

# Plant Associations As Indicators of Maximum Stand Density on Washington DNR Lands

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## Background

- DNR manages Trust lands
  - \$220 million to beneficiaries in FY2008
- Forest Health Improvement Act – WA State Legislature 2004
- Directed DNR to address overstocking, I&D, fire hazard and weather (wind, snow, ice)
- DNR implemented Forest Improvement Treatment (FIT) program

## Maximum Density

- Simple measures: BA and TPA
- Size and quantity measures: SDI, Relative Density and Curtis' RD
- Often described as species specific



## Why Does Overstocked Matter?

- Needed a good metric for
  - When to enter a stand
  - Healthy residual densities
  - Future target densities
- FVS corporate model
  - Uses a plant association based SDImax and BAm<sub>ax</sub> in mortality models
- Aware of the work of Cochran and Powell

## Why Plant Associations?

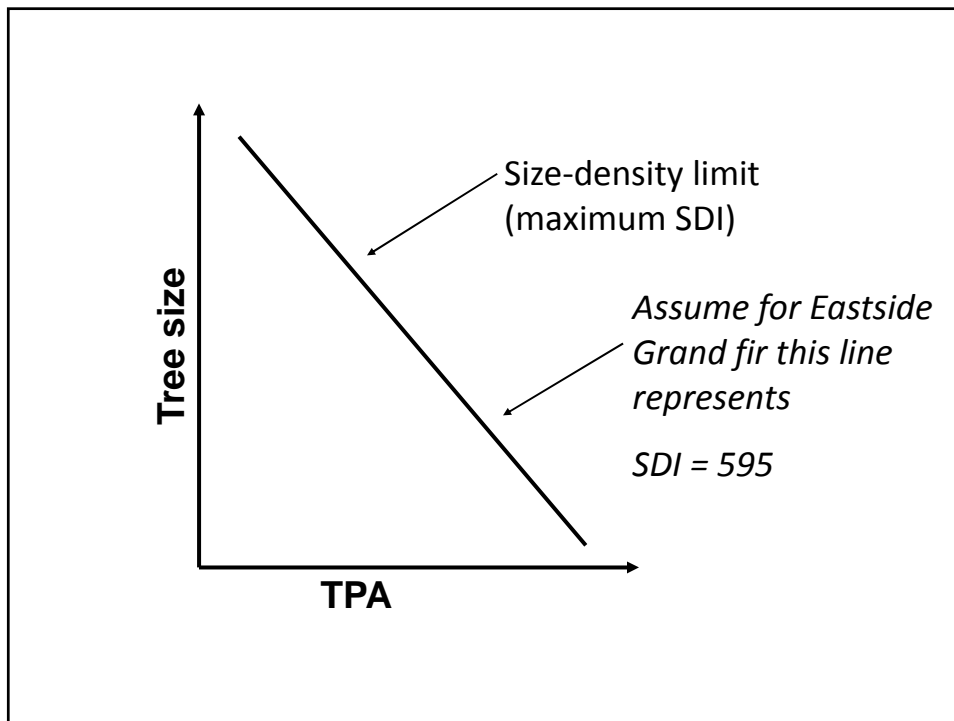
- Environmental conditions are hard to measure.
- Plants integrate environmental conditions - climate, soils, competition and disturbance.
- Plant association: Stable plant communities that will eventually persist on a site, in the absence of disturbance.

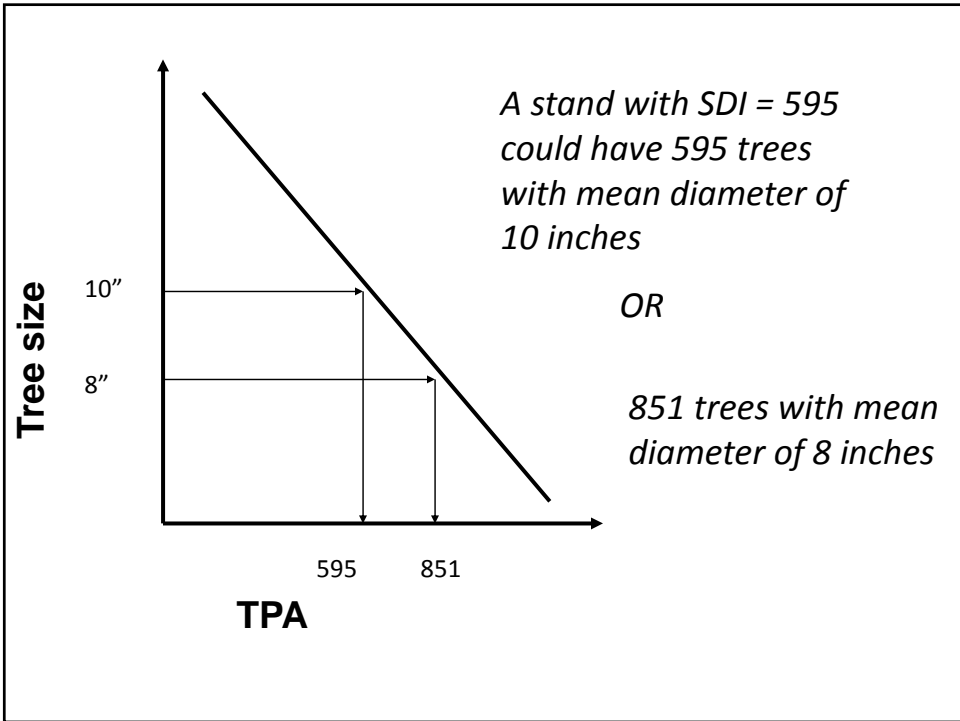
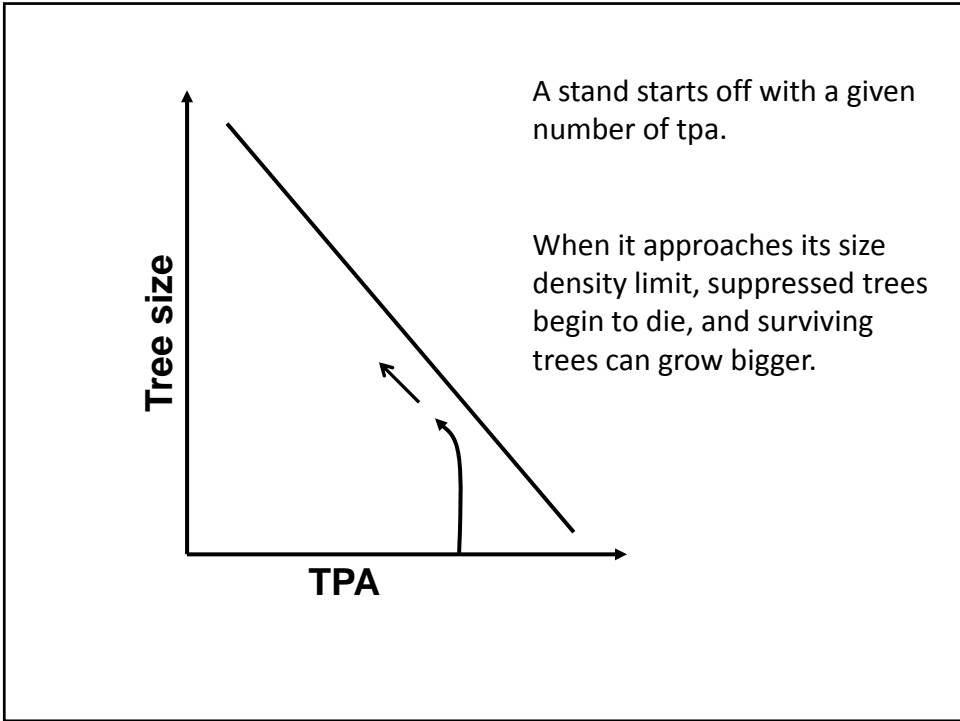


# STAND DENSITY INDEX

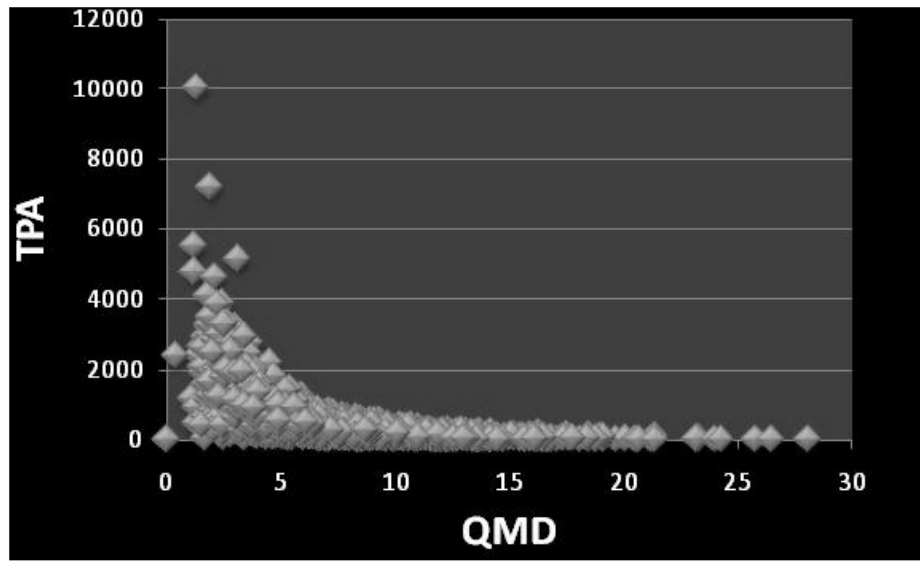
$$SDI = TPA * (QMD / 10)^{-1.605}$$

- Size and quantity assessment
  - how many trees of what dbh.
- Developed by Reineke in 1933 for a species specific maximum density estimation independent of site.
- Plotting QMD by TPA defines max SDI and generally follows the -3/2 power law.
- Indexed as number of ten inch dbh trees per acre.

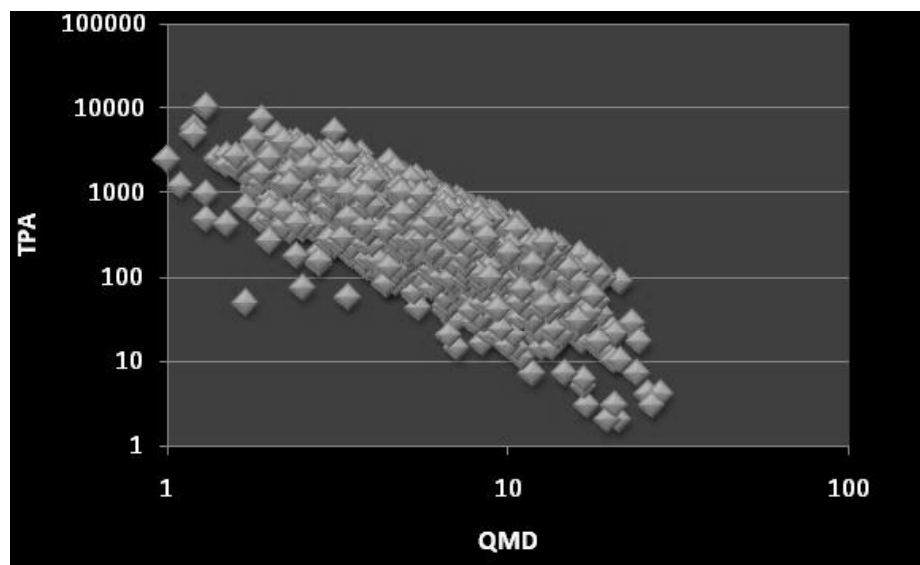


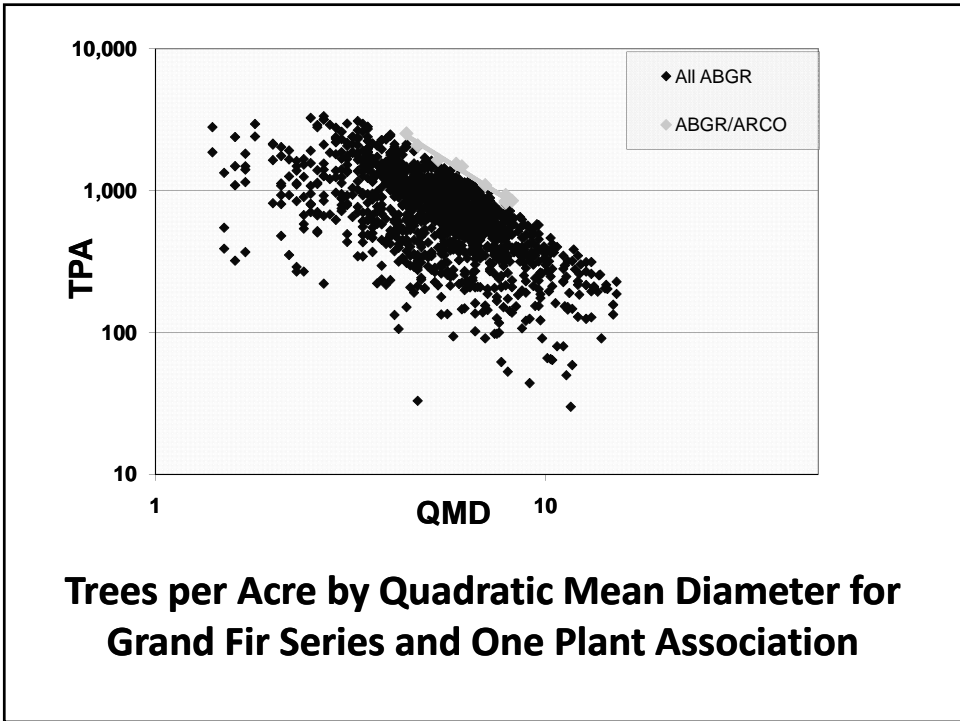
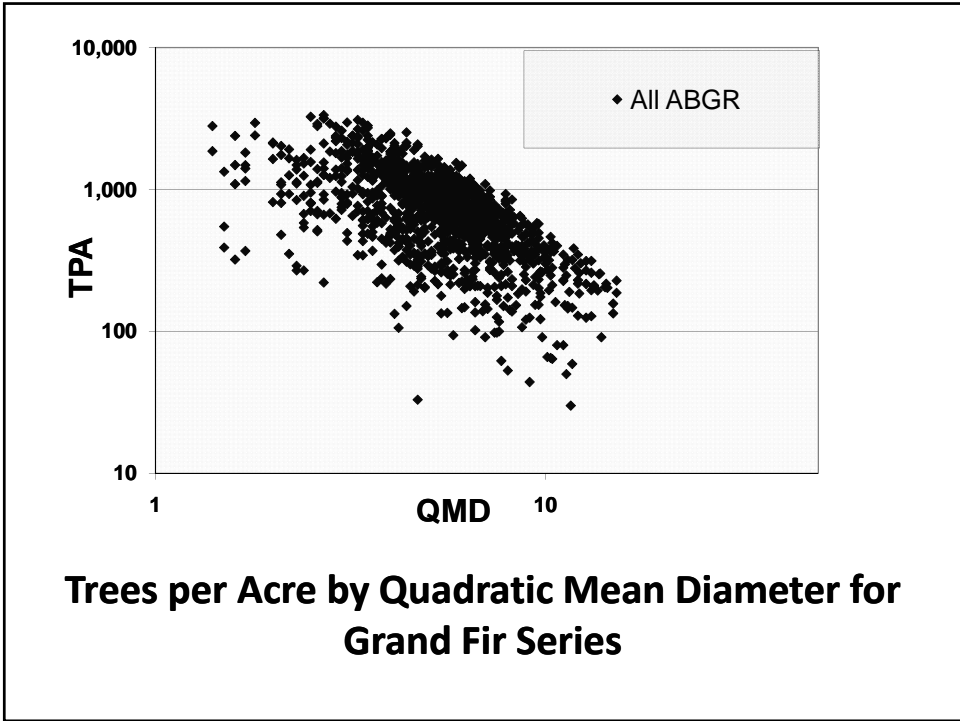


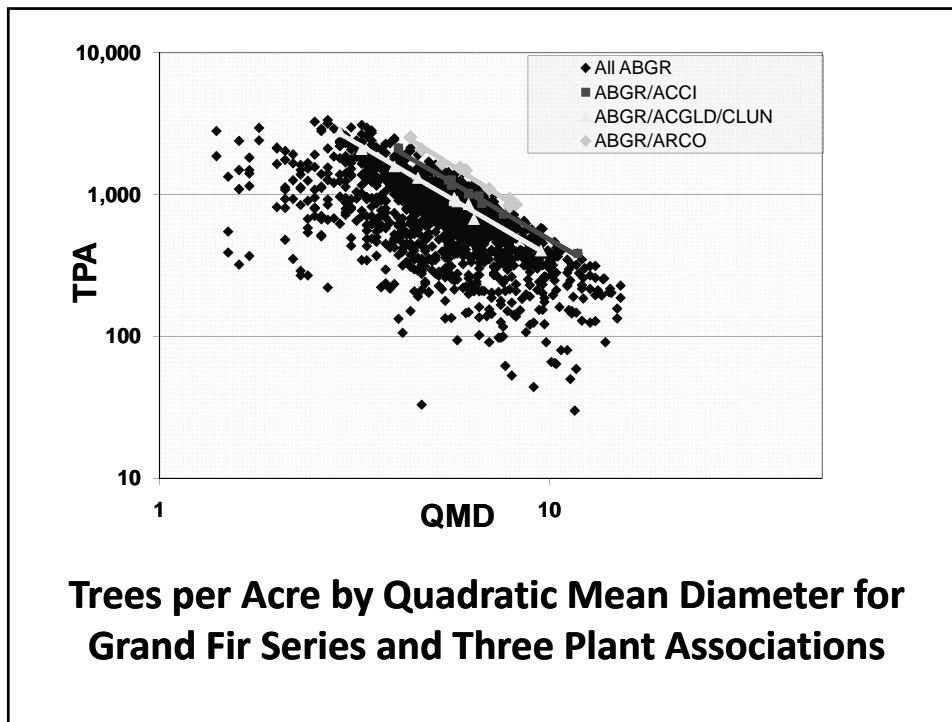
Douglas-fir PA Series:  
TPA by QMD for Eastside Stands



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## Results

- Maximum density displayed strong plant association relationship
  - Only two PA's do not overlap the  $-3/2$  line
  - $r^2$  often  $> .98$
- Max showed a weaker relationship when examined by species, SI, parent material
  - Slopes often did not overlap  $-3/2$  line
  - $r^2$  were lower than for PA



## Where to Next

- Relative density levels
- Management Zone Concept
- Translated to BA max values
- Further represented as TPA for various target tree size
  - Ex. 180, 12" dbh TPA, or 85 TPA, 18" dbh
- Help guide thinning, harvest timing, etc.

## What's It Mean?

- It appears that PA's define distinct maximum densities
- Teasing out the abiotic controls that determine PA may inform us of what controls productivity