

Project Subject/Title: Slash Wall Construction

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Abstract: Heavy browse pressure by deer is negatively impacting forest regeneration following forest management activities. These impacts are forcing foresters to find creative methods of excluding deer from regeneration areas. One method that is gaining attention due to its relatively low cost compared to standard fencing is the use of slash walls. In 2019 a slash wall trial was implemented in Waupaca County as part of a two step shelterwood harvest with the goals of regenerating oak and aspen. Four trial areas were created using left over slash and debris from the harvest. It took approximately 3 days to construct the four exclosures protecting about 1.5 acres of regeneration within the stand. 3700 linear feet of wall was constructed, at about 230 ft per hour. Issues that arose during construction include maneuverability around stumps and finding enough material to use to construct the wall. Because this trial has only been active for two years, no clear results on its effectiveness are available, but they will be following FRM surveys in the coming years.

Trial Location:

County: Waupaca

Township: 25N **Range:** 11E **Section:** 25, 26

GPS Coordinates: **Lat:** 44.61804 **Long:** 89.12589

Property Name: Little Wolf Fisheries Area, WISFIRS ID: P:6912, C:11, S: 4

Site Map: Figure 1.

Figure 1 Stand map, exclosures are within the yellow boxes. 4 exclosures were constructed ranging in size from .16 acres to .9 acres.

Baseline Stand Data: *list pre-trial stand data or attach WisFIRS stand report #113*

- *Cover Type (primary, secondary, understory):* Oak, Oak
- *Acres:* Stand area: 38 acres, treatment areas: 1.5
- *Habitat Type:* AQVb-Gr (Dry-Mesic)
- *Soil Type:* Kennan sandy loams
- *Year of Origin:* 1913
- *Total Height:* 97
- *Site Index Species and Site Index:* 80, species: Northern red oak
- *Mean Stand Diameter:* 17 inches
- *Total Basal Area per acre: pre-harvest:* 118 *post-harvest:* 45
- *Other stand conditions:* High deer densities

Prescription and Methods:

- *Type of prescription:* Two-step shelterwood treatment. Reduce basal area down to 50% of original basal area to establish a new cohort. Following the harvest of the seed cut, slash walls were constructed around the perimeter of gaps to exclude deer. Once regeneration is established, the plan is to remove remaining overstory trees, approximately 2026.
- *Year initiated:* Shelterwood cut occurred in 2019, slash walls were constructed shortly after the harvest
- *Establishment methods (timing, equipment, etc.):* Establishment will occur through natural regeneration with about a 6-year gap between the shelterwood cut and the final overstory removal. Following the shelterwood cut, slash walls were constructed using residual materials left on the site. A WI DNR John Deere 450 LGP with a root rake attachment was used to pull slash into place forming a wall around test areas.
- *Data collection methods:*
 - Slash Wall Evaluation: At 30ft intervals slash wall width and height were measured to determine the average height and width of the barrier.
 - Seedling Regeneration Evaluation: FRM sampling will be conducted both inside and outside the slash wall exclosures to compare regeneration and determine exclosure effectiveness. The site will also be visited during the winter to look for deer activity inside the exclosures to evaluate their effectiveness at keeping deer out.

Results: *overview of prescription results, include any summarized data, charts, graphs, pictures*

Slash Wall Construction: Four slash walls were constructed following the shelterwood establishment cut (Figure 1). Each slash wall differed in size and goal of regeneration (Table 1). Slash walls were constructed by DNR personnel using a John Deere 450 LGP with a root rake blade attachment. Left over slash was pushed onto a flag line surrounding the test area. Approximately 230ft of a circular wall was constructed per hour, with total time of construction taking roughly 3 days for about 3700 linear feet of wall, protecting about 1.5 acres of the stand.

Table 1 Description of each slash wall enclosure

Slash Walls	Slash Wall 1	Slash Wall 2	Slash Wall 3	Slash Wall 4
Regeneration Goals	Aspen	Oak	Oak	Aspen
Location (Lat/Long)	N 44.61820, W 89.13019	N 44.61853, W 89.12791	N 44.61781, W 89.12417	N 44.61758, W 89.12129
Size	0.88 acres	0.26 acres	0.20 acres	0.16 acres
Perimeter	1584 feet	1050 feet	528 feet	528 feet
Average Height	3.85 feet	4.5 feet	5.1 feet	3.95 feet
Average Width	11.2 feet	11.25 feet	10.8 feet	9.4 feet
Materials Used	Aspen (50%), Oak (30%), Mixed Hardwoods (30%)	Oak (50%), Mixed Hardwoods (50%)	Oak (50%), Mixed Hardwoods (50%)	Oak and Mixed hardwoods (50%), Aspen (50%)



Figure 2. Completed slash wall area (photo credit: Jason Hennes).

Preliminary FRM Survey Results

Data on browse pressure from inside and outside of each of the exclosures is not yet available to compare but a preliminary FRM survey was conducted in a select number of plots in 2021. There was mild to little browse observed within exclosures, and only observed on ash and ironwood species. Outside of the exclosures browse was heavier with primary species affected being aspen, ironwood, red maple and black cherry.

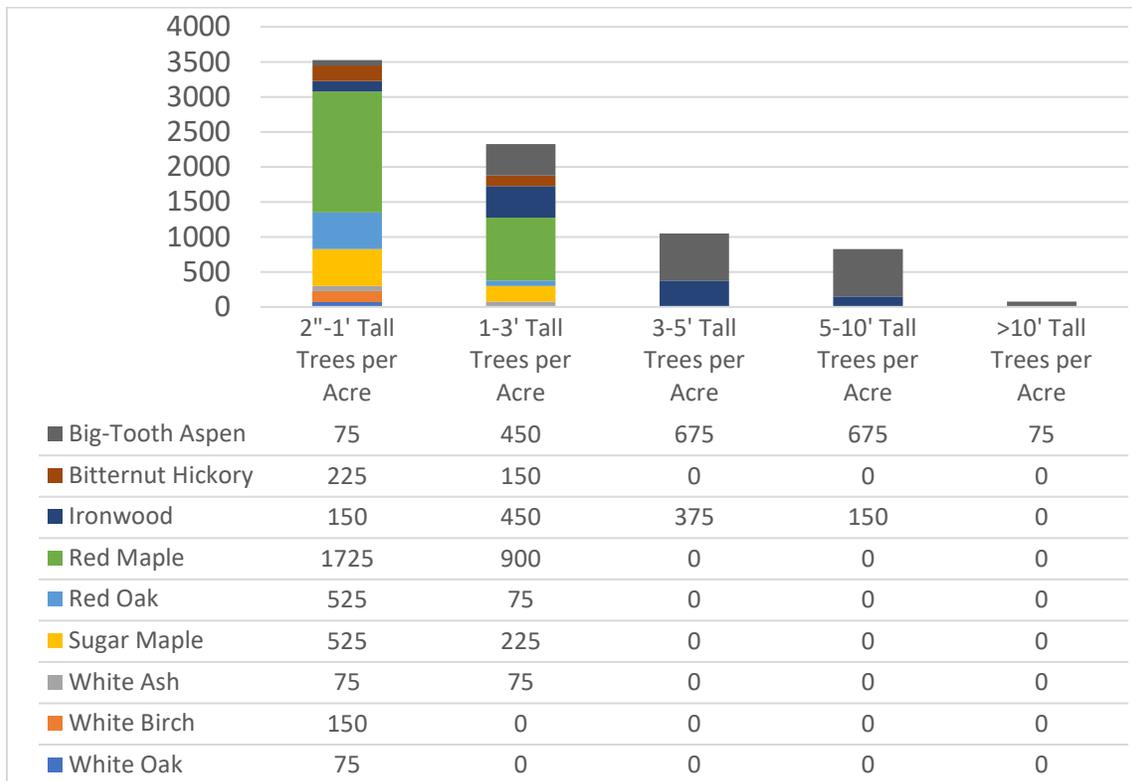


Figure 3. Preliminary FRM survey results from outside of the exclosures.

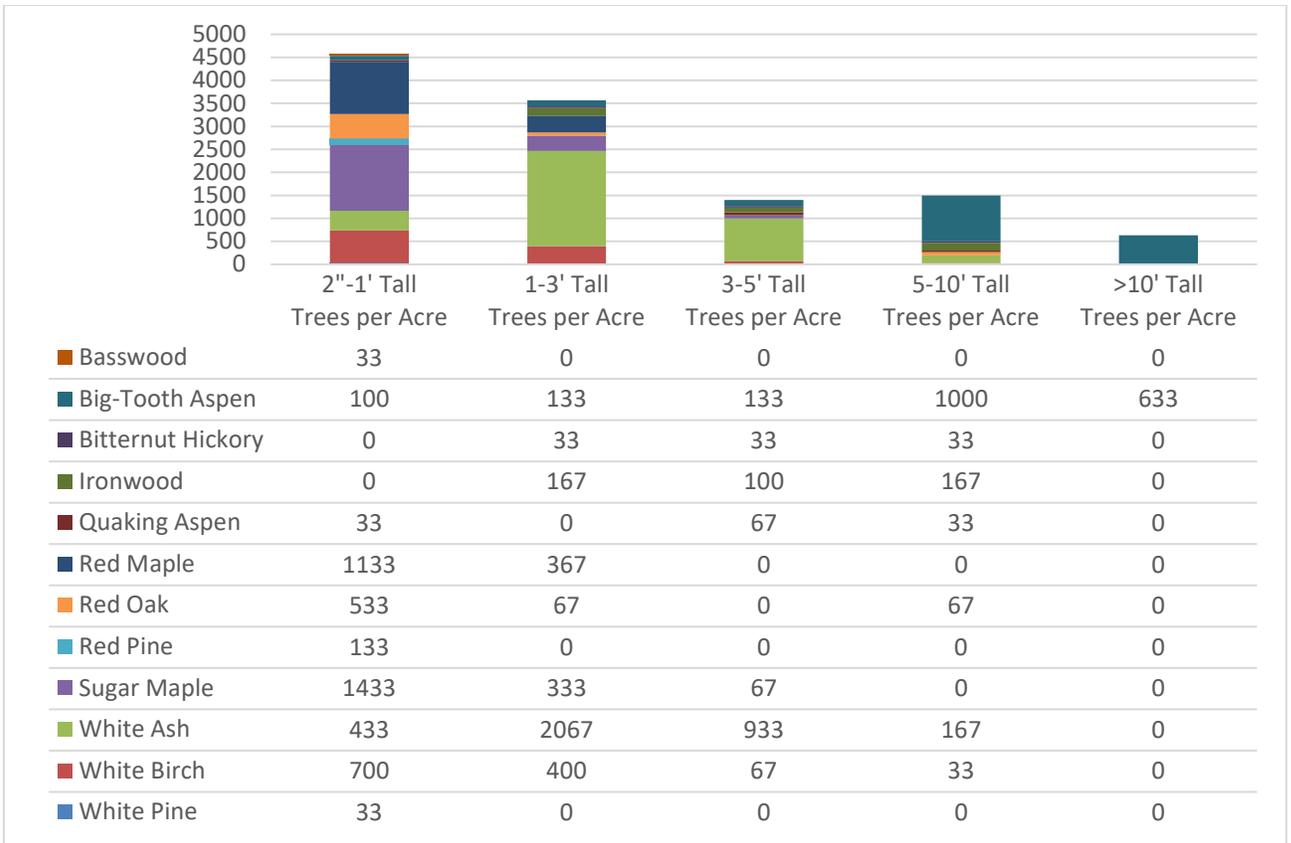


Figure 42 Preliminary FRM survey results from inside the enclosures

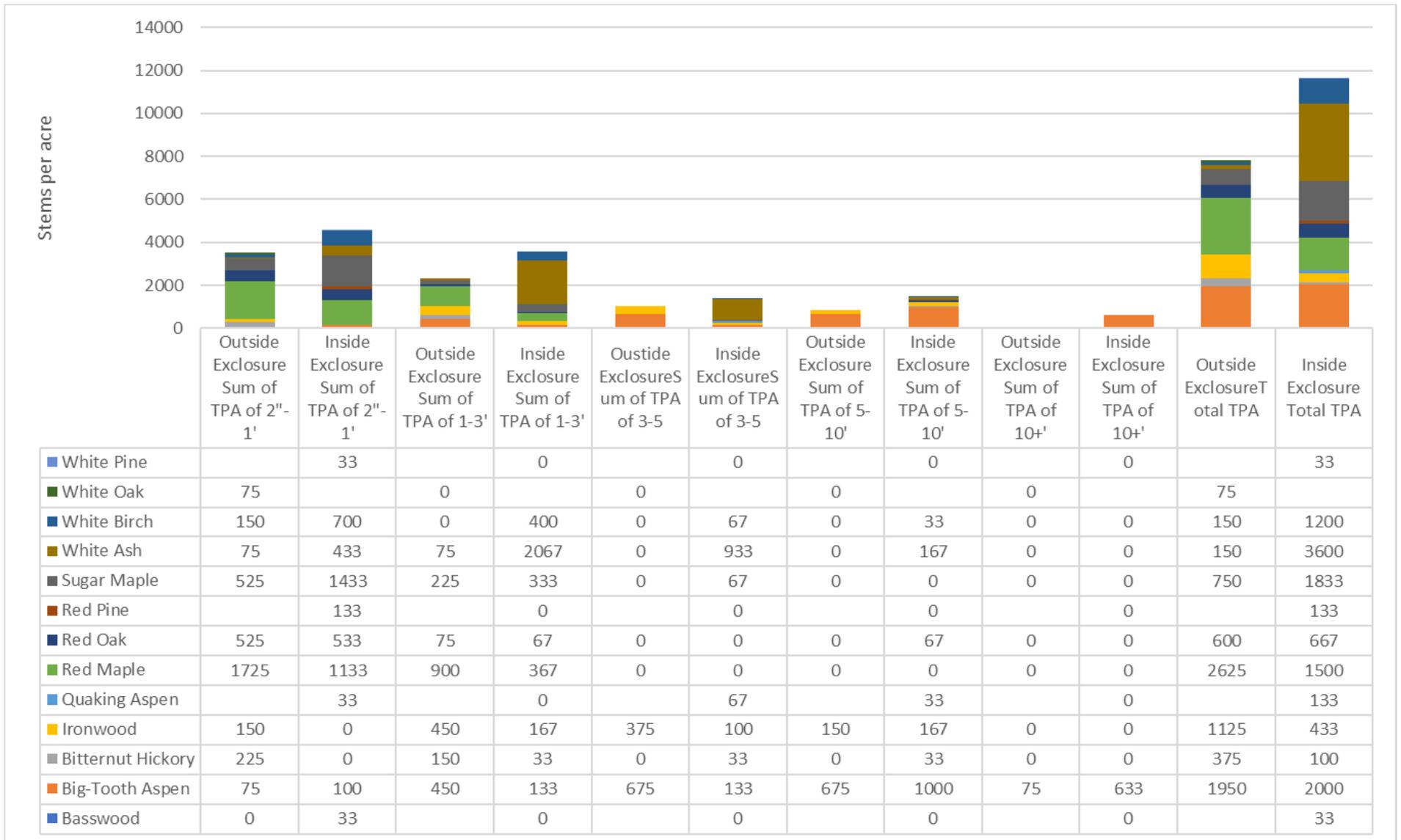


Figure 5. Combined inside and outside exclosure preliminary FRM results

Discussion/Recommendations: *What was learned from trial?*

Waupaca County has a very high deer density, which leads to high browse pressure in forested stands negatively impacting forest regeneration and health. Most stands within the county are below the recommended levels of natural regeneration necessary to adequately regenerate stands. Due to this, methods to protect regeneration, natural and artificial, from deer herbivory are needed. Most deer exclosures are relatively small, expensive to install, and difficult to properly maintain over the time necessary to get seedlings above browse height. To come up with a more cost-effective exclusion method, that can be installed using materials on hand, a slash wall trial was established. Slash wall have been used in other parts of the U.S. where deer densities are impeding regeneration and have had some success. These are the first known slash walls to be tried in Wisconsin.

Construction of the slash walls was aided using WDNR equipment and personnel. This allowed construction costs to stay low, along with the ability to use leftover materials from the associated harvest. It took about 3 days total to construct the four slash wall areas with a construction rate of 230ft per hour. A difficulty that arose during the construction of the slash wall was maneuvering around stumps of harvested trees. Another issue was gathering enough material to form an effective barrier. In areas with poor pulp markets left over material may be more abundant due to its low merchantability, but in areas with good pulp markets the use of this material that would otherwise be sold would result in an income loss.

Suggestions for future implementations of this method would be to have the logger fell trees onto a predesignated line so that leftover tops could form the slash wall. Another suggestion would be to include larger diameter materials, as well as constructing the barriers immediately after or during harvest before materials could break up and decompose. Finally, a suggestion could be to hinge cut pole size stems in order to keep it alive and allow it to form the wall, while also growing branches vertically forming a green wall.

This trial is still in its early stages and future surveys will be needed to determine how effective slash walls are at reducing deer browse. If effective, given the low costs of implementation, it is something that may be worth considering elsewhere in the future. For more information on slash walls and their implementation elsewhere see the [Cornell Slash Wall Resource Center](#).

Extra Materials (deer densities, picture of construction and post construction).



Figure 6. A close aerial view of two of the slash wall areas during leaf off conditions just after harvest.



Figure 7 Complete slash wall during the winter season. Signs of deer will be looked for during this time (photo credit: Jason Hennes).

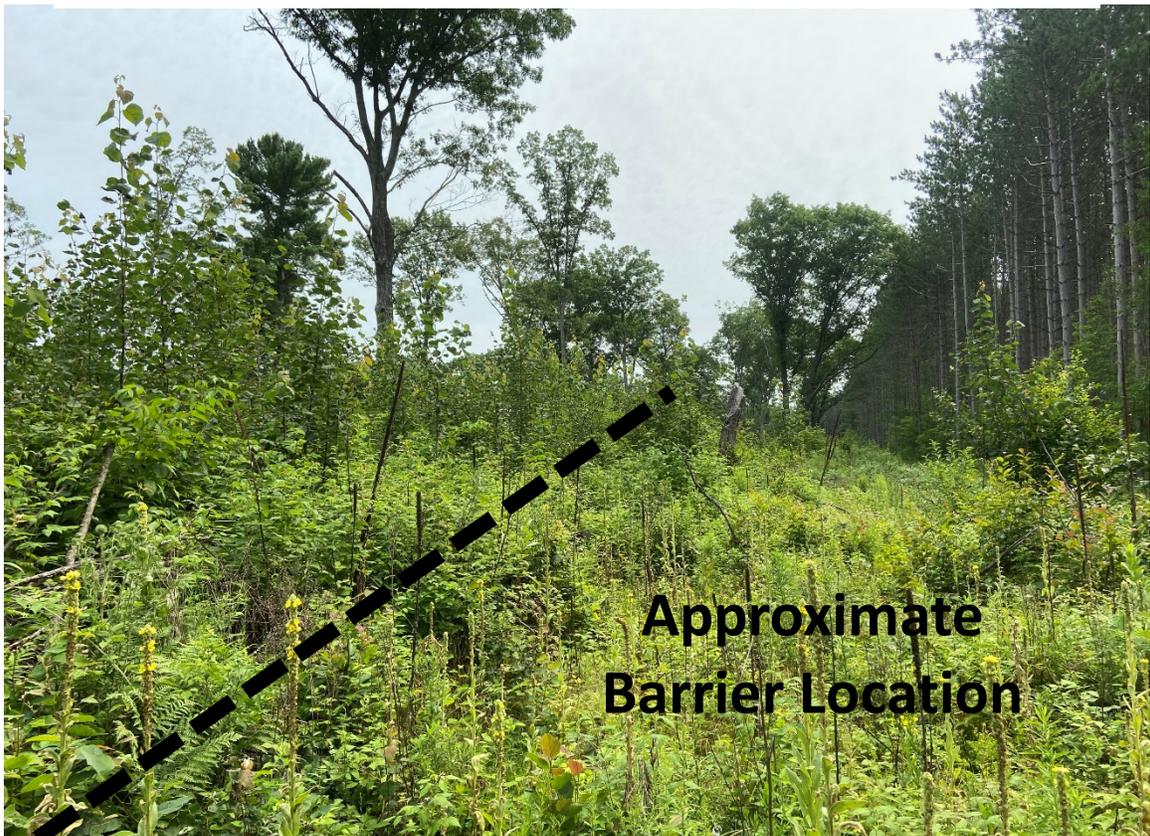


Figure 8 Completed slash wall during growing season a year after construction (photo credit: Jason Hennes).



Figure 9. Picture of a completed slash wall post-harvest during the growing season (photo credit: Brad Hutnik).

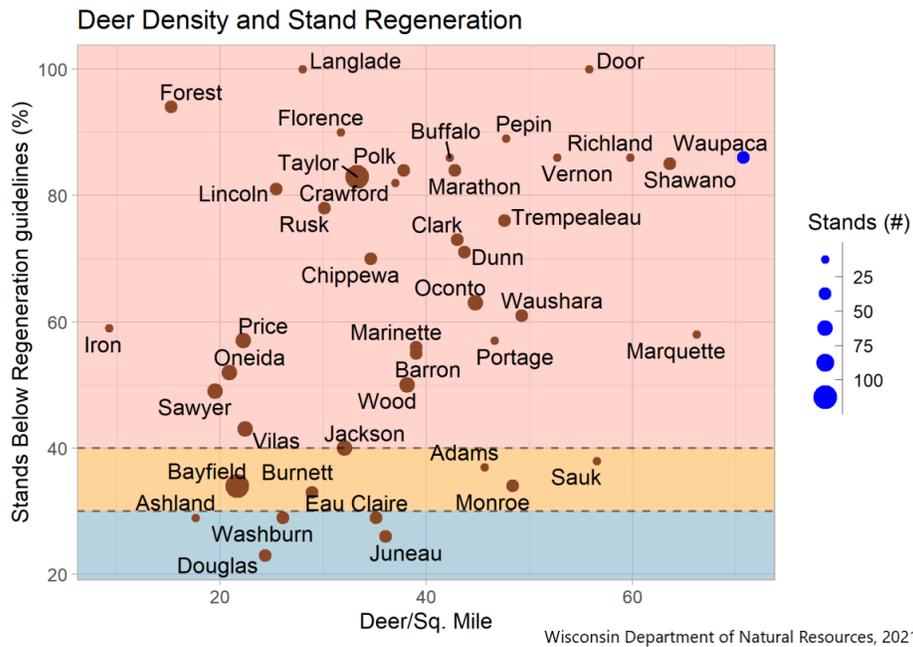


Figure 10. County Deer Density by County Stand Regeneration Stocking Densities (2021)



Figure 11. A WI DNR John Deere 450 LGP with a root rake attachment



Figure 12 Process of constructing a slash wall.

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