

# **Red alder clone performance and potential for tree improvement**

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# My Background

- **Ecology and Management of Hardwoods, specialty area since 1984.**
- **Research, Extension & Consulting**



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# Alder Clones and Tree Improvement

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- Weyerhaeuser and WSU red alder clone program history
- OSU-HSC & WHC clone bank and field trial
- Next steps with red alder clones and tree improvement?





# Weyerhaeuser-WSU red alder clone program history

- Weyerhaeuser Co. red alder clone selections, field trials est. 1999-2008
- Weyerhaeuser donated clones to WSU
- Program was led by Dr. Barri Herman at both Weyco and WSU.
- WSU phased out the program 2022





# Red Alder Clone Bank

- In 2019, the HSC & WHC with help from Hancock FM (Florian Deisenhofer) saved some of the material from the WeyCo/WSU alder clone program and established a clone bank. Objectives were;
  - Preservation of superior genetic material.
  - Foundation for future progeny testing/tree improvement.
- Established at the Oregon Department of Forestry, J.E. Schroeder Seed Orchard, St. Paul, OR





# Red Alder Clone Bank

- Started with 20 WSU production clones
- 3 plants per clone
- Planted Fall 2019
- Replaced 19 trees in 2020 & 2021
- 17 clones surviving as of 2025





# Red Alder Clone Bank Future?

- Add more superior clones if we can acquire them.
- Produce superior seed from open pollinated cone production in the seed orchard.





# Red Alder Clone Trial

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Objective: Establish a clone trial to test the performance of red alder clones in comparison to woods run controls

Established in 2020 at the OSU College of Forestry Research Forests, Blodgett Tract near Clatskanie, OR





# Red Alder Clone Trial

- Four sources of seedlings were used:
  - 1) Eighteen clones from the WSU program and grown as PSB 615A plugs
  - 2) Woods run bare root seedlings from the Weyerhaeuser Aurora nursery
  - 3) Woods run 615 plugs grown by PRT Hubbard from the 041 seed source (SW WA), bought from WA DNR
  - 4) “Open pollinated” plugs (lot #249) from a WSU clone trial grown as plugs by the WSU program
- Planted on April 3, 2020 in a 1.1-acre, unfenced area cleared of any burn piles, and hand sprayed
- Surrounded by an operational planting of the same clonal stock
- Planted on a 9X9' grid (537tpa)



# Red Alder Clone Trial

- The study design was a randomized complete block design with four blocks (i.e. replications).
- Each treatment within each block is represented by an individual-tree plot, with planting locations randomly assigned.
- Each block (rep) contained 21 treatments:
  - 18 clones
  - The three comparison sources (WeyCo, DNR, & WSU) included twice (to account for its expected higher inter-tree variation).
- Each block had 144 planting spots- six individuals for each of the 18 clones, and 12 individuals for the three comparison sources.
- The trial was bordered by 5-tree row plots of randomly assigned 20 treatments all of which was surrounded by the operational planting.



# Red Alder Clone Trial

| Clone | Group | Flag Color                 |     |
|-------|-------|----------------------------|-----|
| 101   | A     | Pink Wetlands              | A   |
| 114   | B     | Lime Green                 | B   |
| 154   | C     | Red Stripes on White       | C   |
| 228   | D     | Red                        | D   |
| 242   | E     | Orange                     | E   |
| 243   | F     | Purple                     | F   |
| 249   | G     | Light Blue                 | G   |
| 250   | H     | Dark Blue                  | H   |
| 309   | I     | Red Polka Dots on White    | I   |
| 321   | J     | Dark Green                 | J   |
| 426   | K     | Yellow Caution             | IK! |
| 433   | L     | Checkered White on Blue    | L   |
| 602   | M     | Pink w/White Polka Dot     | M   |
| 621   | N     | Black Stripes on Yellow    | N   |
| 631   | O     | Blue Stripes on White      | O   |
| 633   | P     | Black Polka Dots on Yellow | P   |
| 635   | Q     | Blue Polka Dots on White   | Q   |
| 639   | R     | Checkered Green on Black   | R   |
| WSU   | S     | White                      | S   |
| DNR   | T     | Pink                       | T   |
| WeyCo | U     | Yellow                     | U   |

Clone Trial Codes

|    |   |     |   |   |   |     |   |     |   |     |     |    |
|----|---|-----|---|---|---|-----|---|-----|---|-----|-----|----|
| 12 | C | L   | M | N | B | F   | D | P   | S | N   | F   | J  |
| 11 | J | R   | U | R | C | I   | B | U   | N | U   | S   | U  |
| 10 | T | S   | P | Q | B | S   | S | J   | U | E   | O   | N  |
| 9  | R | I   | H | I | F | A   | H | B   | G | J   | U   | R  |
| 8  | Q | IK! | L | N | H | C   | A | N   | D | J   | O   | E  |
| 7  | P | J   | I | T | T | T   | R | O   | T | A   | G   | P  |
| 6  | F | IK! | C | C | S | O   | S | T   | M | IK! | L   | P  |
| 5  | F | L   | D | T | P | T   | T | H   | Q | M   | G   | T  |
| 4  | G | U   | E | Q | T | S   | D | I   | M | Q   | S   | H  |
| 3  | A | E   | S | T | T | L   | H | IK! | B | L   | IK! | S  |
| 2  | G | I   | M | R | A | IK! | D | B   | S | C   | A   | T  |
| 1  | E | M   | O | G | T | O   | T | D   | F | E   | Q   | U  |
|    | 1 | 2   | 3 | 4 | 5 | 6   | 7 | 8   | 9 | 10  | 11  | 12 |

Block/Rep #1 Map



# Red Alder Clone Trial

|    |   |    |   |    |   |    |    |    |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |   |    |    |   |  |
|----|---|----|---|----|---|----|----|----|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|----|----|---|--|
|    | ! | K! | B | B  | B | B  | B  | R  | R | R  | R  | R  | C  | C  | C  | C  | C  | D  | D  | D  | D  | D  | H  | H  | H  | H | H  |    |   |  |
| 24 | ! | K! | U | T  | Q | T  | Q  | G  | N | S  | L  | A  | C  | G  | D  | D  | A  | J  | U  | U  | G  | I  | G  | D  | S  | N | A  |    |   |  |
| 23 | ! | K! | T | B  | S | Q  | T  | F  | A | E  | L  | C  | S  | O  | I  | A  | N  | B  | T  | L  | T  | S  | N  | T  | U  | U | A  |    |   |  |
| 22 | ! | K! | T | J  | H | Q  | G  | Q  | C | U  | P  | N  | N  | R  | T  | A  | T  | R  | H  | T  | F  | A  | S  | J  | F  | N | A  |    |   |  |
| 21 | ! | K! | ! | K! | L | D  | S  | P  | F | R  | A  | J  | H  | B  | J  | !  | K! | L  | U  | B  | J  | U  | U  | S  | E  | H | Q  | P  | A |  |
| 20 | J | C  | L | E  | D | D  | R  | F  | B | G  | P  | D  | !  | K! | M  | M  | T  | T  | A  | R  | I  | G  | Q  | Q  | G  | O | A  |    |   |  |
| 19 | J | M  | T | U  | U | D  | U  | T  | I | C  | E  | T  | H  | R  | !  | K! | Q  | F  | U  | M  | O  | F  | S  | S  | H  | ! | K! | P  | A |  |
| 18 | J | B  | N | O  | U | E  | S  | D  | R | F  | N  | !  | K! | S  | C  | R  | U  | B  | H  | I  | S  | J  | M  | O  | H  | O | P  | A  |   |  |
| 17 | J | E  | S | T  | B | F  | L  | G  | F | H  | E  | B  | I  | E  | P  | T  | T  | O  | O  | T  | !  | K! | H  | G  | I  | P | P  | A  |   |  |
| 16 | J | T  | ! | K! | T | O  | U  | J  | A | U  | H  | I  | Q  | M  | P  | A  | M  | B  | Q  | !  | K! | F  | T  | C  | R  | L | E  | P  | A |  |
| 15 | N | L  | A | R  | S | !  | K! | R  | U | O  | I  | M  | G  | H  | !  | K! | S  | J  | E  | T  | E  | E  | U  | D  | S  | B | C  | P  | A |  |
| 14 | N | S  | J | U  | I | U  | M  | S  | P | I  | N  | P  | T  | I  | L  | D  | N  | S  | C  | L  | F  | U  | R  | D  | T  | E |    |    |   |  |
| 13 | N | O  | C | M  | ! | K! | A  | S  | J | O  | S  | M  | U  | P  | Q  | S  | G  | P  | J  | B  | U  | C  | N  | C  | M  | L | E  |    |   |  |
| 12 | N | C  | L | M  | N | B  | F  | D  | P | S  | N  | F  | J  | R  | T  | A  | G  | U  | S  | H  | P  | L  | T  | S  | D  | E |    |    |   |  |
| 11 | N | J  | R | U  | R | C  | I  | B  | U | N  | U  | S  | U  | I  | R  | C  | H  | U  | Q  | Q  | S  | U  | H  | F  | J  | E |    |    |   |  |
| 10 | G | T  | S | P  | Q | B  | S  | S  | J | U  | E  | O  | N  | O  | N  | P  | S  | G  | U  | G  | R  | H  | M  | D  | E  | E |    |    |   |  |
| 9  | G | R  | I | H  | I | F  | A  | H  | B | G  | J  | U  | R  | R  | L  | F  | R  | S  | Q  | Q  | P  | U  | S  | F  | M  | L |    |    |   |  |
| 8  | G | Q  | ! | K! | L | N  | H  | C  | A | N  | D  | J  | O  | E  | M  | E  | U  | T  | T  | H  | P  | U  | A  | L  | D  | ! | K! | L  |   |  |
| 7  | G | P  | J | I  | T | T  | T  | R  | O | T  | A  | G  | P  | Q  | I  | A  | S  | U  | I  | C  | H  | D  | I  | N  | Q  | L |    |    |   |  |
| 6  | G | F  | ! | K! | C | C  | S  | O  | S | T  | M  | !  | K! | L  | P  | S  | M  | J  | S  | L  | J  | T  | A  | I  | T  | P | T  | L  |   |  |
| 5  | Q | F  | L | D  | T | P  | T  | T  | H | Q  | M  | G  | T  | L  | T  | G  | G  | F  | C  | C  | E  | !  | K! | A  | J  | N | L  |    |   |  |
| 4  | O | G  | U | E  | Q | T  | S  | D  | I | M  | Q  | S  | H  | U  | C  | T  | B  | !  | K! | R  | O  | N  | F  | B  | F  | O | U  |    |   |  |
| 3  | O | A  | E | S  | T | T  | L  | H  | ! | K! | B  | L  | !  | K! | S  | E  | A  | J  | T  | B  | M  | I  | S  | N  | T  | N | !  | K! | U |  |
| 2  | O | G  | I | M  | R | A  | !  | K! | D | B  | S  | C  | A  | T  | B  | E  | U  | O  | O  | E  | B  | O  | D  | B  | U  | J | U  |    |   |  |
| 1  | O | E  | M | O  | G | T  | O  | T  | D | F  | E  | Q  | U  | S  | T  | T  | S  | M  | U  | !  | K! | C  | L  | !  | K! | G | D  | U  |   |  |
|    | M | M  | M | M  | M | Q  | Q  | Q  | Q | Q  | I  | I  | I  | I  | I  | S  | S  | S  | S  | S  | S  | F  | F  | F  | F  | F | U  |    |   |  |
|    |   | 1  | 2 | 3  | 4 | 5  | 6  | 7  | 8 | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |   |    |    |   |  |

Clone Trial Map



# Red Alder Clone Trial

## Data collection

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- Tree size and survival measurements were made in years 1, 2, and 5.
- All trees tagged in year 5.
- Measurement interval after year five to be determined.

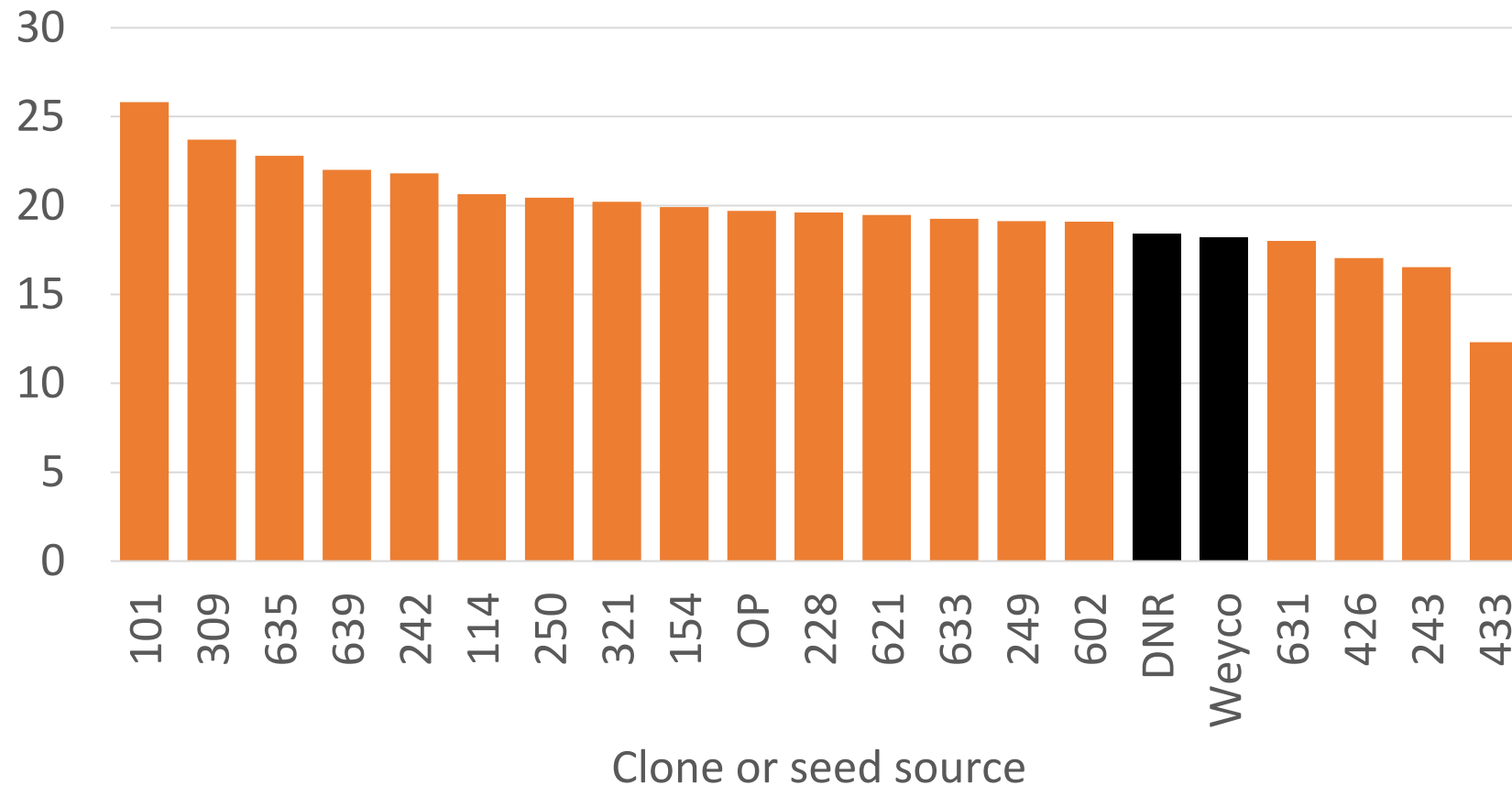








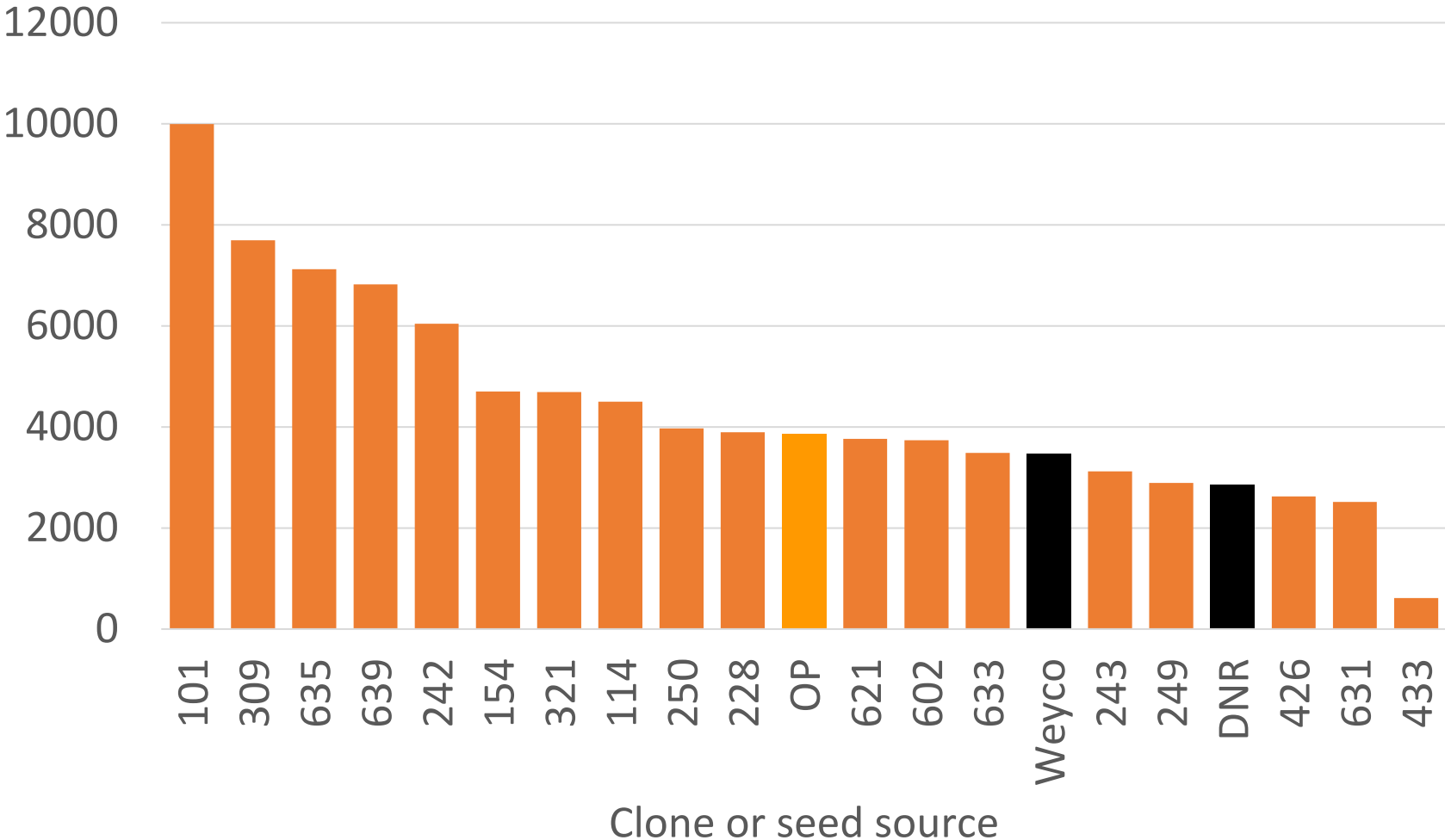
# Red alder clone trial - height year 5 (feet)



| Clone | Height (ft) | Height vs Woods Run |
|-------|-------------|---------------------|
| 101   | 25.8        | 141%                |
| 309   | 23.7        | 129%                |
| 635   | 22.8        | 124%                |
| 639   | 22.0        | 120%                |
| 242   | 21.8        | 119%                |
| 114   | 20.6        | 113%                |
| 250   | 20.4        | 112%                |
| 321   | 20.2        | 110%                |
| 154   | 19.9        | 109%                |
| OP    | 19.7        | 108%                |
| 228   | 19.6        | 107%                |
| 621   | 19.5        | 106%                |
| 633   | 19.2        | 105%                |
| 249   | 19.1        | 104%                |
| 602   | 19.1        | 104%                |
| DNR   | 18.4        | 101%                |
| Weyco | 18.2        | 99%                 |
| 631   | 18.0        | 98%                 |
| 426   | 17.1        | 93%                 |
| 243   | 16.5        | 90%                 |
| 433   | 12.3        | 67%                 |



# Red alder clone trial stem volume year 5 (cubic cm)



| Clone | Stem Volume | Volume vs woods run |
|-------|-------------|---------------------|
| 101   | 9,994       | 315%                |
| 309   | 7,696       | 242%                |
| 635   | 7,123       | 224%                |
| 639   | 6,822       | 215%                |
| 242   | 6,044       | 190%                |
| 321   | 4,699       | 148%                |
| 154   | 4,692       | 148%                |
| 114   | 4,497       | 142%                |
| 250   | 3,969       | 125%                |
| 228   | 3,897       | 123%                |
| OP    | 3,864       | 122%                |
| 602   | 3,763       | 119%                |
| 621   | 3,738       | 118%                |
| 633   | 3,484       | 110%                |
| Weyco | 3,459       | 109%                |
| 249   | 3,119       | 98%                 |
| DNR   | 2,890       | 91%                 |
| 243   | 2,849       | 90%                 |
| 426   | 2,626       | 83%                 |
| 631   | 2,516       | 79%                 |
| 433   | 613         | 19%                 |







# Future of red alder tree improvement?







## Red alder clones and tree improvement – next steps

- Try to find more of the superior clones in remaining field trials.
- Assess interest and demand for superior alder seed and seedlings. Survey nurseries regarding red alder demand and production.
- Learn more about British Columbia alder seed orchard and tree improvement program.





## Red alder clones and tree improvement – next steps

- Use superior clones in open pollinated seed orchard production.
- Explore collaboration – HSC, BC, DNR, ODF - establish and maintain some level of superior seed production.
- Establish more test sites to look into performance across range of geography and environmental conditions.