species. Solid tubes provide a “greenhouse” effect which increases height growth while the seedling is within the tube. This height growth comes at a cost of decreased root and diameter growth, which makes seedlings unstable until they have grown outside of the tube for a number of years. For this reason, the tube should be kept on the seedling for support after it has emerged until the diameter of the tree is approaching the inside diameter of the tube. Tubes should be removed at this point to avoid damage to the tree trunk (tubes with edges that flare outwards on the top will also help prevent trunk damage). Bird netting is recommended over the top of the tube to prevent birds from becoming trapped within the tube. However, it is crucial that the bird netting be removed at the point when seedlings are poised to emerge from the tube. If this is not done the leader of the tree can become twisted and deformed in the netting, causing damage and growth problems. Small rodents can find shelter within the tube and girdle the seedling. To prevent this, make sure that tubes have firm contact with the ground. Solid tubes work best on open sites with full light conditions. They should not be used on sites with partial shade, as not enough light is able to penetrate the tube to promote vigorous growth and can sometimes lead to seedling death. They should also not be used where ventilation may be needed to prevent fungal disease on damp sites. They are not suitable for floodplain sites where floods can damage the tube and seedling within. Cages or perimeter fencing may work better in these three situations. Solid tubes are more expensive than mesh tubes. Economically they are suited for smaller scale regeneration areas (generally less than five acres), or when a small number of seedlings need to be protected in larger regeneration areas (generally 100 trees/acre or less needing protection).

Individual Tree Cages: Individual tree cages are constructed from wire fencing (chicken wire or woven wire) or HDPE safety fence material. Cages are staked with T-posts, garden stakes, or fiberglass stakes. Wooden stakes are not recommended unless they are treated or made from rot-resistant species. Two stakes are recommended, especially where browse intensity is high. One stake may be sufficient when used with a garden staple to secure the cage on the opposite side of the stake. Where large animals such as cattle will be grazing, three T-posts are recommended. Stakes should be driven at least one foot into the ground. In areas that are difficult to access, HDPE safety fence with fiberglass stakes are good options as these materials are lightweight and easier to transport by hand. Cages are primarily used to prevent browse by deer or large grazing animals. Height of the cage should be four to five feet. Diameter of the opening should be one foot or greater. When



seedlings have grown above browse height, the cages should be removed. They can often be re-used on other regeneration sites if desired. Cages work well where shady conditions exist on site, as when underplanting beneath existing tree canopy, as the fence material allows most light to pass through. They also provide good ventilation, ideal for use on damp sites where fungal disease may be a concern. Overall, tree cages provide excellent protection. However, they involve significant labor and material costs. Fencing comes in large rolls that must be cut to the correct length to provide the desired opening diameter. Installation typically takes longer than tubes. Economically, they should be used in similar situations as solid tube protectors – smaller scale regeneration areas, or larger regeneration areas where only a small number of seedlings need protection.



Perimeter Fencing: Perimeter fencing consists of HDPE mesh or wire fencing that encloses the entire regeneration area, primarily to prevent deer herbivory. Perimeter fencing should only be used on sites where the majority of species desired for regeneration are highly palatable to deer, and the species have high potential economic or ecologic value. The tree species that meet these criteria may vary in different parts of the state, but generally include oak species, northern hardwoods, eastern hemlock, and northern white-cedar. Another condition (for financial assistance with deer fence) is that a landowner may not have more than 15 acres of deer fencing on their property at any one time. This is to reduce potential negative effects of fencing on other wildlife species. In addition, the site must meet one of the following criteria to establish deer browse as a problem:

- Be located in a county where the most recent WI DNR Forest Regeneration Monitoring report assigns county risk of deer browse at “Chronic or Widespread”. Forest Regeneration Monitoring occurs in counties where forest cover is at least 30% of the county land area (~75% of the counties in Wisconsin). The reports can be found at <https://dnr.wisconsin.gov/topic/forestmanagement/regenmonitoringreports> or by using a web browser and searching for “WI DNR Effects and Extent of Deer Browse on Forest Regeneration”.
- Be located in a county where the most recent WI DNR Forest Regeneration Monitoring report assigns county risk of deer browse at “Acute or Localized” AND results from the Browse Assessment Tool are “High”, “Very High”, or “No Woody Palatable Vegetation Present”.
- In counties without Forest Regeneration Monitoring reports (those with less than 30% forest cover), use the Browse Assessment Tool. Results from the tool of “High”, “Very High”, or “No Woody Palatable Vegetation Present” are eligible for perimeter fencing.

The Browse Assessment Tool with detailed instructions can be found in the Wisconsin Field Office Technical Guide (FOTG), Section 3 > Conservation Planning Tools > Forestry.

USDA is an equal opportunity provider, employer, and lender.

Fencing systems may be poly mesh plastic fence material or wire fencing. Common fencing designs include wire fencing with manufactured posts, poly mesh fencing with manufactured posts, and poly mesh fencing using trees as posts. Wire fence is typically more expensive than poly mesh. Posts are also a significant expense. Wire fence using manufactured posts is the most expensive fence type. Poly mesh fence using mostly trees as posts is the least expensive fence type. Poly mesh fence using manufactured posts is intermediate in cost. The following specifications cover the two poly mesh fence designs. Standard drawing WI-701-8A and Part IV of WI Construction Specification 10-Fences should be used to design wire fences for deer protection. Note that the drawing is embedded in the general WI-701 drawing. Wire fence will work better in areas where bear activity may be an issue.

Perimeter Fencing Specifications:

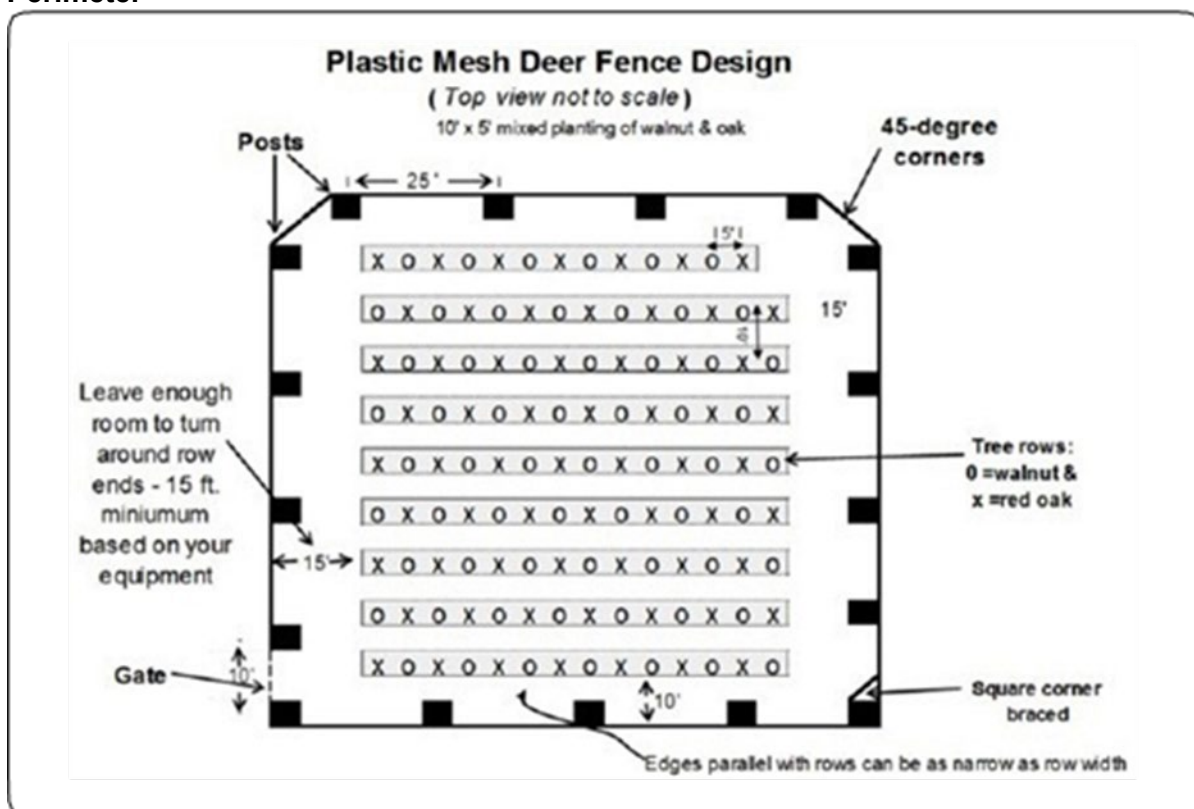
1. Fence height must be a minimum of 84 inches from the ground to top of fence (7 feet).
2. All hazard trees must be removed that are within a tree length of the fence. Hazard trees are dead and dying trees, split trees, heavily leaning trees, and/or root sprung trees, which are in a position to fall across the fence. A qualified forester or biologist will consult with the landowner to identify hazard trees. Additionally, a 6 – 8' corridor should be cleared of brush, small trees, and obstructions along the outside of the fence for equipment to travel and to give deer an alternate path. Equipment should only be used when soil conditions are dry. Landowner will be required to repair areas rutted by equipment with shaping, waterbars, and/or seeding. If there are areas of erosion concern, plan CPS 342-Critical Area Planting to make sure these areas are seeded.
3. Tensile strength of poly mesh needs to be a minimum of 650 lbs/square foot. Maximum square size is 4" x 4".
4. Trees may be used instead of posts with poly mesh fencing. Two posts are required to nail the mesh to at the start and end of the fence (recommended to use posts for required gate). Fence should not be directly attached to trees. Choose undesirable trees. Use 10" lengths of treated or rot-resistant 2x4 lumber or 5/4x6 deck board as battens. One of these battens is needed for every wire attachment point on the tree (details below). Attach a plastic fence insulator to each board using deck screws or other outdoor fastener. Attach the boards to the outside-facing side of the tree so that the insulator is at the correct height for stringing the wires through. Nail the board to the tree using two 3" galvanized nails, with a 1.5" diameter fender washer between each nail head and the board surface (pre-drilling holes will prevent the board from splitting). The fender washer will ensure the board is pushed outward as the tree grows.
5. Maximum distance between posts or trees – 25 feet.
6. Minimum diameter, measured at 7 feet above the ground, of trees to be used as posts – 4 inches.
7. Minimum diameter, measured at 7 feet above the ground, of trees used as corner posts - 6 inches. Battens may be needed on the two outside-facing sides of corner trees to prevent the wire from digging into the tree.
8. Minimum top diameter of manufactured posts for in-line placement is 4". Posts must be treated (see requirements Table 3 in WI Construction Specification 10-Fences) or rot-resistant species with bark removed (red cedar, white cedar, tamarack, osage orange, black locust, white oak). In-line posts should be placed as vertical as possible, with at least 2 feet of length buried in the ground and at least 7' 2" of length above ground.

9. Manufactured posts used for corners must be at least 5" top diameter, treated or manufactured from rot resistant species. Posts should be installed with a 2" to 3" lean away from the direction of pull and firmly tamped in place. Minimum height of 11', with minimum of 3' length in the ground. Bracing should be used to support the corner posts (see Part IV of WI Construction Specification 10-Fences and Drawing 701-11A).
10. At least one gate is required in the fence. Use two posts that are far enough apart to allow access for desired equipment. The simplest gate design is to staple the fence material tightly to one post. On the other post, partially nail in a vertical series of four to five galvanized nails, spaced ~2' apart. The end of the fence can be pulled tightly over the exposed ends of the nails to close the gate. Other gate options may also be used with pre-approval by the district conservationist or NRCS state forester.
11. Two wires are required: top wire strung at 80-82" above the ground and a bottom wire from 12-18" above ground. A middle wire strung at 36-48" is highly recommended to reduce break-throughs.
12. Minimum gauge of high tensile steel wire – 12.5 gauge. Minimum tensile strength – 140,000 PSI. Wire must be galvanized. High tensile steel wire is recommended for the bottom wire to prevent rodents from chewing through it.
13. Minimum breaking strength of monowire/monofilament if used – 900 lbs. Must be UV-protected and durable for the life of the fence.
14. Wire can be strung through plastic fence insulators (where trees are used as posts) or through fencing staples (where manufactured posts are used, minimum 9-gauge and galvanized staples). Care should be taken to allow for movement of wire between fixed points (e.g. do not drive fencing staples all the way into the posts).
15. Use wire tighteners and spring tensioners to take slack out of the wires to reduce sagging. One wire tightener is required for every 2,600' of wire, or for any shorter independent length of wire. Wire tightener should be placed near the middle of the wire where tension is roughly equal from both directions. One spring tensioner is required per wire to be used as a visual gauge of wire tightness.
16. When manufactured posts are used, fencing should be stapled to posts using fencing staples (minimum 9-gauge and galvanized). Where trees are used as posts fencing will not be stapled to the trees; fencing will be attached only to the strung wires.
17. Hog rings or zip ties may be used to attach fence to wires. Maximum distance between hog rings or zip ties used to attach fencing to the top wire is 24". Distance between hog rings or zip ties used to attach the fencing to the bottom wire and the middle wire (if used) is 36-48". Where fencing is stapled to manufactured posts, hog rings should be placed as close as possible to the post on both sides to relieve stress on the fence. Note: Hog rings are less expensive and take less time to install. If zip ties are used they must be UV-resistant and rated for the range of temperatures typical in the area.
18. Poly mesh fences need a minimum 6" lip of fencing laying on the ground and facing outward from the protected area This lip should be secured with rebar stakes of minimum 12" length (or similar stakes) every 10' at the fence line, without putting tension on the fence material. In between stakes woody debris of at least 3" diameter should be placed on the lip itself to prevent animals from entering through the bottom of the fence. Woody debris should be piled in any gaps under the fence, such as with small water channels. The debris should prevent deer entry while still allowing water to flow.

19. Heavy duty forestry flagging tape must be placed both inside and outside of the netting in a zig zag pattern with a minimum linear distance of 5 feet between flagging. Both sides are needed to ensure flagging movement regardless of wind direction. This is to make the fence more visible to deer and help prevent break-throughs.
20. The landowner must drive all deer from the fenced area prior to closing the fence. The deer drive must be conducted with qualified NRCS staff on site. The fence will be closed the same day that the deer drive takes place.
21. Inspect the fence at least twice a year and after severe storms to check for damage and holes. Time an inspection for shortly after deer rut as more damage may happen during this time. Keep extra fencing material on hand to repair damage. Re-tension wire annually. Remove limbs that have fallen on fence. Flagging will need to be replaced approximately every two years. Zip ties will also periodically need replacement if used.
22. After desired regeneration is above browse height (6 – 8', depending on typical snow levels), all fencing material must be removed, including lumber nailed into trees. Material may be re-used in a new location if still serviceable and within manufacturers recommended lifespan. Other material should be properly disposed of.

A publication that details the steps used in building a poly mesh fence with manufactured posts is the Purdue Extension FNR-486-W, "How to Build a Plastic Mesh Deer Exclusion Fence". This publication may be used to design fences with poly mesh fence and manufactured posts (see diagram/pictures below). Designs proposed by landowners not covered in this guidance document may be approved by the NRCS state forester on a case-by-case basis.

Top View Diagram of Fence Design Using Posts and Layout of Seedlings Inside the Perimeter



Attaching Poly Mesh Fence to Manufactured Posts



Hog Ring Pliers and Attachment to Monowire

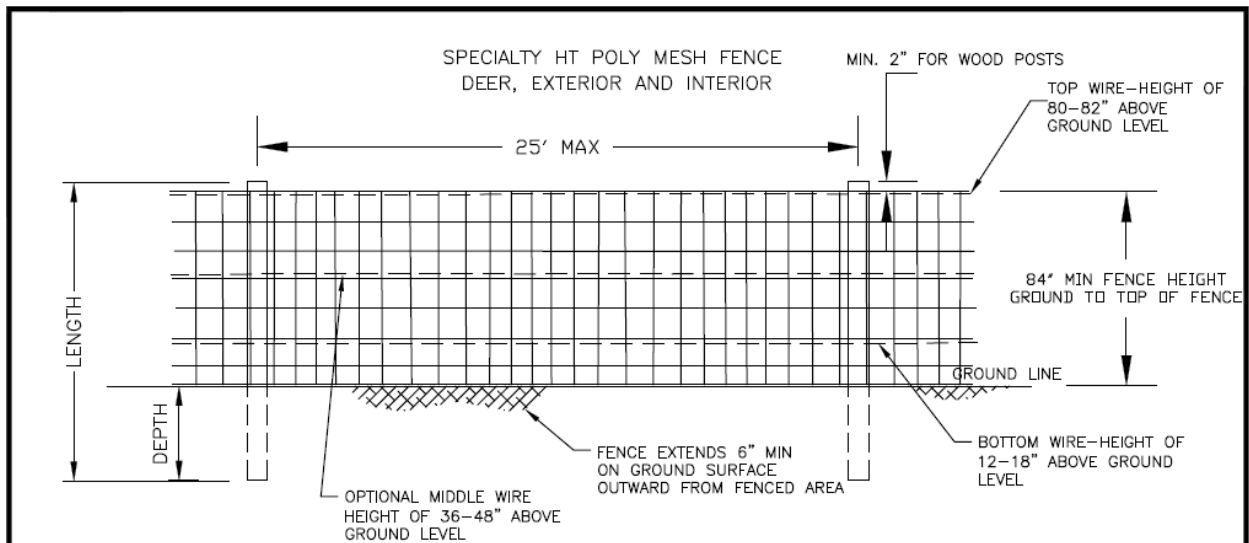


Bottom Staking with Rebar Stakes



Woven Wire Deer Fence with Manufactured Posts for Northern White-cedar





LINE POSTS

WOOD:

TOP DIA. = 5" MIN
 DEPTH = 2' MIN
 MIN. LENGTH = FENCE HEIGHT + POST DEPTH + 2"

ALL WOOD SPECIES EXCEPT RED CEDAR, WHITE CEDAR, TAMARACK, OSAGE ORANGE, BLACK LOCUST, AND WHITE OAK SHALL BE TREATED BY A METHOD LISTED IN WI CONSTRUCTION SPEC. #10-FENCES.

STEEL:

STANDARD "T" POST MIN 1.25 LBS/FT, 1-3/8" X 1-3/8" X 1/8"
 DEPTH = 1.5' MIN
 MIN. LENGTH = FENCE HEIGHT + POST DEPTH + 1"

ALL STEEL POSTS WILL HAVE AN ANCHOR PLATE AND BE STUDDED

ALL STEEL POSTS WILL BE PAINTED WITH A WEATHER RESISTANT PAINT FOR STEEL, ENAMELED AND BAKED, OR HOT DIP GALVANIZED

ALL STEEL POSTS WILL BE ROLLED FROM HIGH CARBON STEEL

PLASTIC/COMPOSITE:

DIA. = 1-1/8" MIN
 DEPTH = 2' MIN
 MIN. LENGTH = FENCE HEIGHT + POST DEPTH + 1"

POSTS SHALL BE DURABLE AND UV-PROTECTED FOR THE LIFE OF THE FENCE.

TREE SUBSTITUTION FOR POSTS:

DIA. AT 7' ABOVE GROUND LEVEL = 4" MIN

LOW QUALITY TREES OR UNDESIRABLE SPECIES PREFERRED, AS IDENTIFIED BY A TRAINED FORESTER ACCORDING TO LANDOWNER FORESTRY OBJECTIVES.

NOTES

BRACES ARE REQUIRED AT ALL CORNERS, GATES, AND END ASSEMBLIES. SEE STANDARD DRAWING 701-11A FOR DETAILS.
 PULL ASSEMBLIES ARE NOT NEEDED FOR POLY MESH FENCE.

TENSION OF FENCE SHOULD BE SET SUCH THAT THE SAG BETWEEN POSTS IS 1 INCH OR LESS

REFER TO WI CONSTRUCTION SPEC #10-FENCES FOR MORE SPECIFIC INFORMATION

POLY MESH FENCE

650 LBS/FT MIN STRENGTH RATING.
 MAX SQUARE SIZE IS 4" X 4".

TOP, BOTTOM, OPTIONAL MIDDLE, WIRE

HIGH TENSILE STEEL WIRE: MEETS PART II OF WCS #10-FENCES

MONOWIRE/MONOFILAMENT: MUST BE UV-PROTECTED FOR LIFE OF FENCE WITH MIN BREAKING STRENGTH = 900 LBS

FASTENERS

ALL WIRES SHALL BE ATTACHED TO EACH LINE POST

STAPLES SHALL BE 9-GAUGE, GALVANIZED STEEL OR HEAVIER.

RECOMMENDED LENGTH: 1.75" MIN. FOR SOFTWOODS
 1" MIN. FOR HARDWOODS

USE BARBED STAPLES FOR WOOD POSTS

USE PLASTIC FENCE INSULATORS ATTACHED TO BATTEN BOARDS FOR LIVE TREES SUBSTITUTED FOR POSTS. BATTEN BOARDS MIN 10" LONG, 3" WIDE, 1" THICK. ATTACH BATTEN BOARD TO TREE USING MIN 3" GALVANIZED NAILS AND MIN 1.5" DIAMETER FENDER WASHER BETWEEN NAIL HEAD AND BOARD SURFACE TO ALLOW FOR TREE GROWTH.

MANUFACTURER'S CLIPS OR 14-GAUGE WIRE MAY BE USED TO FASTEN WIRES TO NON-WOOD POSTS

STAPLES, WIRES, AND CLIPS SHOULD ALLOW FREE MOVEMENT OF THE HIGH TENSILE FENCE WIRE

GROUNDING

IT IS RECOMMENDED THAT FENCES WITHOUT STEEL POSTS BE GROUNDED FOR LIGHTNING PROTECTION AT LEAST EVERY QUARTER MILE. ALL LINE WIRES MUST BE GROUNDED. USE 12.5 GAUGE WIRE FOR LEAD-OUT WIRE.

-GROUND RODS
 MIN 4 FEET INTO GROUND
 0.5" MIN DIAMETER, GALVANIZED STEEL

Fence Length = _____ FT.


 <p>United States Department of Agriculture Natural Resources Conservation Service</p>	SPECIALTY HT POLY MESH FENCE DEER, EXTERIOR & INTERIOR		Date _____ Drawing Name _____
	CLIENT: _____	Drawn _____	Date 05/21
	COUNTY: _____	Checked _____	Approved _____

Photo Credits:

Bud Cap: Bill Barnacle, Minnesota Department of Natural Resources
Mesh Tube: Scott Roberts, Mississippi State University, Bugwood.org
Solid Tube: Mike Jacobson & Dave Jackson, Penn State University
HDPE Tree Cage: Allan Braun, WI NRCS
Wire Cage in Pasture: Virginia Cooperative Extension, Virginia Tech University
Poly-mesh Deer Fence Diagram and Pictures: Purdue Extension, Purdue University
Woven Wire Deer Fence: Bradford A. Bender, Upper Peninsula Tree Improvement Center, Michigan State University

REFERENCES

- Barnacle, Bill. 1997. Protect pine tree seedlings from deer browsing with paper bud caps. Silviculture Field Tip No. 6. Minnesota Department of Natural Resources. St. Paul, MN. 2 pgs.
- el Hani, A. and M.R. Conover, "Comparative Analysis of Deer Repellents" (1995). *National Wildlife Research Center Repellents Conference 1995*. 10 pgs.
<https://digitalcommons.unl.edu/nwrcrepellants/14>.
- Heber, W.G. 2017. Assessing the effects of stock type and tree shelters on forested wetland restoration in Iowa. Master's thesis, Iowa State University. Iowa State University Digital Repository.
- Jacobson, M. 2004. Tree shelters: A multipurpose forest management tool. Forest Finance 7. Penn State Extension of the Pennsylvania State University. State College, PA. 8 pgs.
- Jacobson, M. 2006. Fencing for forest regeneration: Does it pay? Forest Finance 2. Penn State Extension of the Pennsylvania State University. State College, PA. 6 pgs.
- Johnson, Erica. 1997. Restoring upland hardwood forests using tree shelters. Restoration and Reclamation Review, Student On-Line Journal of the Department of Horticultural Science, University of Minnesota. Vol. 2, No. 6, Spring 1997.
- Kochenderfer, J.N. and W.M. Ford. 2008. Utility of wire cages, tree shelters, and repellants to minimize herbivory to oak by white-tailed deer. Res. Pap. NRS-5. Newtown Square, PA: USDA Forest Service, Northern Research Station. 8 pgs.
- McKenna, J., B. Beheler, D. Carlson, and L. Farlee. 2014. How to build a plastic mesh deer exclusion fence. FNR-486-W. Hardwood Tree Improvement and Regeneration Center, Purdue University. Lafayette, IN. 9 pgs.
- Palik, Brian and Jason Johnson. 2007. Constraints of pine regeneration in northern Minnesota: Causes and potential solutions. Final Report to the Minnesota Forest Resources Council North Central Landscape Committee. 37 pgs.
https://mn.gov/frc/docs/MFRC_Constraints_Red_Pine_Regen_2007-11-07_Report.pdf
- Redick, C.H. and D.F. Jacobs. 2020. Mitigation of deer herbivory in temperate hardwood forest regeneration: A meta-analysis of research literature. Forests. 11:1220. Pgs 1-16.
- Sharew, Hailu. 2005. A comparison of seedling growth and light transmission among tree shelters. Northern Journal of Applied Forestry. 22(2):102-110.
- Smallidge, Peter. January 8, 2018. Low-cost fence designs to limit deer impacts in woodlands and sugarbushes. Cornell College of Agriculture and Life Sciences Small Farms Program. Accessed April 2021 from <https://smallfarms.cornell.edu/2018/01/low-cost-fence-designs-2/>.
- Stuhlinger, C.H. "A comparison of tree shelters installed on green ash and cherrybark oak seedlings in Arkansas." *Proceedings of the 15th Biennial Southern Silvicultural Research*

USDA is an equal opportunity provider, employer, and lender.

Conference, November, 2008, Hot Springs, AR. Edited by J.M. Guldin . USDA Forest Service Southern Research Station. April 2013.

Truax, B., D. Gagnon, J. Fortier, F. Lambert, and M-A. Petrin. 2018. Ecological factors affecting white pine, red oak, bitternut hickory and black walnut underplanting success in a northern temperate post-agricultural forest. *Forests*. Vol. 9, 499:24 pgs.

Ward, J.S. and G.R. Stephens. "Protection of tree seedlings from deer browsing." *Proceedings 10th Central Hardwood Forest Conference, March 5-8, 1995, Morgantown, WV.* Edited by K.W. Gottschalk and S.L.C. Fosbroke. USDA Forest Service. March 1995.

Ward, J.S. & T.L. Mervosh. 2008. Strategies to reduce browse damage on eastern white pine (*Pinus Strobus*) in southern New England, USA. *Forest Ecol. and Mgmt.* 255:1559-1567.

Wisconsin Department of Natural Resources-Division of Forestry. 2018. Wisconsin forest management guidelines. DNR PUB-FR-226 2018. Madison, WI.