Red Alder Tree Growing

Density Management & Thinning
Red Alder Density Management
Planting Density

- Initial planting density must be high enough to achieve the following:
  - Quickly occupy the site to capture early height and DBH gains.
  - Keep branch diameters in the first log small and promote rapid crown recession.
  - Provide a high enough thinning selection ratio to weed out damaged and poorly formed stems.
  - Planting 540 to 680 TPA will accomplish these things – higher stocking on lower sites and where aggressive weed competition is expected.
Red Alder Density Management Thinning

- Thinning can maintain diameter growth rates as long as the thinning takes place when crop trees still have a good live-crown ratio.
- Thinning early maintains good diameter growth and crop trees will reach commercial size sooner, but it slows crown recession and increases branch diameters in the first 16-foot log.
- Thinning late, after crown recession exceeds the length of the first log, gives better log quality, but less growth response from thinning, smaller crop tree diameters and a longer rotation to achieve commercial size.
Stand Density by initial planting level at plantation ages 4, 7, 11 and 14 years (after Puettman, et al. 1993)

SDI = TPA*(((DQ/10)^1.64)

Number of trees per acre that a stand would have at a standard average dbh (10 inches).

RD 0.65
RD 0.45
RD 0.25
Red alder crop-tree dbh growth and crown length ratio (150 TPA) -- planting level 680 trees/acre
Red alder crop-tree dbh growth and crown length ratio (150 TPA) -- planting level 435 trees/acre

\[ R^2 = 0.883 \]

\[ R^2 = 0.7562 \]

\[ R^2 = 0.7913 \]
Red alder crop-tree dbh growth and crown length ratio (150 TPA)-- planting level 1200 trees/acre

- $R^2 = 0.9483$
- $R^2 = 0.9345$
- $R^2 = 0.7106$
Red alder crop-tree dbh growth and crown length ratio -- planting level 250 trees/acre

R² = 0.8267

R² = 0.6925

R² = 0.8204
Red alder crop-tree height growth (150 TPA) by plantation age for different planting levels

$R^2 = 0.6335$

$R^2 = 0.7446$

$R^2 = 0.7886$

$R^2 = 0.8455$
Red alder crop-tree height to live crown (150 tpa) by plantation age for different initial planting levels

$R^2 = 0.76$

$R^2 = 0.822$

$R^2 = 0.8807$

$R^2 = 0.9422$
Red Alder Thinning – Time of Entry

- These results indicate that a live crown ratio of between 0.60 and 0.70 should be maintained on crop trees for good crop tree DBH growth
- This equates to a relative density of 0.35 or less.
- The trade-off is that the average height to live crown will be about 12-15 feet.
Red Alder Thinning – Time of Entry

- Delaying thinning until a height to live crown of 22-feet will result in a fine-limbed first-log.
- The trade-off is slowed crop-tree growth and slow crown recovery following thinning.
  - Trees have reached an age where height growth and branch terminal growth is 1-2 feet
The traditional approach to thinning hardwoods is to thin from below gradually with multiple entries.

A thinning regimen that follows the management zone suggested by Puettman, et al. 1993 – thinning down to a relative density of 0.25 would require at least 2 entries.
Red Alder Stand Density Diagram (From Pfeiffer, et al. 1993)
Red Alder Thinning – Thinning Intensity

- Resulted presented by Bluhm & Hibbs 2006 suggest that red alder plantation have a lower competition threshold.
- Results presented here suggest that the competition threshold for crop tree growth may be between 0.15 to 0.20.
- A higher intensity of thinning may be possible without causing growth reduction.
SDI = TPA*(((DQ/10)^1.64)

- RD 0.65  SDI 280
- RD 0.45  SDI 195
- RD 0.35  SDI 150
- RD 0.25  SDI 110
- RD 0.20  SDI  85
Red Alder Thinning – Thinning Intensity

- Benefits of higher intensity thinning
  - Larger dbh crop trees more quickly
  - One thinning entry where commercial thinning is not practical

- Negative effects can be
  - Sun-scald
  - Epicormic branches
  - Particularly when thinning from high densities at later ages.
Number of Epicormic Branches - Undamaged Crop Trees

EPI

Number of Epicormic Branches - Undamaged Crop Trees

0
10
20
30
40
50
60
70

P1200_T0
P1200_T250
P1200_T360
P250_T0
P435_T0
P680_T0
P680_T250
P680_T360

treatment
Length of Epicormic Branches (inches) - Undamaged Crop Trees

- AVE

- Treatment categories: P1200_T0, P1200_T250, P1200_T360, P250_T0, P435_T0, P680_T0, P680_T250, P680_T360

- Box plots represent length distributions for each treatment category.
Our understanding of density management and thinning in red alder is far from complete.

- However, there are findings relative to red alder plantation stand dynamics that can give guidance.

The key factors considered when determining the time of stocking control are crop tree growth, crown-recession, disease, sun-scald, and epicormic branch formation.

- Red alder growing at high densities may be more susceptible to *Neonectria major* stem cankers.
Keeping trees healthy by maintaining proper stand density may help lessen the development of cankers severe enough to degrade wood quality, or cause appreciable growth loss and mortality.
Red Alder Thinning – Summary

- Stand density needs to be regulated to keep the stand growing between Relative Density 0.15 to 0.35 for good dbh growth.
  - Thin when the live-crown on crop trees is approximately 60-70% of the total tree height.
- Can thin down from 540 to 600 TPA to 250 TPA after thinning.
  - Does not seem to increase the negative effects of epicormic branches or sun-scald
  - A higher risk of sunscald on steep, southerly slopes is still a concern – 360 TPA may be a better choice in these situations.
Red Alder Thinning – Summary

- Maintaining a uniform growing environment is critical to the production of quality sawlogs.
- Leave tree selection criterion priorities
  - Spacing
  - Stem Quality
  - Dbh
Red Alder Thinning – Summary

- Minimizing damage to crop trees (stem wounding, top-break) is critical – it is the primary pathway for entry of disease and resulting decay.
- Time the thinning operation for late-summer to late-winter when tree bark is less susceptible to abrasion from falling trees.
  - Direct cut trees into the lower stem of crop trees to facilitate brashing of dead branches from the stem.
  - Cut out forked stems that originate below breast-height – cut with a downward sloping angle to promote shedding of water.
Stand Density by initial planting level at plantation ages 4, 7, 11 and 14 years (after Puettman, et al. 1993)

\[ \text{SDI} = \text{TPA} \times ((\text{DQ}/10)^{1.64}) \]

- **RD 0.65**  SDI 280
- **RD 0.45**  SDI 195
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On the “Right” Sites with the “Right” Practices -- Most Plantations are Successful

BEFORE THINNING-AGE 10

3-YEARS AFTER THINNING
References


References