



Stem damage in New Zealand planted forests

Jenny C. Grace, Céline Meredieu

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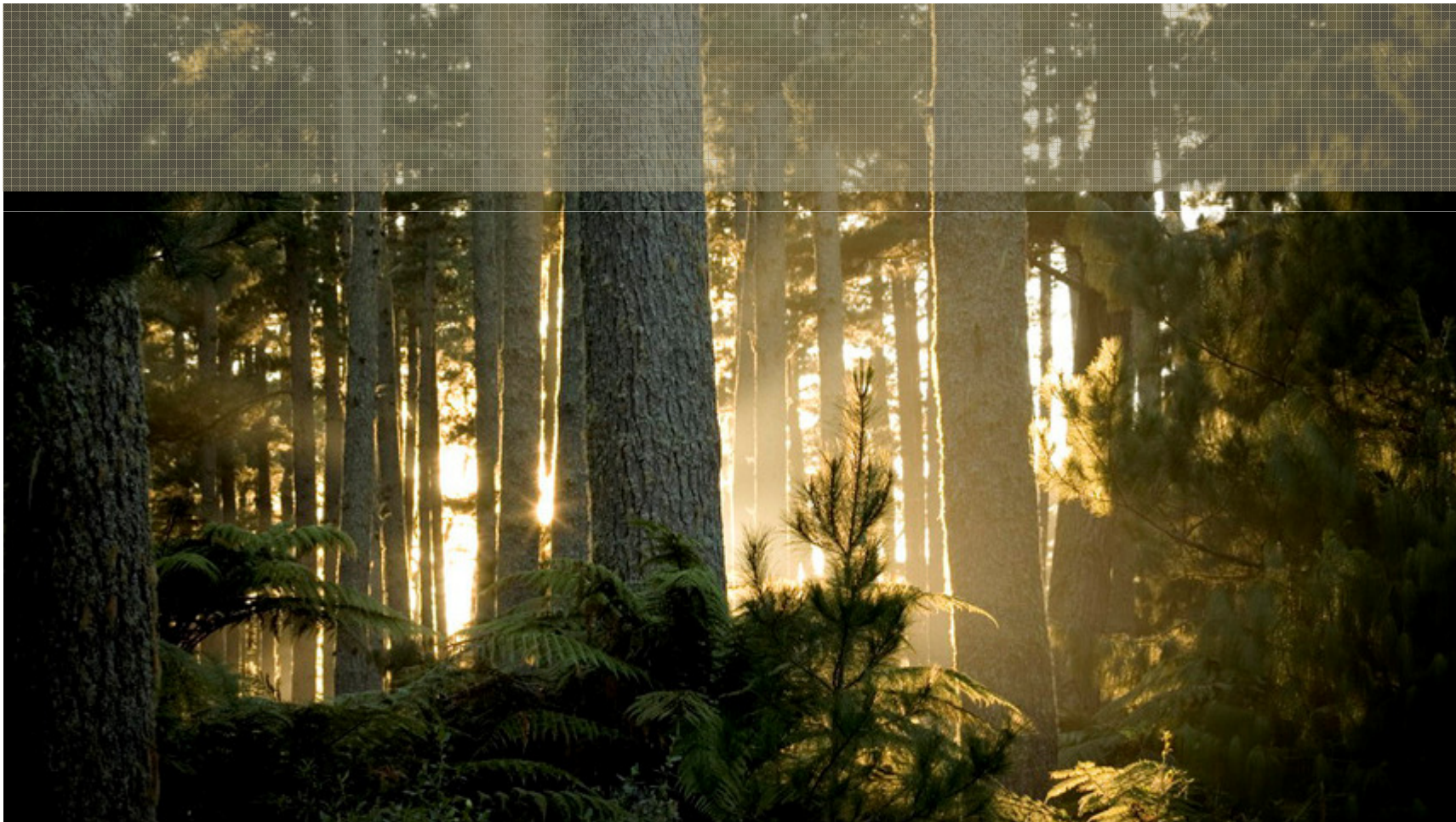
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Stem damage in New Zealand planted forests

J.C. Grace and C. Meredieu



Background

- Growth Models
 - Assume straight stems
 - Regular branching pattern
- But trees are not “perfect”, especially in windy environments
 - For example: trees can lose their top in a storm
 - Results in:
 - Poor stem form
 - Large branches
- Descriptive codes are recorded in New Zealand Permanent Sample Plots

Descriptive codes – related to branching

- BW: Basket Whorl
- DL: Double leader
- FK: forked, two leaders above 1.4 m
- ML: multileader
- DT: dead top
- TO: top out
- LR: leader replacement
- RC: ramicorn
- MF: undefined malformation

Descriptive codes – related to stem form

- SW: gentle sweep
- BS: extreme butt sweep
- CK: crooked
- LN: growing with excessive lean
- SO: socketing
- TP: toppled, roots damaged but tree alive

Descriptive codes – forked trees

- Trees forked below 1.4 m counted as separate trees
- For this study, such trees assigned descriptive code LF (low fork)

This study: Analysis of stem descriptive codes

- Radiata Pine trials
 - Genetics and stocking
 - Eight radiata pine trials containing a range of improved seedlots including ones developed for wood density
- Douglas-fir trial
 - Stocking and Pruning
 - One trial with a range of silvicultural treatments

Radiata pine trials

5 trials planted in 1992, 3 planted in 1994

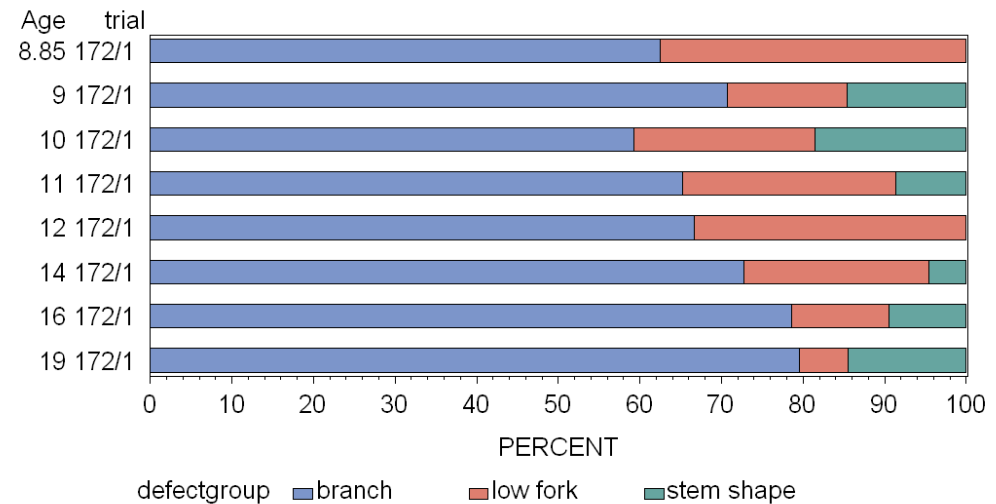
Each trial contains:

- Up to 7 seedlots
- Two silvicultural treatments
 1. Plant 500 stems/ha and leave
 2. Plant 1000 stems/ha,
thin to 400 at mean crop ht of 7 to 8 m
and prune to 2 m

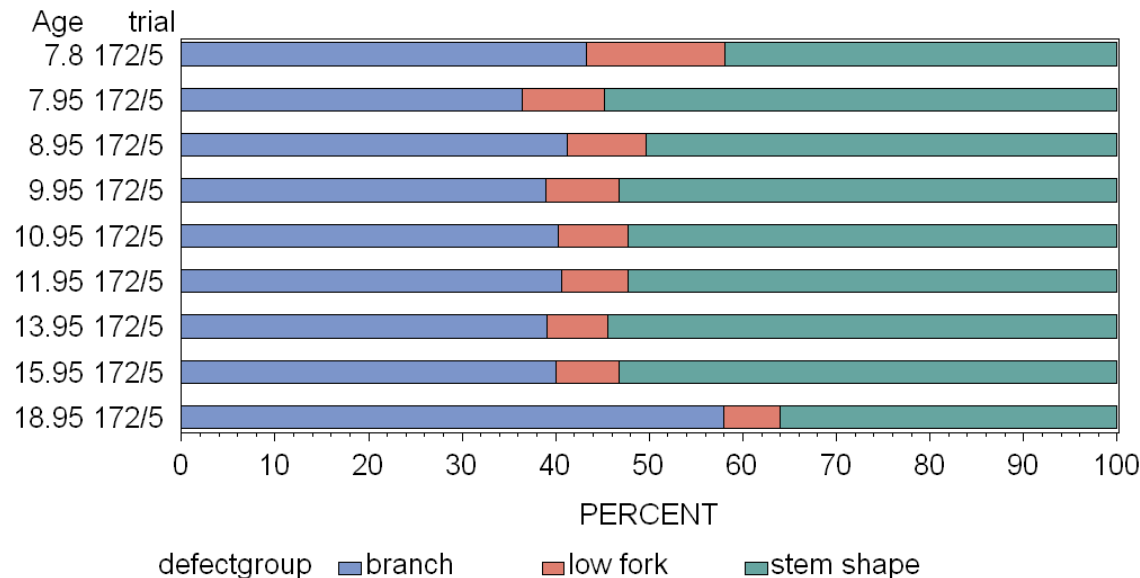
Radiata pine trials

- Proportion of different defect codes varies with site conditions

Stem defects FR172/1, Woodhill (only A and W status codes)



Stem defects FR172/5, Takitooa (only A and W status codes)

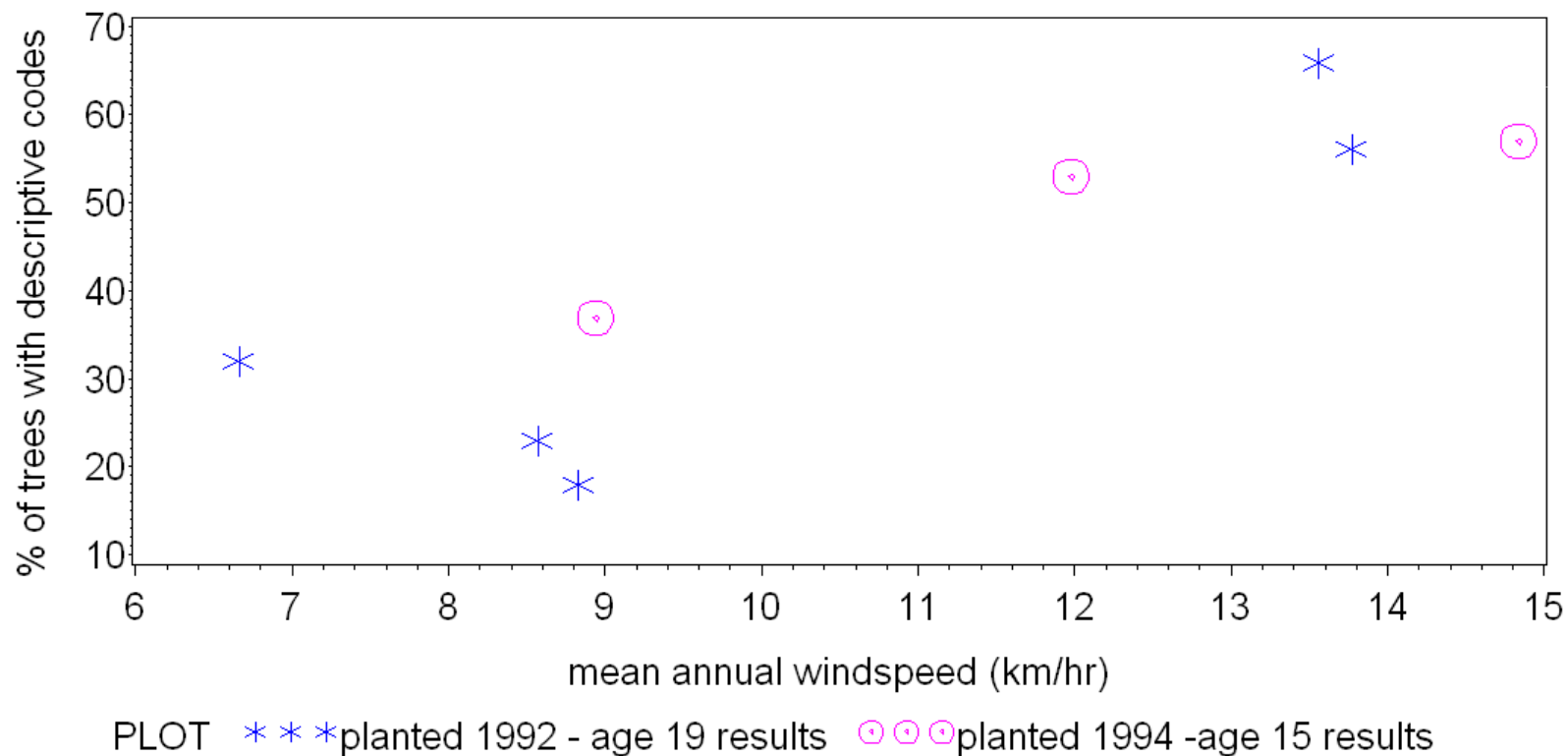


Mean annual
windspeed 8.57
km/hr

Mean annual
windspeed
13.56 km/hr

Radiata pine trials

- Proportion of trees with descriptive codes tends to increase with increasing mean annual windspeed



Radiata pine trials

- Treatment significant: 5 of 8 sites
- Seedlot significant: 4 of 8 sites
- Long-internode seedlot (selected for few branch cluster) generally more trees with “defects” than other seedlots
- Seedlots selected for high and low wood density – similar amounts of defects

Douglas-fir trial in North Island

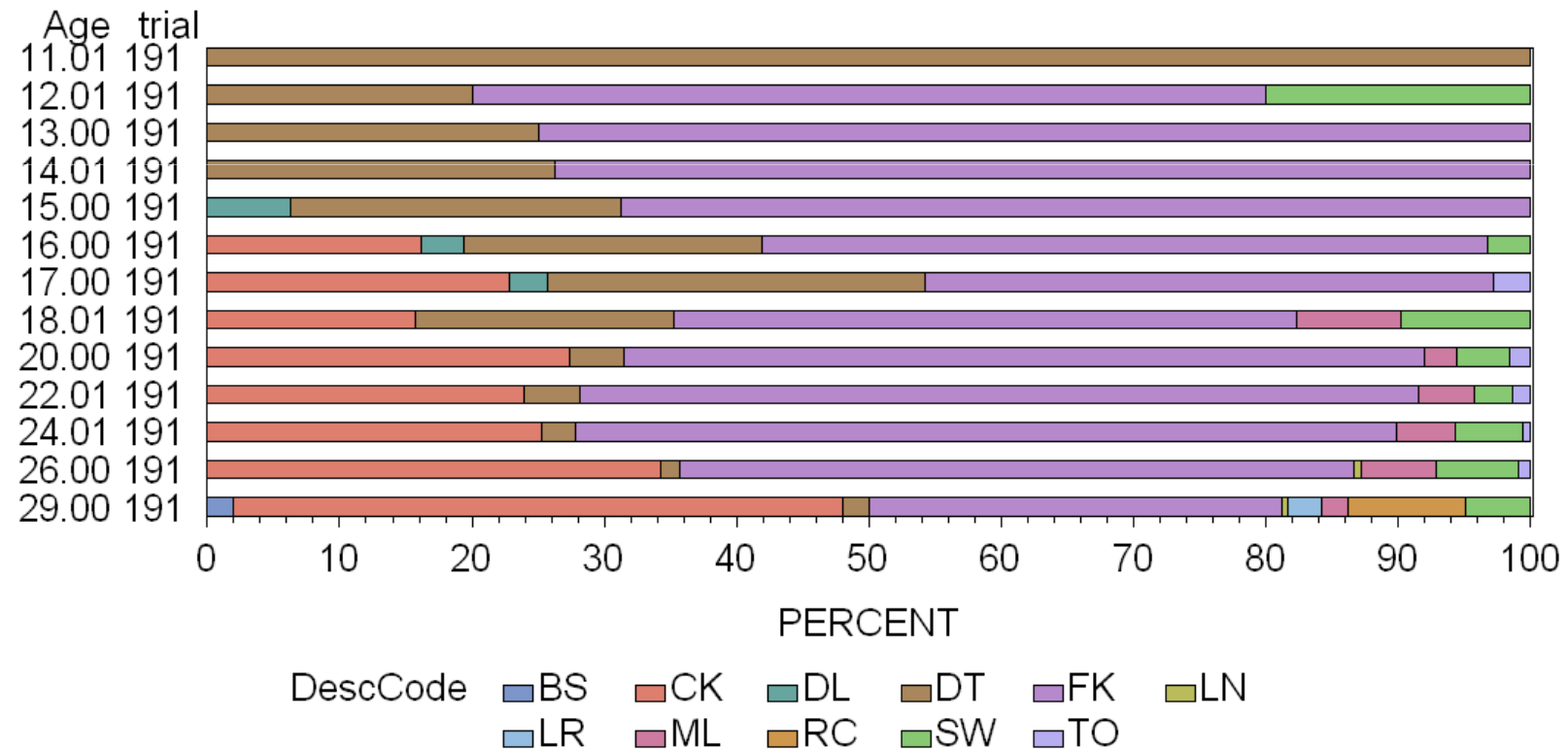


Douglas fir trial

- Site: mean annual windspeed 8.34 km/hr
- Planted 1982
- Thinned once at age 10.93 years
- Final stocking either 250, 500 or 750 stems/ha
- Unpruned or pruned regimes
- Pruning regimes combination of:
- Crown remaining after pruning lift: 4, 6 or 8 m
 - Nominal prune height 6 or 12 m (did not reach 12 m)
 - Stems pruned 250 or 500 sph

Douglas fir Trial

- Fork, most recorded defect. Crook also common



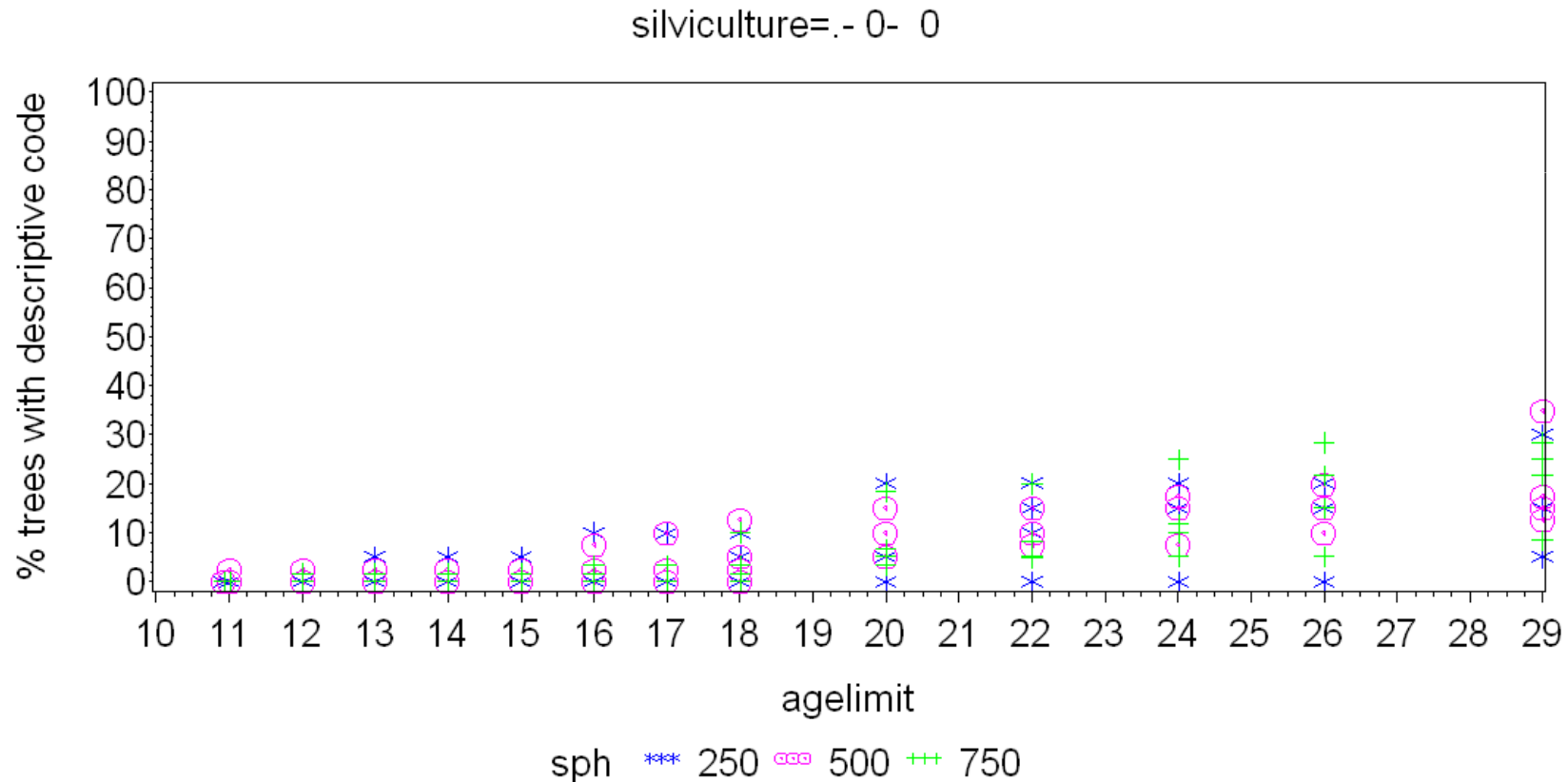
Douglas-fir Trial

- No significant difference with treatment
- On average 9% of trees have a descriptive code at age 20 years, and 18% by age 29 years



Douglas-fir trial

- Time trend in descriptive codes for unpruned plots with different final crop stockings



How to integrate descriptive codes into forest management tools?

- Tree growth model
 - Add a descriptive code to the individual tree
 - At a thinning step in order to constraint the thinning
 - At each step depending of age/ tree density/genetic
 - In connection with a wind model to model the wind breakage probability
- Wood quality model
 - Add a descriptive code to the individual tree
 - To integrate a decrease in wood quality due to tree form

How to integrate descriptive codes into forest management tools

- GIS system
 - To display the risk zone for worst tree form
- Perception from New Zealand industry
 - Too difficult to integrate branch response to damage into modelling systems
 - They already have “fudge-factors” that account for this type of loss

Acknowledgements

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