



University of Idaho

College of Natural Resources

DOUGLAS-FIR 4-YR PPDM GROWTH BY THINNING REGIME, DENSITY AND SITE PRODUCTIVITY

MARK KIMSEY

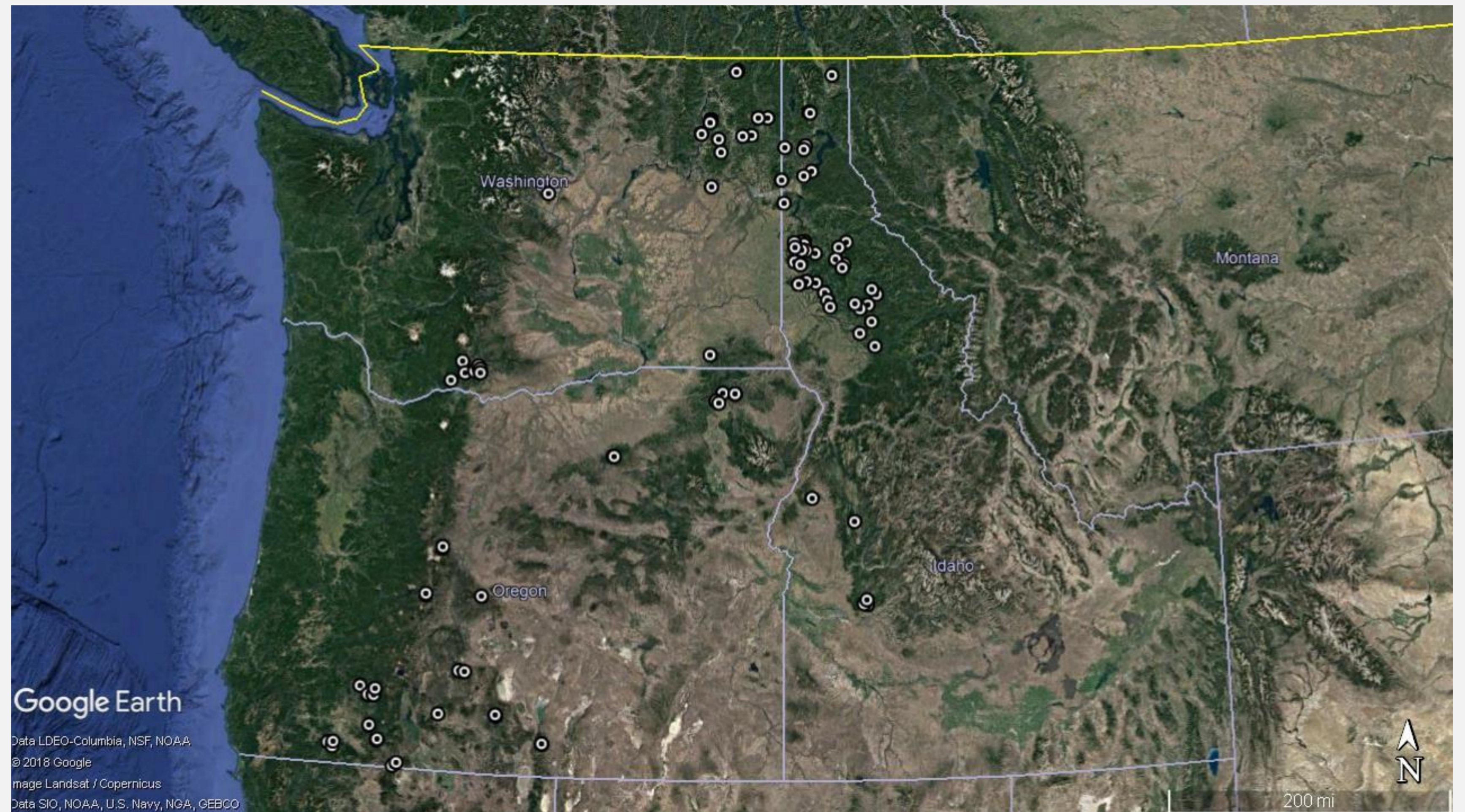
INTERMOUNTAIN FORESTRY COOPERATIVE





IFC PPDM NETWORK

2013-2018





IFC PPDM NETWORK

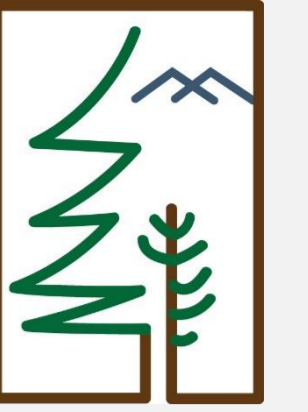
EXPERIMENTAL DESIGN REFRESHER

	Class I 10YR < 18'	Class II 19' ≥ 10YR < 22'	Class III 23' ≥ 10YR < 26'	Class IV 10YR ≥ 27'
Index I RD ≤ 35	1 SEWA ³ (1)	4 NID (2); NEO (1); SCOR (1)	3 NID (1); SCOR (2)	3 NID (1); SCWA (2)
Index II 36 ≥ RD < 60	3 NEWA (3)	6 NEO (2); NID (1); NEWA (2); SCOR (1)	3 SCWA (1) NID (2)	1 SCWA (1)
Index III RD ≥ 60	1 NEWA (1)	3 NID (1); NEWA (1); SCOR (1)	4 NID (4)	2 NID (1); SCOR (1)

Curtis, 1982: $RD = BA/QMD^{0.5}$

Ziede 1978, 1993, 1999: 2-point method

Arney and Miller 2000, Arney 2015: 10m SI



IFC PPDM NETWORK

THINNING PROTOCOL (UNTREATED + 2 THIN TREATMENTS ~ 130 – 430 TPA)



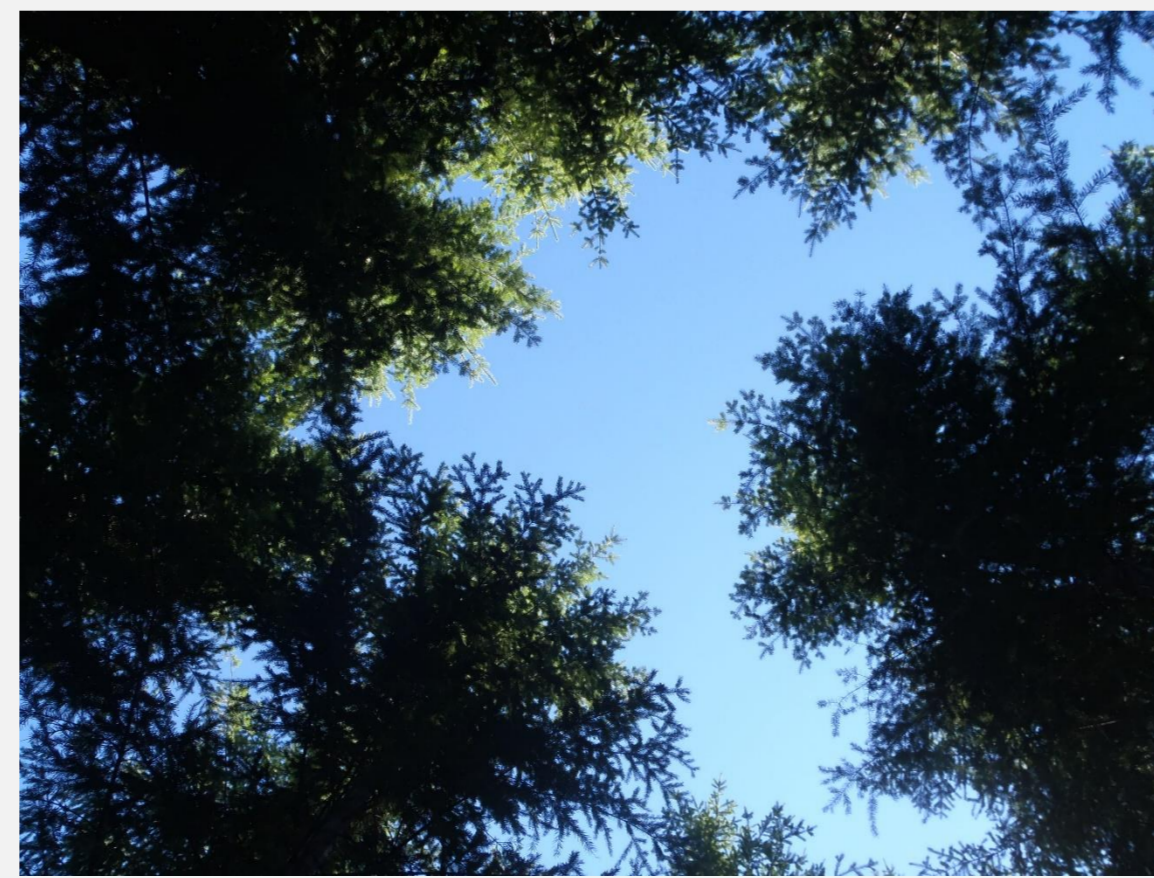
Control



10 x 10 ~ 430 TPA



14 x 14 ~ 220 TPA





IFC PPDM NETWORK

MEASUREMENT PROTOCOL

Every 2 yrs from 0-10, every 5 yrs thereafter

- DBH
- Height growth increment
- Base of live crown
- Defect
- Ingrowth
- Mortality



IFC PPDM NETWORK

CURRENT MEASUREMENT STATUS

38 of 101 sites obtained 4 yr measurements
as of Fall 2018

- 23 DF sites
- 15 PP sites

A photograph of a forest. In the foreground, there are several large, green ferns. In the background, there are many tree trunks, some of which are marked with blue paint. The text "4 YR DF GROWTH & MORTALITY" is written in large, bold, black letters across the middle of the image. Below it, the text "TREE + STAND RESPONSE" is written in smaller, bold, black letters.

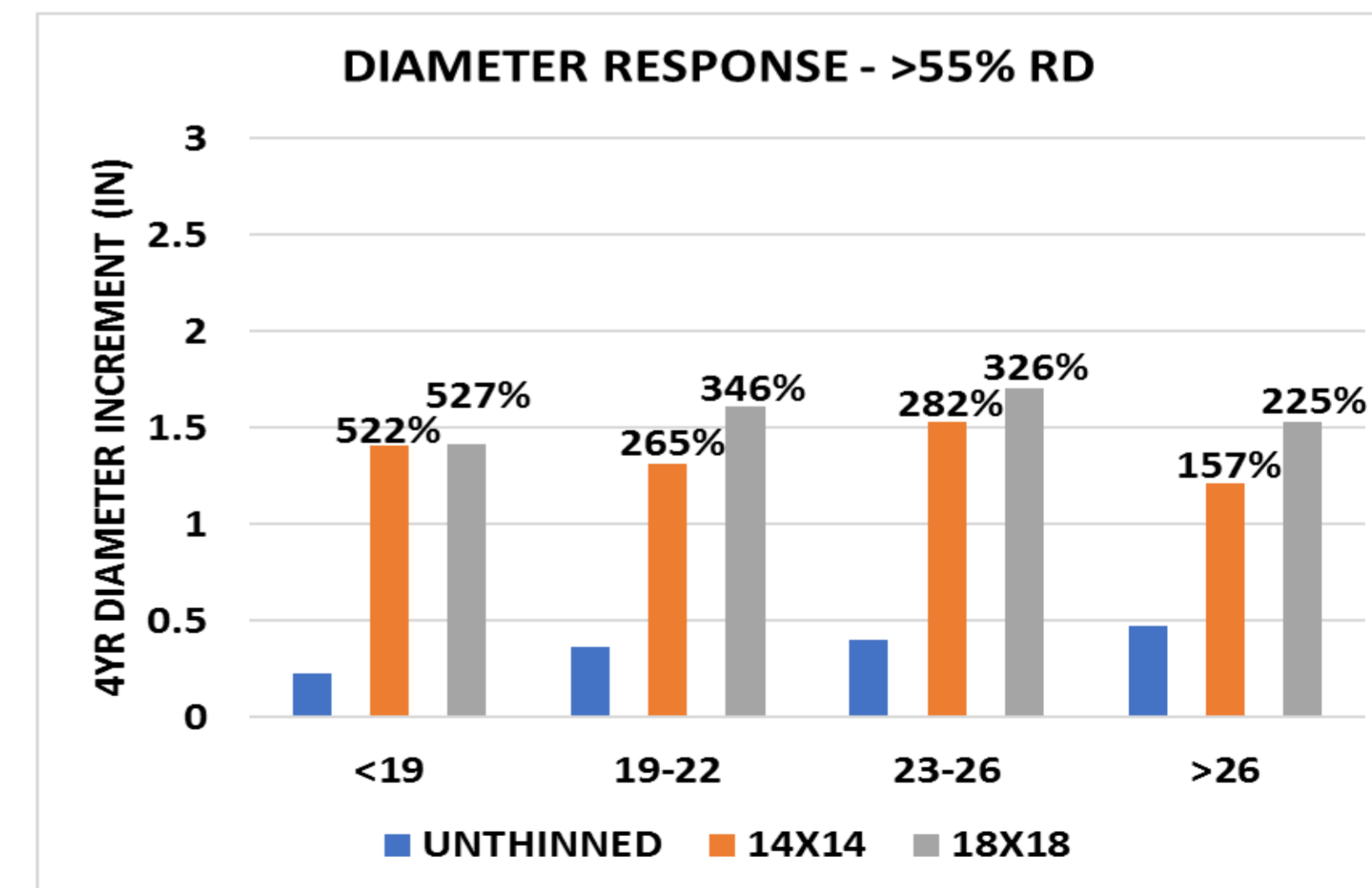
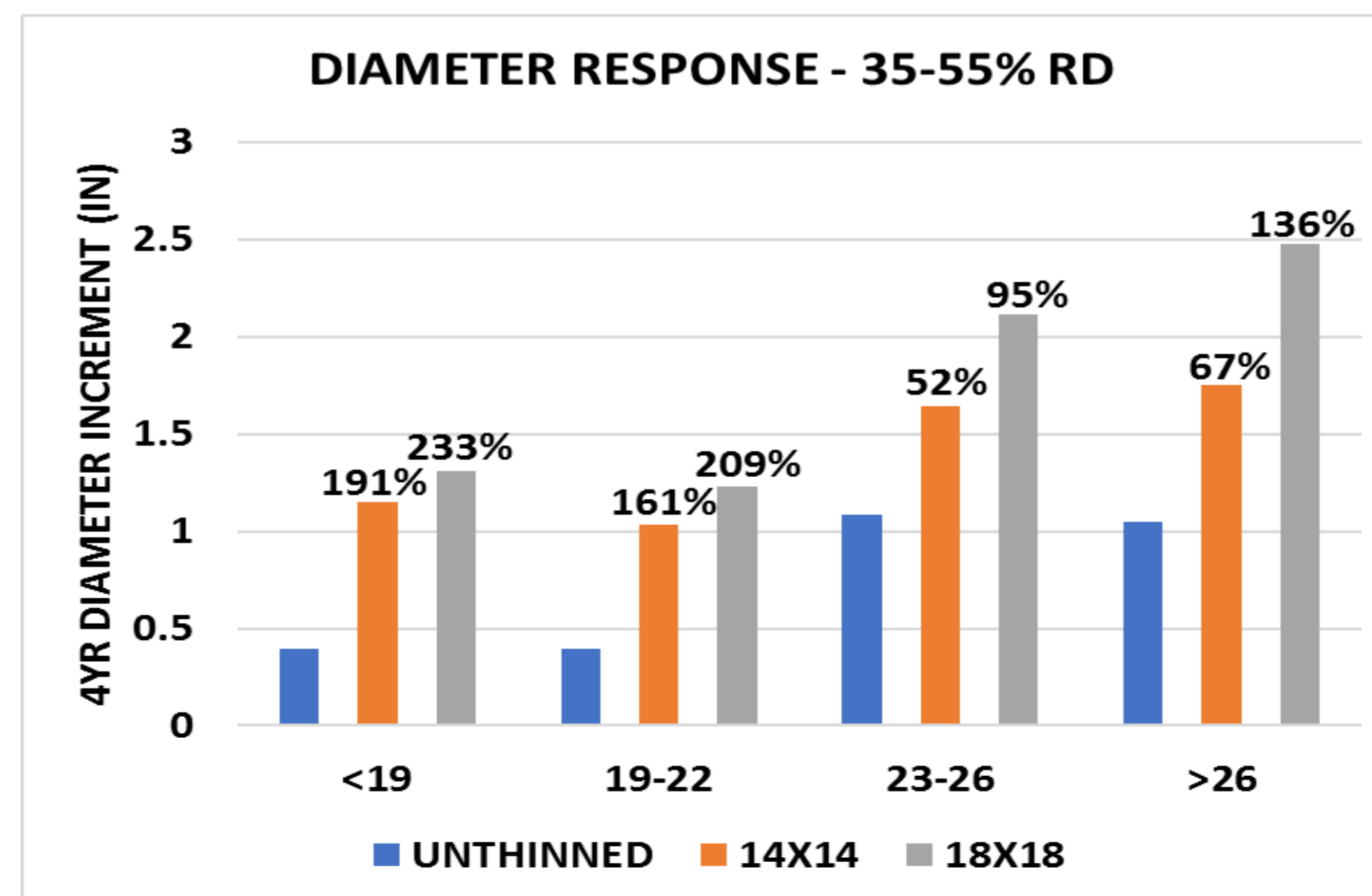
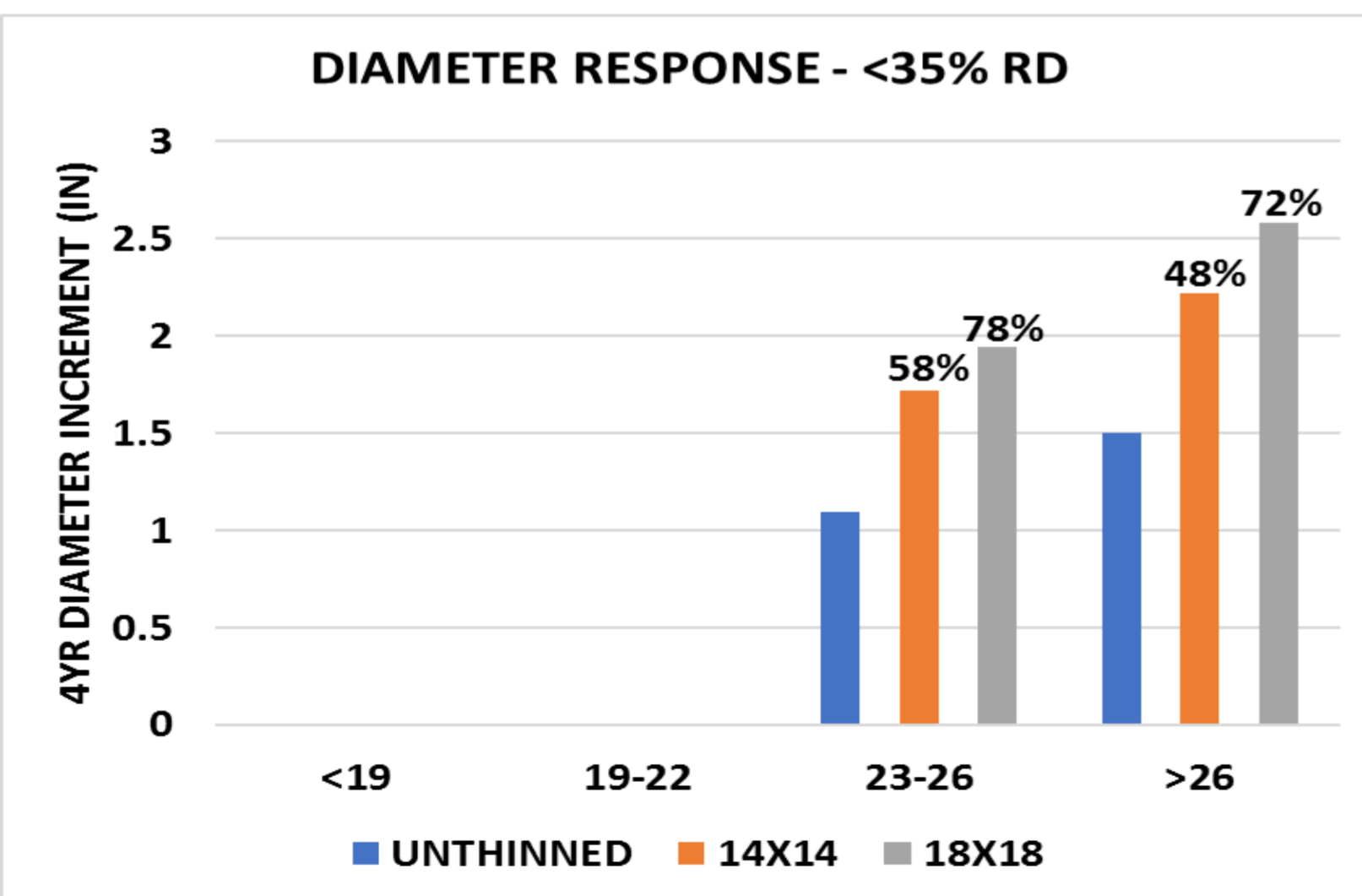
4 YR DF GROWTH & MORTALITY
TREE + STAND RESPONSE



4 YR RESULTS

INDIVIDUAL TREE RESPONSE – DIAMETER

- Thinning response is generally greatest on poor sites, followed by high initial density
- Absolute diameter response increases with increasing site productivity however
- High density is a great equalizer
- Initial results show a sharp decline in thinning response on the highest productive sites once RD exceeds 55%



Note: 10YR height category breaks approximately correspond to 75, 85, 95 Monserud DF SI

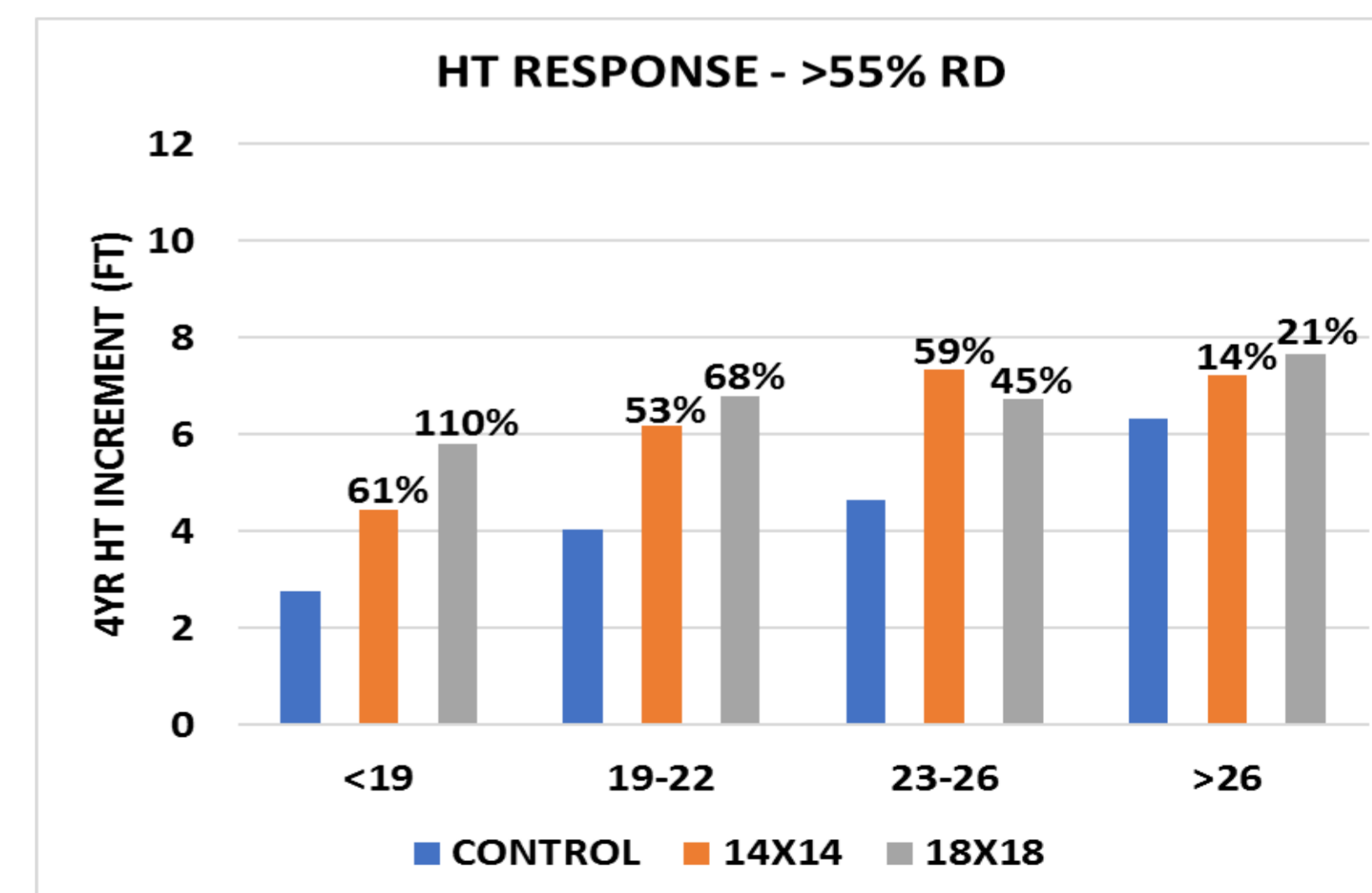
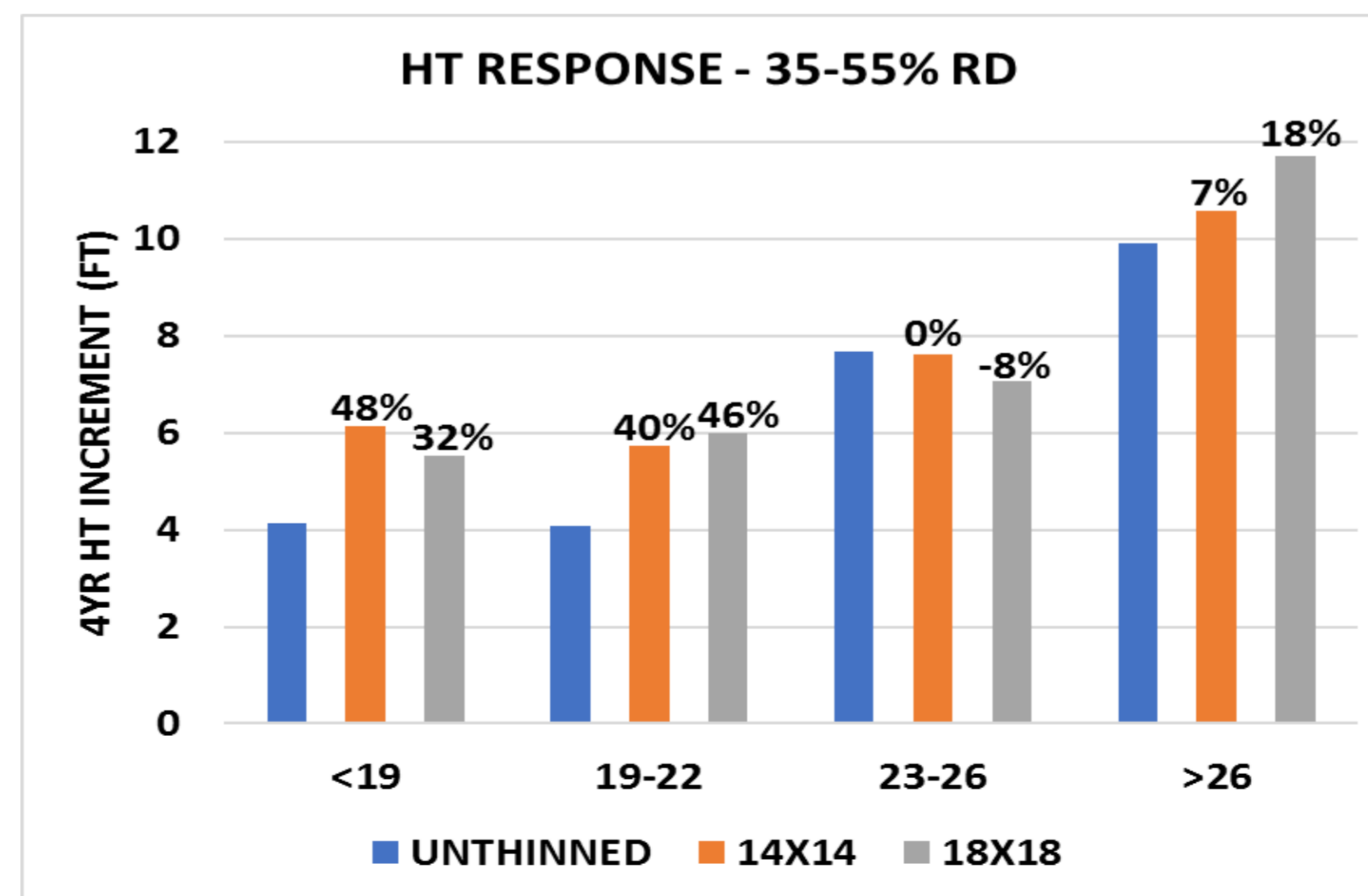
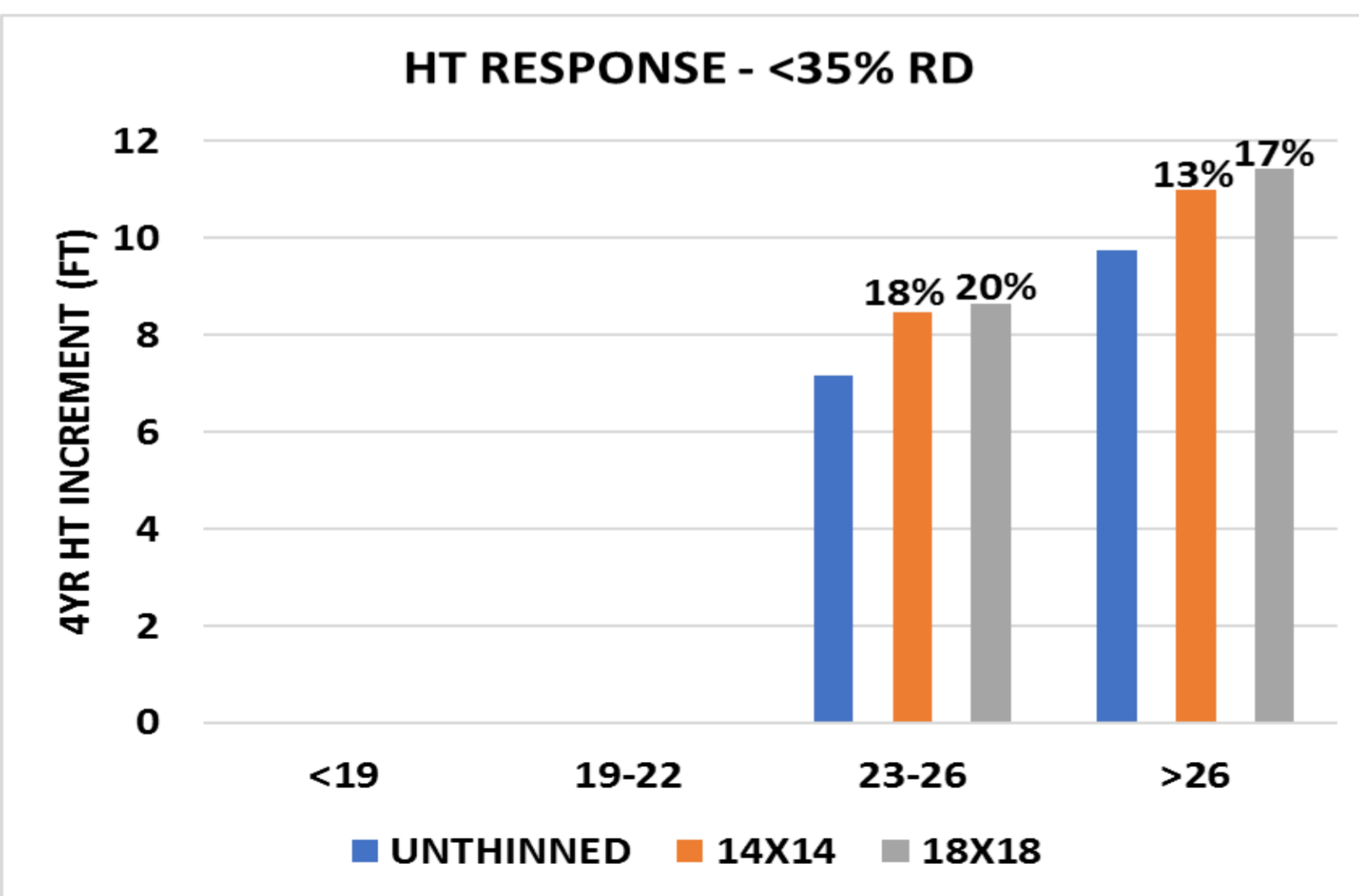
Ripley Conversion: $2.5(10YR) + 30$



4 YR RESULTS

INDIVIDUAL TREE RESPONSE - HEIGHT

- Height generally shows less thinning effect than diameter
- Similar to diameter, height response to thinning is generally greater as site quality decreases
- Absolute height growth increment generally increases with increasing site quality
- At higher densities, we are seeing constrained height growth

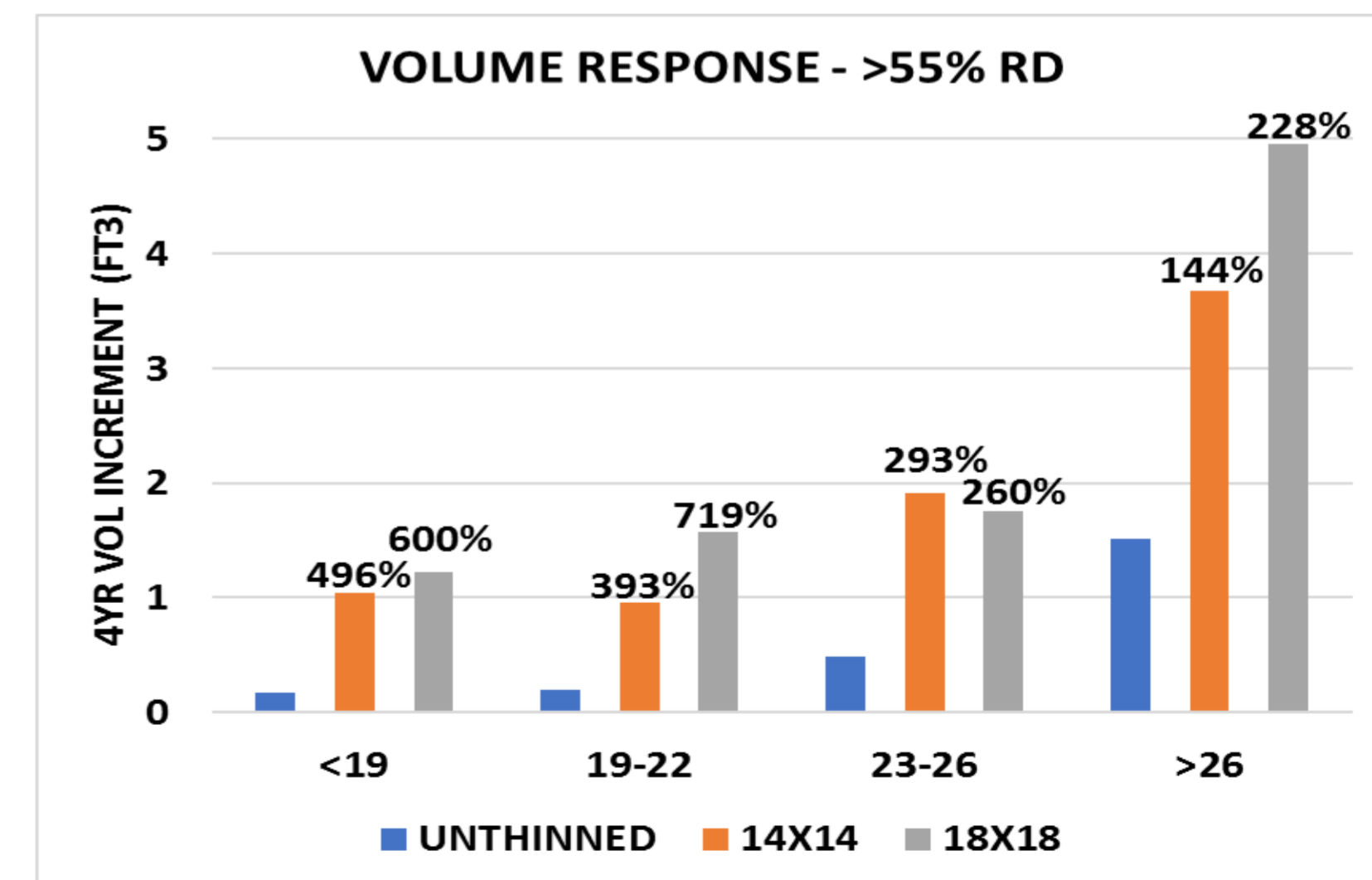
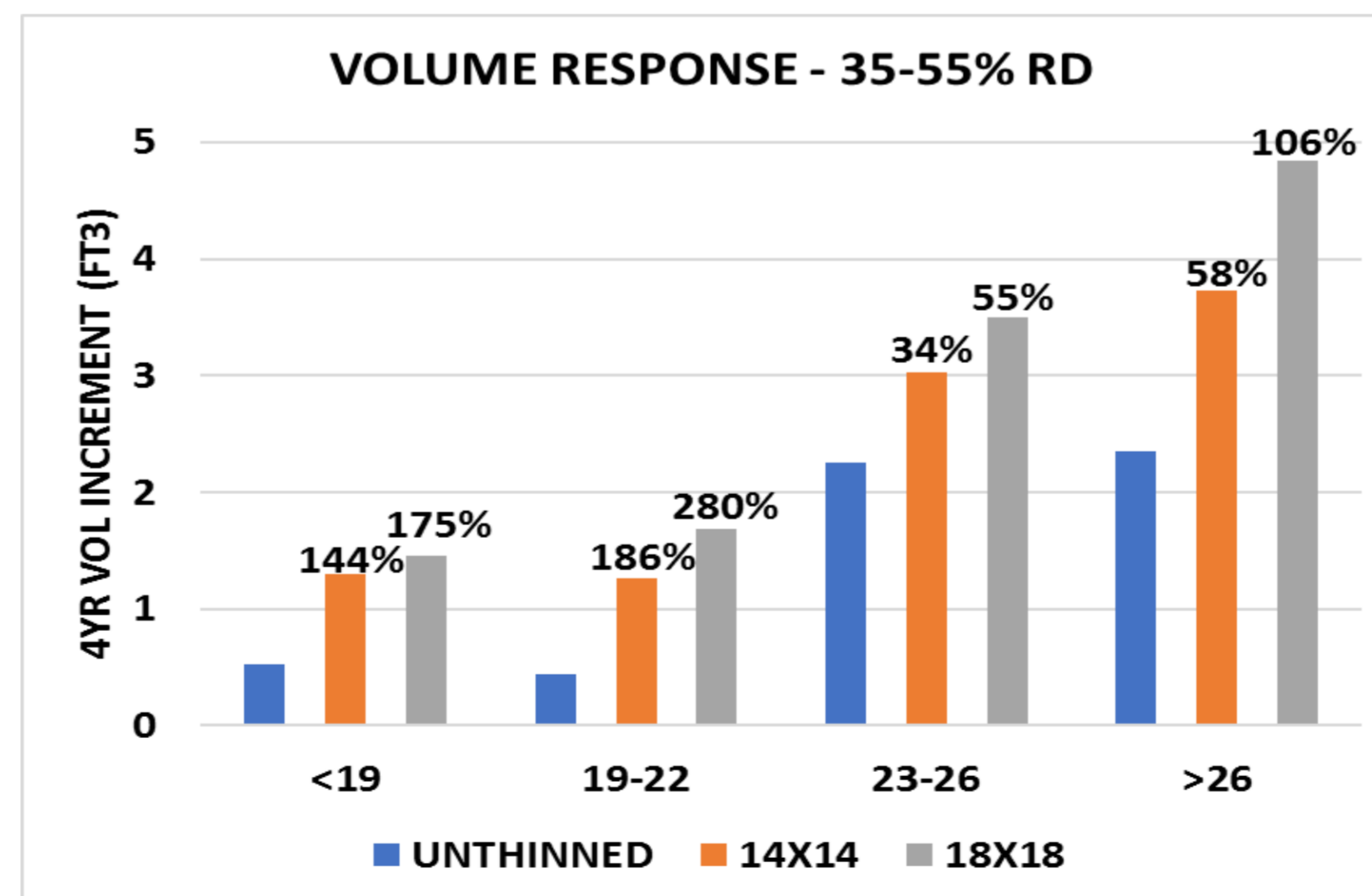
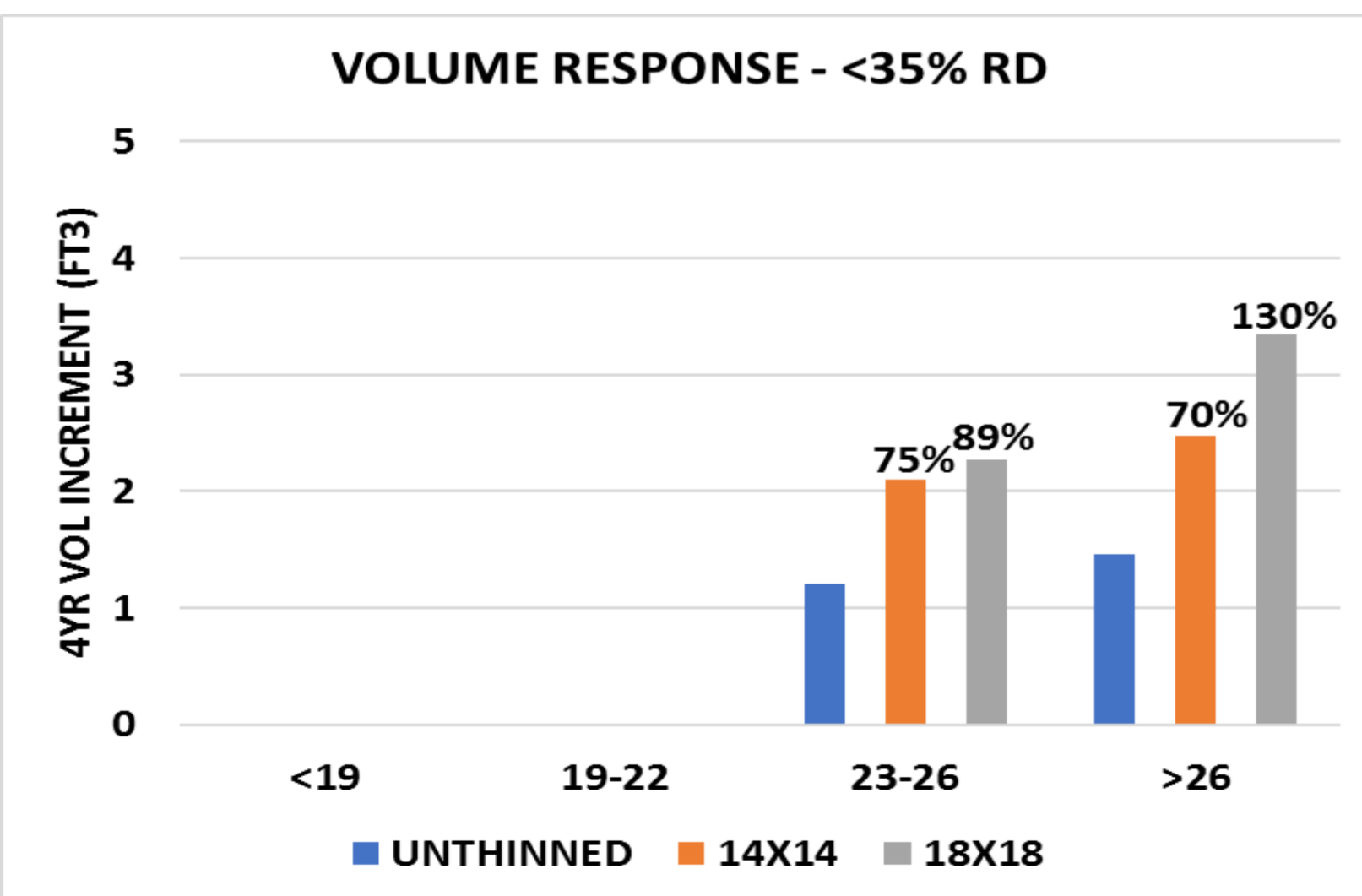




4 YR RESULTS

INDIVIDUAL TREE RESPONSE - VOLUME

- Two-point height growth productivity metric in young, PCT aged stands is proving to be a good discriminator
- The relative lack of height differentiation between the 14 and 18 thinning led to relatively modest volume gains on the 18 – except on the highest quality sites
- Stands that move past >55% RD are rapidly losing individual tree growth potential



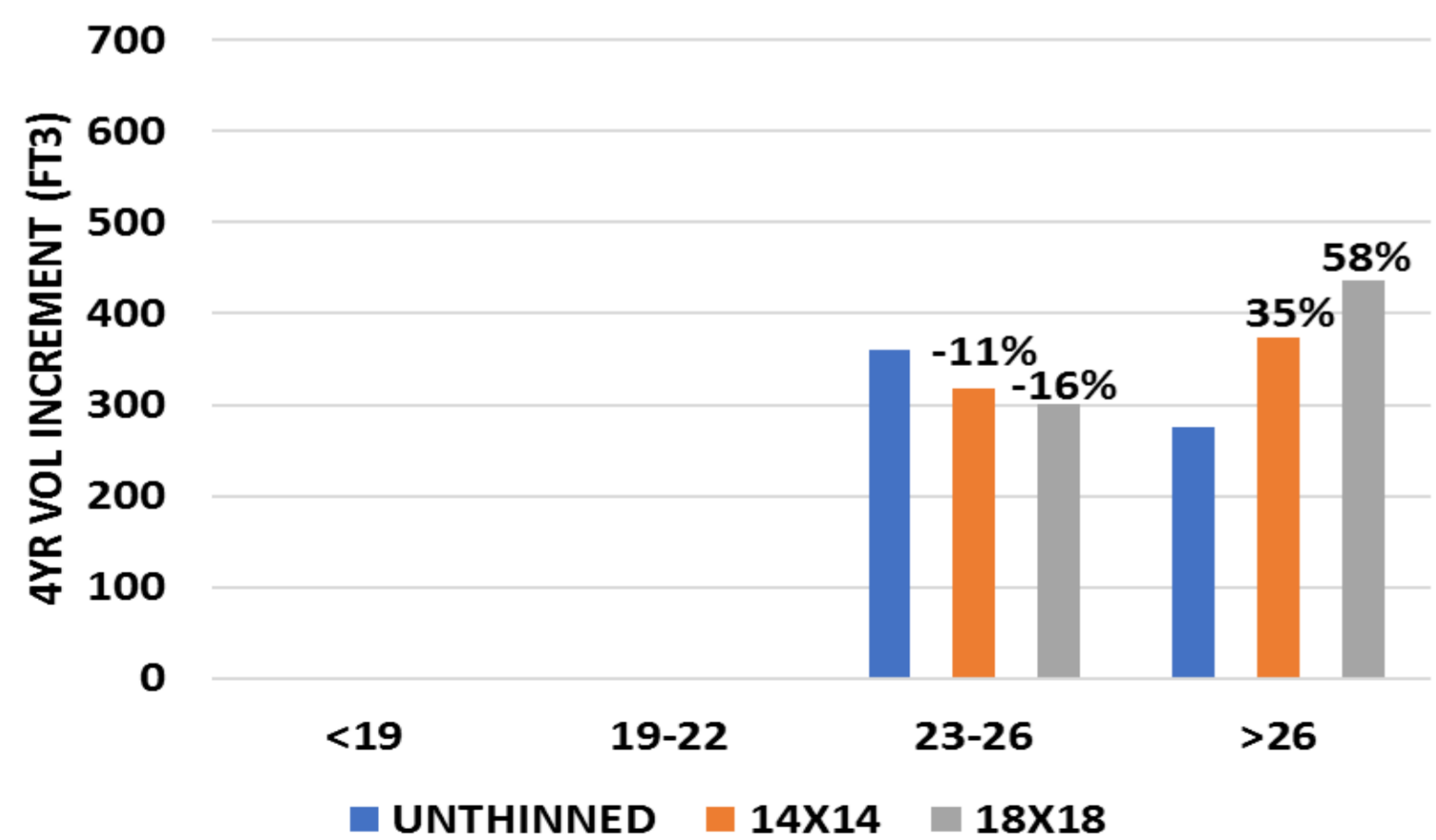


4 YR RESULTS

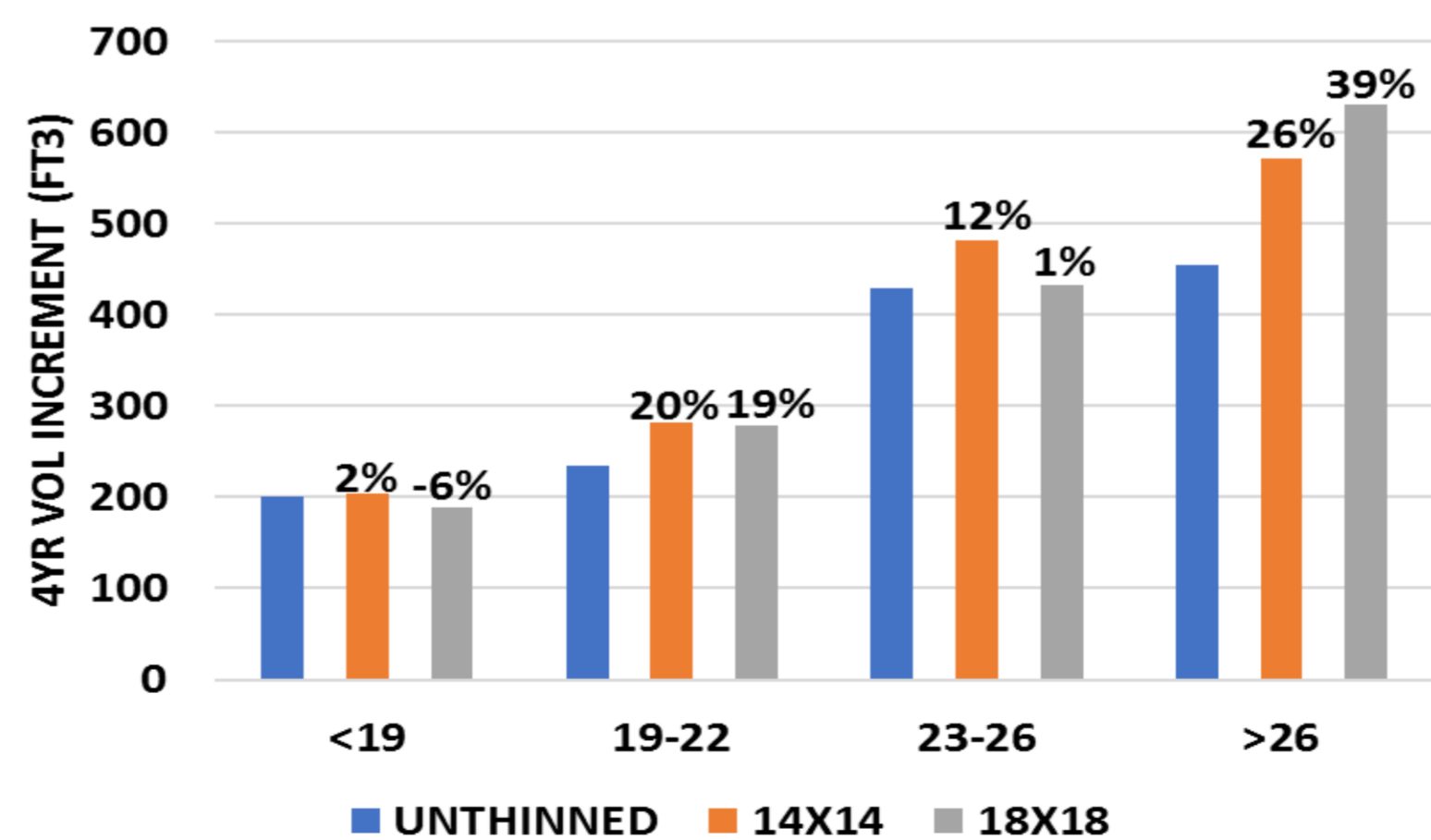
CROP TREE RESPONSE – VOLUME

- We pulled out the largest 13 trees per plot (crop trees) to assess their response to thinning across site quality
- After 4 yrs, generally the highest quality sites show a significant thinning effect on crop tree volume growth
- As these stands develop over time, we expect to see increasing differentiation, leading to a potential crossover

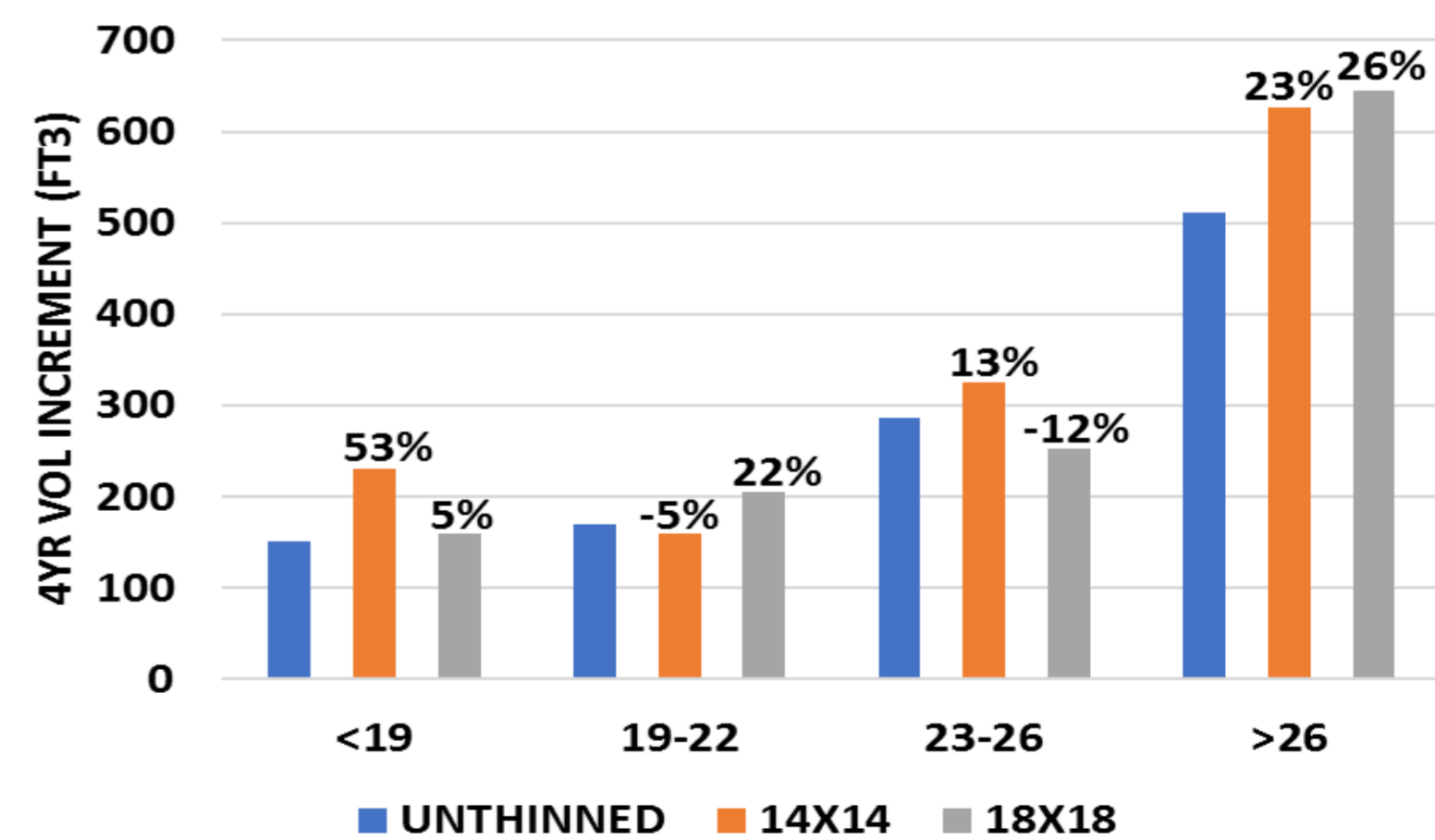
CROP TREE STAND RESPONSE - <35% RD



CROP TREE STAND RESPONSE - 35-55% RD



CROP TREE STAND RESPONSE - >55% RD



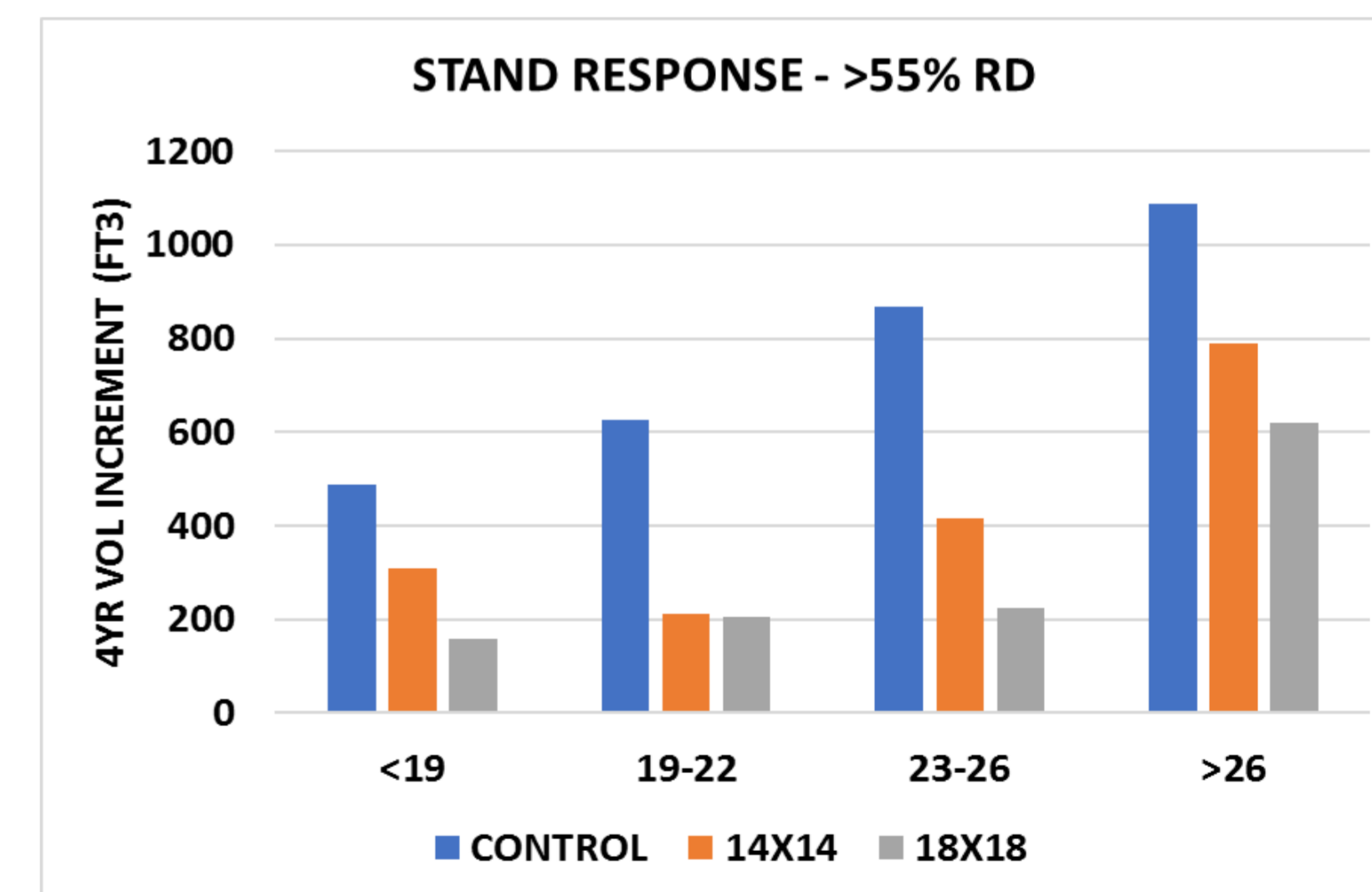
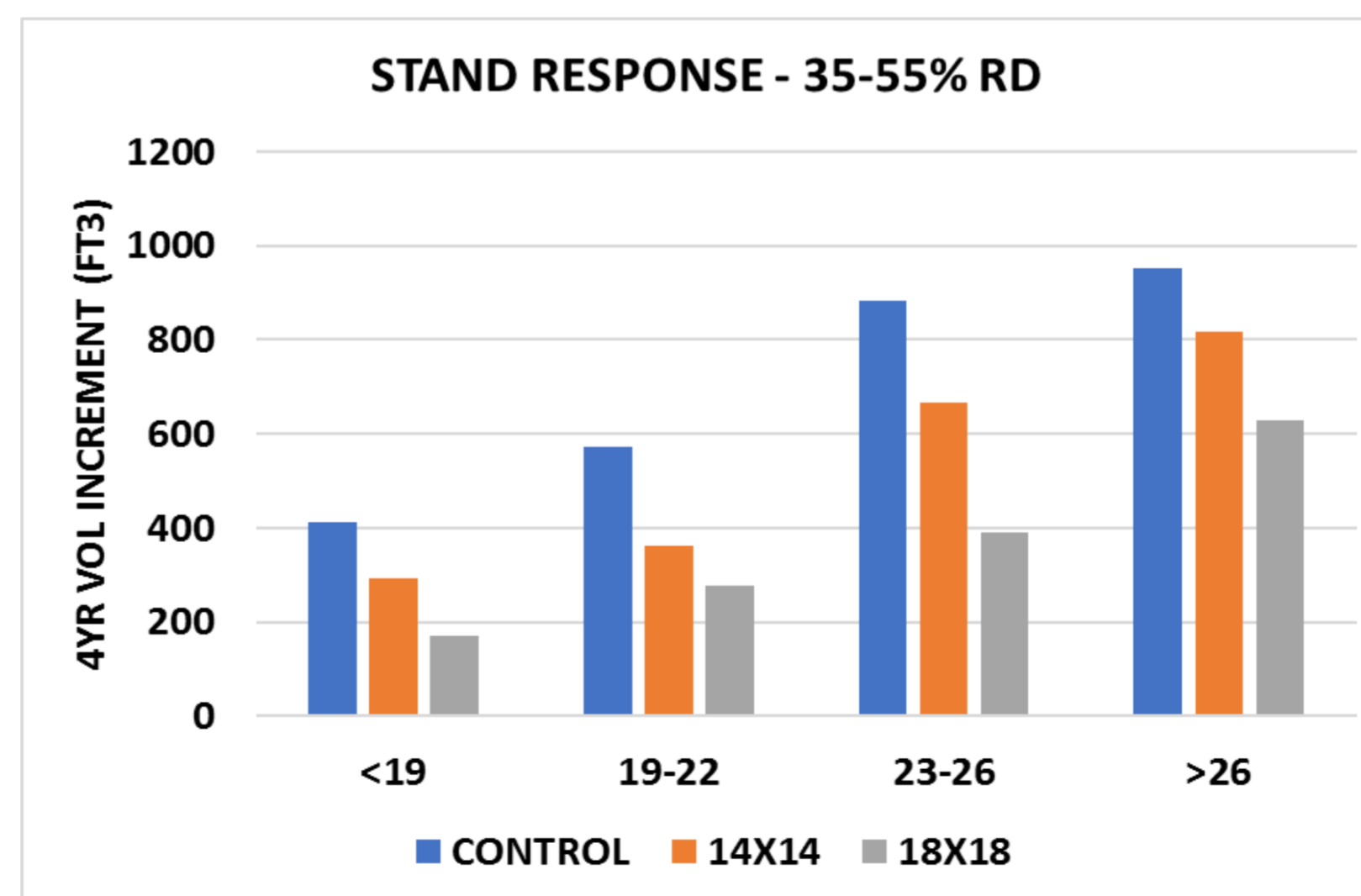
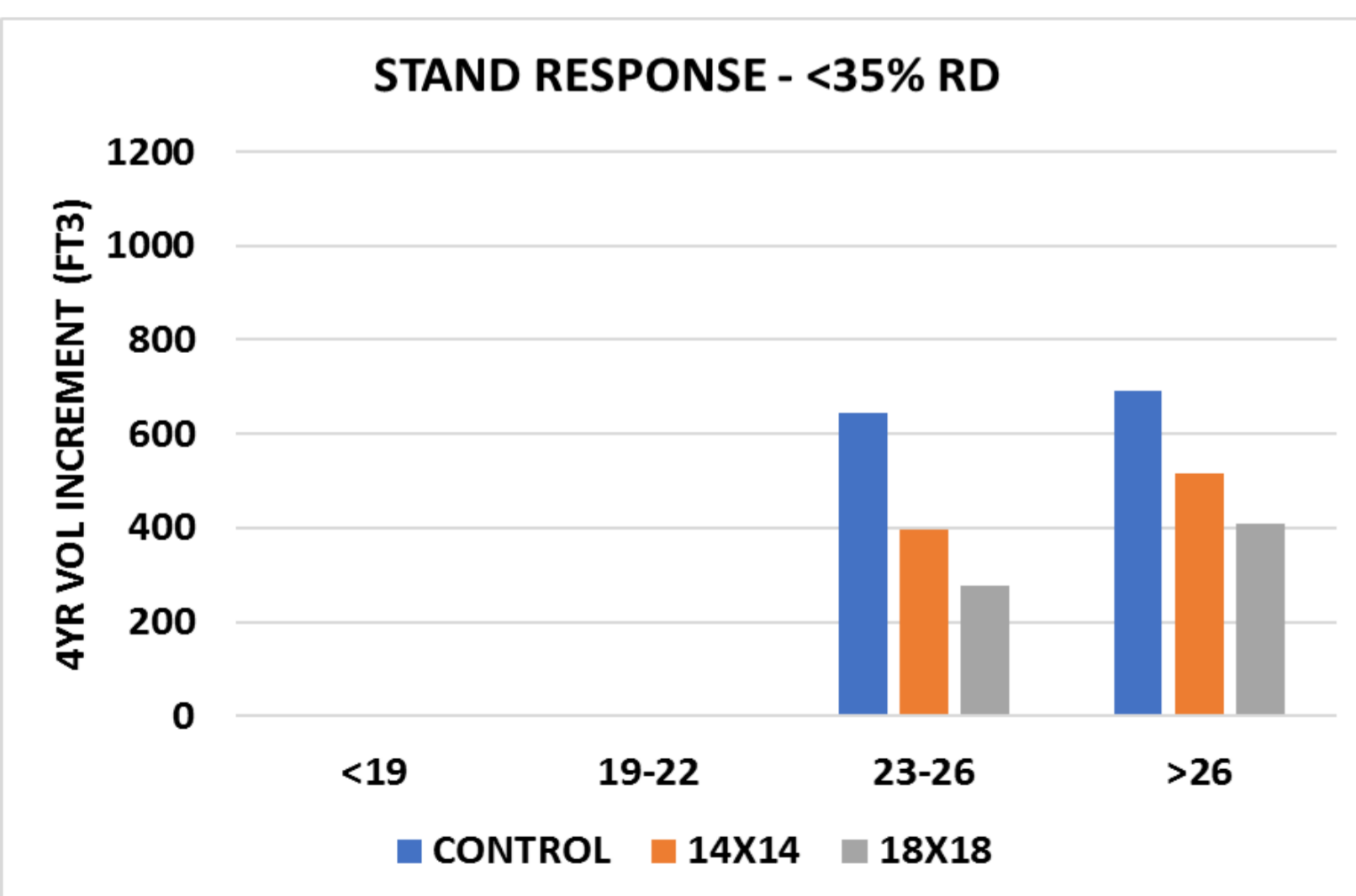
Note: Response +/- 10% is not s.d. than control or between treatments



4 YR RESULTS

OVERALL STAND RESPONSE - VOLUME

- Folks – look at the 10YR classes and observe how it is differentiating growth across the treatment plots
- Stand level productivity is not slowing down as yet, despite individual tree growth decline
- This is not unexpected given the relatively young stage of stand development for study sites
- Results suggest that the PPDM network will allow us to capture the optimal time to thin by site quality and density

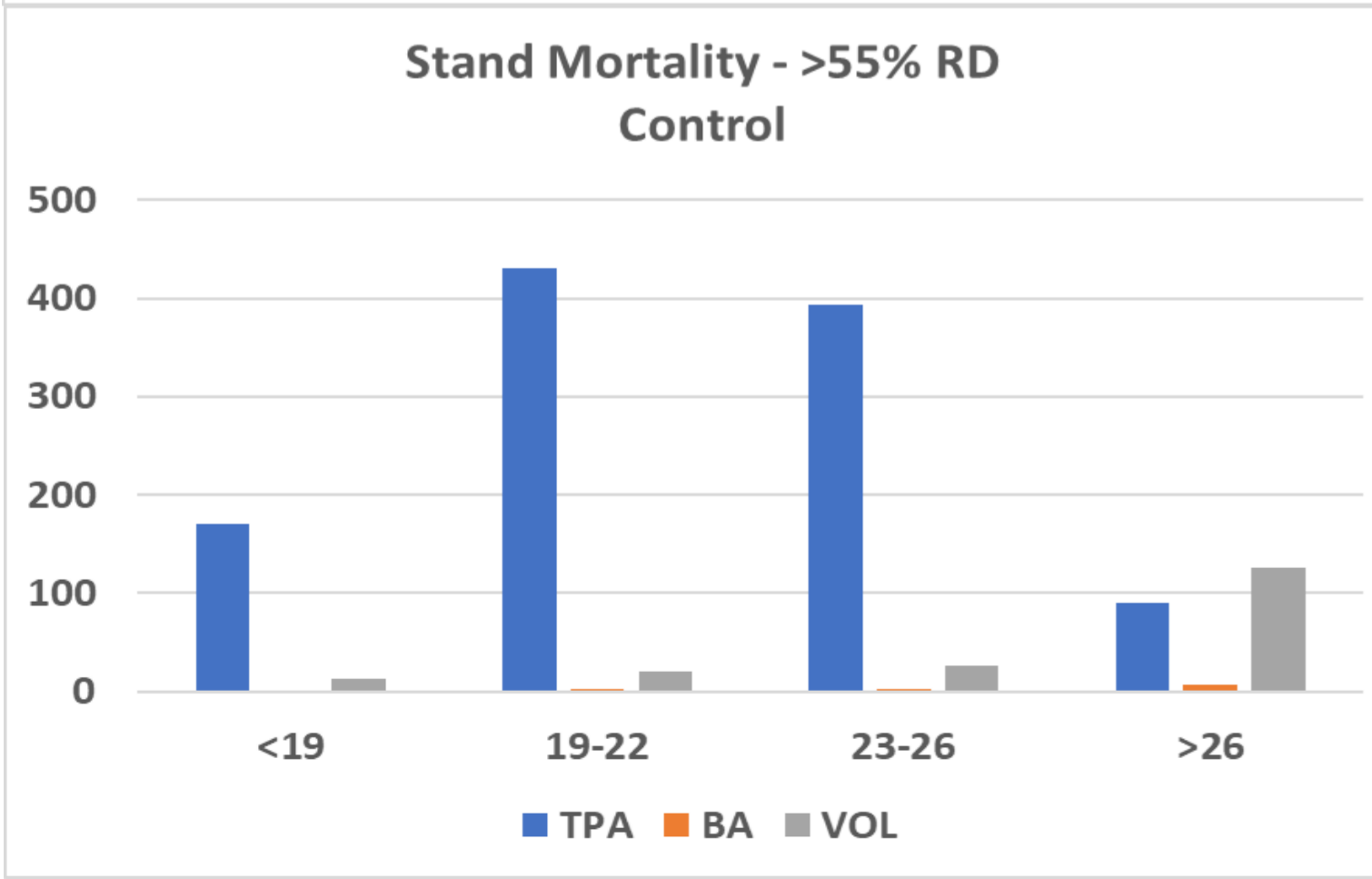
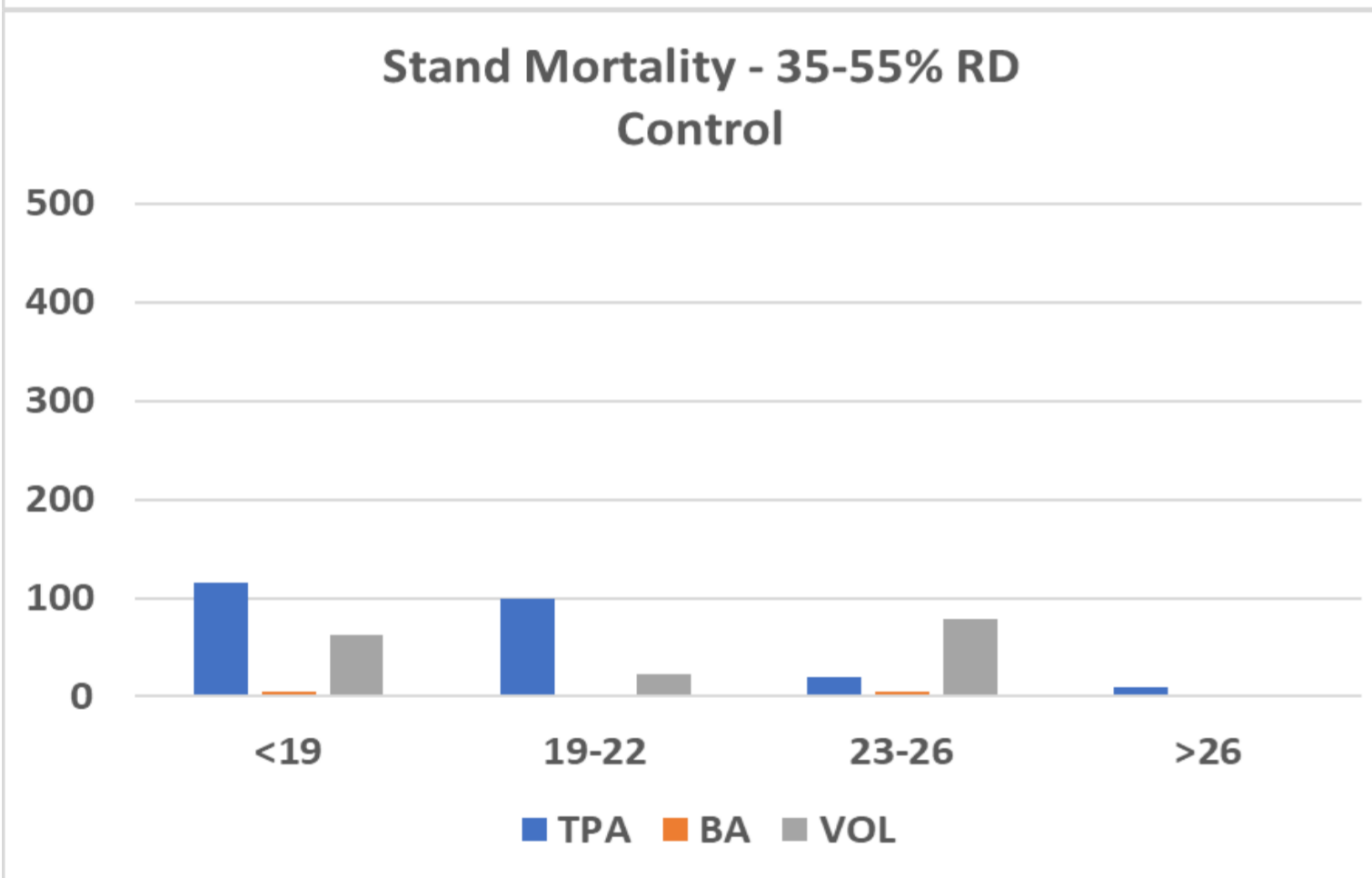
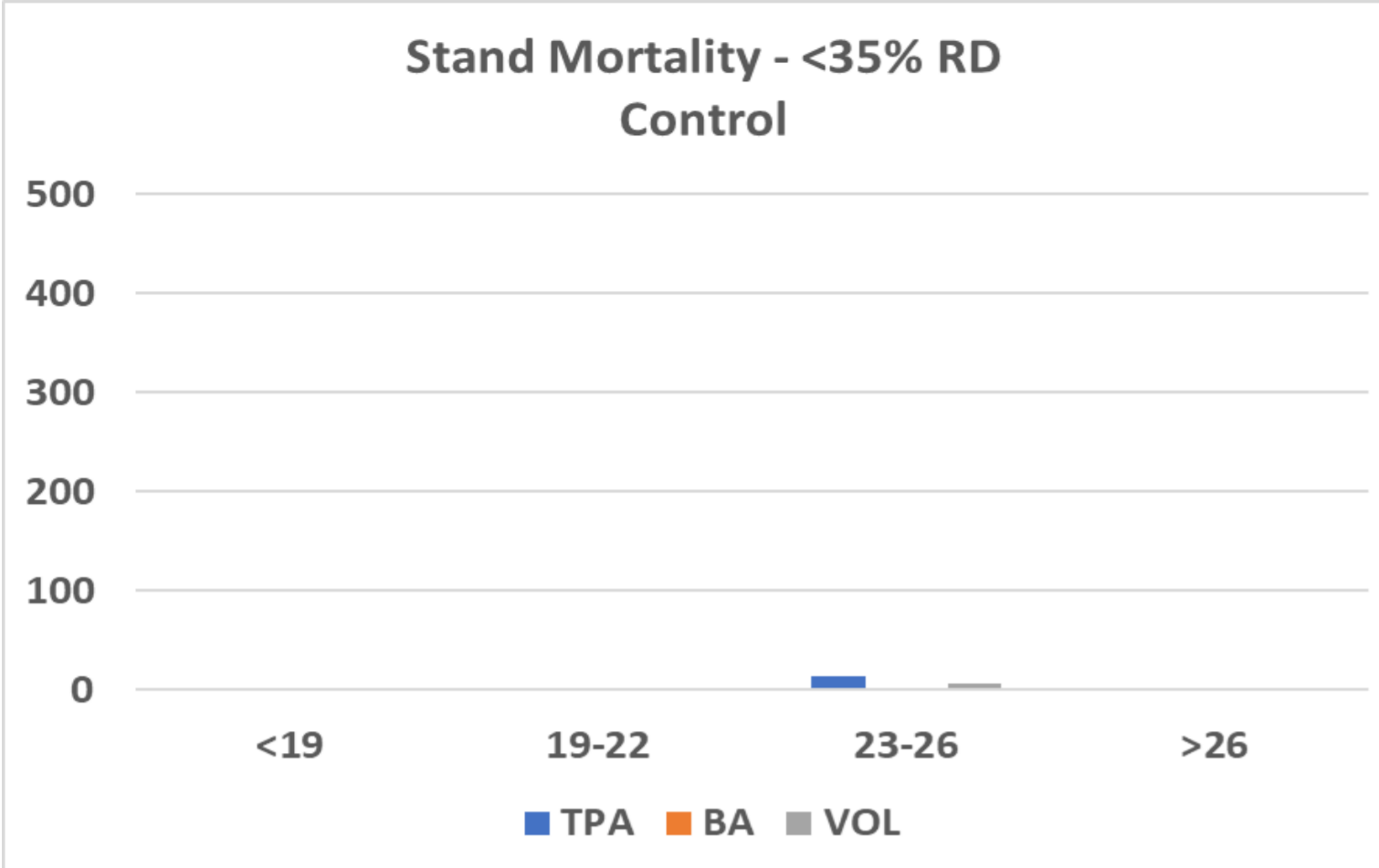




4 YR RESULTS

MORTALITY

- Low to non-existent mortality on:
 - <35% RD stands
 - Stands thinned to 130-220 TPA (data not shown)
 - Mortality causes with increasing density:
 - 67% - Suppression
 - 6% - Snow breakage
 - 3% - Root rot (Armillaria primarily)
 - 2% - Bark beetles
- Remaining mortality scattered across wind, animal, unknown





CONCLUDING STATEMENTS

THE FUTURE OF PPDM

- Begin validating G&Y software thinning projections
- Develop growth and mortality multipliers by site quality, stand density, and species composition
- Develop silvicultural guidelines for targeting optimal timing window for thinning to maximize growth response on crop trees while minimizing mortality



THANK YOU

TO ALL CONTRIBUTING MEMBERS & STAFF

This project would not have been possible without the strong support from the front office to the field forester

And in particular we wish to thank all those field foresters that put up with our discriminating taste for candidate stands