USDA United States Department of Agriculture

Tree and Shrub Establishment

Wisconsin Job Sheet 612

INTRODUCTION

This job sheet describes the necessary techniques to establish woody plants for conservation purposes.

This document does not completely cover the facilitating practices often used in conjunction with tree/shrub establishment, such as site preparation and follow-up weed control that are also necessary to ensure plant survival. For these additional practices, refer to Wisconsin NRCS Conservation Practice Standard (WI NRCS CPS), Tree/Shrub Site Preparation (490), Herbaceous Weed Control (315), Mulching (484), and/or other applicable conservation practice standards and associated job sheets.

PURPOSE

This practice can be used to establish woody plants for:

- Forest products such as timber, pulpwood, etc.
- Wildlife habitat
- Long-term erosion control and improvement of water quality
- Treating waste
- Storing carbon in biomass
- Reducing energy use
- Developing renewable energy systems
- Improving or restoring natural diversity
- Enhancing aesthetics
- Reducing air pollution
- Uptake of soil and water-born chemical and nutrients

COVER CROPS

Cover crops or permanent sod strips may be needed between tree/shrub rows on sandy or highly erosive sites in order to prevent erosion and damage to seedlings by sandblasting. Cover crops are also used to minimize the risk of more aggressive or invasive vegetation (e.g., Canada thistle) establishing.

Ideally, cover crops should be allowed one growing season prior to planting the trees. This will provide flexibility in case the cover crop doesn't establish adequately, due to unfavorable weather conditions, for instance. If cover crops are needed, use WI NRCS CPS, Cover Crop (340).

SITE PREPARATION

Site preparation prior to tree/shrub planting is typically necessary on any site with existing vegetation to reduce competition and assure tree survival. Site preparation likely is not needed on bare or very sparsely vegetated sites recently tilled, following an annual crop (e.g. annual grains, soybeans), moss, sparse Junegrass, etc. Refer to WI NRCS CPS, Tree/Shrub Site Preparation (490) and job sheet for more information.

CARE OF SEEDLINGS

Proper care of seedlings prior to and during the planting process is critical to ensuring a successful planting. Seedlings that have had roots dried, frozen, or subjected to mold or high temperature should be assumed dead and not suitable for planting.

Seedlings should be packed and shipped in wet moss or other similar medium, kept cool (ideal temperature between 33° and 37° F) and moist through the planting process. Make plans for cold storage in case planting is delayed, if possible. Exposure to direct sun and wind can kill a seedling in less than 30 seconds.

Plant seedlings as soon as possible after received, keeping roots moist throughout the planting process.

If seedlings can't be planted right away, store them in a cool, moist, shaded location up to 7 days. Do not stack bundles of trees in layers of more than two deep to allow adequate air circulation and prevent heating.

If planting is delayed for longer than seven days after receipt and they cannot be kept in cold storage, heel in the seedlings in a shaded area and keep them moist. To heel-in seedlings: Dig a trench in the soil, place the seedling in the trench and cover the roots with soil, wetting the soil and roots during the process. Refer to Figure 2. Transplant heeled in seedlings and resume normal tree planting as soon as suitable conditions exist.

Do not immerse roots in water or wash soil off of seedling roots. Mist seedlings to keep them moist.

Water absorbent/retention dip may help conserve moisture on seedling roots when planting in dry weather.

PLANTING REQUIREMENTS

Planting Dates

Plant bare-root stock, seedling plugs, live cuttings, containerized stock or balled and burlapped stock during the dormant season in the spring after the ground thaws until June 1 as soil moisture and local weather conditions permit or in the fall, after October 1 until the ground freezes when soil moisture is adequate.

Do not plant seedlings (bare-root or plugs) in the fall on soils subject to frost-heave action (clays, clay loam, silty clay loams, silts, silt loams, and loams).

Planting Seedlings

The planting trench or hole must be deep and wide enough to permit roots to spread out and down without J-rooting or L-rooting (see figure 1). If the roots are too long for the planting equipment, minimal pruning of small end roots may be needed. Do not prune back into the main root system or more than 25% of the total root length (excluding long individual fibrous roots), or to less than 8 inches. Pack soil around each plant firmly to eliminate air pockets after planting.

Plant trees/shrubs vertically with the root collars equal to or up to one inch below the soil surface to ensure adequate coverage of the roots with soil.

Planting Cuttings

Plant cuttings within 2 days of collection or shipping arrival in the spring before June 1. Plant, with buds pointing up, in firm ground with 1" of cutting exposed above ground.

Planting Containerized Trees

Dig a hole slightly larger than the container diameter. Gently remove plants from containers before placing in the ground and firmly pack soil around roots to eliminate air pockets. Before planting, loosen any spiraling or compacted roots. Water should be applied generously.

Planting Balled and Burlapped Trees

When handling stock, never lift a tree at the stem or trunk. Handle stock at the root ball. Dig a hole 1 1/2 times as wide as the root ball and about the same depth as the root ball. Remove any rope, wire, or plastic twine from the tree. Pull back burlap around trunk and fold down into the hole. Carefully place the tree in the hole and firmly pack soil around roots to eliminate air pockets. Water should be applied generously.

Other Planting Information

Use equipment and plant on the contour or across the slope, as much as possible, to minimize erosion potential.

Use of a professional tree planting contractor has been shown to significantly increase the chances for successful tree establishment.

If damage from deer, rabbits or other herbivores is anticipated, consider the use of tree shelters, repellents, or habitat protection to increase chances of successful planting and natural regeneration.

MAINTENANCE

Weed Control

Maintain a 36” diameter weed-free area in all directions from planted seedlings or cuttings until average tree/shrub height is taller than the surrounding weeds. This will typically take 3 to 5 years. Use WI NRCS CPS, Mulching (484) for organic or inorganic mulch, including fabric weed barriers. Use WI NRCS CPS, Herbaceous Weed Control (315) for chemical or mechanical (tillage) weed control.

If tillage is used for weed control, care must be taken not to damage plant stems. Keep tillage depths shallow to avoid root damage.

Note: Mowing is not considered a weed control practices in sod, as it tends to stimulate root growth of grasses. It can be used between tree rows, however, to improve access, and reduce cover for potentially damaging herbivores. Sod would need chemical treatment.

Mulch and Fabric Weed Barriers

Note: Organic or inorganic mulch, including fabric weed barriers, should be specified as WI NRCS CPS, Mulching (484). However, some additional guidance is provided here.

Mulch is organic or inorganic material that is spread around the individual seedling to help retain soil moisture, moderate soil temperature, and prevent weed growth. Apply mulch in a 3’ diameter circle around each seedling, 2 to 3” deep, and pulled back from the plant stem slightly. Straw or other similar mulch generally should be avoided as it can encourage mice and other small herbivores that may damage the seedlings.

Freshly chipped wood mulch should be aged for a few months to minimize the risk of heat damage to the seedlings (chips heat up significantly during the early stages of decay), and nitrogen deficiency problems (decaying organic matter can deplete the soil of nitrogen).

Fabric weed barriers are porous, yet opaque material that is installed over a tree or shrub seedling. They permit water to seep through to the seedling, but prevent weed growth. They are installed as 3’ x 3’ squares over individual plants, or as long rolls that can be rolled out over rows of trees. Again, do not allow mulch to be in direct contact with the tree stem.

If weed barriers or mulch will be used for follow-up weed control, site preparation may not be required.

However, in sites with aggressive difficult-to-kill weeds (e.g., reed canary grass), mechanical or chemical site preparation should be used prior to planting and installation of the weed barriers or mulch.

Other Maintenance Information

Supplemental planting is recommended if survival drops below 70% of the minimum allowed stocking level (see “Spacing Requirements” above).

Protect trees and shrubs from fire, insects, disease, and animals until established. Refer to WI NRCS CPS, Firebreak (398) or other applicable standards as needed.

Pruning may be required to remove damaged, diseased or unwanted limbs to improve health and quality. Refer to WI NRCS CPS, Tree/Shrub Pruning (660).

Tree and Shrub Regeneration Area with Protection

At this time this scenario only applies to sensitive areas in the counties of Marathon, Shawano, and Waupaca. It can be contracted after a mature harvest has been conducted and natural regeneration of native trees and shrubs is limited by browsing. A Deer Browse Assessment Tool will be used by a qualified forester or biologist. Minimum area size of 1 acre, any one plot not to exceed 7 acres. Maximum not to exceed a cumulative 15 total acres per contract. For specific information refer to Forestry Tech note 6.

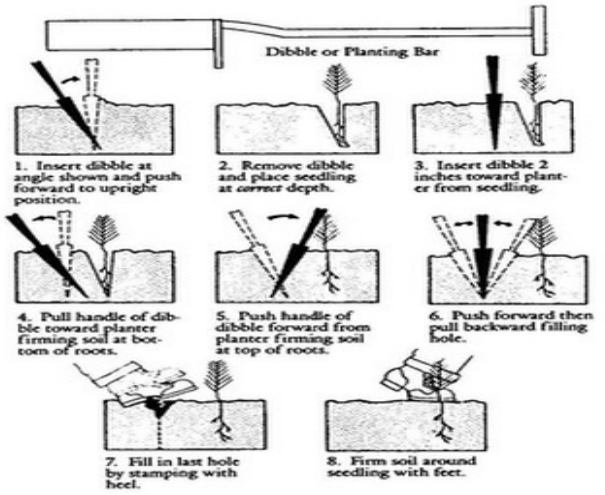


Figure 1 : Using a dibble (planting bar) to plant seedlings.

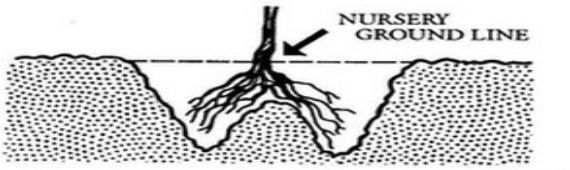


Figure 2 : An example of the hole and shovel method of planting seedlings.

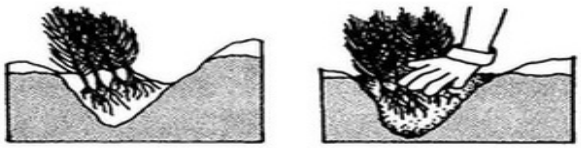


Fig. 3 . One method of long-term tree storage is the “heeling-in” technique. Roots must be packed tightly in soil and kept moist, and the heel-in trench must be shaded and protected from the wind.

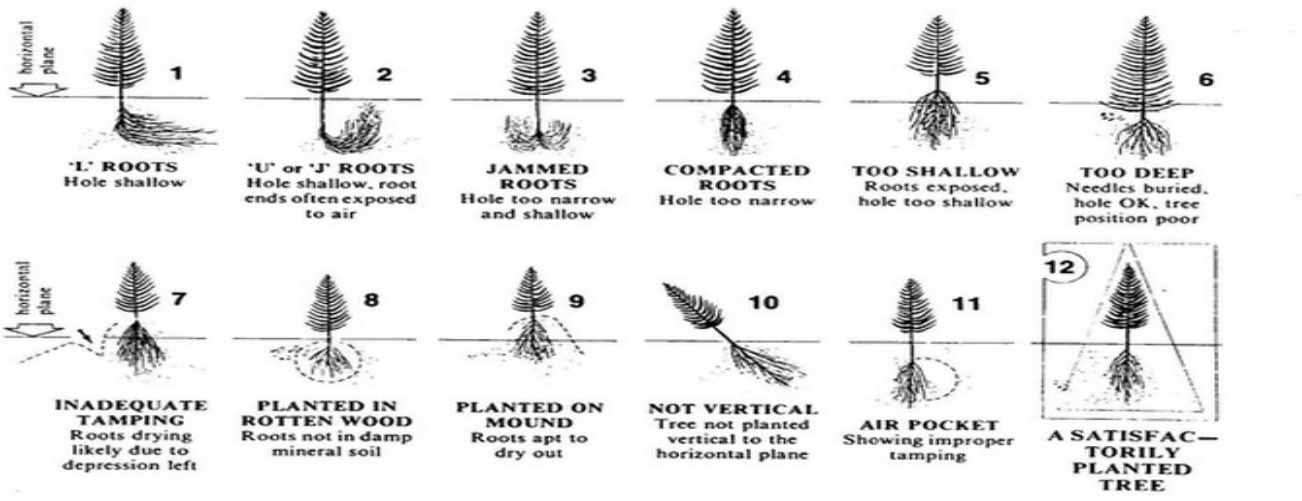


Fig. 4 . Drawings 1 through 11 illustrate various ways that trees should *not* be planted. The ideal planting is shown in drawing 12.

Tree and Shrub Specifications Worksheet

General Information

Client Name _____ Tract No. _____ Field No. _____

Site Specifications _____ Acres To Be Planted _____

Soil Map Unit(s) _____

Map of site - attach a sketch, map, or aerial photo indicating the location of area to be treated with FSI.

Purpose(s) *(check all that apply)*

- ☐ Forest products such as timber, pulpwood, etc.
- ☐ Wildlife habitat
- ☐ Long-term erosion control and improvement of water quality
- ☐ Treating waste
- ☐ Storing carbon in biomass
- ☐ Reducing energy use
- ☐ Developing renewable energy systems
- ☐ Improving or restoring natural diversity
- ☐ Enhancing aesthetics
- ☐ Reducing air pollution
- ☐ Uptake of soil and water-born chemical and nutrients

Site Preparation *(for information only - include site preparation in plan as separate conservation practice Tree/Shrub Preparation (490))*

Initial Site Preparation Method _____ Date _____

Additional Information _____

Tree/Shrub Establishment

Planting Method _____ Planting Date _____

Storage Requirements (if any) _____

Average spacing between rows _____ Average in-row spacing _____

Average stems per acre _____ Average seeding size/type _____

NUMBER OF TREES/ACRE AT VARIOUS SPACINGS

Spacing	Stems per Acre	Spacing	Stems per Acre	Spacing	Stems per Acre
5 x 5	1742	8 x 10	544	15 x 15	194
6 x 6	1210	9 x 9	538	16 x 16	170
6 x 8	907	9 x 10	484	18 x 18	134
6 x 10	726	10 x 10	436	20 x 20	109
7 x 10	622	10 x 12	363	30 x 30	48
7 x7	889	12 x 12	302	40 x 40	27
8 x 8	681	14 x 14	222		

To calculate stems/acre for other spacings: 43,560 divided by (row spacing in feet x stem spacing in feet)

SPECIES COMPOSITION

Species/Cultivars	Form		Kind of Stock[1]	Total Stems Planned	Total Stems Contracted	Total Stems "As Installed"
	☐ Tree	☐ Shrub				
	☐ Tree	☐ Shrub				
	☐ Tree	☐ Shrub				
	☐ Tree	☐ Shrub				
	☐ Tree	☐ Shrub				
	☐ Tree	☐ Shrub				
	☐ Tree	☐ Shrub				
Total number of trees/shrubs needed for planting:						

[1]Bareroot, container, balled and burlapped, etc. Include size, caliper, height, and age as applicable.

☐ Species selected common to county and suitable for soil type

Post Planting Weed Control

Herbivore Protection

- ☐ Tree tubes (max 200/acre)
- ☐ Individual mesh protectors (max 200/acre)
- ☐ Habitat barrier acres _____

Habitat Barriers Technical Specifications *(all items must be checked to meet standard)*

- ☐ > 90” from the ground
- ☐ 6” lip of galvanized wire fencing facing outward side of fence with coarse wood debris on top
- ☐ Bottom has tension wire and anchors
- ☐ No T&E hits for wood turtle
- ☐ Entrance/Exit present
- ☐ Flagging present

CONSTRUCTION PLAN

PRACTICE _____

LANDOWNER _____

ADDRESS _____

LANDOWNER PHONE NO._____ COUNTY_____

TOWNSHIP_____ T _____ N, R_____ E/W, Sec._____

FIELD OFFICE Waupaca TELEPHONE NO. 715-258-8380

DIGGERS HOTLINE

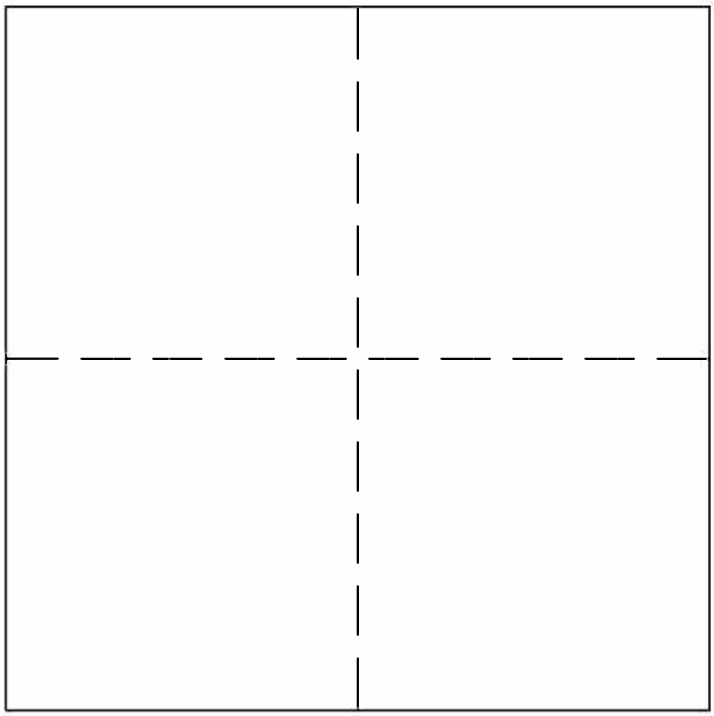
Call 3 Work Days
Before You Dig!

Nationwide
811

Toll Free
1–800–242–8511

TDD
1–800–542–2289

Website
www.diggershotline.com



N

Not to Scale

LOCATION MAP

NOTICE TO LANDOWNERS AND EXCAVATORS

Any representation made by the USDA, Natural Resources Conservation Service, or the Waupaca County LCD, as to the approximate location or nonexistence of above or under ground hazards does not relieve the owner of the property or the excavator that is hired to complete construction, from notifying Diggers Hotline of the pending construction. You will be liable for damages resulting from construction activities.
Call Diggers Hotline! Ticket Number _____

CONSTRUCTION DRAWINGS AND SPECIFICATIONS ACCEPTANCE

I have reviewed and understand the construction plans and specifications and agree to complete the work accordingly. Failure to meet these plans and specifications may jeopardize any continued NRCS technical assistance or program cost sharing applied for. I understand that it is my responsibility to secure all necessary permits and licenses, and to complete the work in accordance with all local, state, and federal laws. Modification of these construction plans or specifications must be approved by the NRCS before installation. I assume all responsibility for negotiations and contract agreements with the construction contractors.

Signed: _____ Date: _____

Designed by: _____ Date: _____

Checked by: _____ Date: _____

Approved by: _____ Date: _____

The installed practices comply with applicable NRCS technical standards and specifications. The "redlined" construction plans (as–built drawings) reflect changes made during construction.

Construction Approved by: _____ Date: _____

Job Approval Class _____

Sheet _____ of _____

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY	SHEET NUMBER	WI. CONSTRUCTION SPEC. OR JOB SHEET NUMBER
Plastic Mesh Fence	Ln. Ft.			WI Forestry Tech Note 6
12.5 ga. High Tensile Wire (top wire)	Ln. Ft.			WI Forestry Tech Note 6
Posts (Wood, PVC, Steel, Trees)	Ea.	As Needed		WI Forestry Tech Note 6
Ground Stakes	Ea.	As Needed		WI Forestry Tech Note 6
Fasteners (ie: zip ties)	Ea.	As Needed		WI Forestry Tech Note 6
Wire Tightener	Ea.			WI Forestry Tech Note 6
Wire Tightener Tool	Ea.	1		WI Forestry Tech Note 6
Spring Tensioner	Ea.			WI Forestry Tech Note 6
Flagging (blue is recommended)	Roll			WI Forestry Tech Note 6

Quantities are estimated to the neat lines on the construction plan unless otherwise stated.

USDA

ESTIMATED QUANTITIES

CLIENT: _____

COUNTY: _____

Date

Designed DJR

Drawn _____

Checked _____

Approved _____

Drawing Name WI–005

Date

Sheet of

CONSTRUCTION NOTES

1. ALL UNDERGROUND HAZARDS AND UTILITIES MUST BE INVESTIGATED PRIOR TO CONSTRUCTION. NOTIFICATION OF EFFECTED UTILITY COMPANIES IS THE RESPONSIBILITY OF THE CONTRACTOR. CONTACT DIGGERS HOTLINE AT LEAST THREE DAYS PRIOR TO START OF CONSTRUCTION.

2. A PRE-CONSTRUCTION MEETING SHALL BE SCHEDULED WITH NRCS PERSONNEL, THE CONTRACTOR, AND THE LANDOWNER PRIOR TO CONSTRUCTION START-UP.

3. THE CONTRACTOR AND/OR LANDOWNER SHALL NOTIFY NRCS AT LEAST 3 DAYS PRIOR TO START-UP OF CONSTRUCTION.

4. ALL WORK TO BE PERFORMED IN ACCORDANCE WITH WISCONSIN NRCS FORESTRY TECHNICAL NOTE 6. MATERIALS SHOULD BE APPROVED BY TECHNICIAN PRIOR TO INSTALLATION. MATERIALS NOT LISTED IN TECH NOTE 6 SHOULD BE CLEARED WITH NRCS PRIOR TO INSTALLATION

5. LANDOWNER SHALL OBTAIN ALL PERMITS AND RIGHTS, AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, AND REGULATIONS PERTAINING TO AND NECESSARY FOR THE INSTALLATION OF THIS PROJECT.

6. LOCATE ANY AND ALL EXISTING SUBSURFACE DRAINAGE LINES THAT MAY BE AFFECTED BY THE INSTALLATION OF THIS PROJECT.

7. NRCS STAFF WILL INSPECT INSTALLATION AND COLLECT DOCUMENTATION AS REQUIRED FOR FINANCIAL ASSISTANCE.

USDA

CONSTRUCTION NOTES

CLIENT: _____

COUNTY: _____

Date

Designed _____

Drawn _____

Checked _____

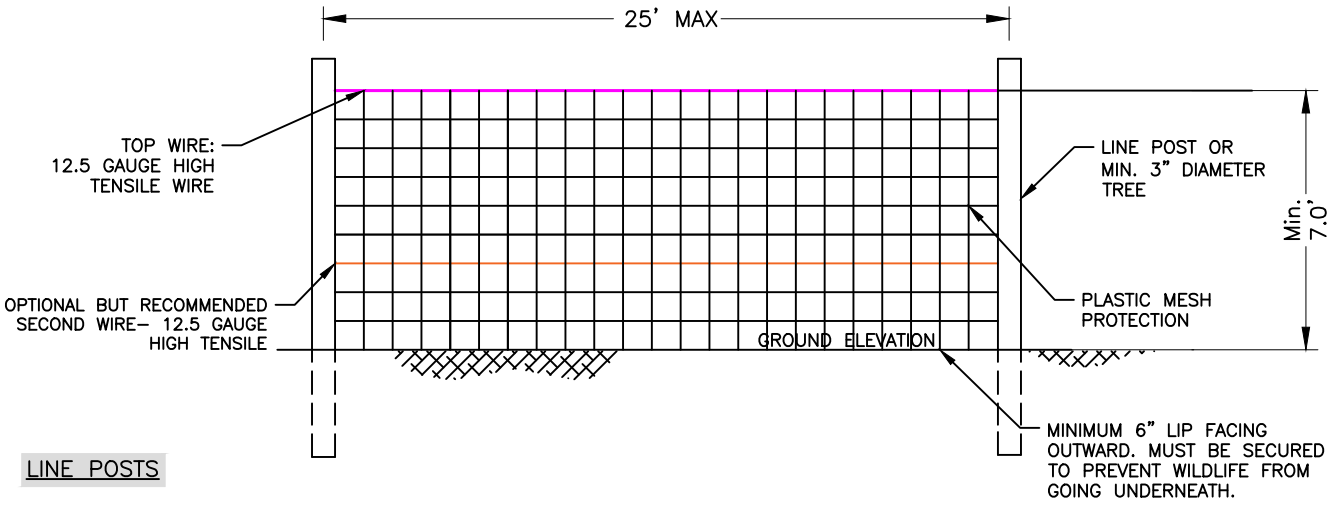
Approved _____

Drawing Name

Date

Sheet of

PERIMETER BASED TREE–SHRUB REGENERATION AREA WITH PROTECTION



LINE POSTS

MAXIMUM DISTANCE BETWEEN POSTS= 25'

WOOD:

LINE POST	CORNER POST
DIA.= 4" MIN	DIA= 5" ROUND OR 6"X6"
LENGTH= 10' 'MIN	LENGTH= 11
DEPTH= 2' MIN	DEPTH =3'
	**BRACING OR GUY WIRES

REQUIED FOR ADDITIONAL SUPPORT OF CORNER.

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

STEEL:

STANDARD "T" POST > 1.25 LBS/FT, 1 $\frac{3}{8}$" X 1 $\frac{3}{8}$" X $\frac{1}{8}$"
LENGTH= 10' MIN
DEPTH= 2' MIN

TREE:

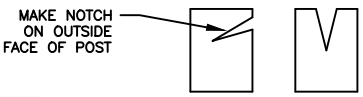
LINE POST= MIN. DIAMETER TREE–3"
CORNER POST– MIN. DIAMETER TREE–6"

LIVE OR DEAD TREES MAY BE USED. IF USING A DEAD TREE IT MUST BE A RECENTLY HARVESTED TREE STRONG ENOUGH TO WITHSTAND THE WEIGHT OF THE FENCE FOR UP TO 5 YEARS.

PVC/STEEL "T"–POST COMBINATION

"T"–POST
LENGTH= 5' MIN
DEPTH= 2' MIN

SCHEDULE 40 PVC
DIAMETER= 1.5–2"
LENGTH= 10 or 12'
PVC SLIDES OVER "T" POST. CUT NOTCH IN TOP OF PVC FOR FENCE TO SET IN.
EXAMPLES BELOW:



WIRE

MINIMUM 12.5 GAUGE CLASS III GALVANIZED HIGH TENSILE WIRE OR MINIMUM $\frac{3}{16}$" MONOWIRE WITH LINE TENSIONERS AS NEEDED

TOP WIRE IS REQUIRED, BUT A SECOND WIRE 4' UP FROM THE GROUND IS HIGHLY ENCOURAGED FOR ADDED BARRIER SUPPORT.

WIRE TENSIONER AND SPRING TENSIONER

MINIMUM 1 WIRE TIGHTENER PER 2600' OF WIRE LOCATED AT THE CENTER POINT OF THE WIRE

REQUIRED: 1 SPRING TENSIONER PER WIRE.

BARRIER MESH

7' 6" MINIMUM HEIGHT OF POLY MESH
MINIMUM TENSILE STRENGTH=650 psi
MAXIMUM SQUARE SIZE OF 4"

FASTENERS

MINIMUM SPACING = 3'
ZIP TIES OR HOG RINGS CAN BE USED TO ATTACH BARRIER TO HIGH TENSILE WIRE.

HOG RINGS= REQUIRE A HOG RING PLIERS TO PROPERLY

GROUND STAKES

MAXIMUM SPACING= 10'

ANY FORM OF STAKE IS ACCEPTABLE SO LONG AS IT PREVENTS THE ACCESS OF WILDLIFE FROM ENTERING BENEATH THE FENCE.

COARSE WOODY DEBRIS SHOULD BE USED IN PLACE OF STAKES IN AREAS WHERE STAKING MAY NOT BE POSSIBLE.

FLAGGING

HIGH VISIBILITY FLAGGING MUST BE ATTACHED TO THE BARRIER AT A MINIMUM SPACING OF 5' IN A ZIG ZAG PATTERN TO IMPROVE VISIBILITY OF BARRIER FOR WILDLIFE.

NOTES

ALL HAZARD TREES AND GROUND DEBRIS MUST BE REMOVED PRIOR TO BARRIER INSTALLATION.

ALL DEER BARRIER POLY–MESH AND HIGH TENSILE WIRE SHOULD BE FREE TO MOVE, FLEX AND SLIDE AS NEEDED.

CREATE AN ACCESS POINT TO ENTER INSIDE THE BARRIER AREA.

DEER BARRIER MUST REMAIN UP LONG ENOUGH TO REDUCE THE AMOUNT OF BROWSE THAT CAN OCCUR ON YOUNG TREES. CONTACT NRCS FOR BROWSE ASSESSMENT PRIOR TO BARRIER REMOVAL.

REFER TO THE WI FORESTRY TECHNICAL NOTE 6 FOR MORE SPECIFIC INSTALLATION INFORMATION

USDA United States Department of Agriculture Natural Resources Conservation Service	DEER BARRIER Natural Regeneration CLIENT: _____ COUNTY: _____	Date Designed _____ Drawn _____ Checked _____ Approved _____	Drawing Name Date Sheet of

OPERATION AND MAINTENANCE PLAN

PERIMETER BASED TREE-SHRUB REGENERATION AREA WITH PROTECTION

This practice shall be maintained long enough to reduce the amount of browse that can occur on young trees and until the height and diameter of the trees have reached a size that is browse-resistant. This may require several years of maintenance depending on tree growth. Contact NRCS for a browse assessment prior to barrier protection removal.

1. **Inspect barrier on regular basis to ensure it is structurally sound and no openings have occurred in the fence or along the ground that may allow wildlife inside barrier.**

2. **Maintenance will be ongoing and repairs will be made as needed to ensure barrier braces, stays and gates are working properly and serving their intended use.**

3. **Remove all brush that encroaches and may impact integrity of barrier. Remove any fallen limbs that may put stress on barrier. Overhanging trees and limbs should be trimmed or removed as needed to prevent damage to the barrier. Materials shall be replaced when necessary to maintain the integrity of the barrier.**

4. **Maintain proper tension on the high tensile wire and plastic mesh fence. Top wire should be maintained at a minimum height of 7' 0".**

Participant's Signature **Date**

Project Job Approval Class _____

Design Approval

Designed By: Date:

Approved By: Date: Job Approval Authority:

Client Acceptance

I have reviewed and understand the implementation requirements and agree to complete the work accordingly. Failure to meet these plans and specifications may jeopardize any continued NRCS technical assistance or program cost sharing applied for. I understand that it is my responsibility to secure all necessary permits and licenses, and to complete the work in accordance with all local, state, and federal laws. Modification of these implementation requirements must be approved by the NRCS before installation. I assume all responsibility for negotiations and contract agreements with contractors.

Signature: Date:

Installation and Certification

The installed practice meets NRCS technical standards and specifications. The "redlined" information reflects any changes made during installation of the practice.

Printed Name: Date:

Title: Job Approval Authority:

Signature: Date:

Notes: