Eastside Type F Riparian Effectiveness Monitoring Study (Bull Trout Add-on)

Post-Harvest Change in Stand Structure, Tree Mortality and Wood Recruitment in Eastern Washington Type F Riparian Buffers

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Eastside Type F Riparian Prescriptions

Core Zone

- Core zone = 30 ft wide with no harvest

Inner Zone

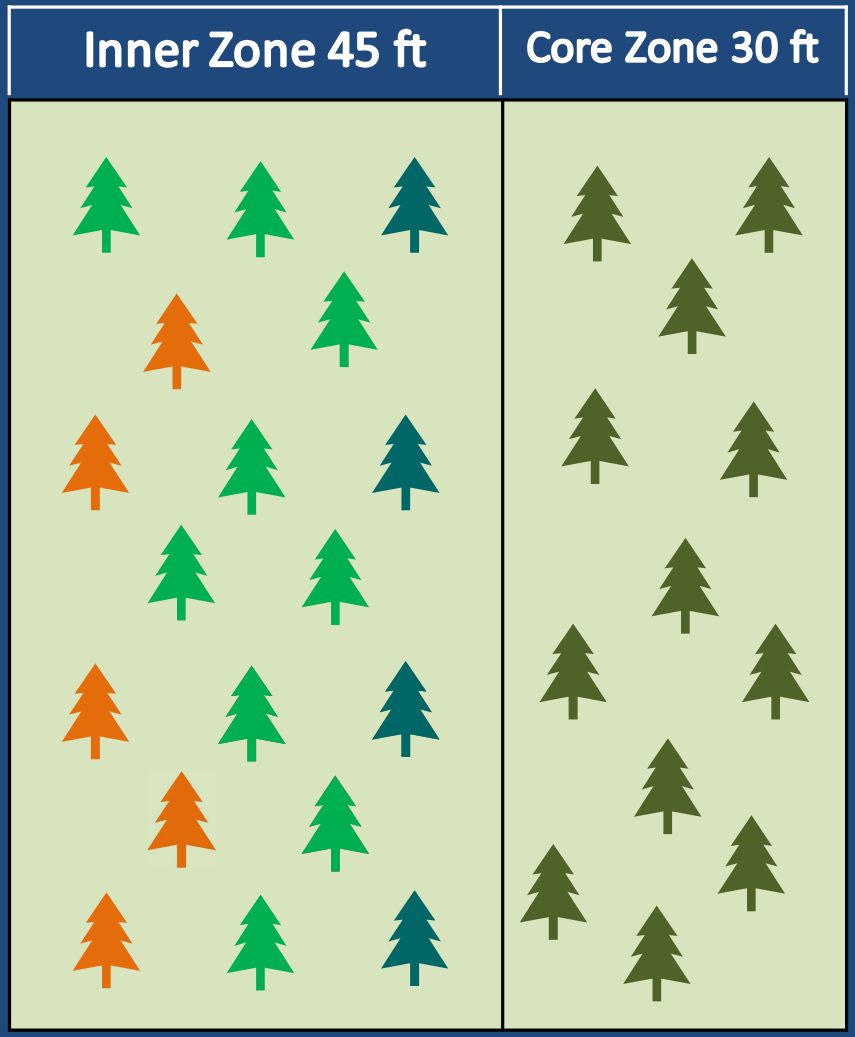
- Inner zone = 45 ft or 70 ft wide (depending on stream width)
- Managed to improve forest health and fire resistance
- Thinning to maintain stand basal area within a range (Eastside DFC)
- Basal area range varies by 3 elevation zones (timber habitat types)
- Increase tree size and shift composition to preferred species

Shade Requirements Limit Thinning

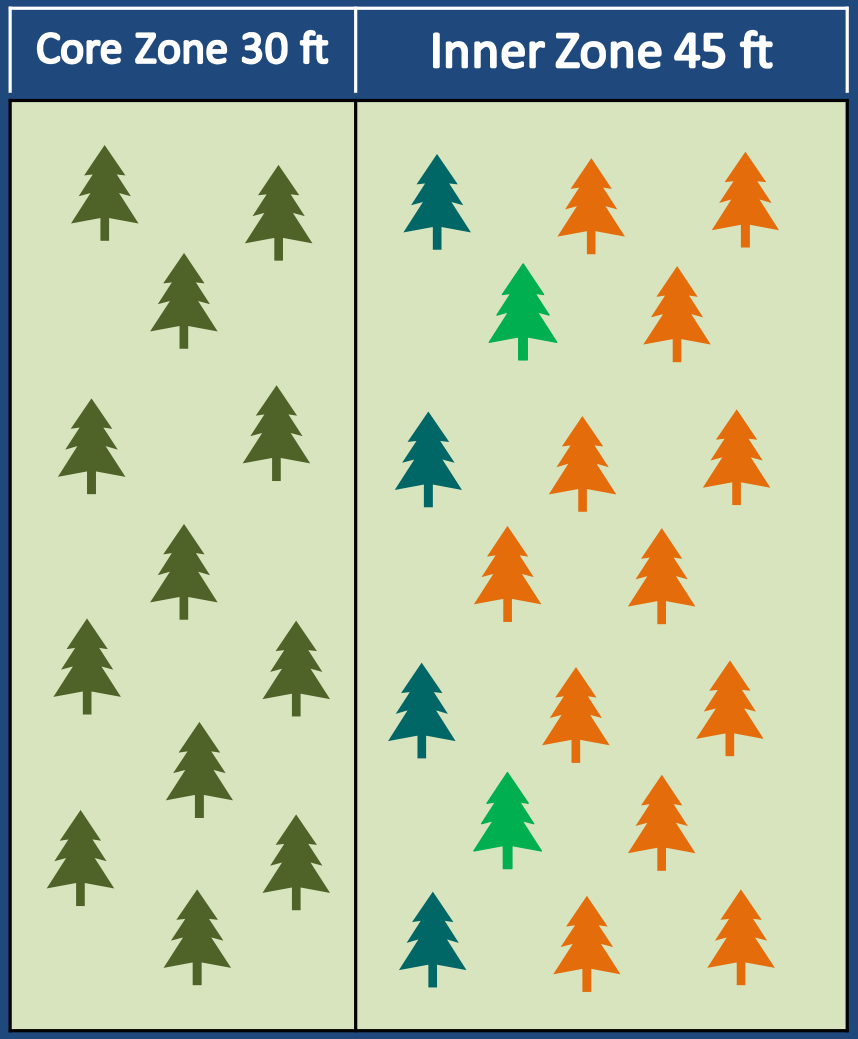
- Standard Rule (SR)
  - Shade requirements vary with elevation and Water Quality class
- All Available Shade (AAS)
  - Potential Bull Trout habitat (bull trout overlay)
  - Leave all Inner Zone trees providing shade to stream

Eastside Type F Riparian Shade Prescriptions

BTO All Available Shade



Standard Rule Shade



CMER Eastside Type F Prescription Effectiveness

Three Related Studies

- Focus on small streams (<15 ft wide) in mixed conifer zone (2500-5000 ft)
- Compare Standard Rule (SR) and All Available Shade (AAS) treatments
- Paired reference/treatment sites (upstream/downstream)

Eastside Riparian Shade/Temperature Study

- Compared shade and stream temperature response

Solar Radiation/Effective Shade Study

- Compared incoming solar radiation

Eastside Type F Riparian Effectiveness Monitoring Study (Bull Trout Add-on)

- Compared changes in stand structure, mortality, wood recruitment

Eastside Type F Riparian Effectiveness Monitoring (Bull Trout Add-on) Study

Design

- 17 sites (9 AAS, 8 SR) paired reference/treatment

Data Collection

- Standing trees
- Fallen trees
- Large wood recruitment

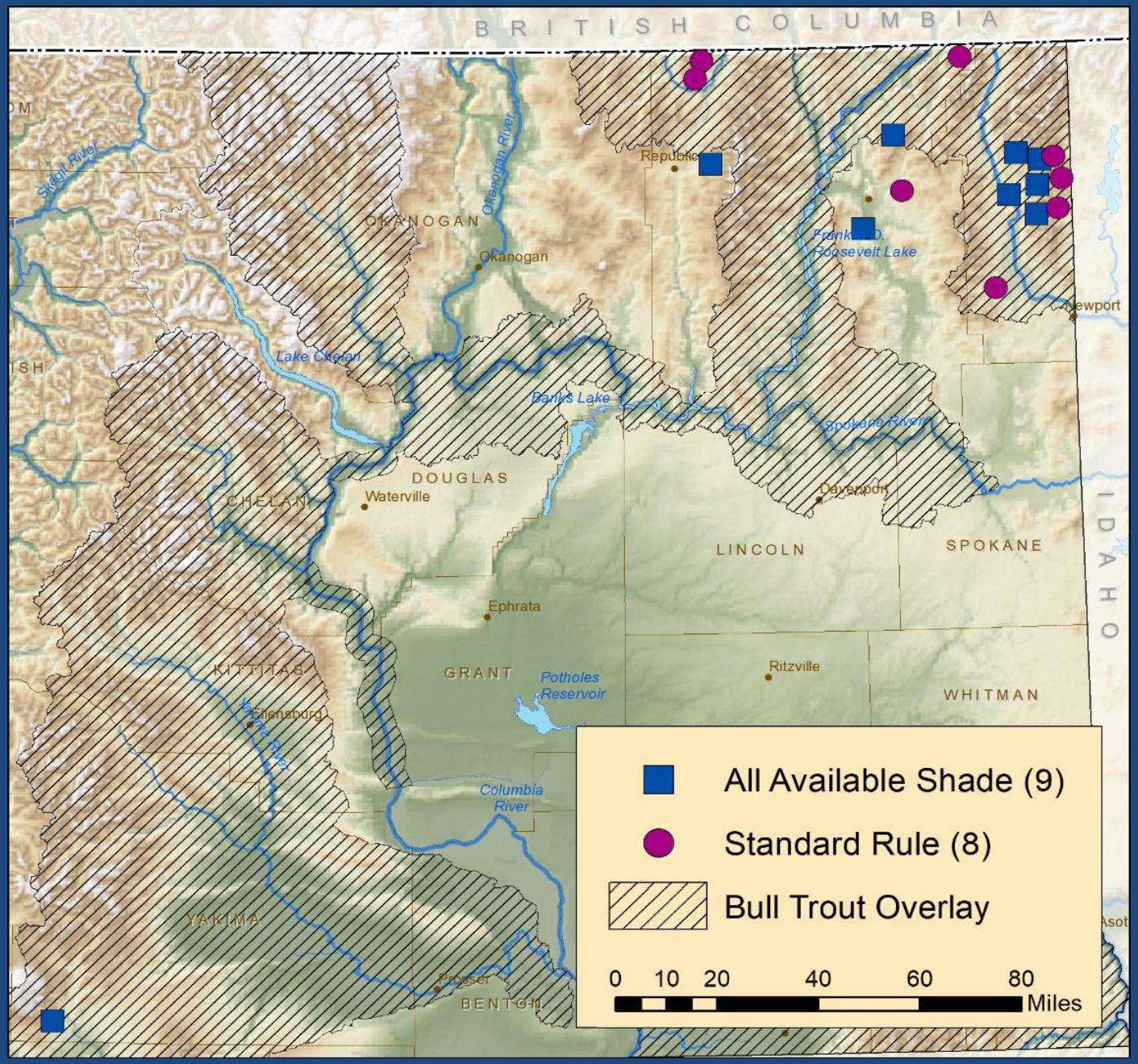
Metrics

- Live basal area/acre
- Percent change in live basal area
- Percent mortality in basal area
- Large wood recruitment piece count

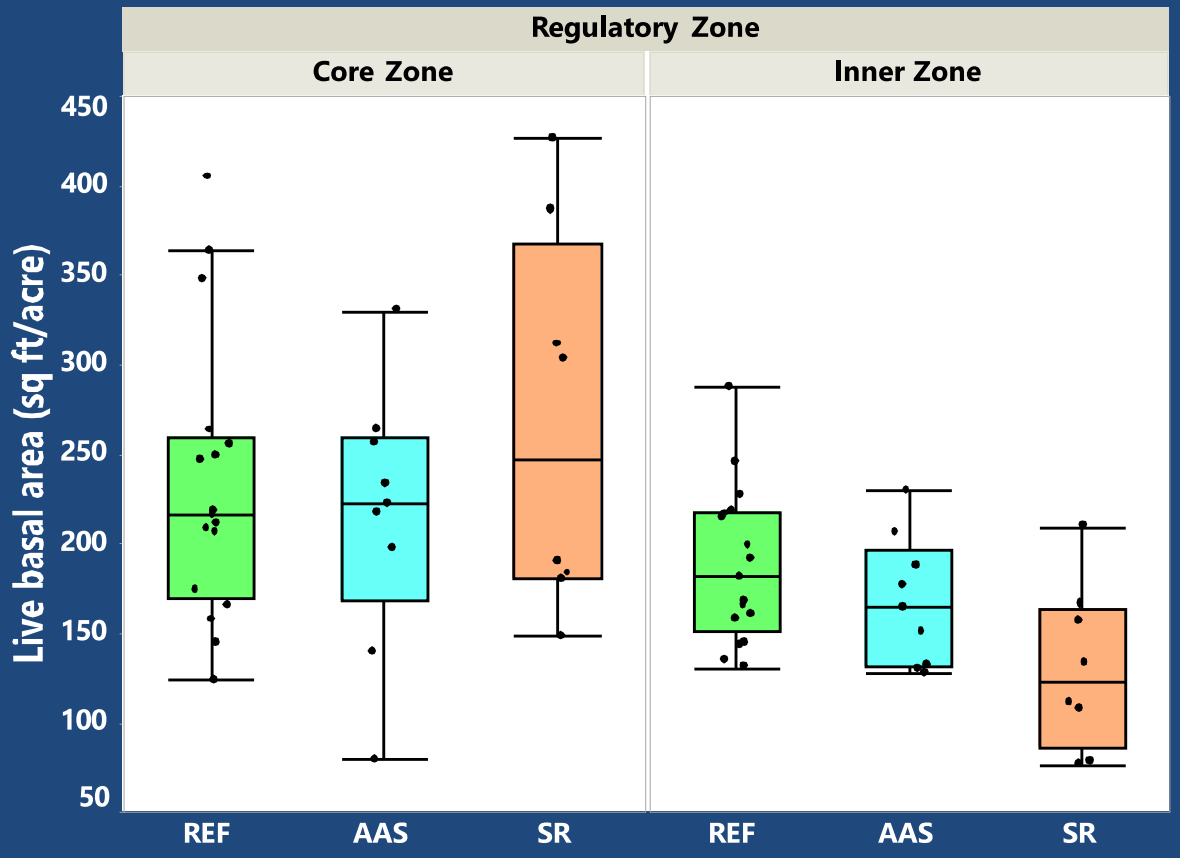
Treatment Comparisons

- Generalized Linear Mixed Models

Study Sites

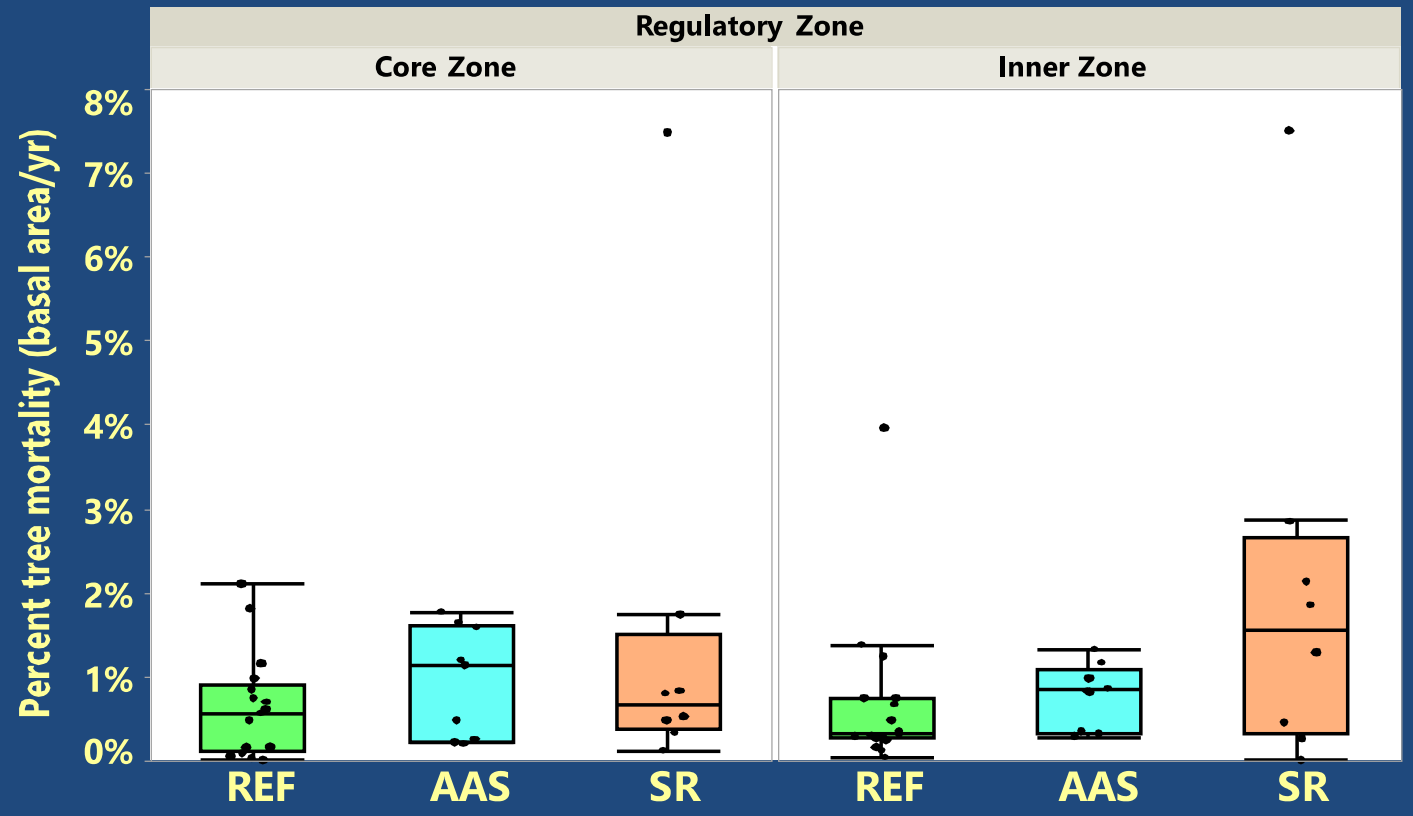

BRITISH COLUMBIA
Skagit River
Okanogan River
OKANOGAN
Okanogan
Republic
Frankl... D.
Roosevelt Lake
Newport
Lake Chelan
Banks Lake
Spokane River
DOUGLAS
CHELAN
Waterville
Davenport
LINCOLN
SPOKANE
IDAHO
Ephrata
KITTITAS
GRANT
Potholes
Reservoir
Ritzville
WHITMAN
Ellensburg
Yakima River
Columbia
River
YAKIMA
Prosser
BENTON
All Available Shade (9)
Standard Rule (8)
Bull Trout Overlay
0 10 20 40 60 80
Miles

Stand Structure: Immediate Post-Harvest



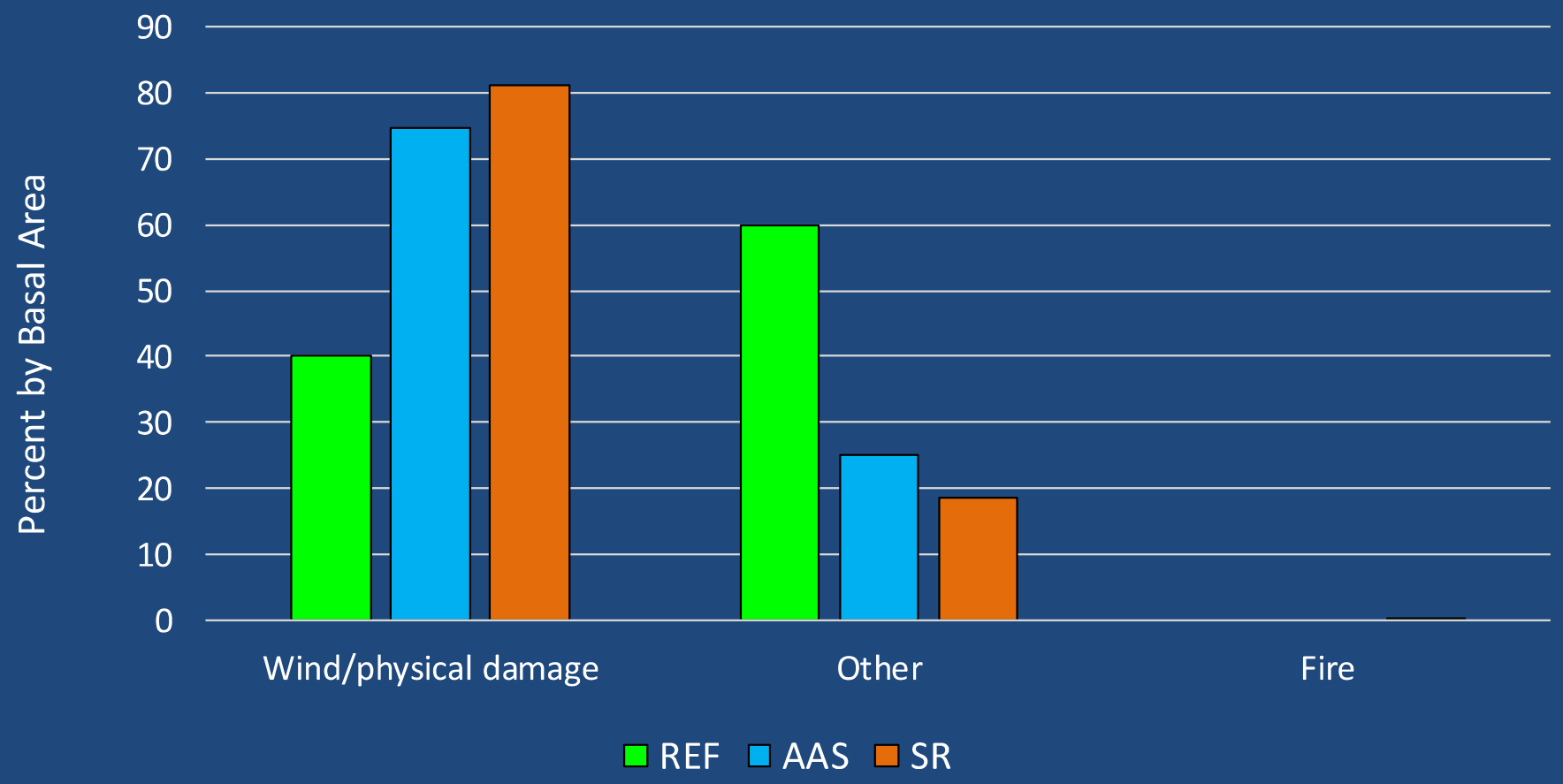
- Core Zone: Treatment differences not significant
- Inner Zone: SR significantly lower than AAS or REF
- Gradient shows effect of Inner Zone thinning prescriptions

Buffer Tree Mortality: Annual Rate



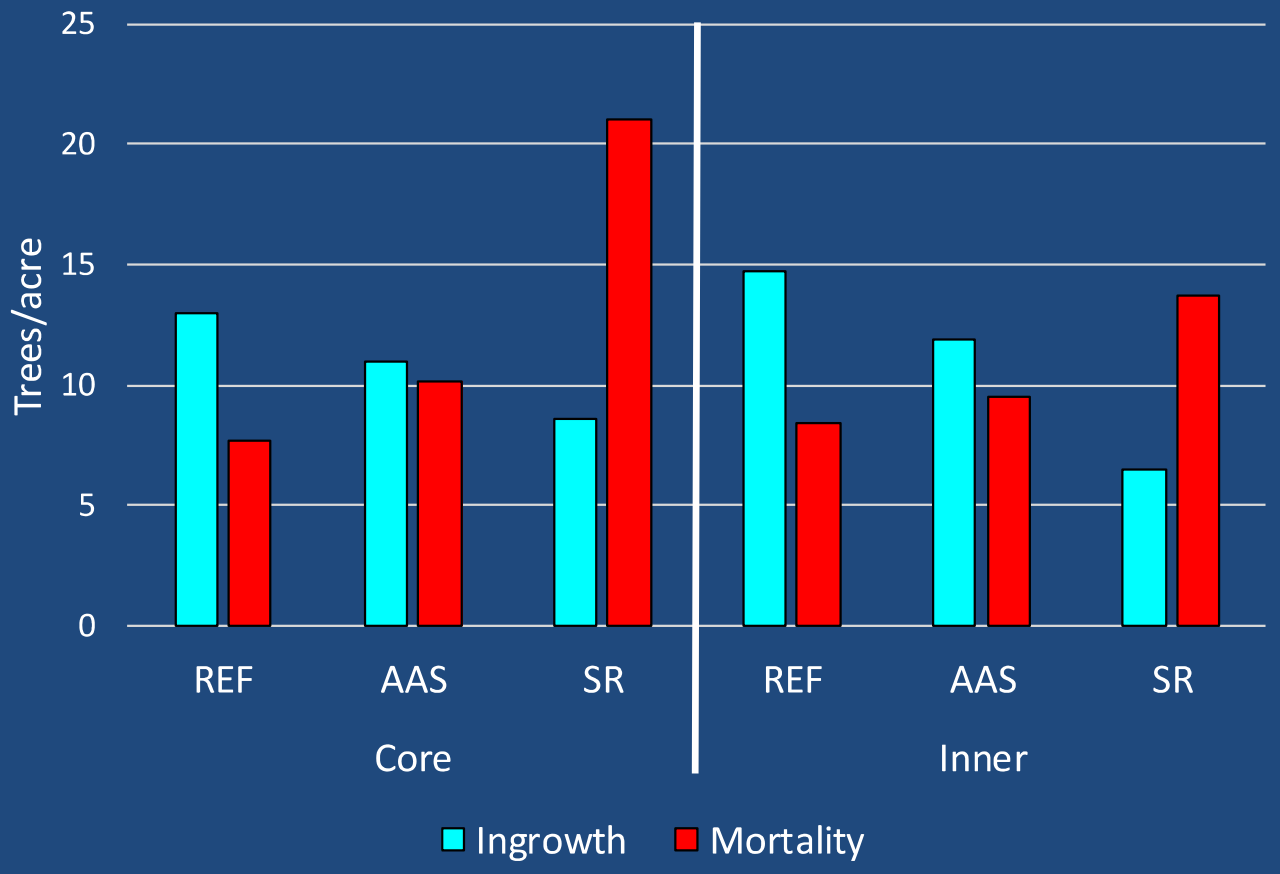
Mortality in SR Inner Zone higher than in AAS or REF

Mortality Agents



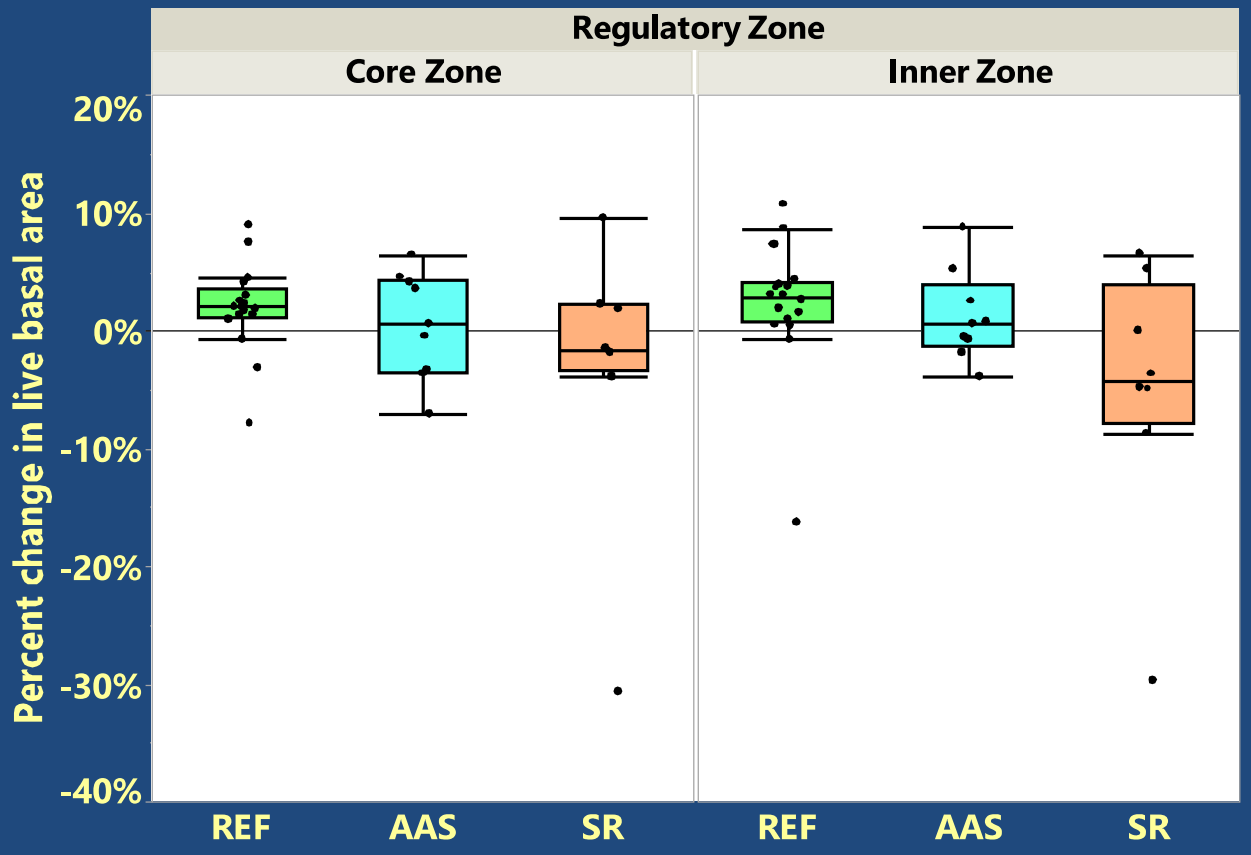
- Wind was the dominant mortality agent in SR and AAS sites

Ingrowth vs. Mortality



- Ingrowth exceeded mortality in REF and AAS : REF>AAS>SR
- Mortality exceeded ingrowth in SR: SR>AAS>REF

Change in Stand Structure



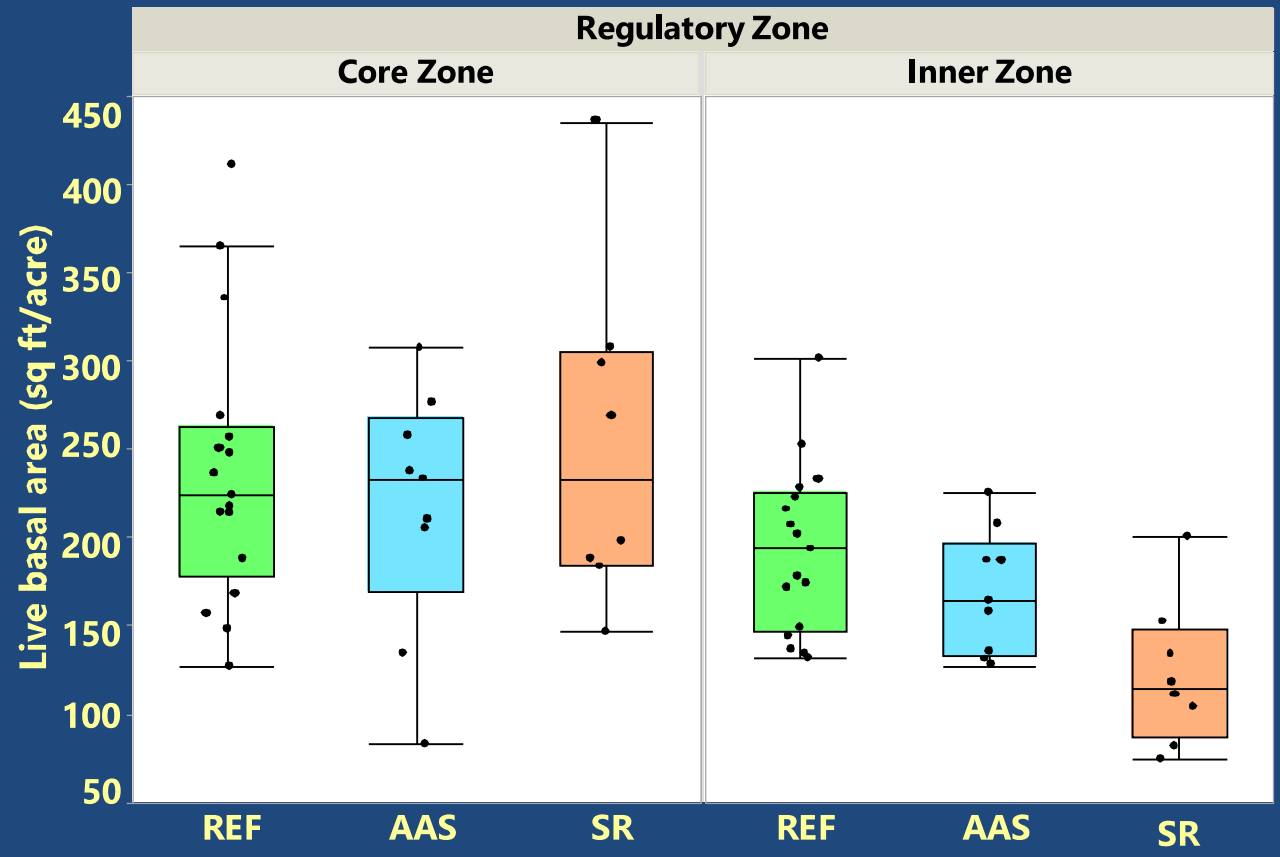
REF: Increasing BA in both core and inner zones

AAS: Little change in BA, balance between growth and mortality

SR: Decreasing BA (most pronounce in inner zone)

REF/SR contrast significant for both core and inner zones

Stand Structure: Five Years Post-Harvest



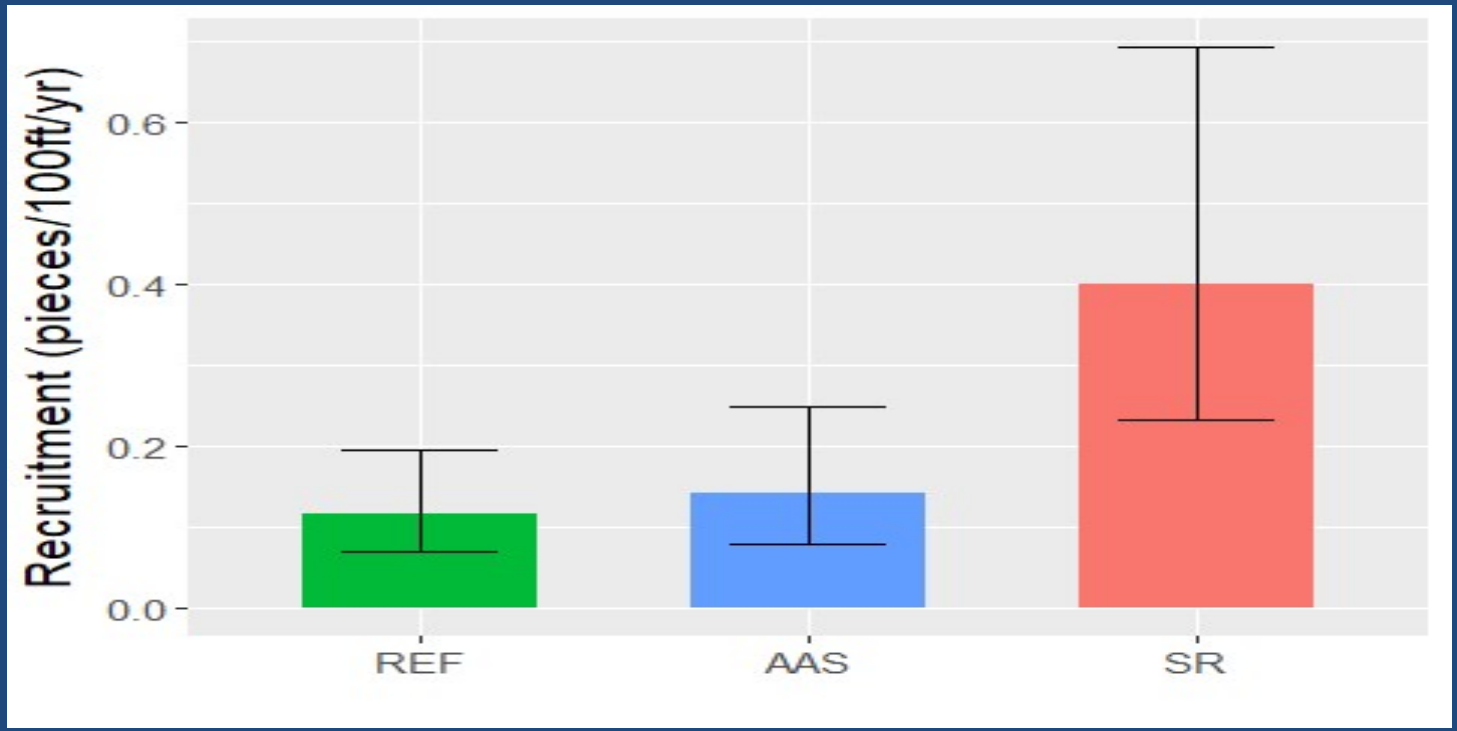
Core zone: Differences not significant

Inner zone: Gradient more pronounced

SR significantly lower than AAS or REF

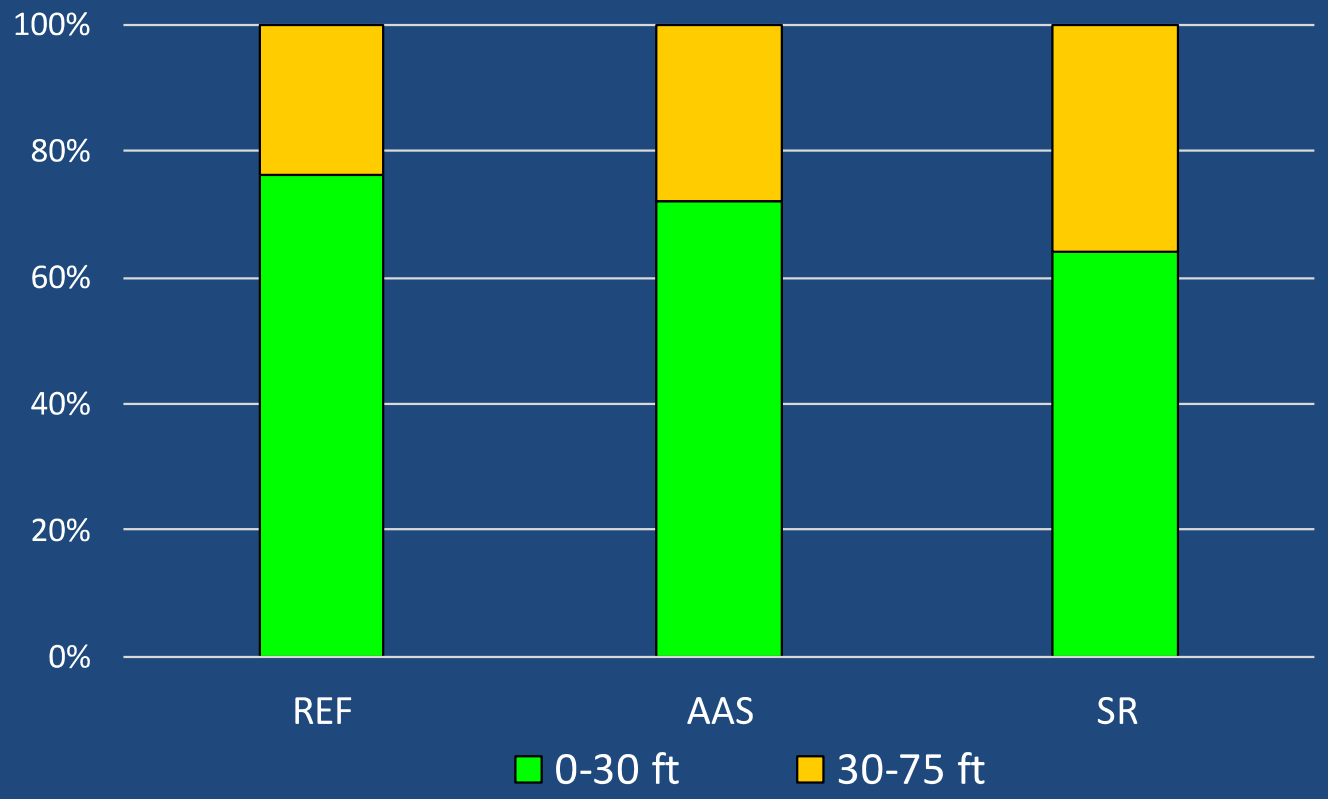
Mortality in SR inner zone augmented effect of greater thinning

Large Wood Input



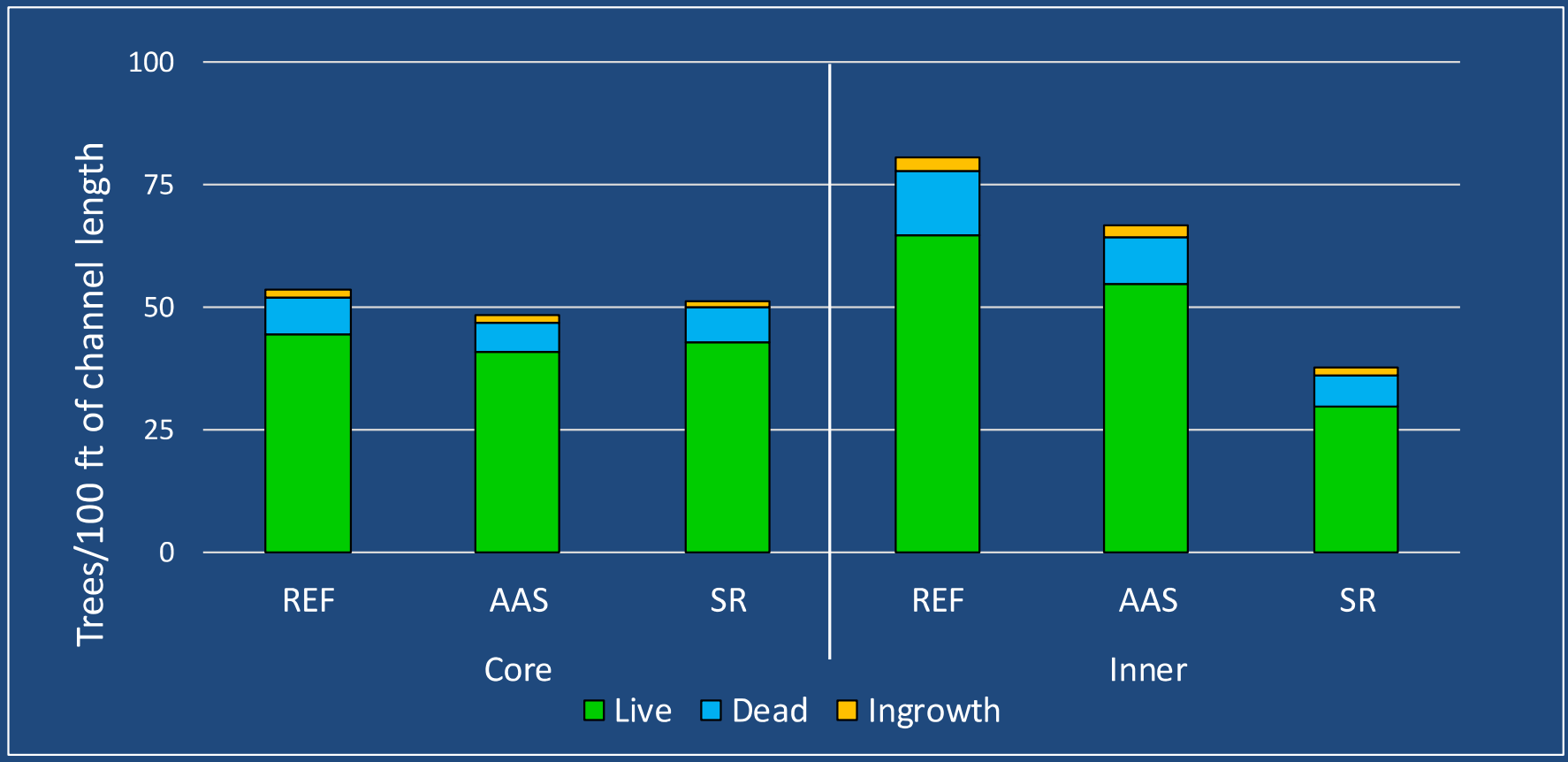
- Wood input followed mortality pattern: SR>AAS>REF
- Post-harvest wood input can be helpful in streams with low wood loading

Fallen Tree Recruitment Source Distances



- Majority (60-70%) comes from core zone (<30 feet)
- Substantial proportion (30-40%) from inner zone (30-75 feet)
- Inner zone proportion higher in SR treatment

Tree Recruitment Potential: Year 5 Post-Harvest



- Gradient in Inner Zone: REF>AAS>SR
- SR received initial input from wind mortality, but has lowest future recruitment potential due to thinning and mortality

Findings

Summary

- The SR treatment resulted in the greatest change in riparian stand structure, highest mortality, greatest wood recruitment
- The SR responses were significantly different from the REF
- The AAS response was intermediate, more similar to the REF

Immediate Post-harvest Stand Structure/Composition

- Inner zone density/basal area differed due thinning intensity (SR<AAS<REF)
- Greater percentage of preferred species in AAS and SR Inner Zones

Change in Stand Structure 5 Years Post-harvest

- Mortality > ingrowth in SR, ingrowth > mortality in REF, AAS
- Reduction in density/basal area in SR, but increases in REF
- AAS response more similar to REF than SR

Findings

Mortality and Wood Recruitment

- Mortality and wood recruitment in SR ~ double the REF; AAS intermediate
- Wind the dominant mortality agent in SR and AAS sites
- Mortality rates were low (<5%/year) in all AAS and 7 of 8 SR sites
- Majority of SR and AAS sites fit the chronic mortality/stable wood input scenario
- Subset of wind-affected SR sites had a pulse of wood input characteristic of an episodic input regime associated with disturbance
- ~60% of recruited wood pieces were stems with attached root wads
- Majority of recruited wood pieces came to rest over the bankfull channel
- Future wood recruitment potential was lowest in the SR Inner Zones

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