Afforestation and water yield: the New Zealand experience

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Plantation forestry

- Mostly Pinus radiata
- 2002 – 1.8 million hectares (7% land area)
Afforestation catchment studies

1 - Moumoukai
2 – Purukohokohu
3 – Mangatu
4 – Moutere
5 – Ashley
6 – Kakahu
7 – Glendhu
8 – Berwick
## Brief summary of results

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Annual water yield summary

• 30-80% reduction following afforestation from pasture
• 37% reduction following afforestation of scrub
• Similar for gorse
• Percentages can be deceptive
  – 10% of total rainfall may or may not be important
• Normally long term averages
  – Variation year to year
% change in annual water yield

Annual precipitation (mm)
Annual water yield summary

- 30-60% reduction following afforestation from pasture
- 37% reduction following afforestation of scrub
- Similar for gorse
- Percentages can be deceptive
  - 10% of total rainfall may or may not be important
- Normally long term averages
  - Variation year to year
  - Timing of average important
    - Ashley drops from 62% to 52% by including one more year’s data
Annual yield vs low flows

Annual yield cf MALF7day

% change

Purukohukohu | Berwick | Glendhu | Kakahu
---|---|---|---
Annual | MALF7day

0 | 50 | 40 | 30 | 20 | 10 | 0
Impact of forest cover on storm flow

Figure 15.9 Storm hydrographs from catchments in tussock grassland and in 10-year-old *P. radiata*, Glendhu, east Otago.
Stormflow hydrology

- Greatest effect is on small floods
  - Return period of a year or less
- Timing of when flood occurs is important
  - Main impact is through soil moisture deficit
Sediment yield

- Many studies highlighting forestry practices
  - Roading
  - Logging operations
- Recent study looking at long term sediment yield from pasture and forestry
  - More sediment from pasture
  - Steady drip vs pulse
Changing issues and stakeholders

- 1930s – 1985: large scale state ownership of forests
  - Catchment research answering management questions of the day
- Post 1985: private forestry companies
  - Increasing foreign ownership
  - Disinvestment in science for management
- In past 5 years starting to see removal of plantation forestry
  - Land use change: dairy conversion
  - Nutrient and water quality issues
- Reforestation for carbon sinks and biodiversity
  - Native forest regeneration on marginal land
Summary

• Long history of catchment research on afforestation-deforestation issues
  – Consistent signal of water yield reduction
  – Majority reduction in small floods
  – Complicated in low flow area

• Sediment yield reduced following afforestation
  – Management practices main issue
  – Single pulse compared to drip of sediment

• Changing forest industry has seen a change in science emphasis and change in stakeholder group