

Risk assessment models for post-mining land use

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A tale of five models

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The legislative context

- Mining attracts society's attention
- Legislation
 - Safe
 - Stable
 - No adverse impacts off-site
 - Sustains an agreed end use
- Progressive rehab and sign-off

Risk assessment of a proposed end-use required

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The environmental context

The Bowen Basin





Miners dig it up, smooth it down, plant grasses and trees, and then use it for ...

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Key end uses and hazards

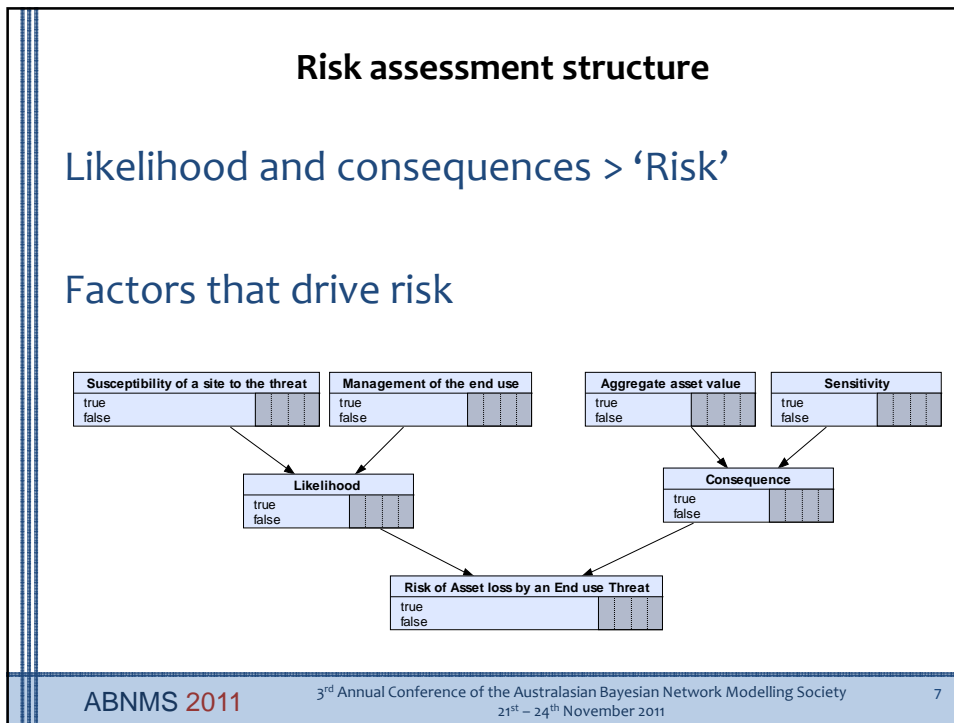
Ascertained from stakeholders using a web-based survey

Three end uses:

- Bushland – managed for ecological services
- Bushland – not actively managed
- Grazing – managed by graziers

Five risk factors

- Surface erosion
- Sub-surface erosion
- Bushfire
- Noxious weeds
- Feral animals



- ### Steps: Understand/define
- Likelihood**
- Identify susceptibility components that drive likelihood
 - Identify management actions that may modify likelihood
- Consequences**
- What is it that's actually 'at risk'
 - What about recovery
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Process to identify susceptibility and management factors

Literature

Experts

- Separate meetings with experts in each risk factor
- Long-listed drivers
- Short-listed key drivers – and their parent drivers

Comprehensiveness vs simplicity

Results of the process

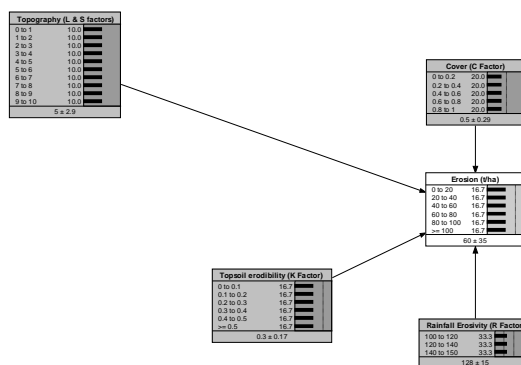
Five models for likelihood (surface erosion, bushfire etc)

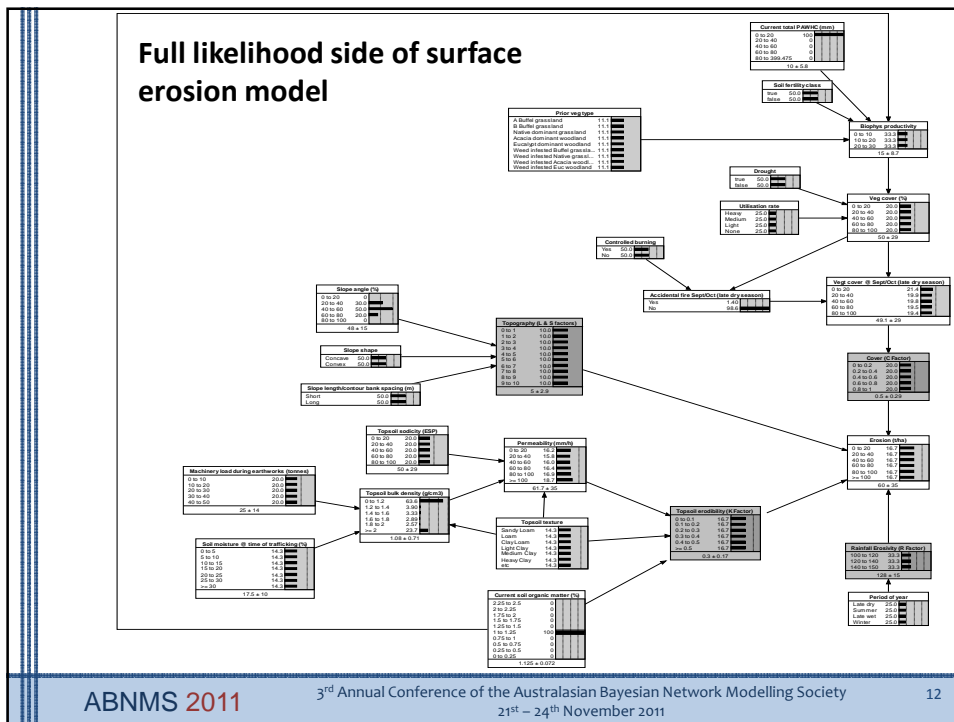
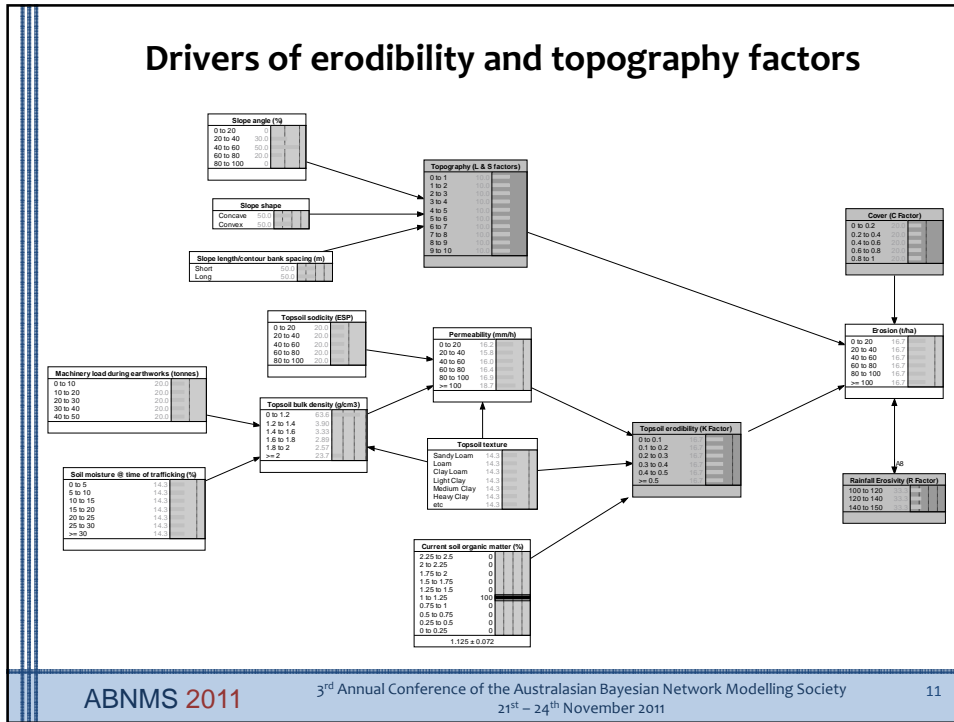
Surface erosion: USLE factors

Surface erosion likelihood (A)

Soil erodibility (K)
Rain erosivity (R)
Slope length and gradient (S and L)
Vegetation cover (C)

$$USLE: A = K * R * S * L * C$$





Process used to identify consequences

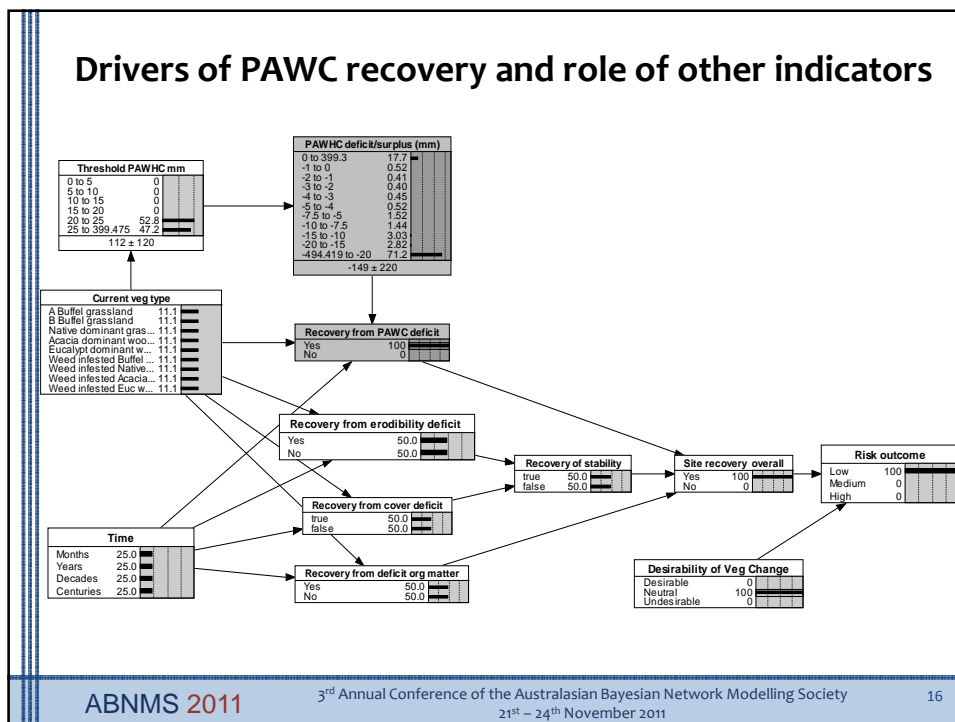
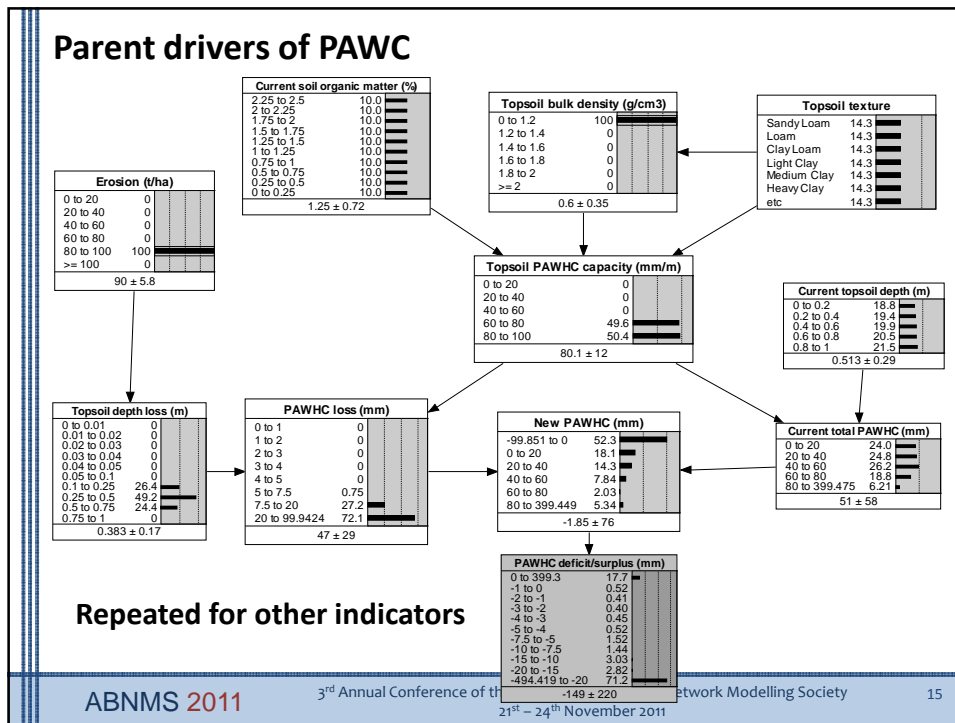
Elicited model composition and structure

- Meetings of the research team
- Meetings with the risk-factor experts

Settled on 'Site Condition' as the threatened asset of value

Indicators of 'Site condition'

- Plant-Available Water-Holding Capacity (PAWC)
- Soil erodibility (K)
- Vegetation cover (C)
- Soil organic matter content (%)
- Possible change from existing vegetation type to a less preferred type (e.g. after fires)

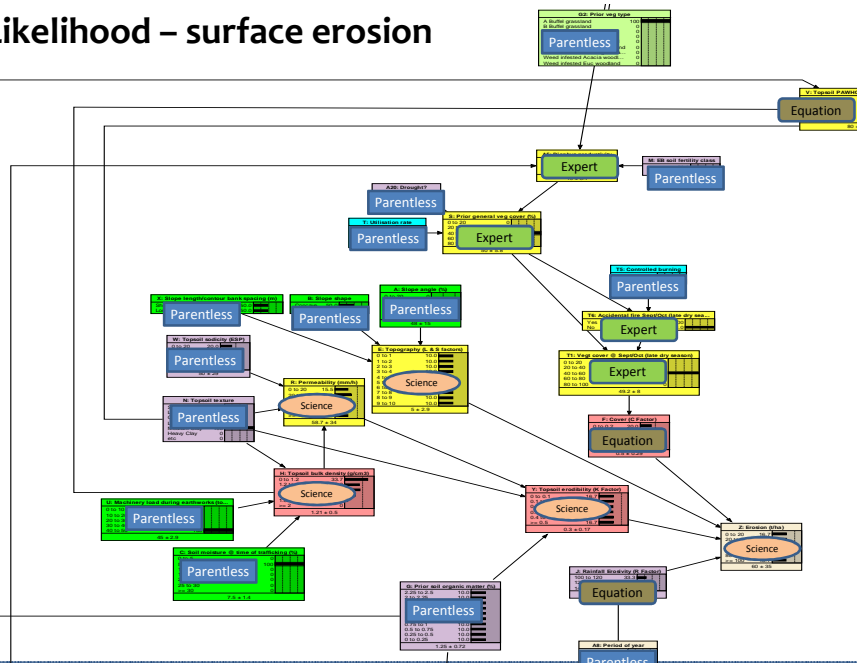


Next step

Probability data

- Science- eg USLE
- Equations - logical expressions
- Empirical data - site data if available
- Expert opinion (CPTs)

Likelihood - surface erosion



Summarised data requirements

| | 1: Surface erosion | 2: Subsurface erosion | 3: Bushfire | 4: Weeds | 5: Feral animals | Totals |
|-----------------------------------------------|--------------------|-----------------------|-------------|----------|------------------|--------|
| Total nodes appearing for first time | 58 | 9 | 12 | 21 | 19 | 119 |
| Parentless nodes | 18 | 2 | 3 | 8 | 7 | 38 |
| Child nodes | 40 | 7 | 9 | 13 | 12 | 81 |
| Scientific sources - equations, tables | 7 | | | | | 7 |
| Expert opinion | 17 | 7 | 9 | 13 | 12 | 58 |
| Simple logical expressions + - / * | 16 | | | | | 16 |

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Questions or comments?

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