# Contents

Preface

Acknowledgements

1 **The science of understanding landscape change: setting the scene for the Tumut Fragmentation Study**
   - A guide to using the book
   - A few caveats

2 **The theory: an overview of landscape change and habitat fragmentation**
   - The ‘species-orientated’ to ‘patterns-based’ continuum
   - Conceptual models of landscape cover
   - Landscape context and landscape heterogeneity
   - Threshold responses to native vegetation cover
   - Patch size relationships
   - Habitat subdivision, habitat isolation and metapopulation dynamics
   - Connectivity
   - Nestedness
   - Edges
   - Summary

3 **The field laboratory: the Tumut study area and the vertebrate animals it supports**
   - Geology and climate
   - Plantation vegetation cover
   - Native vegetation cover
   - Disturbance
Contents

Fauna of the Tumut region 45
Birds 47
Mammals 50
Reptiles 57
Frogs 57
Other groups 66
Summary 66

4 Setting up the study: the design and implementation of the main cross-sectional study at Tumut 67
The experimental design underpinning the cross-sectional study at Tumut 67
Reasons why the Tumut area was selected for study 89
Limitations of the cross-sectional study of landscape context effects 93
Target groups selected for study 93
Summary 94

5 The core findings: the effects of landscape context on animals and plants 97
Survey methods 97
Arboreal marsupials 98
Small terrestrial mammals 101
Birds 104
Reptiles 109
Frogs 111
Invertebrates 112
Vascular plants 115
Invasive vascular plants 115
Bryophytes 118
Summary of landscape context effects for different groups 120

6 Patch use: how animals use patches of remnant eucalypt forest surrounded by pine 123
Movement and other changes in patches of different sizes 123
Bird calling behaviour within patches 128
Contents

Patch–matrix interrelationships 134
Altered breeding behaviour and dispersal 135
Summary 136

7 Theory against data: testing ecological theories and concepts 139
Conceptual models of landscape cover 139
Nested subset theory 144
Ecological thresholds in the amounts of native vegetation cover 149
Landscape indices 153
Tests of the peninsula effect 161
Other tests of theory 164
Summary 164

8 Testing PVA models with real data: melding demographic work with population modelling 167
Population viability analysis (PVA) 167
PVA model testing at Tumut 168
Model testing for arboreal marsupials 169
Model testing for small mammals 177
Model testing for birds 182
Lessons from Tumut 186
Summary 190

9 Genes in the landscape: integrating genetic and demographic analyses 193
Genetic analyses of Bush Rat populations 194
Genetic analyses of Agile Antechinus populations 201
Genetic analyses of Greater Glider populations 203
Genetic analyses of saproxylic beetle populations 208
Summary 209

10 Refining and extending the research programme: additional studies at Tumut (and nearby) that build on the Fragmentation Study 211
The Edge Experiment 212
The Nest Predation Study 214
The Nanangroe Natural Experiment 217
Summary 222
### 11 Recommendations for plantation managers: implications for biodiversity and conservation in plantations

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The significance of plantation expansion as a form of landscape change</td>
<td>225</td>
</tr>
<tr>
<td>Softwood plantation management and the conservation of remnant native vegetation</td>
<td>226</td>
</tr>
<tr>
<td>The lack of indicator species</td>
<td>232</td>
</tr>
<tr>
<td>Summary</td>
<td>232</td>
</tr>
</tbody>
</table>

### 12 Lessons on running large-scale research studies: some insights from running the Tumut Fragmentation Study and directions for the future

<table>
<thead>
<tr>
<th>Lessons</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The challenges of maintaining a large-scale, multifaceted research project</td>
<td>235</td>
</tr>
<tr>
<td>Deficiencies in existing work and future work</td>
<td>238</td>
</tr>
<tr>
<td>Some concluding remarks</td>
<td>240</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Appendix 1</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of collaborators /contributors to the Tumut Fragmentation Experiment</td>
<td>241</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Appendix 2</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detections of bird species in the Tumut Fragmentation Study classified by four broad classes of sites</td>
<td>245</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>References</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>253</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Index</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>283</td>
</tr>
</tbody>
</table>