

Conifer

Seedling Release



Site Summary

| | |
|-------------------|--|
| Stand type | Douglas-fir |
| Location | Napavine, WA |
| Soils | Salkum Silty Clay Loam Site Class II Site Index 126 (DF) |
| Aspect | Flat to southerly |
| Elevation | 400' |

Treatment Variables

| | |
|-------------------------|---|
| Design | Two 1.0-acre treatment sites. Four 1/20th-acre plots per site |
| Type of labor | Manual with 4-person chainsaw crew |
| Invasive species | Scotch broom |
| Other species | Grand fir, red alder |

Funding for this project was provided by the USDA's Western Sustainable Agriculture and Research Education (SARE) program.



PROJECT & STAND DESCRIPTION

This project treated a newly established plantation of Douglas-fir (*Pseudotsuga menziesii*) that was overgrown with Scotch broom (*Cytisus scoparius*). The unit was clearcut in 2017 and replanted the following winter exclusively with Douglas-fir at an 8' x 8' density (680 TPA). Dormant Scotch broom germinated in the newly exposed soils and rapidly colonized the majority of the site. The planted Douglas-fir had experienced high browse damage and consequently was stunted in growth. Within three years the Scotch broom had overtopped the fir seedlings and was threatening to shade out the fir.

This project utilized two treatment techniques and documented labor costs and effectiveness of both seedling release and suppression of competing vegetation. The first technique involved lopping and scattering the broom to monitor its ability to suppress regrowth. The second technique involved gathering the broom into piles.



TREATMENT GOALS

The objective of each treatment was to reduce competition of Scotch broom until Douglas-fir reaches a free-to-grow height across the unit. The two differing methods allowed observations of regeneration response of broom to having cut material scattered across the site vs. piled, as well as cost comparisons of labor.

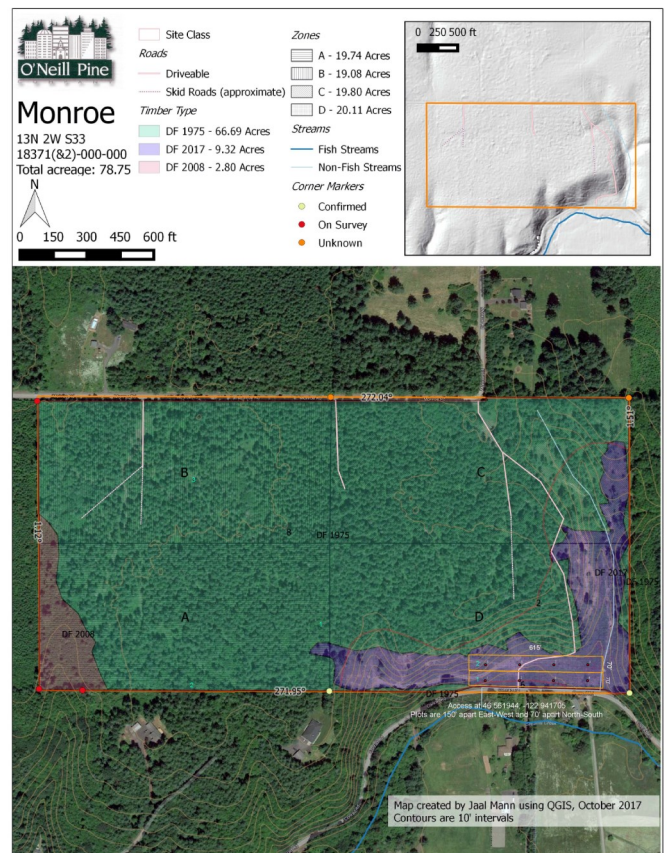
TREATMENT CONSIDERATIONS

1. In Treatment Site 1 all scotch broom was lopped and scattered across the site, leaving a layer of cut material on the ground.
2. In Treatment Site 2, all scotch broom was cut, then gathered and piled into several piles throughout the unit.
3. Replanting scotch broom in both treatment sites was sprayed approximately three months later with Garlon.
4. The project was part of a larger 3.0-acre scotch broom removal project. The broom was inconsistently distributed throughout the entire area, but covered comparable areas within the two treatment sites.
5. The broom was more than twice the height of the planted fir seedlings, making it difficult to locate all fir seedlings during the initial survey.

TREATMENT PRESCRIPTIONS

Two different treatments were used to study the effects on seedling growth and subsequent resprouting of scotch broom. Scotch broom was cut in February, allowed to regrow, then the regrowth sprayed in June of the same year.

1. Cut, lop, and scatter scotch broom, followed by herbicide spray.
2. Cut and pile scotch broom, followed by herbicide spray.



Seedling release treatment sites in SE corner.

| 2020 Stand Summary | | | | | |
|--------------------|------------|-----|--------|--------|-----------|
| Site | # of Plots | TPA | TPA DF | TPA RA | Avg Ht DF |
| 1 | 4 | 440 | 440 | 0 | 2.7 |
| 2 | 4 | 405 | 405 | 0 | 2.5 |
| 2022 Stand Summary | | | | | |
| Site | # of Plots | TPA | TPA DF | TPA RA | Avg Ht DF |
| 1 | 4 | 825 | 525 | 300 | 6.4 |
| 2 | 4 | 562 | 450 | 112 | 5.8 |

LABOR & OTHER COSTS

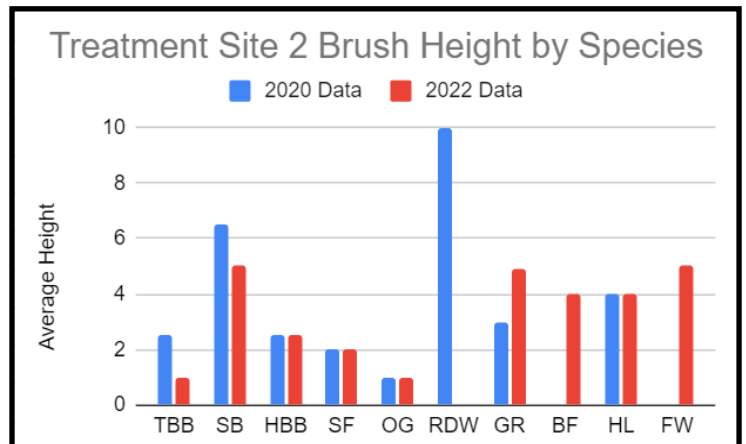
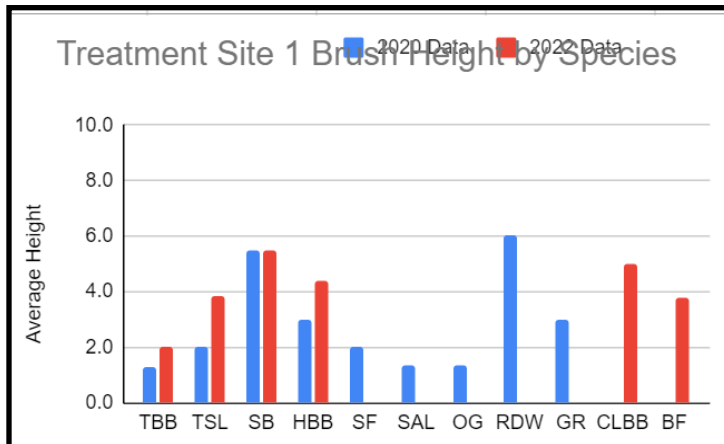
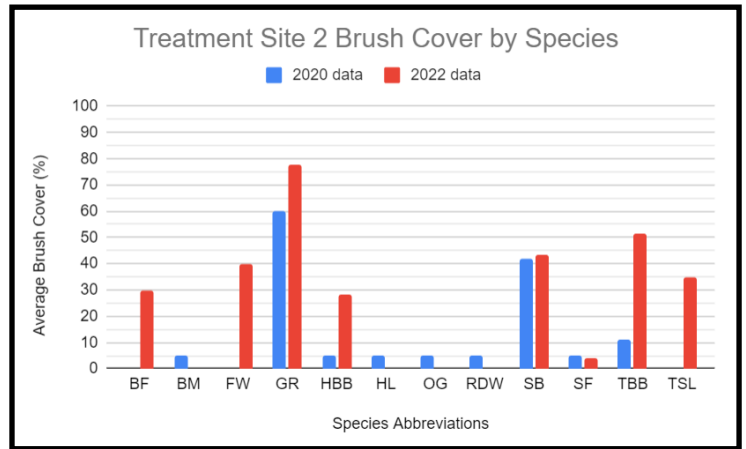
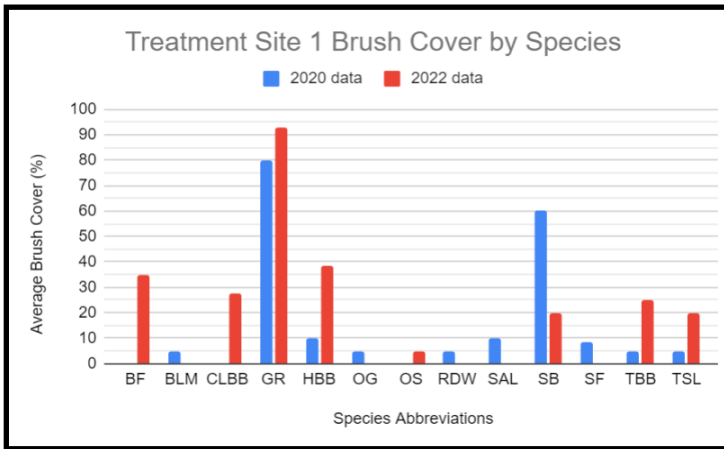
Scotch broom removal was conducted by a contracted four-person crew using chainsaws in late February. Herbicide was applied by a single operator in early June.

| | Treatment Site #1 Lop-and-scatter (Per acre) | Treatment Site #1 Herbicide (Per acre) | Treatment Site #2 Piling (Per acre) | Treatment Site #2 Herbicide (Per acre) |
|----------------------|--|--|---|--|
| Labor | 4 workers, 3 hours (12 person hours) | 1 worker, 1 hour (1 person hour) | 4 workers, 4 hours (16 person hours) | 1 worker, 1 hours (1 person hour) |
| Cost | \$40/hr, total \$480 | \$95/hr, total \$95 | \$40/hr, total \$640 | \$95/hr, total \$95 |
| Fuel | 4.0 gallons ⁺ | None | 5.3 gallons | None |
| CO2 Emissions | 78.56 lb CO ₂ ⁺⁺ | 0 | 104 lb CO ₂ ⁺⁺ | 0 |

+ assumption: 0.25 gallons of gas/45 minutes/worker

++ assumption: 19.64 lbs CO₂/gallon

TREATMENT PLOT DATA



ANALYSIS

Analysis of this project focused on both labor practices and growth data of both tree seedlings and brush species. Since it is difficult to draw definitive conclusions from only two years of growth data, some inferences had to be made from both subjective observations of seedling and brush growth and analysis of data.

1. The higher rates of seedling height growth and red alder regeneration in Treatment Site 1 likely had more to do with higher site productivity (wetter soils) than any relationship with the scotch broom treatment method.
2. Removal of scotch broom triggered an increase in both species and abundance of other competing brush species, in particular bracken fern, Himalayan blackberry, grasses, and trailing blackberry. Additionally, removal of scotch broom provided the opportunity for red alder to naturally regenerate in both units.
3. Additional Douglas-fir seedlings were revealed during the 2022 survey than were originally counted in 2020 once the scotch broom was removed. At a current stocking density of 450—525 TPA there are ample seedlings to fully occupy the site.
4. The lop-and-scatter method resulted in a greater reduction in scotch broom cover than the piling method. However, it's undetermined whether this was solely due to the treatment method or other factors such as herbicide effectiveness.
5. The lop-and-scatter method did not appear to have a suppressive effect on the growth of competing vegetation as was expected by leaving a mulch mat.
6. Despite the continuing presence and abundance of competing vegetation throughout both treatment sites, the Douglas-fir seedlings had achieved a free-to-grow height above most other vegetation and appeared to be thriving.
7. The chlorotic appearance of many Douglas-fir seedlings in 2020 was not observed in 2022, which may have been a result of a flush of nitrogen into the soil from the cut scotch broom, a nitrogen-fixing species.

KEY LESSONS LEARNED

1. Given that both treatment methods resulted in comparable growth rates of Douglas-fir seedlings, the less expensive lop-and-scatter method is recommended for future similar scenarios.
2. Both treatment methods, combined with the herbicide application, were sufficiently effective at suppressing scotch broom long enough for planted fir seedlings to achieve a free-to-grow height above remaining scotch broom.
3. Dense scotch broom has a suppressive effect on other competing vegetation, and its removal triggers the “release” of this vegetation. Follow-up monitoring is recommended to ensure the resulting growth of other competing vegetation does not continue to impede the growth of planted tree seedlings.