THE UNIVERSITY OF WESTERN AUSTRALIA

Achieve International Excellence

SCHOOL OF AGRICULTURAL & RESOURCE ECONOMICS

Balancing competing values in natural resource management

David Pannell

ARC Federation Fellow
Director, Centre for Environmental Economics and Policy
University of Western Australia

bushfire CRC

Bushfire policy and management

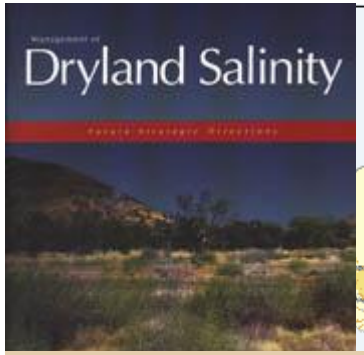
- Decisions are complex
- Not unique
- Can learn from experiences in other sectors
  - Mistakes
  - Successes
  - Approaches
  - Tools
  - Concepts

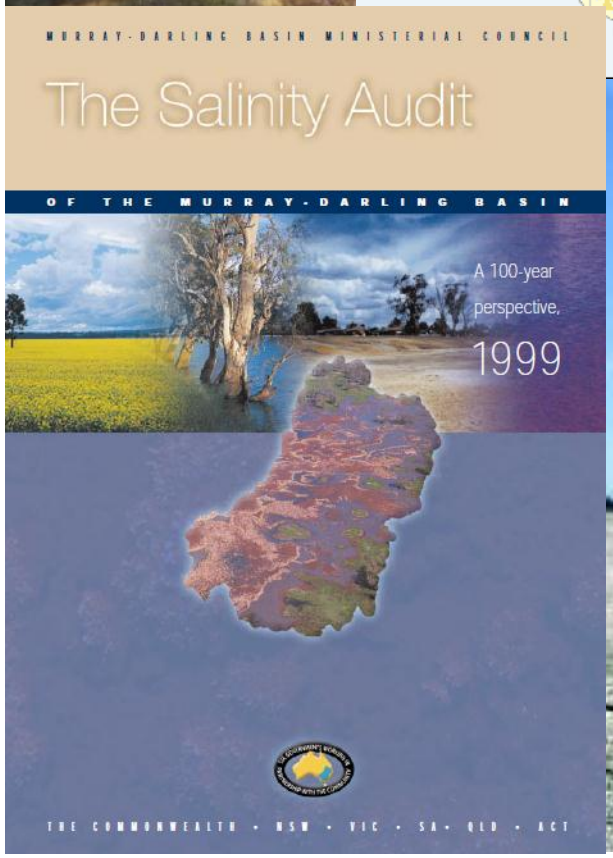
bushfire CRC

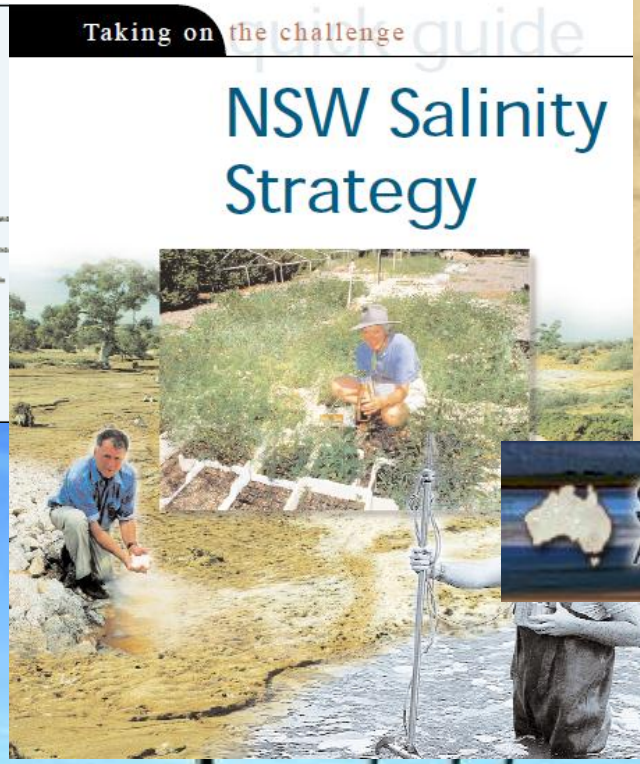
Remember 2000

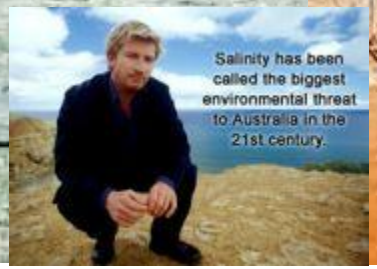
bushfire CRC

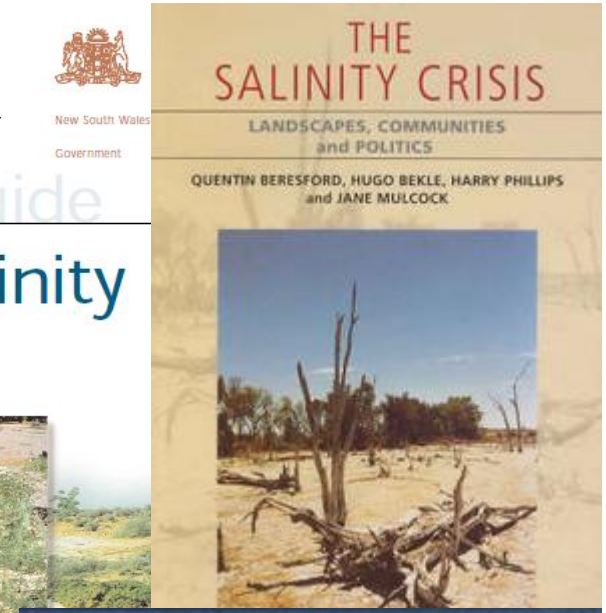
Salinity was a hot topic

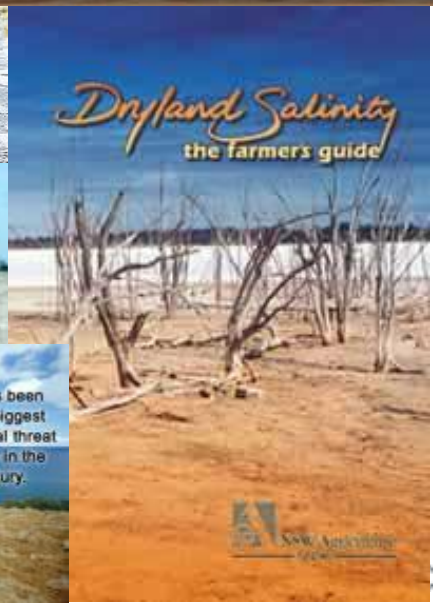












I was doing research on …

- the economics of salinity
- adoption of salinity management practices
- the hydrology of salinity

Aust. J. Soil Res., 2001, 39, 861–875

Explaining groundwater hydrographs: separating atypical rainfall events from time trends

Ruhi Ferdowsian[AC], *David J. Pannell*[B], *Clare McCarron*[A], *Arj*
and Lisa Crossing[A]

[A]Agriculture Western Australia, Albany, WA 6330, Australia.
[B]Faculty of Agriculture, University of Western Australia, Perth, WA 6907
[C]Corresponding author; email: rferdowsian@agric.wa.gov.au

Abstract

By 1994, an estimated 1.8 million hectares of cleared land in Western Aus
dryland salinity to some extent. The area affected is likely to double in th
this salinity is excessive recharge under traditional agriculture, leadin
Monitoring changes in groundwater levels is helpful in indicating the deg
and public assets. Many researchers have studied groundwater level rises
statistically.

We present an approach for statistically estimating trends in groundwat
the effect of atypical rainfall events from the underlying time trend and
impact on groundwater is explicitly represented. Rainfall is represented a
from average rainfall. Application of the approach is demonstrated
Jerramungup Shire, Western Australia. The approach provides high exp

The Australian Journal of Agricultural and Resource Economics, 45:4, pp. 517–546

Dryland salinity: economic, scientific, social and policy dimensions†

David J. Pannell*

of information relevant to salinity is reviewed in order to critically
g and prospective policy responses. The review includes issues of
armer perceptions and preferences, farm-level economics of salinity
ractices, spill-over benefits and costs from salinity management,

l challenge of preventing salinity is far greater than previously
farm-level economics of currently available management practices
vention are adverse in many situations. Off-site benefits from on-
re often small and long delayed. Past national salinity policies have
flawed. While current policy proposals include positive elements,
ufficiently escaped from the past.

1. Introduction

is seen as one of Australia's most serious environmental
anagement problems. There have been major government

CHAPTER 21

EXPLAINING NON-ADOPTION OF PRACTICES TO PREVENT DRYLAND SALINITY IN WESTERN AUSTRALIA: IMPLICATIONS FOR POLICY

DAVID J. PANNELL

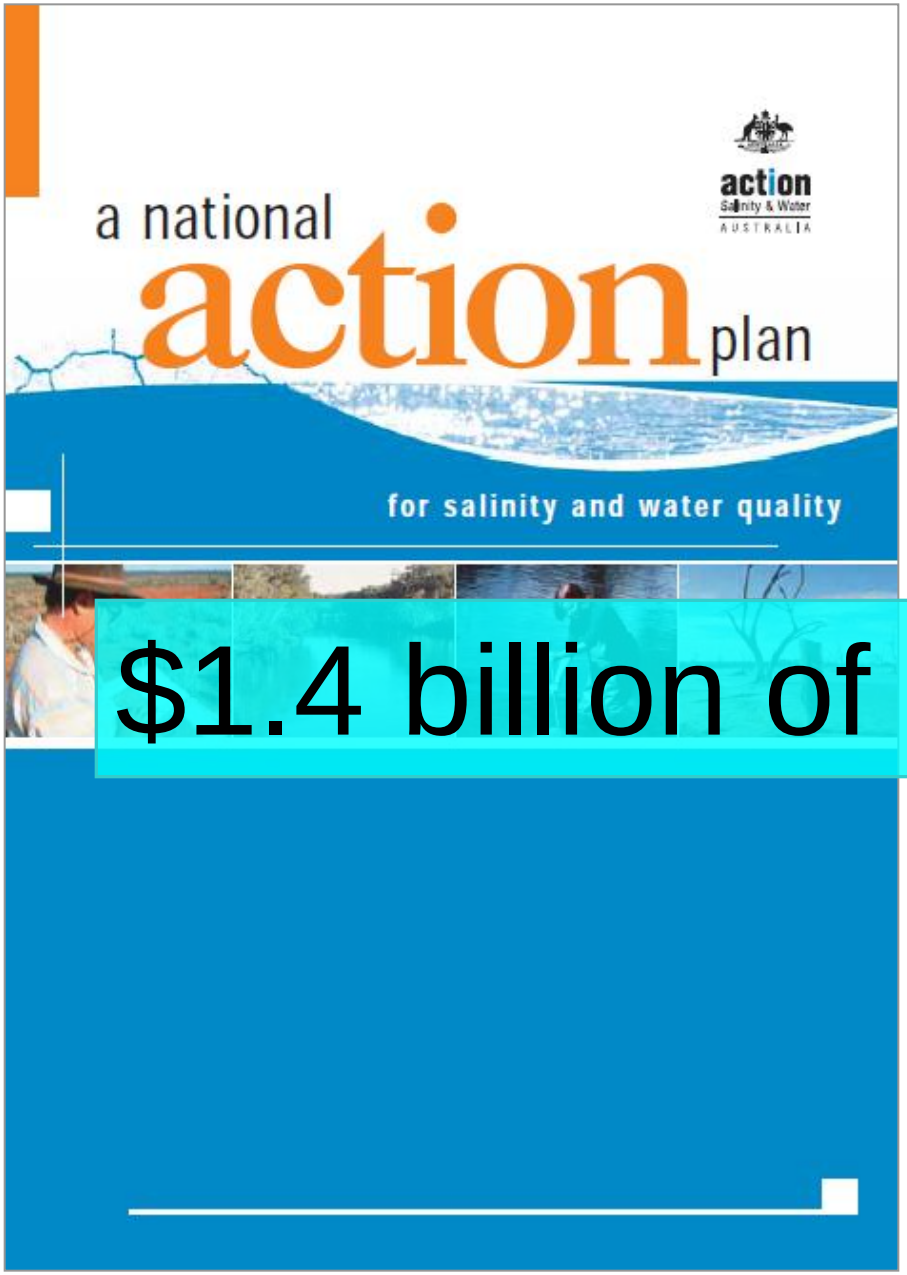
1. Abstract

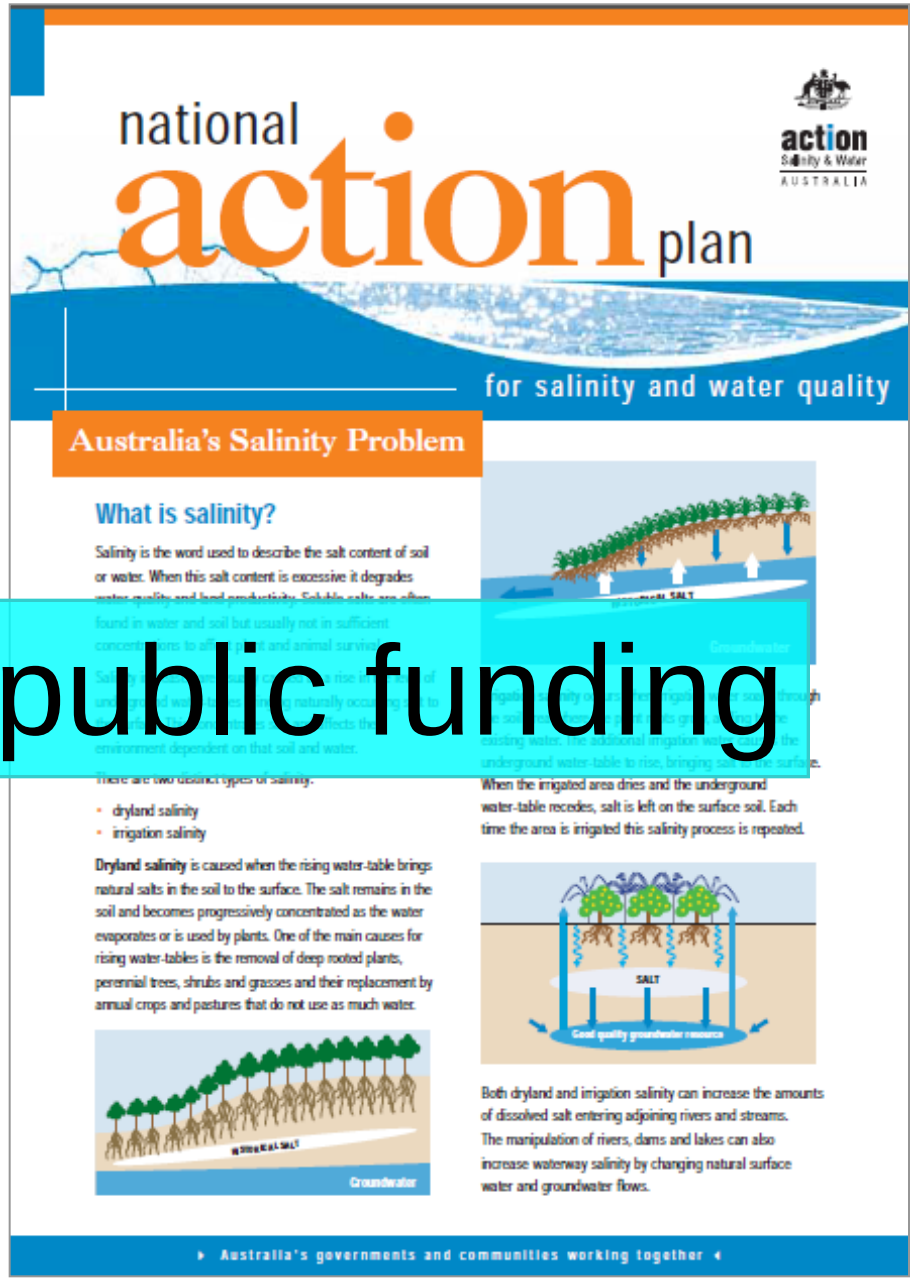
In agricultural regions of Western Australia in the coming decades, dryland salinity will result in the loss of millions of hectares of productive agricultural land, will severely affect native vegetation and fauna, will continue to salinise almost all waterways and lakes, and will cause great damage to roads, buildings and other infrastructure. Scientists believe that to avert (or even to significantly reduce) this disaster, very large areas of current agricultural land would need to be converted to perennial plant species, either trees or perennial pastures. Although the farming community in Western Australia has become

- Some findings controversial
- Was taking time to marshal evidence
- Was ready to go public

- Just then, the Australian Government announced …

bushfire CRC





$1.4 billion of public funding

Shocked

- … at poor design of the program
- Program developers seemed to have been unaware of two crucial areas of salinity research and their combined implications
- The physical science provided clear evidence about the degree of change required
- The social science provided clear evidence that this was impossible to achieve with the approaches being used in the NAP

bushfire CRC

Lesson 1.

For complex problems like this, you need to account for both:

- the technical/physical/biological aspects, &
- the social/economic/political aspects

in an integrated way.

bushfire CRC

Worried and angry

- the biggest single-issue environmental program in Australia's history
- no chance of doing anything significant

Jump forward to end of program

"… with a few exceptions, projects under the National Action Plan generated few worthwhile salinity mitigation benefits and will have little enduring benefit."

Pannell, D.J. and Roberts, A.M. (2010). The National Action Plan for Salinity and Water Quality: A retrospective assessment, *Australian Journal of Agricultural and Resource Economics*, 54(4): 437-456.

bushfire CRC

My response

- Media
- Discussion papers
- Presentations
- Submissions

Millions wasted fighting salinity, says researcher

By Science Writer
MARK STEENE

THE millions of dollars spent fighting dry-land salinity was largely being wasted because it could not solve the problems, a researcher said yesterday.

Associate Professor David Pannell, of the University of Western Australia, said the current philosophy of Integrated Cat
was misguided
Instead, he a
generally be t
problem.
Professor Pa
dia Associatio
water moved

lems." Professor Pannell said in some situations it could take up to 3000 years for water to cross aquifers, while water generally only moved horizontally across the water table a few metres a year.

He gave an example in Western Australia where groups of trees planted to alleviate salinity only had an effect on the water table up to

Salt plan fails to bring new ideas

PICTURE in your mind's

☐ The fourth salinity plan in

Given that the new WA Gov-

Economist puts salt on tail of big debate

SALT concerns must be addressed as a local problem, and not a catchment concern, if progress is to be made in overcoming dry-land salinity.

University of WA resource economist David Pannell has warned of the damage caused by the common "whole valley" approach to solve salinity concerns.

While acknowledging his approach as "almost heretical", he described the whole valley approach as a national mistake, saying most salinity concerns arose on site and could be ad-

Given the localised nature of salinity concerns, Mr Pannell said it was going to be difficult for the community to justify government spending to solve individual on-farm problems.

He said the implications of a community salt levy were extreme when there was a low transfer of benefits off-farm or off-site.

He also attacked the level of spending on research for salt solutions, claiming it was "a disgrace" there was no government investment in salt tolerant industries in WA.

Salinity policy: a tale of fallacies, misconceptions and hidden assumptions

by David Pannell
Associate Professor, Agricultural and Resource Economics, University of Western Australia

Past national salinity policies have been seriously flawed. The new 'National Action Plan' has positive elements but has not sufficiently escaped from the past. We need to get beyond the idea that, with small inputs of public money,

New direction urged for salinity

he real salinity story

Western Australia is stuck with salinity.

30 years, people in WA have

chance for soils to absorb particularly heavy rainfall. Eventually, extra rain is like pouring water onto a plastic sheet, and the increased runoff increases the flood risk. In

THE ISSUES

Big decisions called for on salinity fight

☐ Common sense must be a priority in tackling salt worries, says David Pannell and Ted Lefroy.

MILLIONS of dollars are being spent managing salinity and the need for more money has raised the possibility of a salt levy.

Farmer groups argue that the money should

For nature reserves in farming areas, drains and pumping may be the only effective remedy.

This would benefit the whole community.

As the problems generally were not caused

Convinced WA Salinity Council

- Established committee to develop “Salinity Investment Framework”
- I let them get on with it
- Mistake
  - Struck resistance from people who didn’t understand the research, or had vested interests
  - Individuals moved on or lost interest
  - Got overwhelmed by the integration task
  - Insufficient dedicated resources

bushfire CRC

Lesson 2.

It’s not enough for researchers to point out the need for change. Must stay engaged with the change process to help people understand the research and its implications, and to help with integration challenge.

bushfire CRC

Re-engaged

- Developed INFFER (Investment Framework for Environmental Resources)
  - ❖ Prioritisation of environmental projects
  - ❖ Assess cost-effectiveness of projects
  - ❖ Selection of policy mechanism
  - ❖ Improved project design

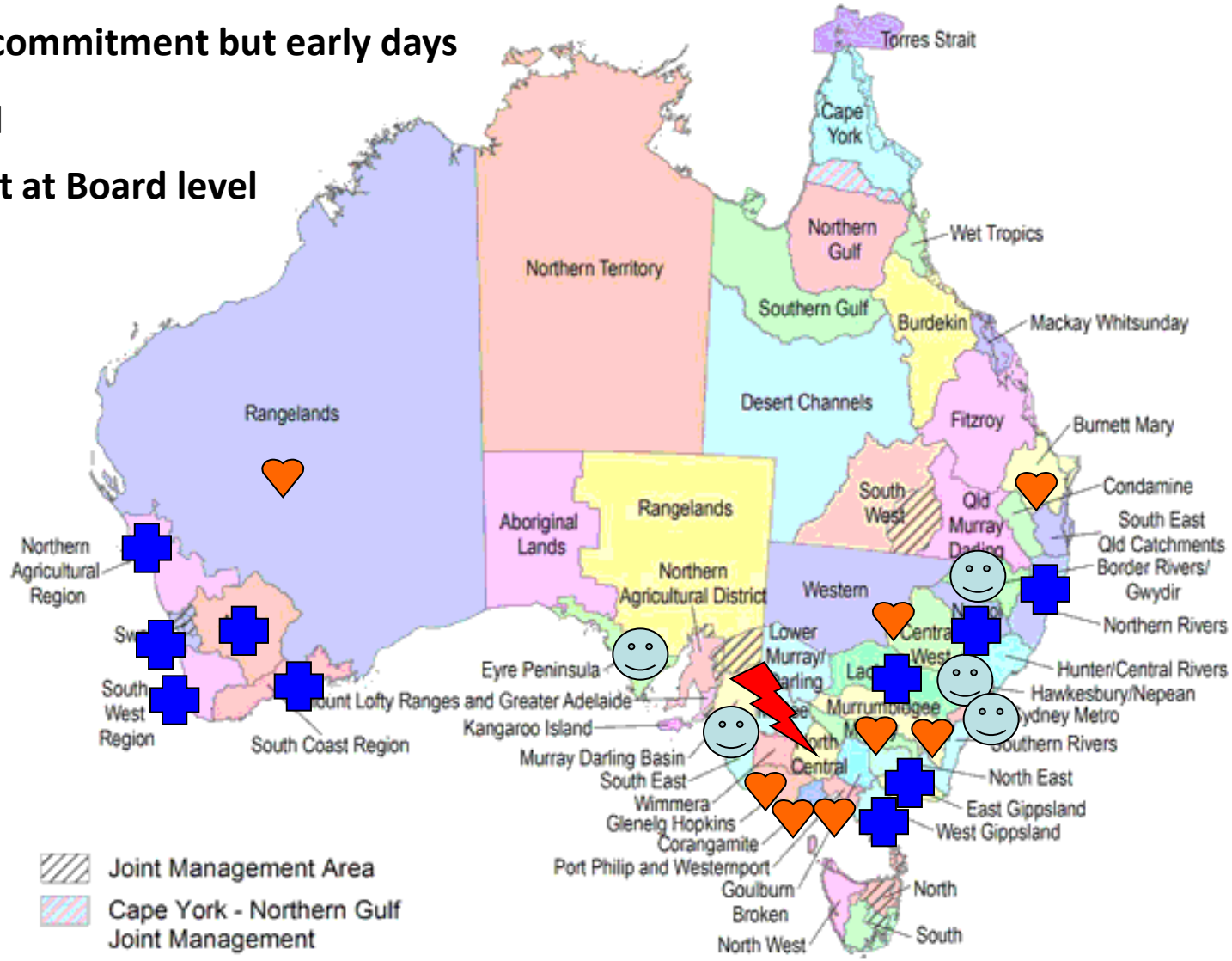
inffer
Investment Framework for Environmental Resources

Full adoption - embedded

Board commitment but early days

Trialled

Interest at Board level



Also has been used in Canada, Italy, and The Netherlands

bushfire CRC

- The following slides outline several lessons that have emerged from the work with INFFER that are relevant to bushfires

Lesson 3.

Managers and policy makers find the issue of “values” difficult.

Values

- Need information on values to
  - Evaluate cost-effectiveness of strategies
  - Assessing trade-offs between values
- Usually not handled explicitly
- Sometimes there is reluctance to do so
  - Subjectivity
  - Not sure how to account for them
  - Don’t believe they are relevant
  - Prefer not to know

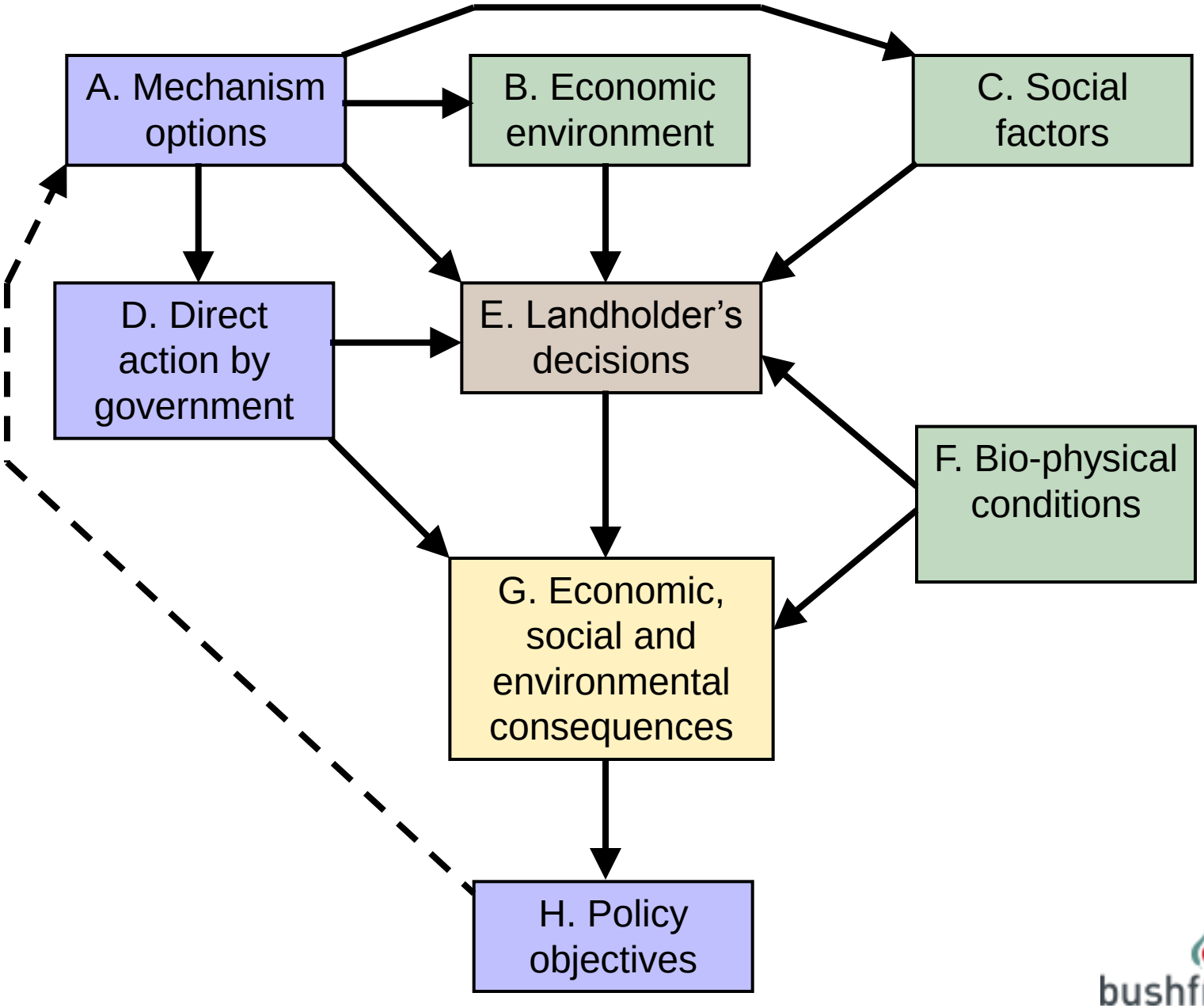
bushfire CRC

Lesson 4.

A policy can influence but not control people.

There are limits to what policy can achieve in the way of behaviour change, even if implemented perfectly.

bushfire CRC



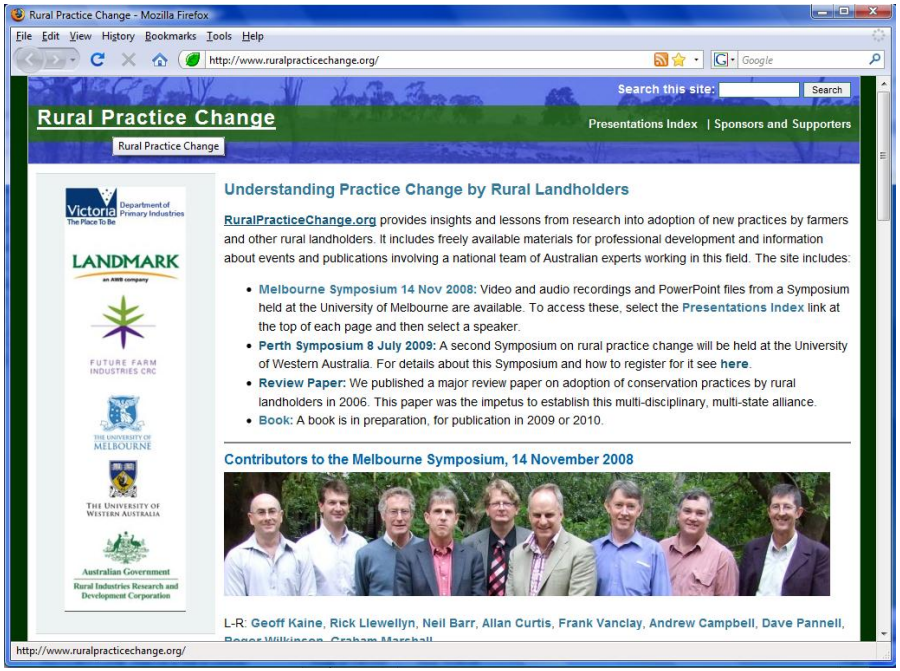
bushfire CRC

Many possible reasons for not changing

- Don’t believe in the promised benefits
- Changes benefit others but not self
- Developed own strategy already
- Don’t understand or misinterpret the recommendations
- Too expensive to be worth the benefits
- Too expensive to afford
- Too time consuming or too complex
- Not paying attention
- Not aware of the relevance
- Other issues more important

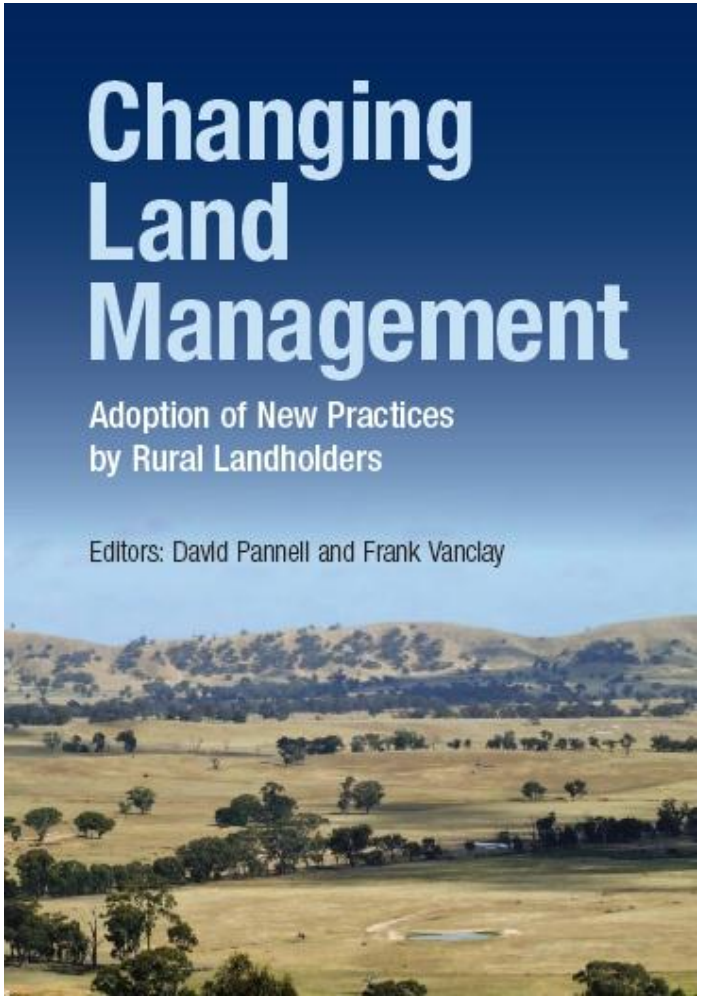
bushfire CRC

www.RuralPracticeChange.org



- Videos
- Audio
- PowerPoints
- Book flier
- ADOPT (coming soon)

Book



bushfire CRC

Lesson 5.

Strategies can have both benefits and costs (not just financial) that need to be weighed up.

Benefits and cost

- Salinity example
  - ❖ Planting trees reduces groundwater-driven salinity, but may increase river salinity by reducing surface water flows, and reduce downstream water availability.

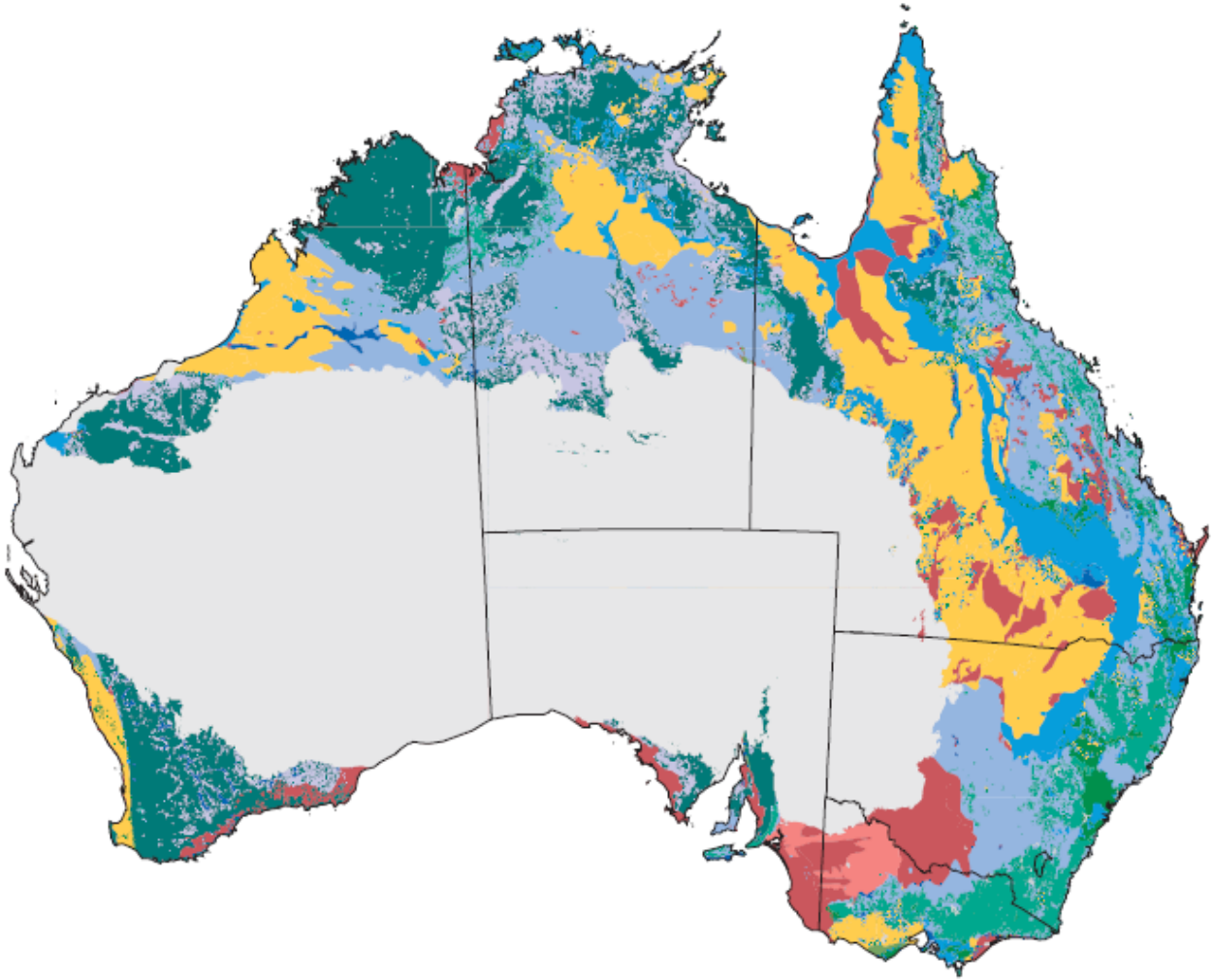
- Bushfire example
  - ❖ Prescribed burning reduces risks to life and property, but may increase risks to some biodiversity

bushfire CRC

Lesson 6.

Spatial heterogeneity means a simple uniform strategy may be unwise.

Australian groundwater flow systems



Local

- deeply weathered rocks
- fractured rocks or weathered fractured rocks
- fine-grained sediments
- sand dunes

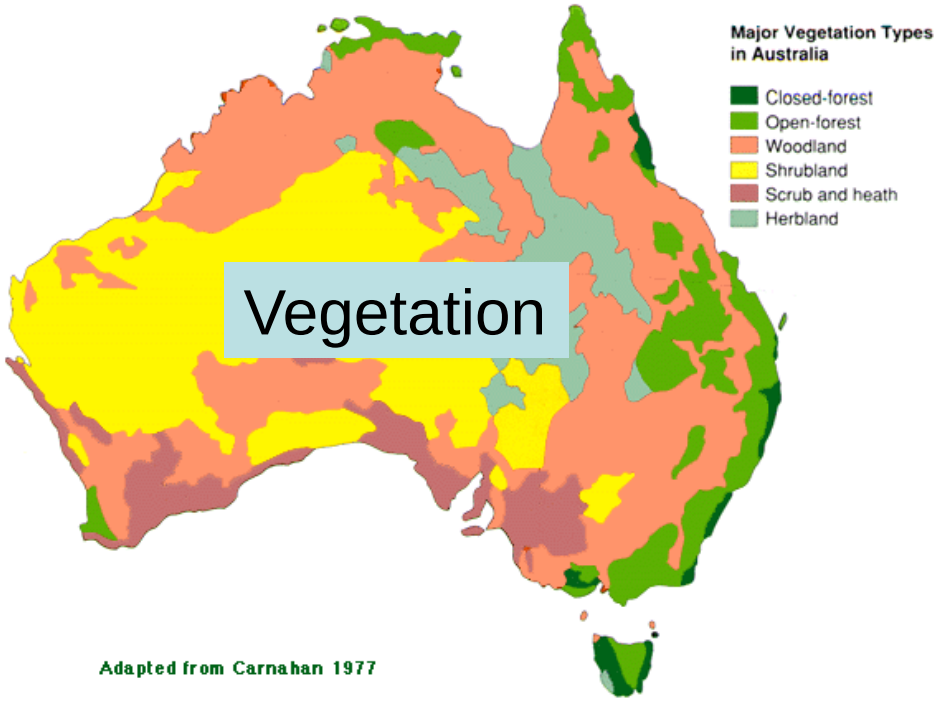
Intermediate

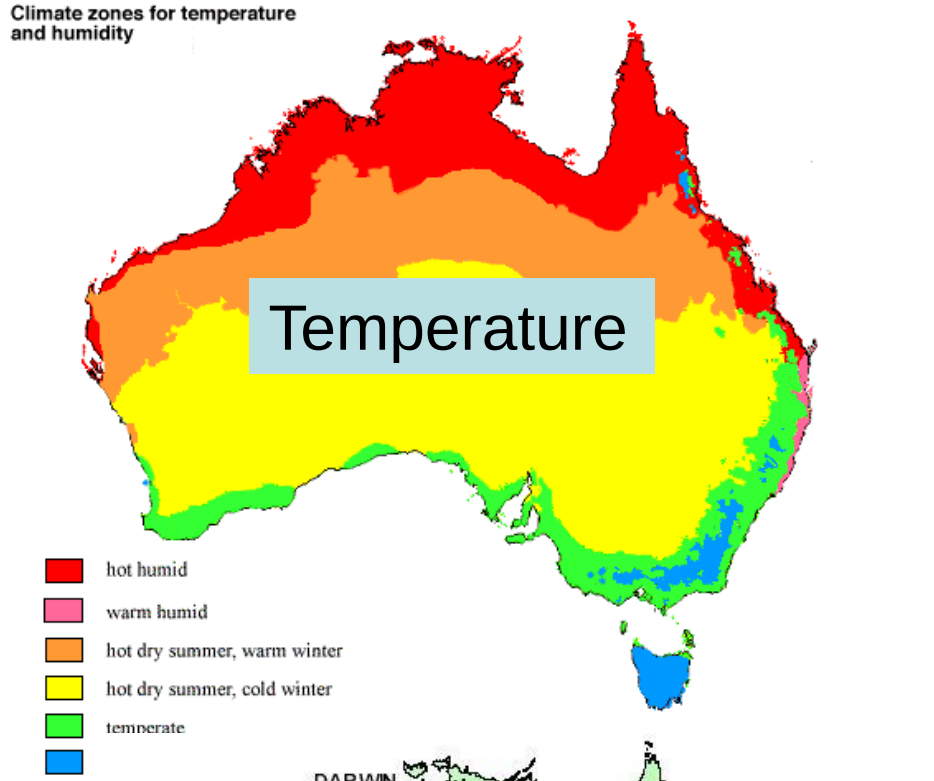
- sedimentary sequences
- layered sedimentary sequences or fractured basaltic rocks
- fractured rocks
- deeply weathered rocks

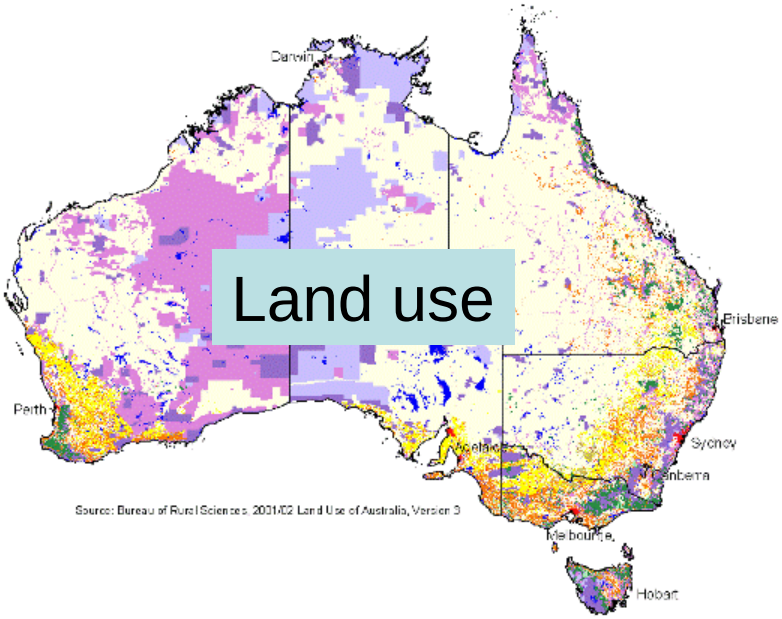
Regional

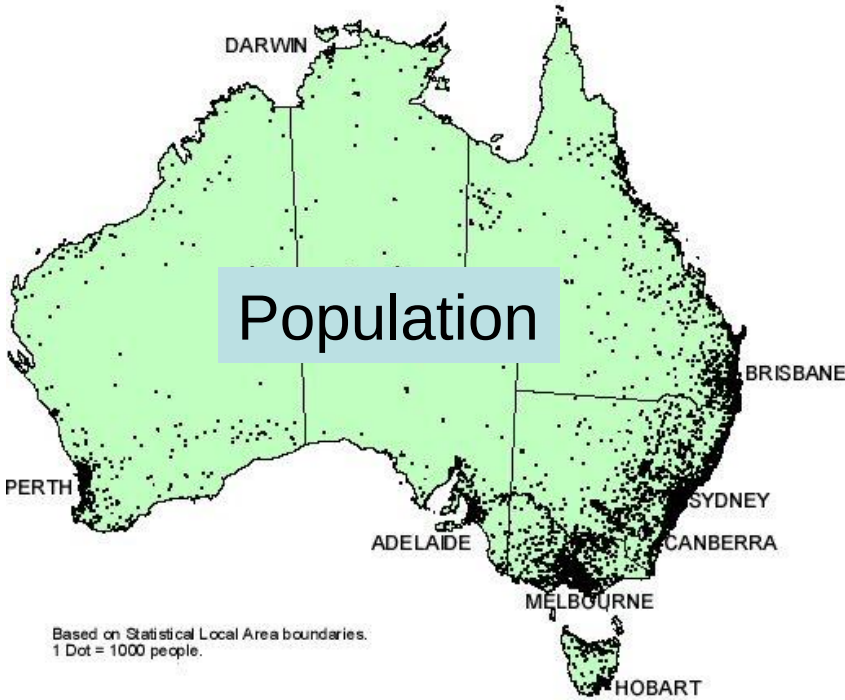
- alluvial sediments
- shallow marine and other sediments
- layered sedimentary or fractured basaltic rocks
- (less than 300 mm annual rainfall zone)

bushfire CRC


Major Vegetation Types in Australia
Closed-forest
Open-forest
Woodland
Shrubland
Scrub and heath
Herbland
Vegetation
Adapted from Carnahan 1977


Climate zones for temperature and humidity
Temperature
hot humid
warm humid
hot dry summer, warm winter
hot dry summer, cold winter
temperate


Land use
Darwin
Brisbane
Perth
Sydney
Canberra
Melbourne
Hobart
Source: Bureau of Rural Sciences, 2001/02 Land Use of Australia, Version 3


Population
DARWIN
BRISBANE
PERTH
SYDNEY
ADELAIDE
CANBERRA
MELBOURNE
HOBART
Based on Statistical Local Area boundaries.
1 Dot = 1000 people.

Lesson 7.

Uncertainty is ubiquitous.

Even for issues that have been extensively researched, you can never get the numbers you really need for decision making.

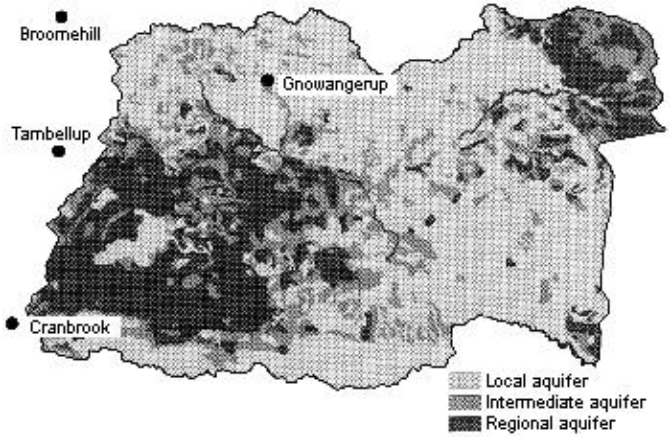
Uncertainty

- Why?
  - ❖ Information requirements are large
  - ❖ Researchers not focused on decisions
- Uncertainty should be handled explicitly
- Consider information quality in decisions
- Deal with knowledge gaps
  - ❖ Identify them
  - ❖ Assess their importance
  - ❖ Have a strategy

bushfire CRC

Conflicting scientific opinions

- Salinity – importance of external impacts from management



- Bushfires – environmental impacts of prescribed burning

THE UNIVERSITY OF WESTERN AUSTRALIA
Achieve International Excellence

SCHOOL OF AGRICULTURAL & RESOURCE ECONOMICS

Project:
Integrated assessment of prescribed burning

Funding from Bushfire CRC for a 12-month project

bushfire CRC

Aims

(a) To provide integrated assessment of various prescribed burning strategies

(b) To quantify trade-offs between socio-economic and environmental outcomes from various prescribed burning strategies

(c) To identify circumstances where prescribed burning is a preferred strategy, and how that strategy should vary in different circumstances

bushfire CRC

Elements

- Alternative goals/outcomes
- Value/significance of different outcomes
- Management options
- Assets at risk
- Risk levels under various management regimes (cause and effect)
- Landholder adoption/compliance
- Policy options
- Costs of projects/interventions (short term and long-term)
- Risks of projects/interventions

bushfire CRC

Handling uncertainties

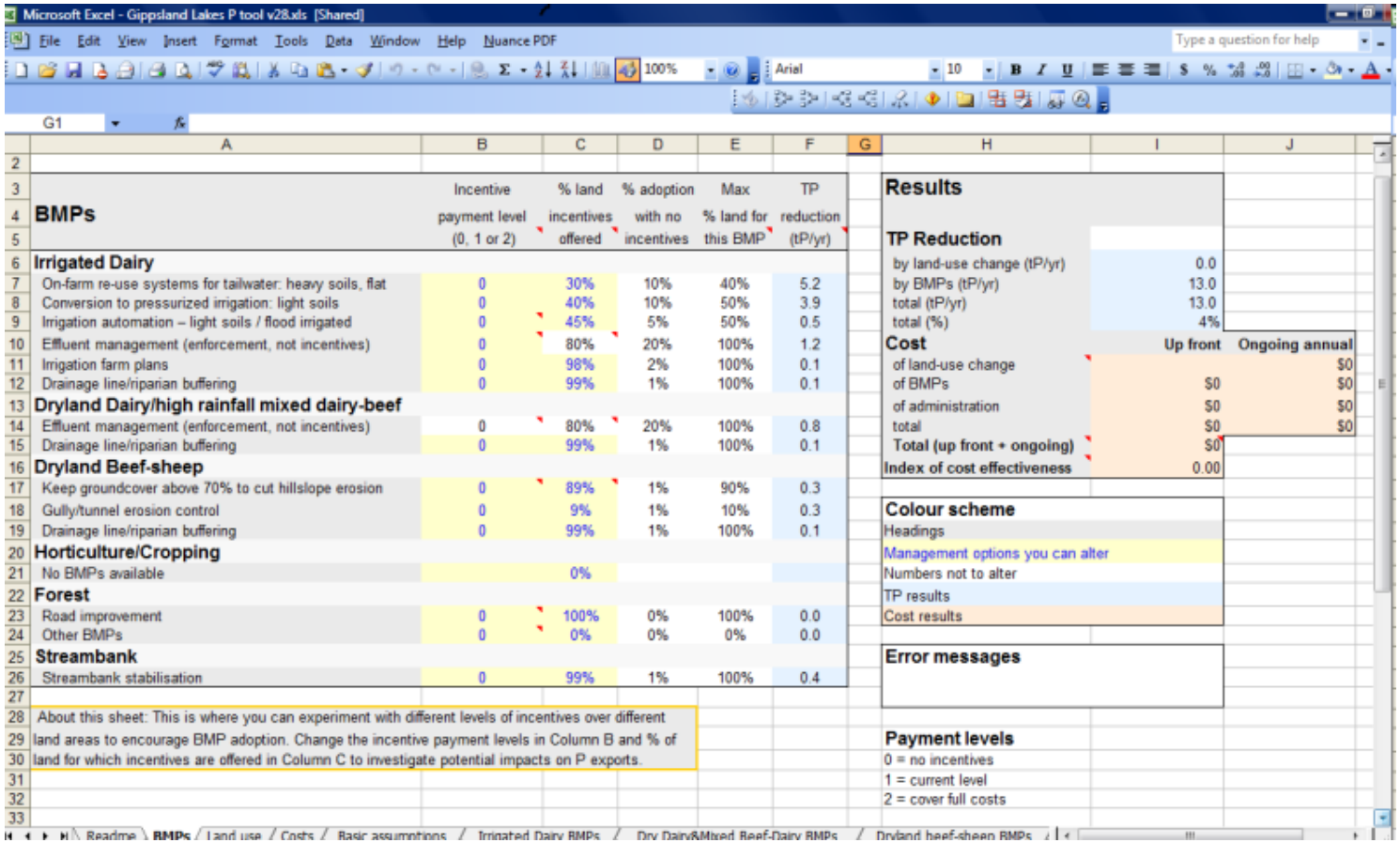
- Areas of uncertainty identified
- Sensitivity analysis conducted

- Identify areas of disagreement
- We don’t aim to resolve them, but to tease out their consequences

bushfire CRC

Integration

- Tool for interrogation and optimisation



Microsoft Excel - Gippsland Lakes P tool v28.xls [Shared]

BMPs	Incentive payment level (0, 1 or 2)	% land incentives offered	% adoption with no incentives	Max % land for this BMP	TP reduction (tP/yr)
Irrigated Dairy					
On-farm re-use systems for tailwater: heavy soils, flat	0	30%	10%	40%	5.2
Conversion to pressurized irrigation: light soils	0	40%	10%	50%	3.9
Irrigation automation – light soils / flood irrigated	0	45%	5%	50%	0.5
Effluent management (enforcement, not incentives)	0	80%	20%	100%	1.2
Irrigation farm plans	0	98%	2%	100%	0.1
Drainage line/riparian buffering	0	99%	1%	100%	0.1
Dryland Dairy/high rainfall mixed dairy-beef					
Effluent management (enforcement, not incentives)	0	80%	20%	100%	0.8
Drainage line/riparian buffering	0	99%	1%	100%	0.1
Dryland Beef-sheep					
Keep groundcover above 70% to cut hillslope erosion	0	89%	1%	90%	0.3
Gully/tunnel erosion control	0	9%	1%	10%	0.3
Drainage line/riparian buffering	0	99%	1%	100%	0.1
Horticulture/Cropping					
No BMPs available		0%			
Forest					
Road improvement	0	100%	0%	100%	0.0
Other BMPs	0	0%	0%	0%	0.0
Streambank					
Streambank stabilisation	0	99%	1%	100%	0.4

About this sheet: This is where you can experiment with different levels of incentives over different land areas to encourage BMP adoption. Change the incentive payment levels in Column B and % of land for which incentives are offered in Column C to investigate potential impacts on P exports.

Results

TP Reduction	
by land-use change (tP/yr)	0.0
by BMPs (tP/yr)	13.0
total (tP/yr)	13.0
total (%)	4%

Cost	Up front	Ongoing annual
of land-use change		$0
of BMPs	$0	$0
of administration	$0	$0
total	$0	$0
Total (up front + ongoing)	$0	
Index of cost effectiveness	0.00	

Colour scheme
Headings
Management options you can alter
Numbers not to alter
TP results
Cost results

Error messages

Payment levels
0 = no incentives
1 = current level
2 = cover full costs

Readme / BMPs / Land use / Costs / Basic assumptions / Irrigated Dairy BMPs / Dry Dairy&Mixed Beef-Dairy BMPs / Dryland beef-sheep BMPs

bushfire CRC

Output

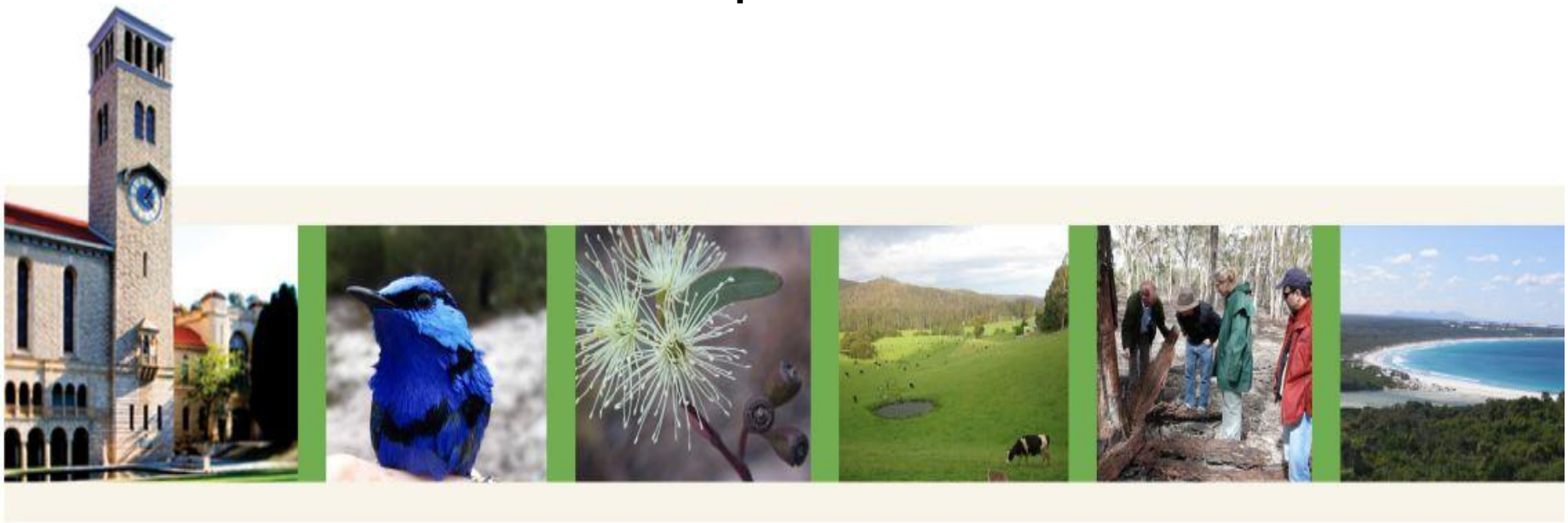
- Integration of research
- In a management context
- To support decisions
- With buy-in from decision makers

bushfire CRC

Centre for

Environmental Economics and Policy

www.ceep.uwa.edu.au



The University of
Western Australia

bushfire CRC