

analogue forestry: a design

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INTRODUCTION

Commercial plantation forestry in Australia has been focused on producing timber products at minimal cost and in the shortest time possible. This has commonly led to 'industrial' plantations on a large scale, using a few highly productive species. Despite the widespread use of this 'industrial' approach and the popularity of farm forestry, other tree-based production systems ('permaculture' and 'analogue forestry') are being developed in Australia. Analogue forestry differs from farm forestry and industrial forestry practices as it includes an explicit focus on biological diversity. In addition, analogue forestry aims to identify key ecological functions and structures of the natural forest and to devise models to meet their needs. These models blend species that offer functional and/or commercial benefits to create an ecosystem framework that is analogous to the naturally evolved forest.

DESIGN FOR THE SOUTH WEST SLOPES

A design prepared in 1997 has been used to illustrate the concepts of analogue forestry. The property is located near Jindera on the southern margin of the NSW South West Slopes and is managed for lifestyle, grazing and timber production. Analogue forestry requires careful planning based primarily on the architecture of the natural forest ecosystem and the outcomes of the decision model (see Figure 1). Consequently, the design that was prepared is highly specific and cannot be used for other locations.

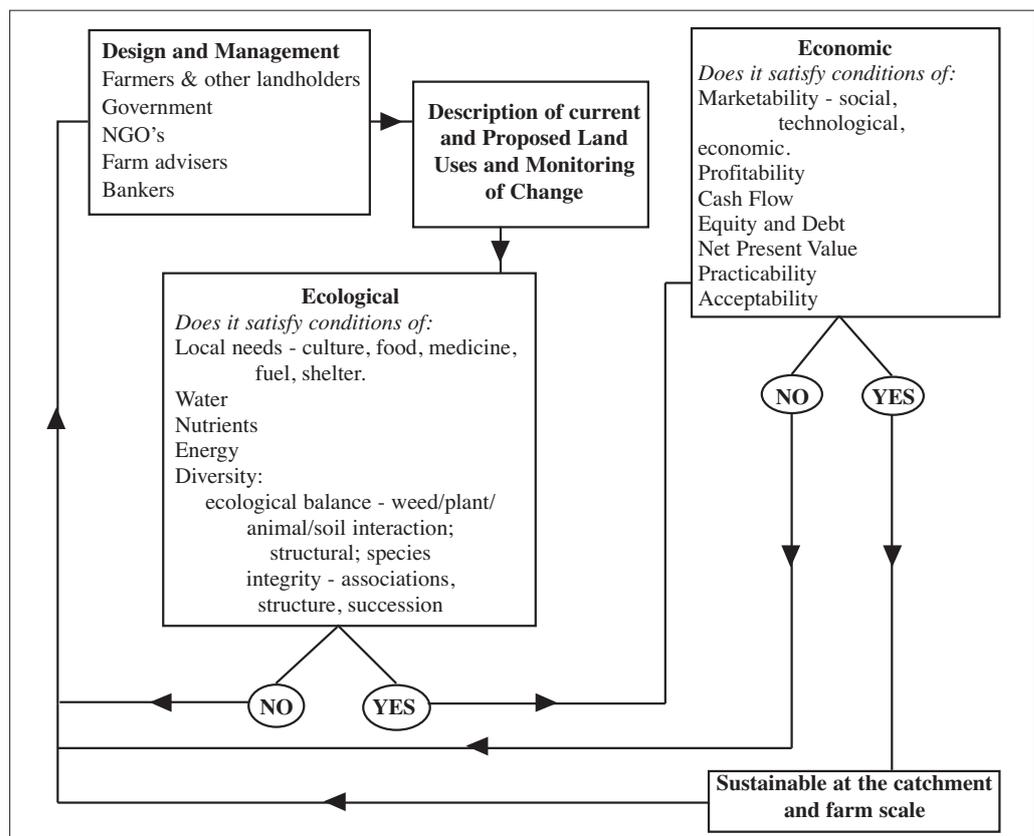


Figure 1. Analogue forestry decision model.

Adapted from Senanayake, R. and Jack, J. *Analogue Forestry: An Introduction*, Department of Geography and Environmental Science, Monash Publications in Geography: Number 49. Monash University Press, Melbourne [in press].

The design site comprises about 4.5 ha and is located in the south-west corner of the property adjacent to a road reserve, that contains locally native trees and shrubs. Minimal salinity and erosion is evident on the site, although much of the native vegetation has been cleared for farming (simplified plant and animal community, low amounts of soil carbon, high soil compaction and high soil acidity). The soils are grey, duplex clayey-loam and are relatively acid (pH 5.0–5.5). The site has a north-western aspect of slight grade and has reasonable drainage. Average rainfall is

about 575 mm/year and light frost can occur between August and October. The initial aim of the land managers was to produce a sustainable farming system that was financially viable and included locally native seed and native fruit production.

A large number of commodities are planned for production in the analogue forest design (see Table 1) However, without ecosystem stability, no long-term productivity is expected and the value of such a design would be low. Thus, some species in the analogue

Table 1. Species Selected

Botanical Name	Common Name	Size	Product
<i>Acacia dealbata</i>	Silver Wattle	6–30m x 5–10m	F, Tc, P, E, S, N, H, SF, IS
<i>Acacia implexa</i>	Hickory Wattle/Lightwood	5–15m x 4–10m	H, Tf, E, N, S, IS
<i>Acacia mearnsii</i>	Black Wattle	8–25m x 6–10m	F, Tc, Tf, P, E, S, N, H, SF
<i>Acacia paradoxa</i>	Kangaroo Thorn	2–4m x 2–5m	H, N, E
<i>Acacia pycnantha</i>	Golden Wattle	3–10m x 2–6m	H, N, P, C
<i>Allocasuarina verticillata</i>	Drooping Sheoak	4–11m x 3–6m	Tc, H, F, SF, IS
<i>Allium sativum</i>	Garlic	1.8m tall	He, C
<i>Artemisia absinthium</i>	Wormwood	1.2m x 1m	He
<i>Backhousia citriodora</i>	Lemon-scented Myrtle	3–20m x 2–8m	C
<i>Brachychiton populneus</i>	Kurrajong	6–20m x 3–6m	H, F, IS
<i>Bursaria spinosa</i>	Sweet Bursaria	3–10m x 1–5m	P, H, IS
<i>Calendula officinalis</i>	English Marigold	0.6m x 0.3m	He
<i>Chamomilla recutita</i>	German Chamomile	0.6m x 0.3m	C, He
<i>Ceratonia siliqua</i>	Carob Tree	3–10m x 3–10m	C, SF, N
<i>Cynara scolymus</i>	Globe artichoke	2.0m x 1.5m	C, He
<i>Davidsonia pruriens</i>	Davidson's Plum	6–10m x 1–3.5m	C
<i>Echinacea angustifolia</i>	Echinacea	0.8m x 0.1m	He
<i>Eucalyptus albens</i>	White Box	15–25m x 12.5m	Tc, H, F, SF, S, IS
<i>Eucalyptus blakelyi</i>	Blakely's Red Gum	15–20m x 12.5m	Tc, H, F, S, IS
<i>Eucalyptus bridgesiana</i>	Apple Box	10–18m x 5–15m	H, F, S, IS
<i>Eucalyptus melliodora</i>	Yellow Box	10–30m x 8–25m	Tc, H, F, IS
<i>Eucalyptus microcarpa</i>	Grey Box	10–25m x 12.5m	Tc, F, IS
<i>Eucalyptus cladocalyx</i>	Sugar Gum	8–35m x 10–20m	Tc, F
<i>Eupomatia laurina</i>	Native Gauva	4–10m x 2–4m	C
<i>Juglans regia</i>	English Walnut	15m x 10m	C
<i>Leptospermum myrsinoides</i>	Heath Tea-tree	1–4m x 1–4m	H
<i>Lomandra effusa</i>	Scented Mat-rush	0.2–0.5m tall	H
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	0.5–1m tall	H
<i>Rosmarinus officinalis</i>	Rosemary	1.5m x 1.2m	C, He
<i>Quillaja saponaria</i>	Soapbark Tree	16–21m x 8–16m	P
<i>Valeriana officinalis</i>	Valerian	0.6–1.5m x 0.3m	He

Commodity product codes: F — Fuel; Tc — Timber for construction; Tf — Timber for furniture; P — Pharmaceuticals; C — Culinary or condiment; IS — Locally native seed; SF — Stock feed; He — Herb.
Functional product codes: E — Erosion control or prevention; N — Nutrient enhancement; S — Shelter; H — Habitat.

forest offer no economic benefit but are included because they provide functions to support the overall farm ecosystem.

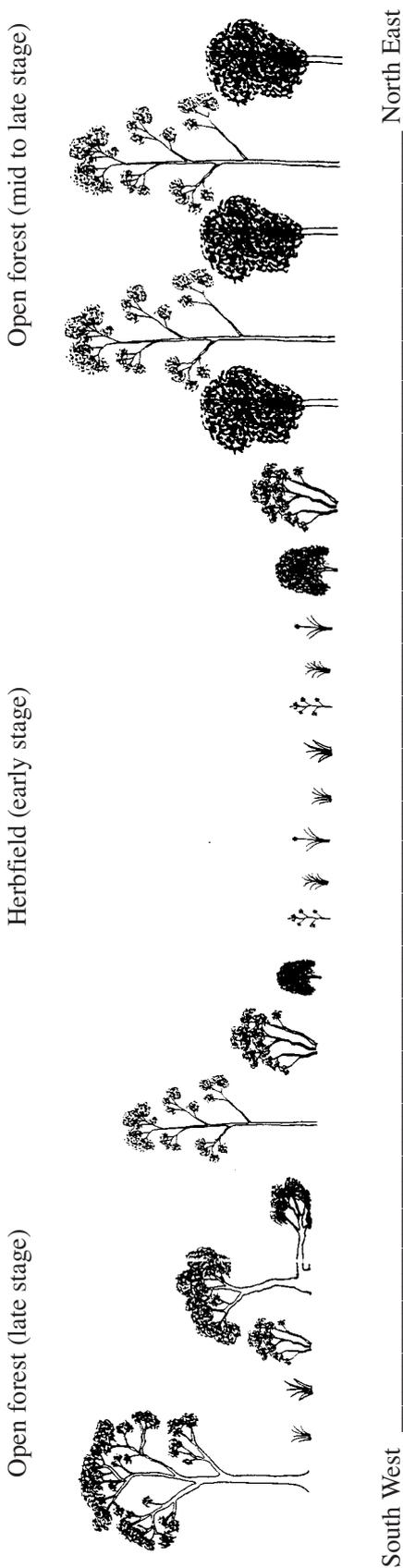
The analogue forest will create functional products (greater nutrient availability, high energy capture, stabilised environment and water control) as well as commercial products (pharmaceuticals, timber and culinary fruits, nuts, spices and herbs) that help to move the system towards sustainability. With time, the natural progression of any undisturbed forest community is to increase in diversity and stability, until a highly complex ecosystem or climax state is reached. Each level of complexity that develops during such community succession is known as a 'sere'. The analogue forest was designed to mimic the structure of the locally native open forest community at three levels of complexity (see Figure 2): late plant community successional stage (high biological and product diversity, and good stability); mid-late plant community successional stage (low biological diversity but high product diversity and stability); and early plant community successional stage (low biological and product diversity, and low stability).

In this design, the late sere open forest consolidates remnant habitat on the road reserve (which provides a biolink to other habitat patches and the nearby State Forest) and products (e.g. spices, medicinal herbs) that bring in revenue. This vegetation community will undergo little disturbance during ongoing management of production. Subsequently, the microhabitats and 'forest furniture' created will support high numbers of animals, plants and microorganisms and help stabilise the entire system. Plants such as Sweet Bursaria (for butterflies and native parasitic wasps), Heath Tea-tree (for insects), Mat-rushes (for frogs) and Kangaroo Thorn (for birds and small animals) have been included to provide habitat, while other species occupy a dual role (e.g. Globe Artichoke and Hickory Wattle/Lightwood provide habitat and commodities). The early sere herbfield is primarily for the production of medicinal and culinary herbs and has little functional role, although it provides the opportunity to

eliminate some existing environmental weeds. In addition, the potential for good returns from the herbfield early in the forests development will assist the entire system to advance economically. The mid to late sere open forest provides firewood and native fruit as its principal commodities, although pharmaceuticals (tannin, adhesives), poles and posts, and locally native seed are additional commodities that could be harvested if market demand is high. The presence of a high proportion of Black Wattle (analogous species) enhances soil nutrient levels (by preventing erosion and 'fixing' atmospheric nitrogen) while providing valuable habitat due to several structural similarities (height, branch size and form, leaf form, flower form) to Silver Wattle (locally native species). Importantly, the three communities, or sere, are interactive and localized disturbance in the system (especially the herbfield) during cultivation and harvesting will not create any serious degradation in the ecosystem. Such disturbance would promote a higher level of biological diversity across the entire system due to the creation of niches not normally available in an advanced stable system (or near climax community).

The diversity of products and their maturing times mean that the forest sustains production with many economic cycles, of various periods up to 50 years (Walnut and Yellow Box timber). Such economic bases are very stable and with a high degree of quality assurance (attainment of organic certification and use of world best standards) can offer greater returns and marketability. In addition, the commodities have been selected to reflect the culture and lifestyle of the land managers and thus the system has relevance and sustainability.





Commodity Species:	Commodity Species:	Commodity Species:
Golden Wattle (<i>Acacia pycnantha</i>)	Garlic (<i>Allium sativum</i>)	Black Wattle (<i>Acacia mearnsii</i>)
Lemon Scented Myrtle (<i>Backhousia citriodora</i>)	Wormwood (<i>Artemisia absinthium</i>)	Davidson's Plum (<i>Davidsonia pruriens</i>)
Carob Tree (<i>Ceratonia siliqua</i>)	English Marigold (<i>Calendula officinalis</i>)	Yellow Box (<i>Eucalyptus melliodora</i>)
Globe Artichoke (<i>Cynaria scolymus</i>)	German Camomile (<i>Chamomilla recutita</i>)	Sugar Gum (<i>E. cladocalyx</i>)
Blakely's Red Gum (<i>Eucalyptus blakelyi</i>)	Narrow-leaf Echinacea (<i>Echinacea angustifolia</i>)	Drooping Sheoak (<i>Allocasuarina verticillata</i>)
Native Guava (<i>Eupomatia laurina</i>)		Soapbark Tree (<i>Quillaja saponaria</i>)
English Walnut (<i>Juglans regia</i>)		
Rosemary (<i>Rosmarinus officinalis</i>)		
Valerian (<i>Valeriana officinalis</i>)		
Functional Species:	Functional Species:	Functional Species:
Hickory Wattle/Lightwood (<i>A. implexa</i>)	Scented Mat-rush (<i>Lomandra effusa</i>)	Kurrajong (<i>Brachychiton populneus</i>)
Kangaroo Thorn (<i>A. paradoxa</i>)		White Box (<i>E. albens</i>)
Silver Wattle (<i>A. dealbata</i>)		Blakely's Red Gum (<i>E. blakelyi</i>)
Sweet Bursaria (<i>Bursaria spinosa</i>)		Apple Box (<i>E. bridgestiana</i>)
Grey Box (<i>E. microcarpa</i>)		
Heath Tea-tree (<i>Leptospermum myrsinoides</i>)		
Spiny-headed Mat-rush (<i>Lomandra longifolia</i>)		

Figure 2. Profile of analogue forest.

REFERENCES AND FURTHER READING

Mallet, P. 1997, *Analog Forestry Manual*, Falls Brook Centre, New Brunswick, Canada.

Senanayake, R. and Jack, J. *Analogue Forestry: An Introduction*, Department of Geography and Environmental Science, Monash Publications in Geography: Number 49. Monash University Press, Melbourne [in press].

