

Willows or natives

is that the question?

Chris Phillips

Outline

- Introduction
- Catchment mgmt – riparian
- The issue
- A little of what we know
- A little of what we should know
- Some takeaways



The Q's?

- What's there?
- What's the condition?
- What are the functions?
- Can we do anything about it?
- What should we do, and where?
- What would the benefits be?



“where in the catchment should I start and what should I do first”



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The Big Question?

Can our New Zealand native plants perform E & SC functions as well as introduced plants?

In geotechnical terms, how do we quantify the benefits of vegetation to soil stabilisation?



What do we want from our plants?

- Rapid growth -->> surface cover
- Resilience/wide environmental tolerance
- Root depth - anchor plant
- Root spread – overlap with adjacent plants
- Strong surface root mat – hydraulic protection
- High root biomass – more the better
- Root occupancy – biggest volume
- Root strength – stronger roots more resistant to external forces



What we know about reveg. with natives

- Native reveg. not new – new & growing interest
- NZ R&D not kept pace with demand for knowledge
- International activity >>> NZ
- Emerging preference of natives over exotics
- Focus has been on biodiversity not other functions
- Biod vs Landscaping vs functional bio-engineering
- Some empirical data on function – limited
- Some observations – valuable e.g. NZERN
- Information is not connected well
- Little on cost/benefit or performance



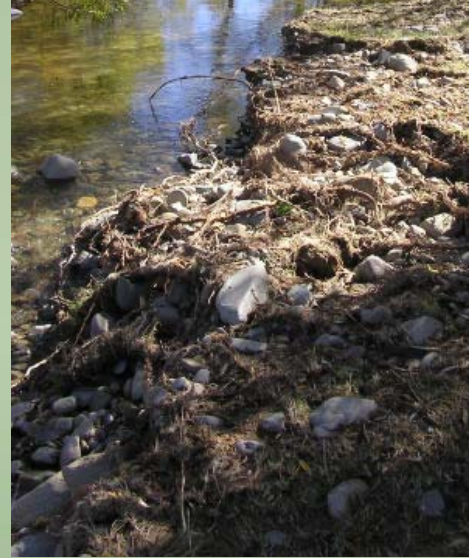
What about willows?

- Ubiquitous in the landscape
- Love 'em or hate 'em
- Problem or protector
- Weed or wonder
- How do we move from willows to something else?
- Should we change & why?



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*Hydraulic
resistance*

*Strong root
architecture*



2 recent strands of root work

Riparian plant trial

554 plants from age classes 1-5 yr

Common name	Botanical name
Karamu	<i>Coprosma robusta</i>
Ribbonwood	<i>Plagianthus regius</i>
Kowhai	<i>Sophora tetraptera</i>
Lemonwood	<i>Pittosporum eugenoides</i>
Kohuhu	<i>Pittosporum tenuifolium</i>
Lacebark	<i>Hoheria populnea</i>
Mapou	<i>Myrsine australis</i>
Fivefinger	<i>Pseudopanax arboreus</i>
Cabbage tree	<i>Cordyline australis</i>
Rewarewa	<i>Knightia excelsa</i>
Manuka	<i>Leptospermum scoparium</i>
Tutu	<i>Coriaria arborea</i>

Marden, Rowan, Phillips (in press)

Cabbage trees

13 plants age 2-25 yr



Czernin (2002)

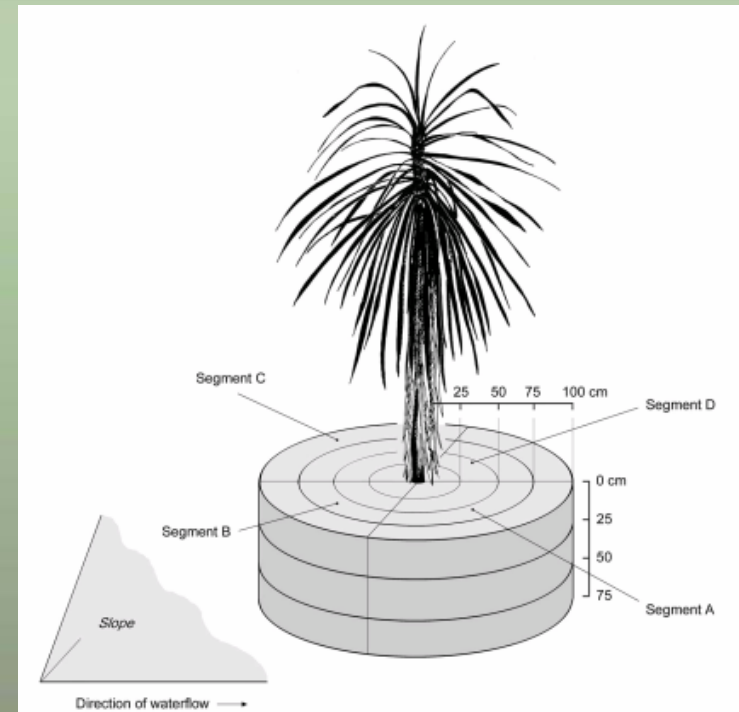
Czernin & Phillips (in prep)



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Root methods - general

- Self-sown and planted
- Water or air excavation
- Morphology and biomass
- Partitioning of root system
- Root tensile strength
- Pullout tests



Root spread

Pittosporum tenuifolium (kohuhu)

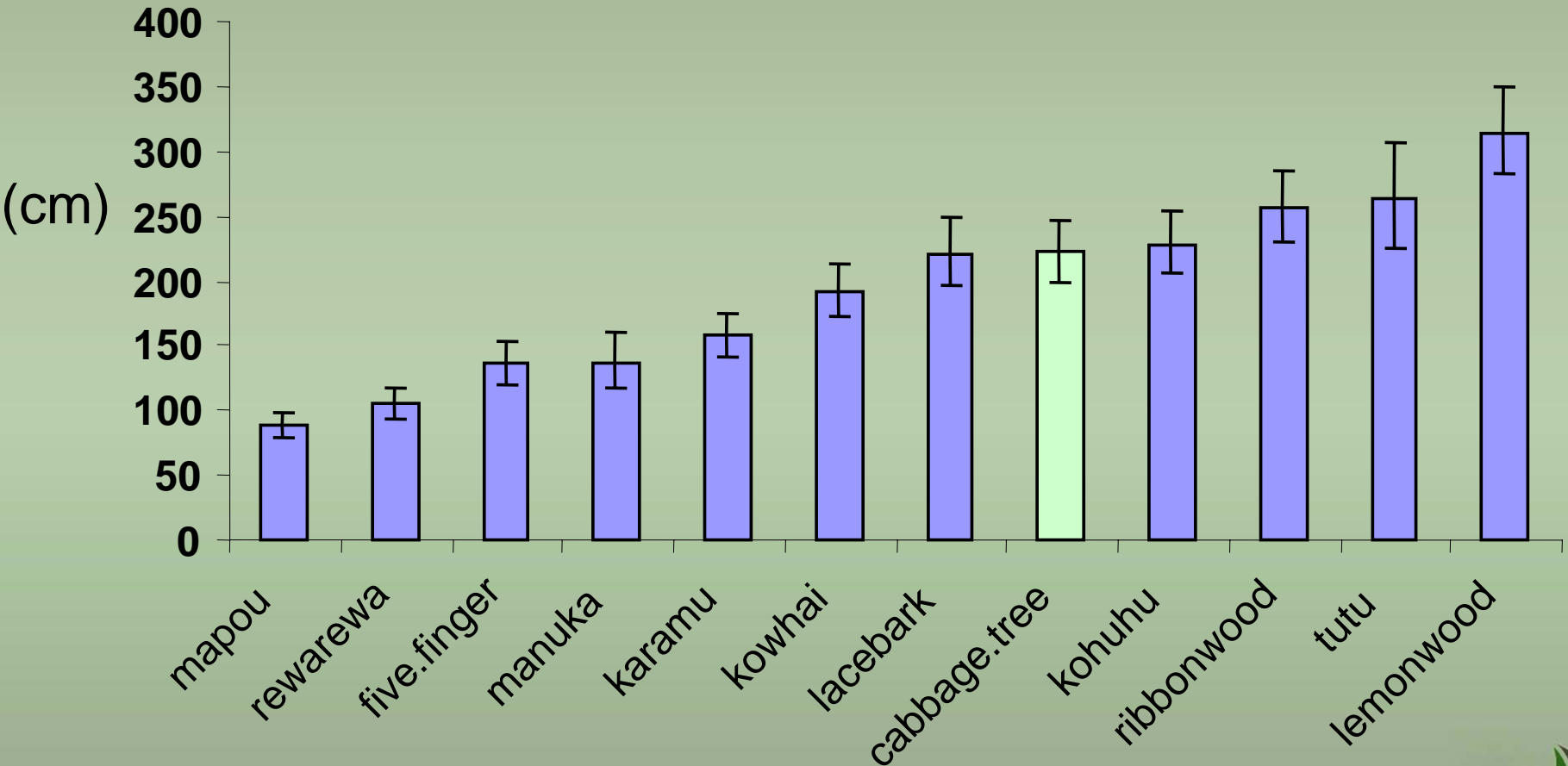


Coprosma robusta (karamu)

Cordyline australis
(ti kouka)



Mean max. root spread – 5 year old



Marden, Rowan, Phillips (in press)

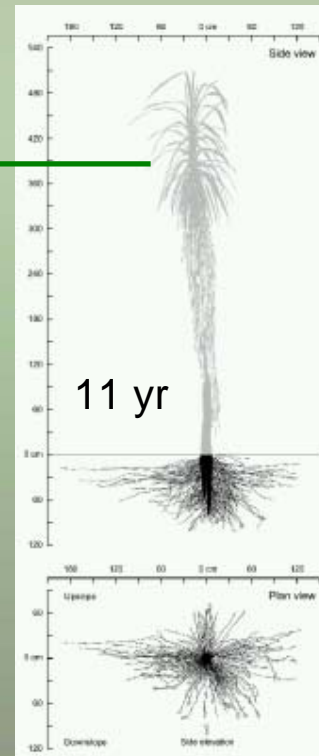
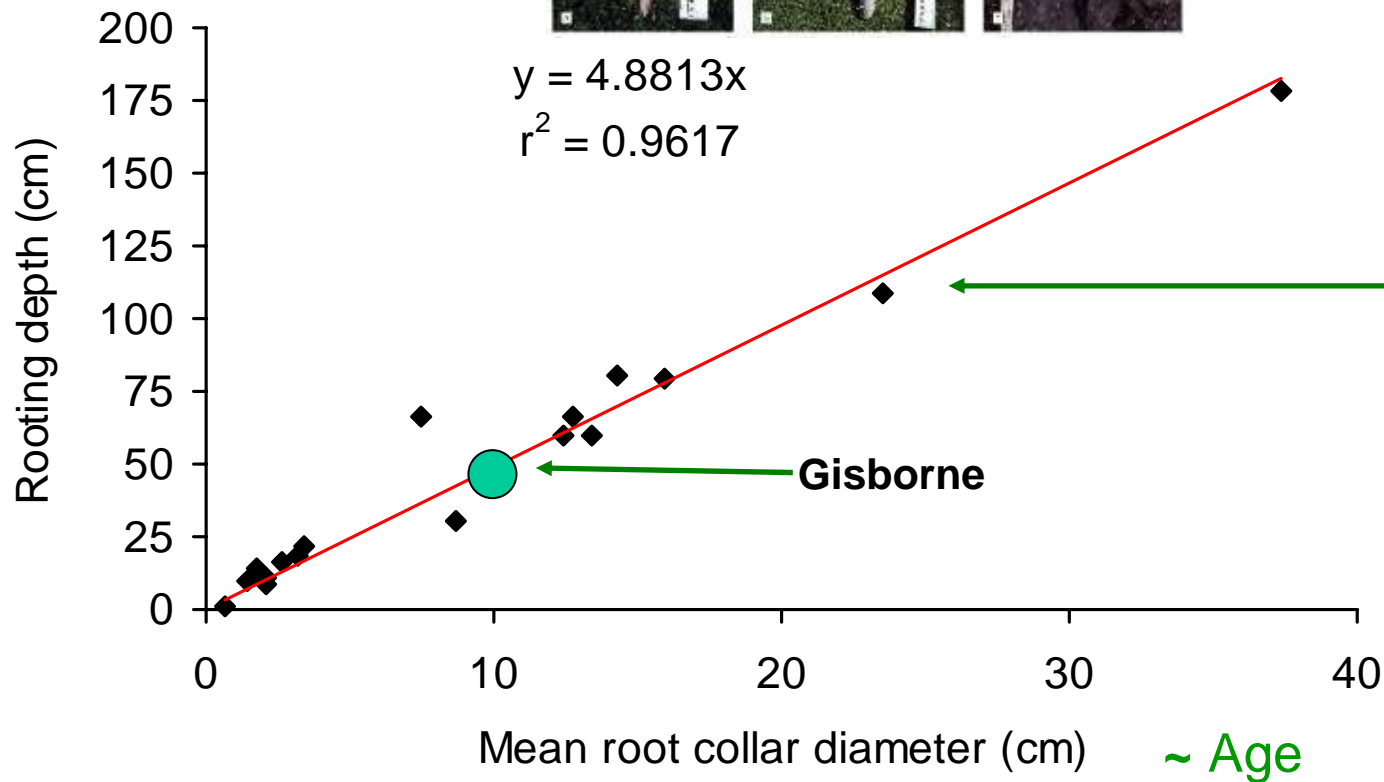
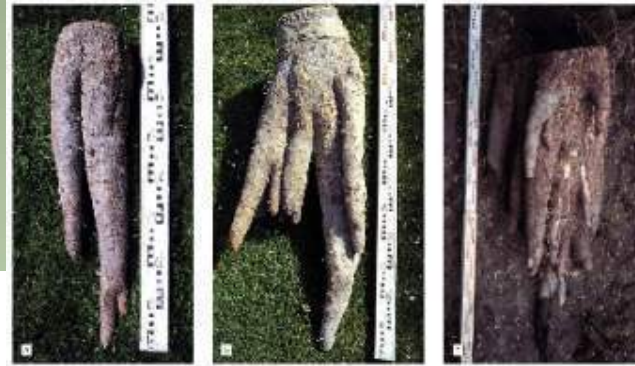


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Root depth – 5 year old

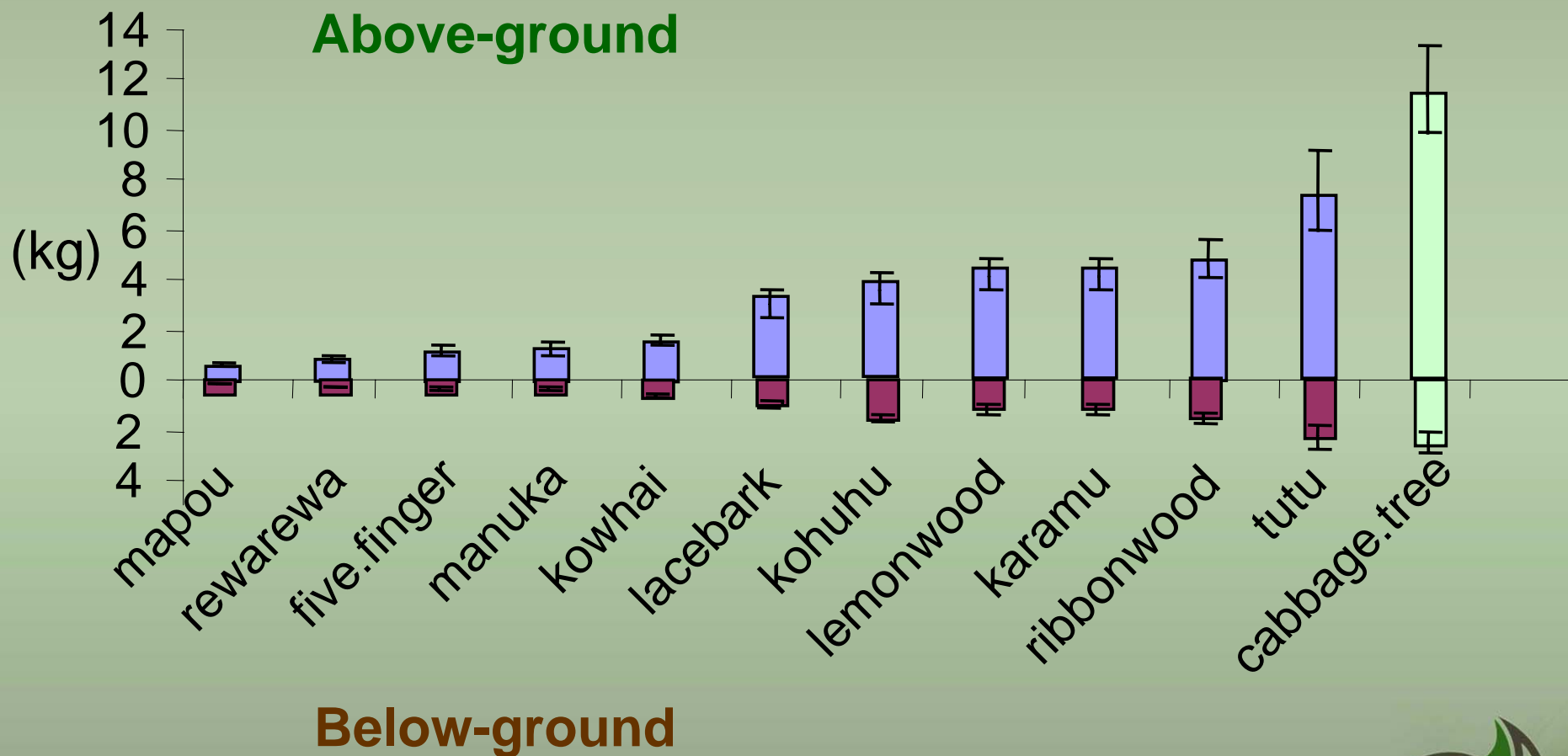


Root depth – cabbage tree



Czernin & Phillips (in prep)

Biomass – 5 year old



Marden, Rowan, Phillips (in press)

What to use?

Ecologically designed vs functional performance?

- Depth – cabbage tree, ribbonwood
- Spread – lemonwood, ribbonwood
- Above gd biomass – cabbage tree, tutu
- Below gd biomass – cabbage tree, tutu
- Tree height – lacebark, ribbonwood, cab. tree
- Canopy spread – tutu, karamu
- Root strength – lacebark, kanuka, kohuhu



Implications for bank stabilization - small streams

- no limitations, provided that bank height is not more than ~2 m and channel bed is stable
- success depends on density - formation of dense canopy & full root occupancy of the soil
- shallow soil stabilisation after 3-5 years
- improvement in deeper slope stabilisation expected within 7-10 years of establishment
- species can withstand breakage and over-topple

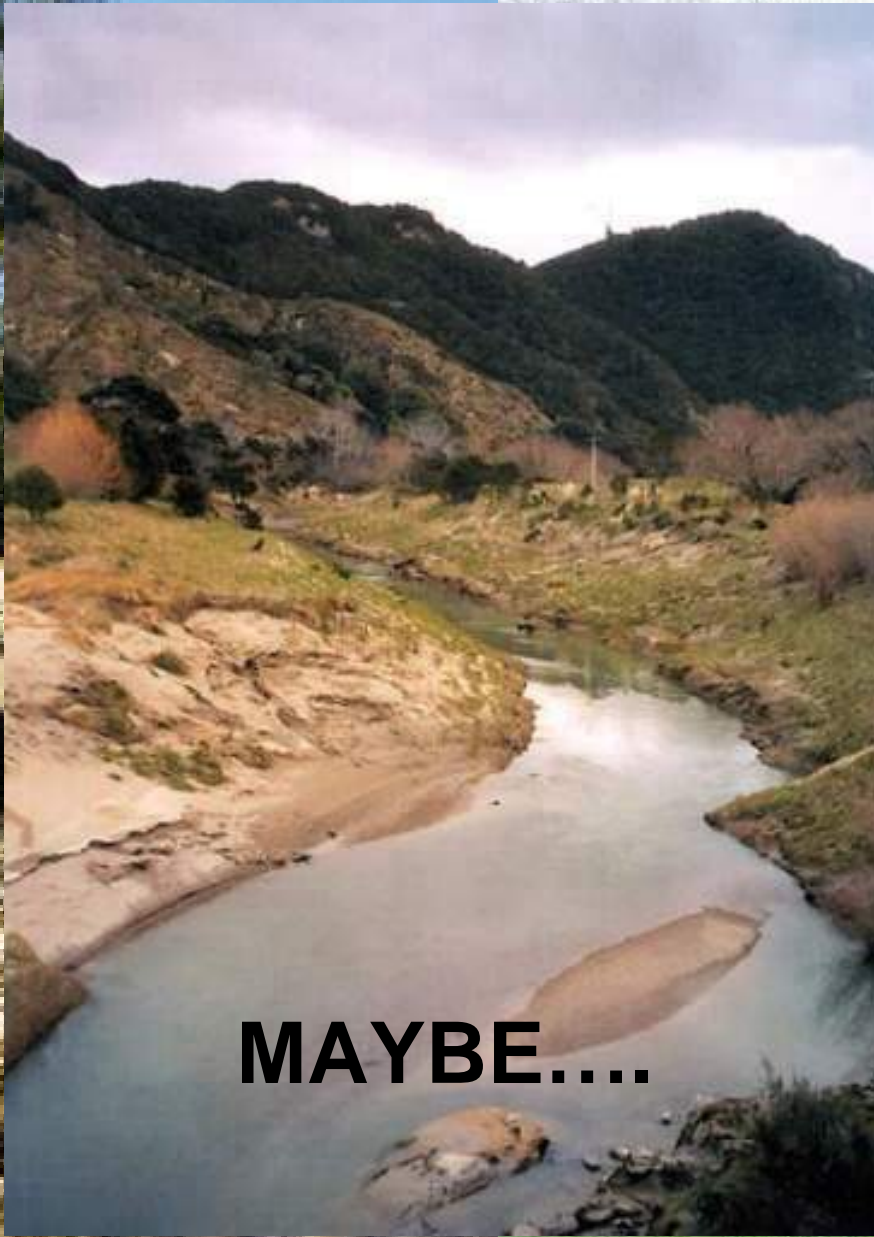


Implications for bank stabilization - large streams

- lack of roots in deeper soil layers limits usefulness in streams where bank undercutting occurs
- ineffective if bank height exceeds effective rooting depth ~ 2 m.
- banks would need to be graded and unstable channel beds artificially regraded prior to planting



Pictorially



MAYBE....



Avondale Stream, existing channel, May 2004



Avondale Stream, *Carex* added



Avondale Stream, *Juncus* added



Avondale Stream, native trees added



Existing channel has little in-stream cover



Riparian grasses provide cover & spawning habitat



Cabbage trees suitable above the wetland grasses



Summary – natives in general

- NZ natives take longer to grow cf exotics – but not slow
- Some natives can regenerate, eg cabbage trees - good
- Woody plants effective after about 5 years
- Change the ecological mix to suit the site
- Mixed plantings of natives and exotics?
- More work needed on functional performance



Future – needs mostly applied science!

- Faster growing – seed/cutting/???
- The answer lies in the soil ‘me lad’!?
- Roots & soil strength – how does it work?
- Delivery applications – what’s best?
- What’s the best mix for E&SC?
- Performance – functional and C/B
- Performance – natives vs exotics
- Performance – weeds and maintenance
- Performance – plants and “hard controls”
- Commercial advantage & public good?
- Info & Knowledge connecting & sharing



Take home messages

- We don't know as much as we should
 - Protection is better than fixing it
 - Mitigation does not get us back
 - Topsoil is key to reveg. success
 - Salvage/re-use is a viable alternative
 - Roads & Streams can play a big part in NZ's biod. recovery
 - More work needed on native establishment techniques
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- Vegetation is not just for looking at – it can also have a range of engineering functions
 - Our native plants can provide an E & SC service



The end



INTEGRATED CATCHMENT MANAGEMENT

for the *Motueka River*

<http://icm.LandcareResearch.co.nz>