

How Field-based Research and a Systems Perspective can Increase Industry Competitiveness and Innovation while Minimizing Risk to the Crown

by
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Past Management Practices

Many forest management investments in the past were based on simplified models which utilized limited field observations or on trials that limited the number of complicating factors or were limited in time span. Factors that can impact on success were often not accounted for and generally lead to poor investments.

Unbiased Observations

It is human nature to pay attention to facts or observations that reinforce our beliefs and ignore those that don't. Unbiased observations relate to those viewed with no preconceived bias. Researchers tend to be less biased observers due to their training and they back up beliefs with empirical data

Systems Perspective

A systems perspective or systems thinking involves thinking about all the parts of a “system” to find a solution that is optimum. If an engineer is designing a structure they must consider intensity and angle of sun, amount of snow, wind strength, earthquake probability, etc. in order to design an optimum structure for a particular site.

Systems Perspective (cont)

In forest management the system is the forest (eco)system. In order to find optimal treatments for increasing yield or value for our uses we must consider factors such as the basic biology of the target species, the biology of the other species that interact with the target species such as other vegetation, diseases, insects, soil conditions, climate etc. and the impacts of a treatment on other resource values

Examples

3 examples of large capital investments made by the forest industry that could be more strategically targeted to situations that provide a large return for a relatively small investment based on longer-term field based empirical data and/or unbiased field observations, and a systems perspective

Example 1

- Spacing of young stands
- 1990's spacing occurred on 40 – 50,000 ha/yr at a cost of over \$40 million/yr, a lot of which targeted Pl stands (FRDA, FRBC)
- Pl is a 'r' species which relies on large numbers to form a mature stand (foliar diseases, rusts, MPB)
- Spacing young Pl stands is a high risk venture without high returns

Stand established by seeding on snow and spaced to 2000 sph



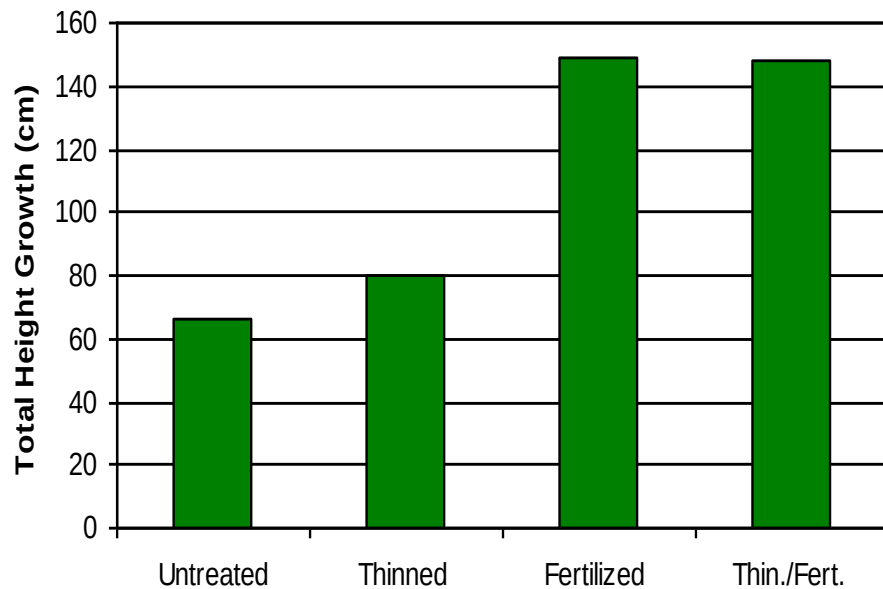
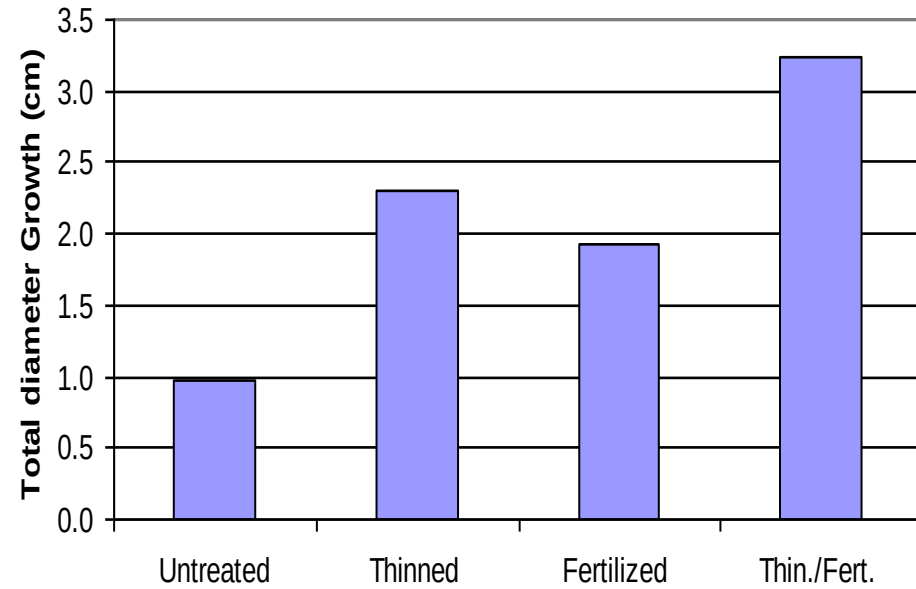
Stand established by seed and not spaced adjacent to the spaced stand



Height repressed Pl stand in dry cold ecosystem (EP 1221)

Better height and diameter growth response to fertilization with no thinning compared to the very dry cold leaving the option of improving growth without sacrificing numbers

Total height growth 2002 to 2007 Total diameter growth 2002 to 2007



Data courtesy Teresa Newsome, Research Silviculturist, Williams Lake

Where to space

- Where ecologically possible choosing other species to space such as Douglas-fir, a K species which relies more on high survivorship, would be suggested by a systems perspective and would result in a more profitable investment.
- assumes that the end product requires larger piece sizes since in general spacing does not increase overall volume of the stand, just size of the individual stems.

Example 2

- Brushing and weeding of young stands
- late 1990's brushing and weeding was conducted on between 60 – 90,000 ha/yr at a cost of over \$25 million/year. (FRDA, FRBC)
- Much of the research for 80's and 90's (Newsome, Simard, DeLong, etc.) demonstrated little growth response unless competitors at high density or cover

EP 1080: Effects of aspen on survival and growth of lodgepole pine and hybrid spruce in moist Sub-boreal forests

10 year results

- 42% of variation in Pl growth could be accounted for by aspen competition but only when aspen >2500 total stems per hectare
- <10% of variation in Sx diameter could be accounted for by aspen competition. Soil factors such as soil displacement and aeration accounted for as much of the variability
- 22 year results still no difference in height and diam up to 2500 sph for both Pl and Sx

Moist Cool Site in Sub-boreal Forest (SBSmk1)

- Good growth of spruce but diameter reduction in pine at high aspen density

Spruce



Pine



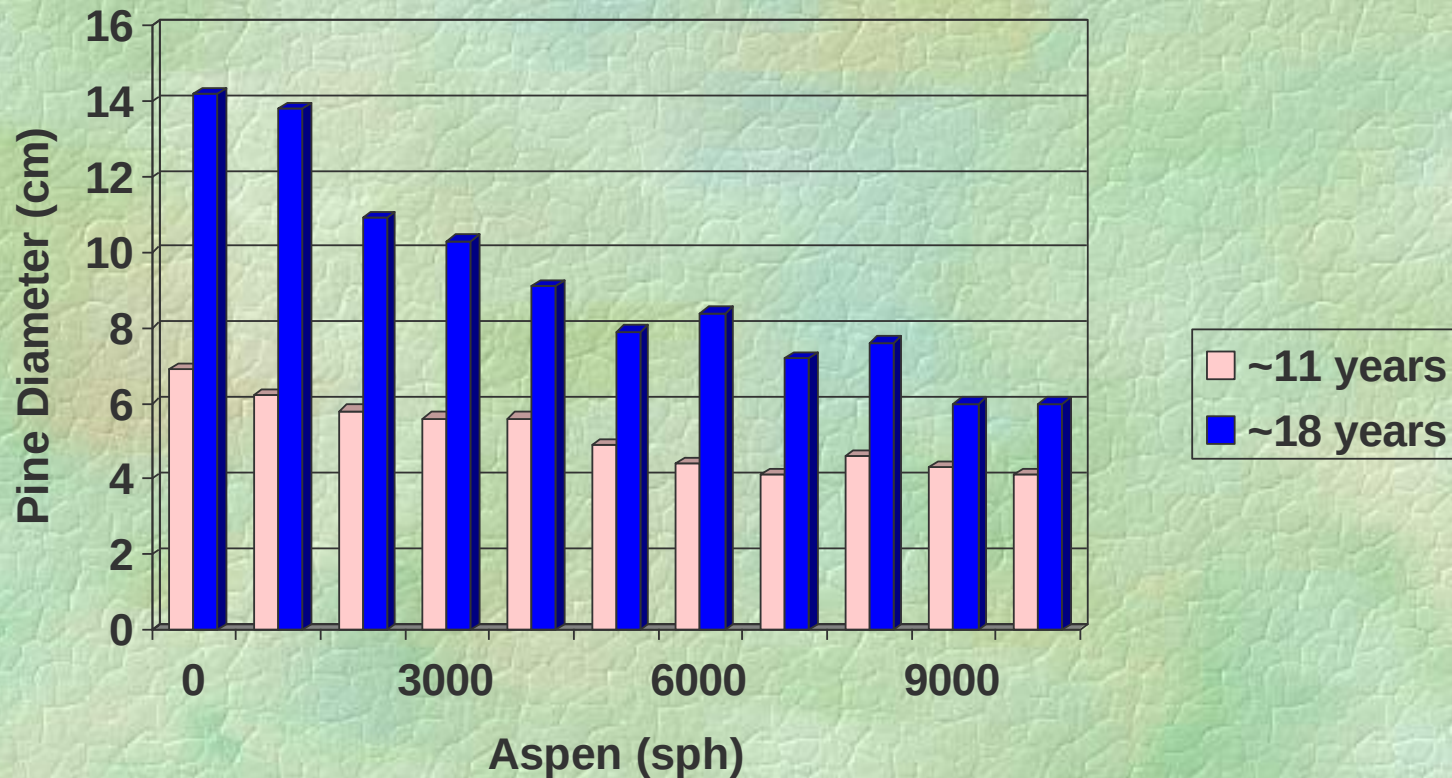


EP1152 : Changes in Pine Responses to Aspen Competition across an Ecological Gradient from Very Dry to Moist Climates

- The initial belief that was reflected in policy (free growing guidelines) was that even small amounts of aspen in a pine stand would reduce pine performance.
- There was no adjustment based on differences between ecosystems
- Good field-based research has provided ecosystem based updated policy

Dry Warm Interior Sub-boreal

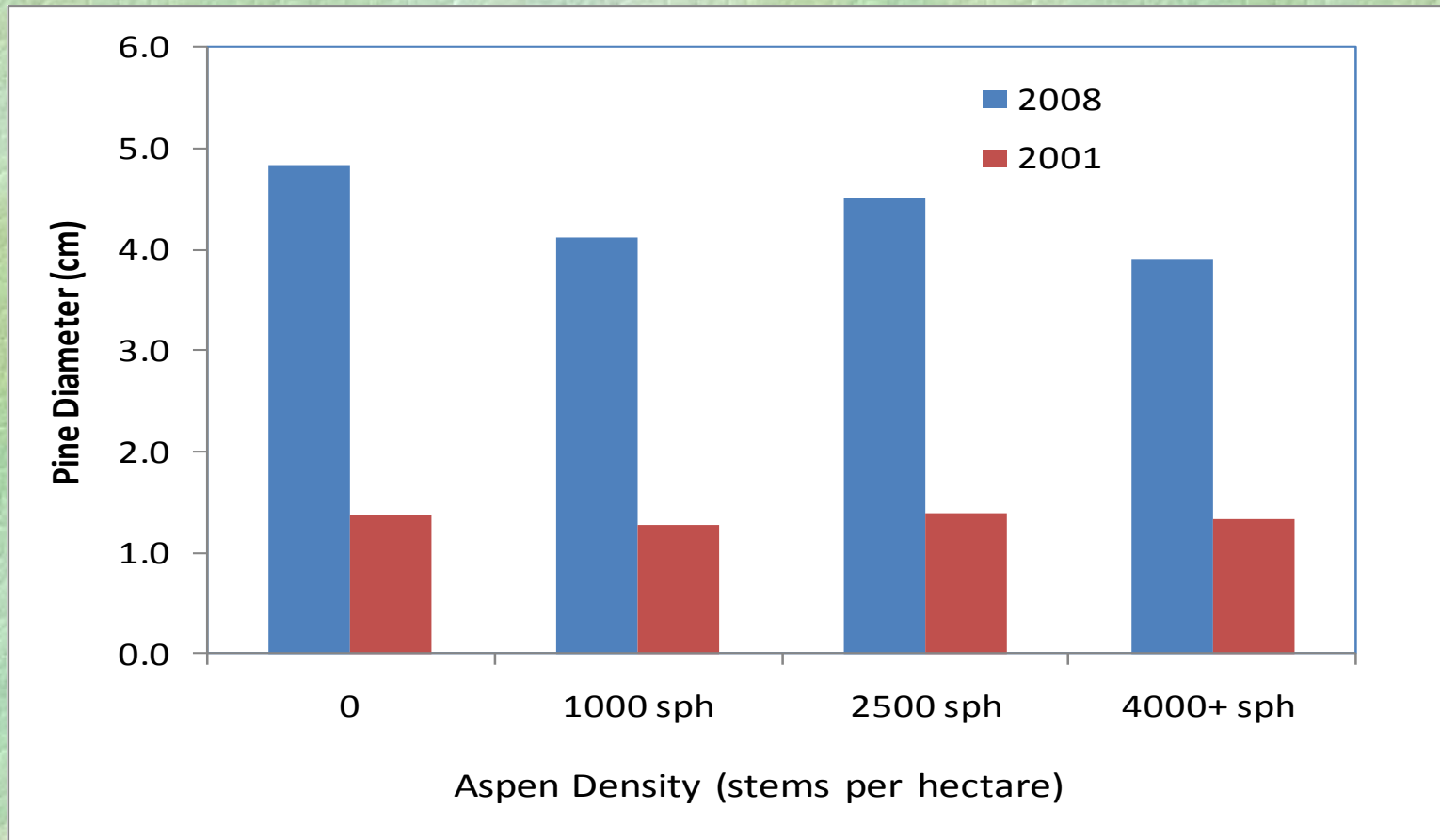
- Repression of diameter growth only at aspen densities above about 2000 stems per hectare



Data courtesy Teresa Newsome, Research Silviculturist, Williams Lake

Very Dry Cold Interior Plateau

- No obvious indication of reduced pine performance at any density



Data courtesy Teresa Newsome, Research Silviculturist, Williams Lake

Very Dry Cold Interior Site (SBPSxc)

- Good growth of pine even at high aspen density

Moderate aspen density



High aspen density



Photos courtesy Teresa Newsome

EP1152 Results have lead to following changes

- Moratorium on brushing of aspen in the very dry cold plateau sites – saving companies millions of dollars
- Higher tolerance of aspen in a number of warmer moister ecosystems reducing the number of stands requiring brushing treatments.

Example 3

- Boreal mixedwood
- when spruce is harvested off a site even when in mixtures with aspen the intent of the prescription is to bring the site back to a spruce forest
- depending on the amount and distribution of the aspen and site moisture conditions favouring bluejoint reedgrass a site generally needs to be mechanically site prepared (approx \$800/ha) and often treated with herbicide (approx \$300/ha)

Example 3 (con't)

- Research and operational trials in BC and Alberta have demonstrated high survival (>90%) and acceptable growth of spruce planted under aspen
- When aspen is harvested off the site the growth response of the protected spruce has been demonstrated to be very high
- regulatory barriers exist that prevent this innovative management strategy from being implemented since investments are required to be made on the area harvested
- allowing a natural mixed stand to develop on the harvested site while investing in underplanting an equivalent area of mature aspen somewhere else on the landscape reduces regeneration costs with minimal risk to the crown

EP 1114: Planting white spruce under trembling aspen

10 year results

- Over 90% survival at 3 sites
- Less frost damage than clearcut sites planted at same time
- Reduced growth compared to clearcuts but less variability
- Observations from natural windthrow event indicate high release response following aspen removal which should happen about year 20

Bluejoint is a very aggressive competitor after clearcutting as it responds to the increased light and soil temperature



Spruce planted under aspen after 14 growing seasons





Conclusions

- As new building design has moved from a focus on keeping the elements out to a focus on utilizing those same elements (e.g., green roofs, use of solar and wind energy) we need to move forestry from a man against nature (e.g., heavy emphasis on site preparation, thinning, brushing and weeding) to a man with nature philosophy
- will reduce costs and help meet our obligation to reduce our carbon footprint (Strategic Investment)
- can only be achieved through a thorough understanding of the ecosystems we are managing and long term field based research.

Recommendations

- Increase our field research activities by having researchers whose focus is field based research and who take a systems perspective. They should be stationed in close proximity to our different types of ecosystems (e.g., different Biogeoclimatic zones) across the province. This increases their familiarity with the ecosystems and how they behave with management interventions and reduces carbon footprint due to close proximity for accessing research sites

Recommendations

- Use our research to make industry more efficient through; more efficient landscape design of openings thereby reducing road building, fuel costs, etc.; more effective use of tools like site preparation, thinning, brush and weeding by applying treatments only where treatments are effective and have high return on investment; and use a mix of natural regeneration and planting appropriate tree species mixes that reduce risk, increase resilience while minimizing cost
- Fund and encourage (MSc) meta data analyses

Recommendations (con't)

- Ensure that our management maintains ecosystem integrity, function, and long-term productivity to ensure our environmental reputation is the best in the world in order to address the increasing demands of the world market
- Have a person whose soul job it is to link researchers and research findings to policy so policy changes can be made much more quickly than has happened in the past

Recommendations (con't)

- Connect field researchers, product researchers and market researchers so that we can develop strategic forest management techniques that can produce the desired tree qualities for the intended product in the desired quantities to meet market demands with a focus on high value products
- Make sure the people making the decisions on the ground have a good grounding in forest ecology and are up to date on research findings. Slow down and think rather than go fast and fill in blanks