# Effect of Porous Paving on Tree Growth

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# Pervious Paving in the Literature

- Search for pervious paving on Scopus yielded:
  - **61** articles prior to 1980
  - **67** between 1980 – 1990
  - **118** between 1990 – 2000
  - **409** since 2000
- Research mirrors increased installation of PP

# The Motivation

- Too many "factoids"
- Prof. Bruce Ferguson, University of Georgia "***ideal for protecting trees in a paved environment***"[1]
- Tennis et al. 2004, Portland Cement Association "***increase the longevity of trees by improving moisture and oxygen relations***"[2]
- Prof. Vern Schaefer, University of Iowa "***preserving native ecosystems***"[3]
- Where's the proof?

# Hypothesis

In the presence of varying construction intensity, porous paving affects tree growth relative to standard impervious paving

# Treatments

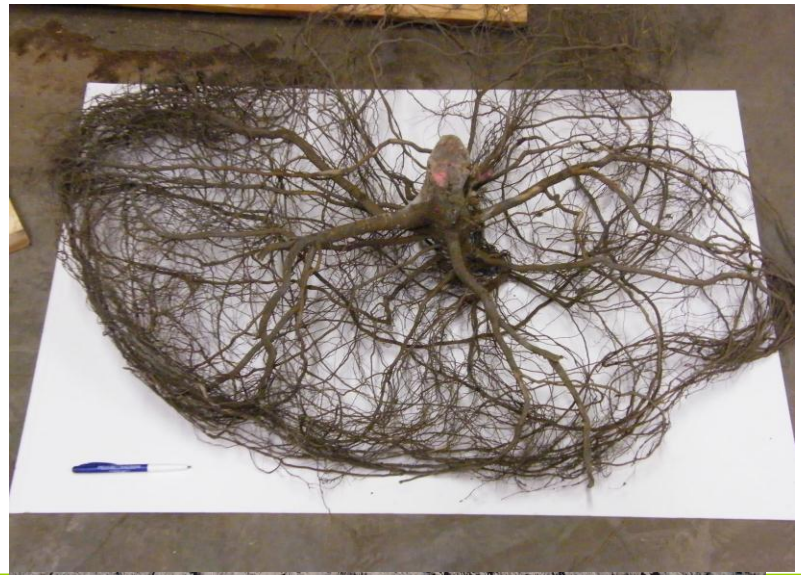
**Pavement Type → Porous, Impervious**
**Construction Type → No Subbase, Compacted Gravel Subbase**

# End of the First Season

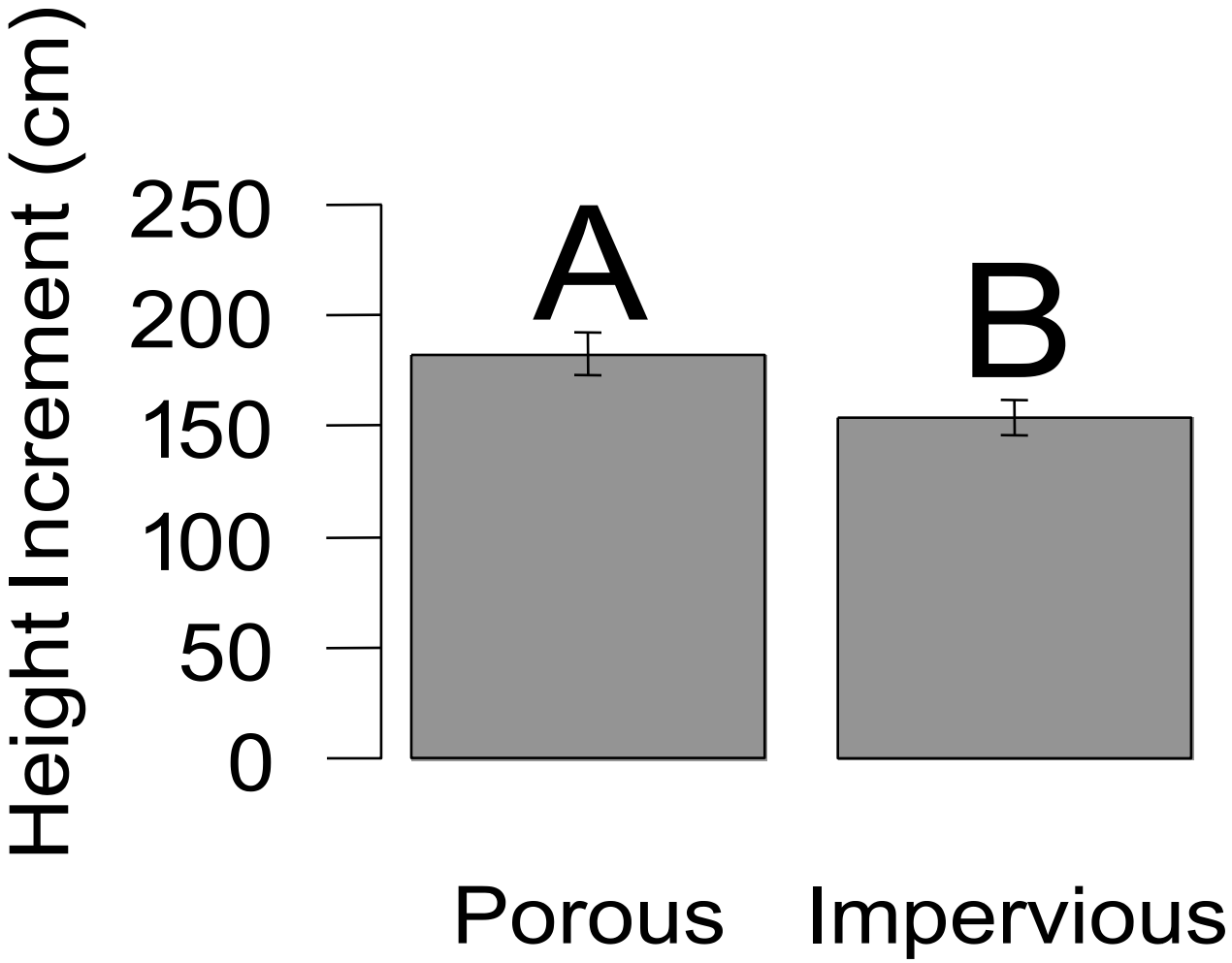
# End of Second Season

# Data Collection

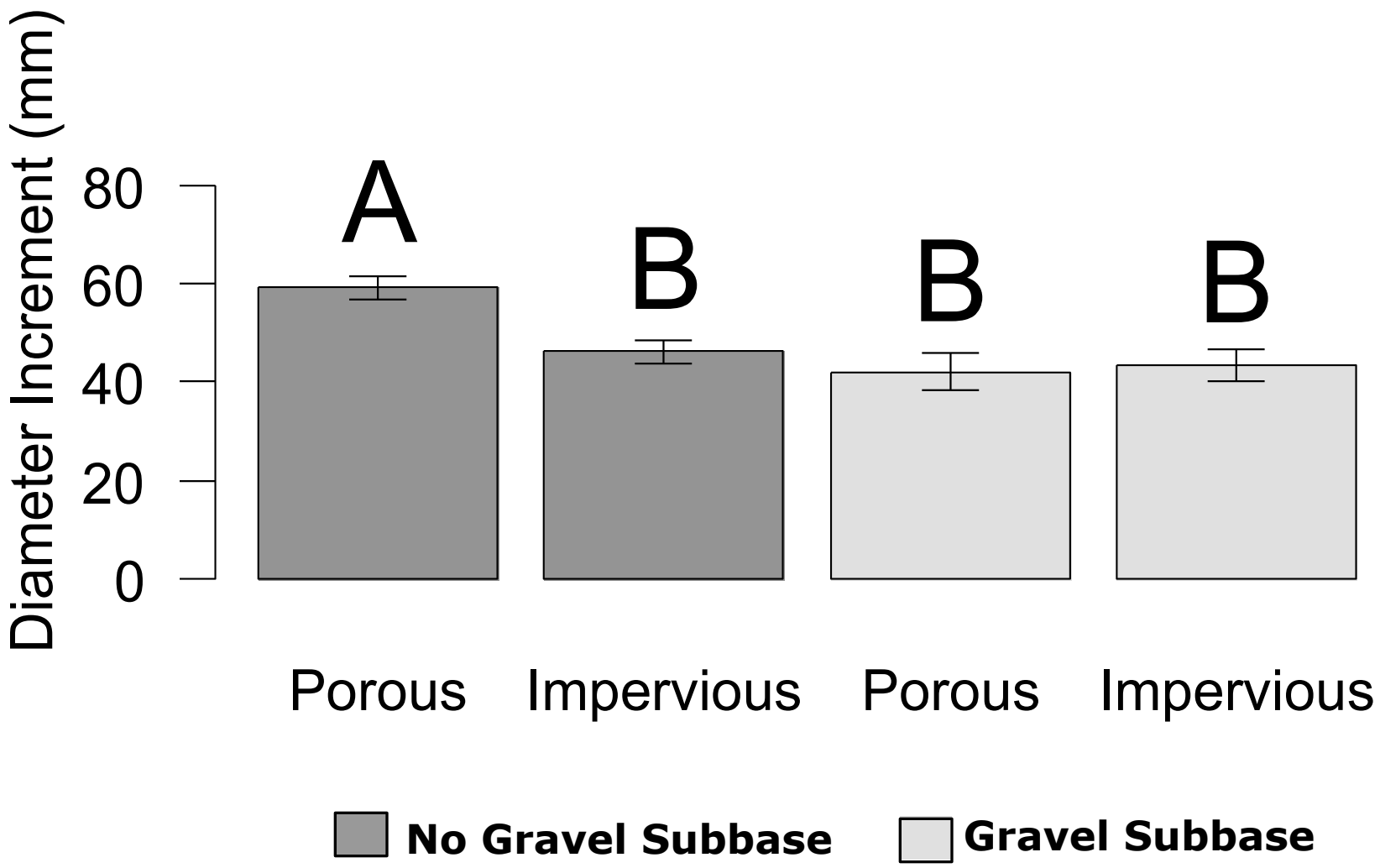
- Height
- Diameter
- Biomass
- Root Diameter and Distribution



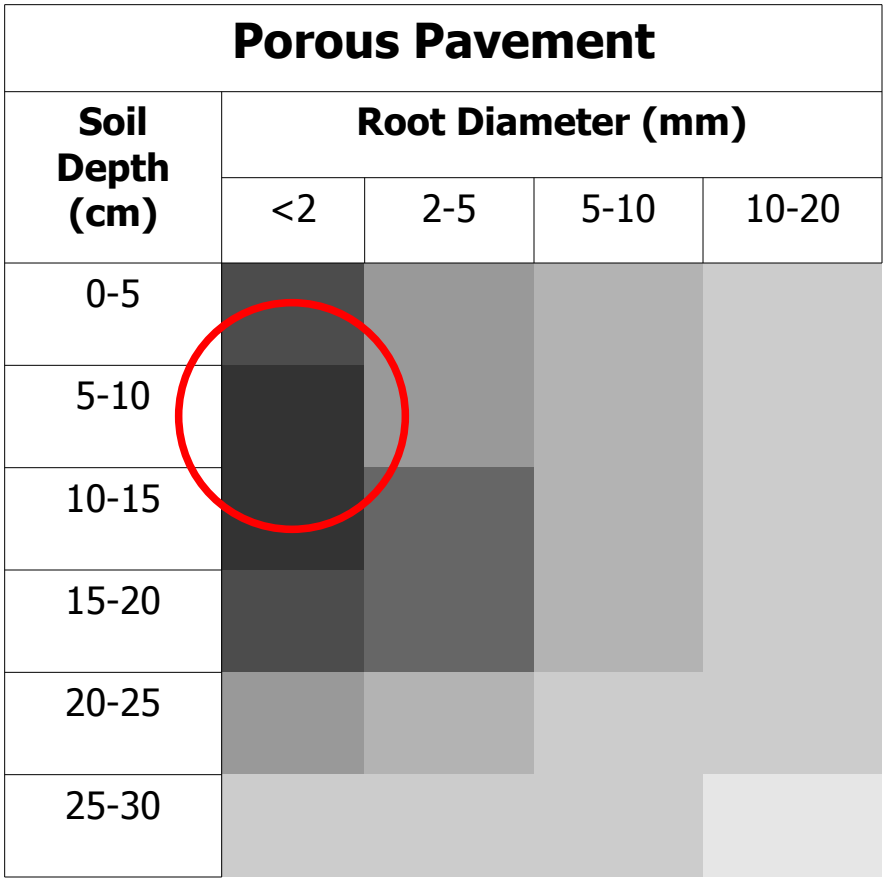
# Stem Height Growth

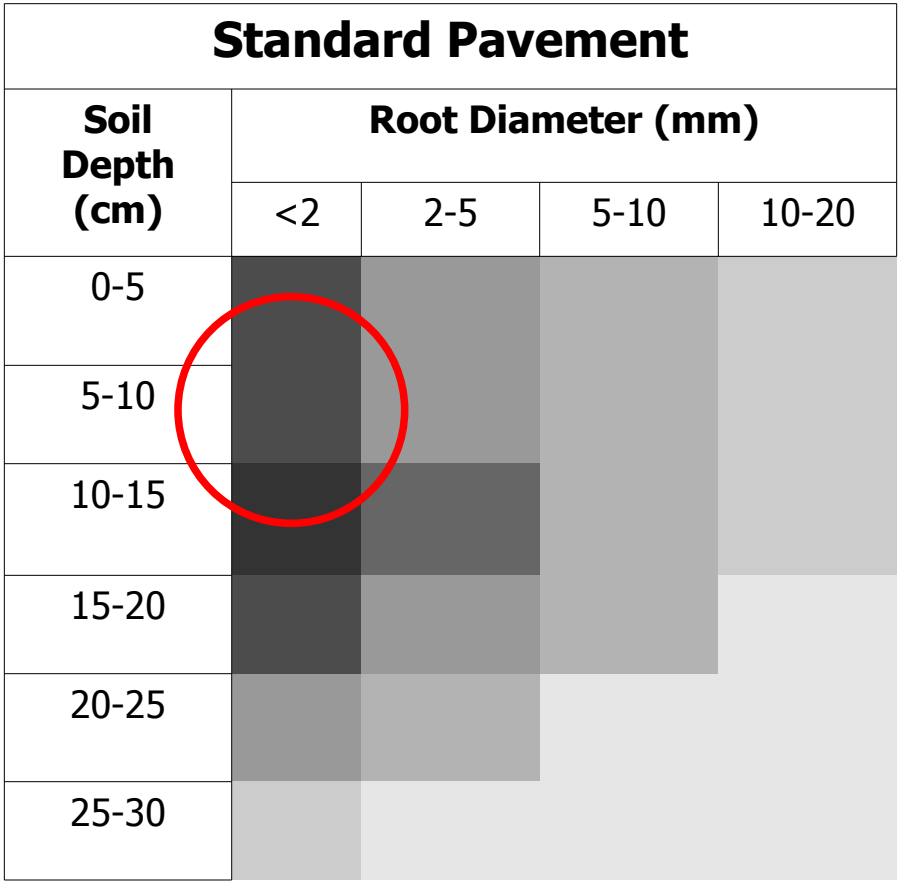


# Stem Diameter Growth



# No Subbase - Root Diameter and Distribution




# Gravel Subbase - Root Diameter and Distribution

**Porous + Subbase**

| Soil Depth (cm) | Root Diameter (mm) | | | |
|---|---|---|---|---|
| | <2 | 2-5 | 5-10 | 10-20 |
| 0-5 | | | | |
| 5-10 | | | | |
| 10-15 | | | | |
| 15-20 | | | | |
| 20-25 | | | | |
| 25-30 | | | | |

**Standard Concrete + Subbase**

| Soil Depth (cm) | Root Diameter (mm) | | | |
|---|---|---|---|---|
| | <2 | 2-5 | 5-10 | 10-20 |
| 0-5 | | | | |
| 5-10 | | | | |
| 10-15 | | | | |
| 15-20 | | | | |
| 20-25 | | | | |
| 25-30 | | | | |

# Summary of Findings

- Porous paving yielded significantly greater:
  - Stem height Increment
  - Stem diameter Increment
  - Above-ground biomass
  - Below-ground biomass
- With the exception of height increment this held true only when pavement was installed directly on the soil surface
- Root frequency and distribution data may yet provide interesting results

# Implications

- Load-bearing pavement (vehicular traffic) → little to no impact of porous paving
- Low load-bearing pavement (pedestrian traffic) → porous paving may improve tree growth

# Acknowledgements and References

**Funding**: TREE Fund, University of Canterbury, New Zealand School of Forestry, Auckland City Council, The McKelvey Fund, The Robert Bruce Trust

**Supervisors**: Dr. Rien Visser, Dr. Graeme Buchan, Dr. James Mackechnie

**Field work**: Joe Cartman, Lachlan Kirk, Nigel Pink, Alwyn Williams, Lisa Kulczycki, Neil Smith

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2. Tennis, P.D., M.L. Leming and D.J. Akers 2004. *Pervious Concrete Pavements*. Portland Cement Association and the National Ready Mixed Concrete Association.
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