Potential of Low Fertility Sites for Plantations in North-eastern Tasmania

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Abstract

Growth data from four plantation trials established in the 850-1100 mm rainfall zone in north-eastern Tasmania are presented. The highest mean annual increment, to age 10 years was 5 m^3/ha/yr for Pinus radiata *at one site. Growth rates for species of* Eucalyptus *and* Acacia *were much lower, varying from 0.2 to 3 m^3/ha/yr. Fertilizing did not substantially improve growth. The results confirm that these sites are not economically viable for plantation forestry.*

Introduction

Plantation forests are becoming increasingly important as a source of high quality pulpwood in Tasmania. One of the major limitations to further expansion of this resource is the limited availability of suitable land. Many areas which could be converted to plantations are of insufficient potential productivity for these plantations to be economically viable. Experience indicates that eucalypt plantation forestry requires land of at least moderate soil fertility, with slopes of less than 30%, below 700 m in altitude and located in areas with an annual rainfall in excess of 1000 mm (Neilsen 1990).

In north-eastern Tasmania, there are substantial forest and woodland areas between Long Reach and the east coast commonly referred to as the 'Barrens'. These areas possess good topography and are close to potential pulpwood markets, such as the Australian Pulp and Paper Mills and the Forest Resources woodchip mills at Long Reach. Their soils, however, are infertile and frequently exhibit shallow impeding layers which reduce effective soil depth. Annual rainfall in these areas is generally below 1000 mm. This paper reports the results of trial plantations in this area.

Methods

Four representative sites were selected for planting: North Retreat, Old Port Road, Arnon River and Banca Road (Table 1; Figure 1). The pre-existing forest at each site was dominated by *Eucalyptus amygdalina* with a mature height generally below 30 m. Other species observed at the sites included *E. ovata*, *E. obliqua* and understorey species such as heaths, sedges, bracken, *Leptospermum* sp., *Banksia marginata*, *Allocasuarina verticillata* and *Exocarpos cupressiformis*.

Each trial consisted of four replicates of up to 23 species including eucalypts, acacias and pines (Table 2) planted in small blocks of approximately 30 trees each. Site preparation consisted of clearing, either complete ploughing or mound-ploughing, fencing to minimise damage by native animals and an initial application of fertilizer. The trials were established in the years 1978 to 1980. At Arnon River and Old Port Road, additional 7:6:0 (N:P:K) fertilizer was applied in the second year after establishment at a rate of 2 t/ha. The trials were assessed periodically following establishment and a detailed assessment was completed in 1989 when the trials were between 9 and 11 years old.

Mean annual increment (MAI) to age 8-10 was calculated for each species at each site

Table 1. Altitude, mean annual rainfall and geology for the trial sites.

Site	Altitude (m)	Mean annual rainfall (mm)	Geology
North Retreat	100	880	Lower Devonian/Cambrian Mathinna sediments
Banca Road	100	980	Devonian granite/granodiorite
Arnon River	100	870	Devonian granite/granodiorite
Old Port Road	140	1070	Tertiary non-marine sequences

Table 2. Species planted in the trials (most at all four sites).

Eucalyptus amygdalina	*Eucalyptus obliqua*	*Eucalyptus tenuiramis*
Eucalyptus delegatensis	*Eucalyptus ovata*	*Eucalyptus viminalis*
Eucalyptus fastigata	*Eucalyptus pilularis*	*Acacia melanoxylon*
Eucalyptus globulus	*Eucalyptus pseudo-globulus*	*Acacia dealbata*
Eucalyptus grandis	*Eucalyptus regnans*	*Acacia mearnsii*
Eucalyptus maideni	*Eucalyptus saligna*	*Pinus pinaster*
Eucalyptus nitens	*Eucalyptus sieberi*	*Pinus radiata*
Eucalyptus nitida	*Eucalyptus smithii*	

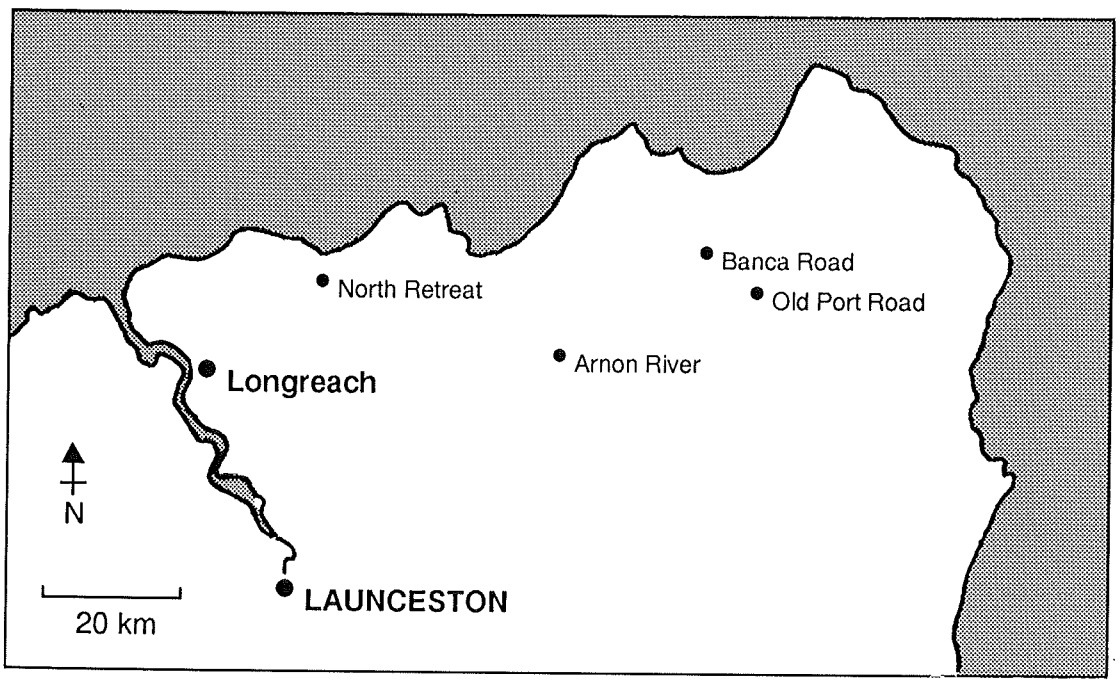

Figure 1. Map of north-eastern Tasmania indicating the location of the trial sites.

using a standard volume model. At this stage it is possible to accurately predict growth potential.

Results

The North Retreat site was the most productive of those tested, with the fastest growing species *(Pinus radiata)* attaining a mean growth rate of 4.6 m^3/ha/yr. Growth of the other species was much less than this, varying from between 0.2 and 3 m^3/ha/yr. Neither growth nor survival approached acceptable limits for any of the eucalypt species (Figs 2 and 3; see Photo 1). Figure 4 indicates the response to additional fertilization at Banca Road and Old Port Road. Small positive responses to fertilization were generally observed for species other than the acacias. *Pinus pinaster* and the worst performing eucalypts have been excluded from these figures.

Discussion

Significant differences in growth rates occurred between the species tested, and

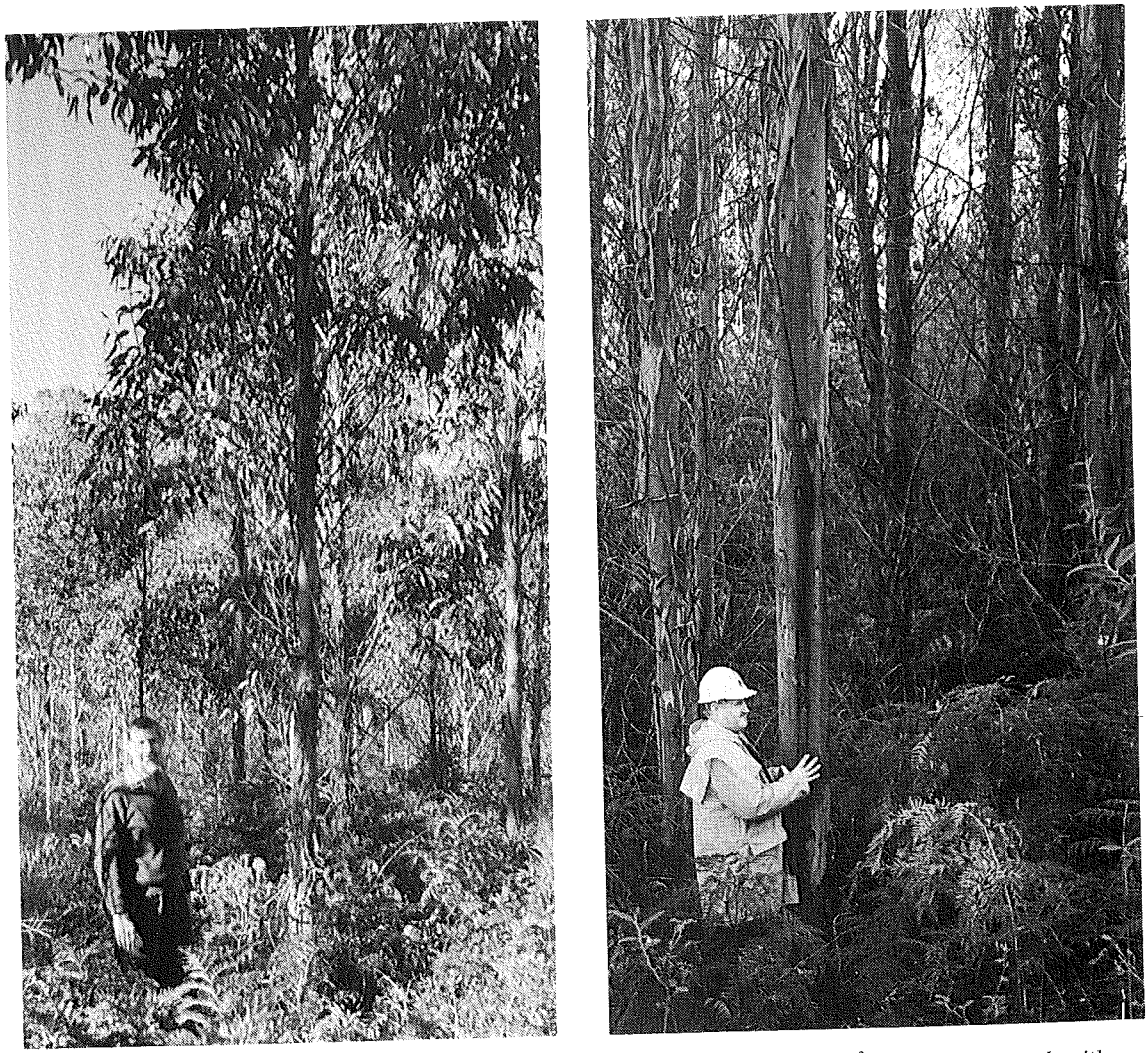

Photo 1. (Left) Eucalyptus globulus *(age 8) at the Old Port Road trial (MAI = 1.6 m^3/ha/yr) is compared with (right)* E. nitens *(age 10) in a provenance trial on fertile soils at Esperance (MAI = 22 m^3/ha/yr).*

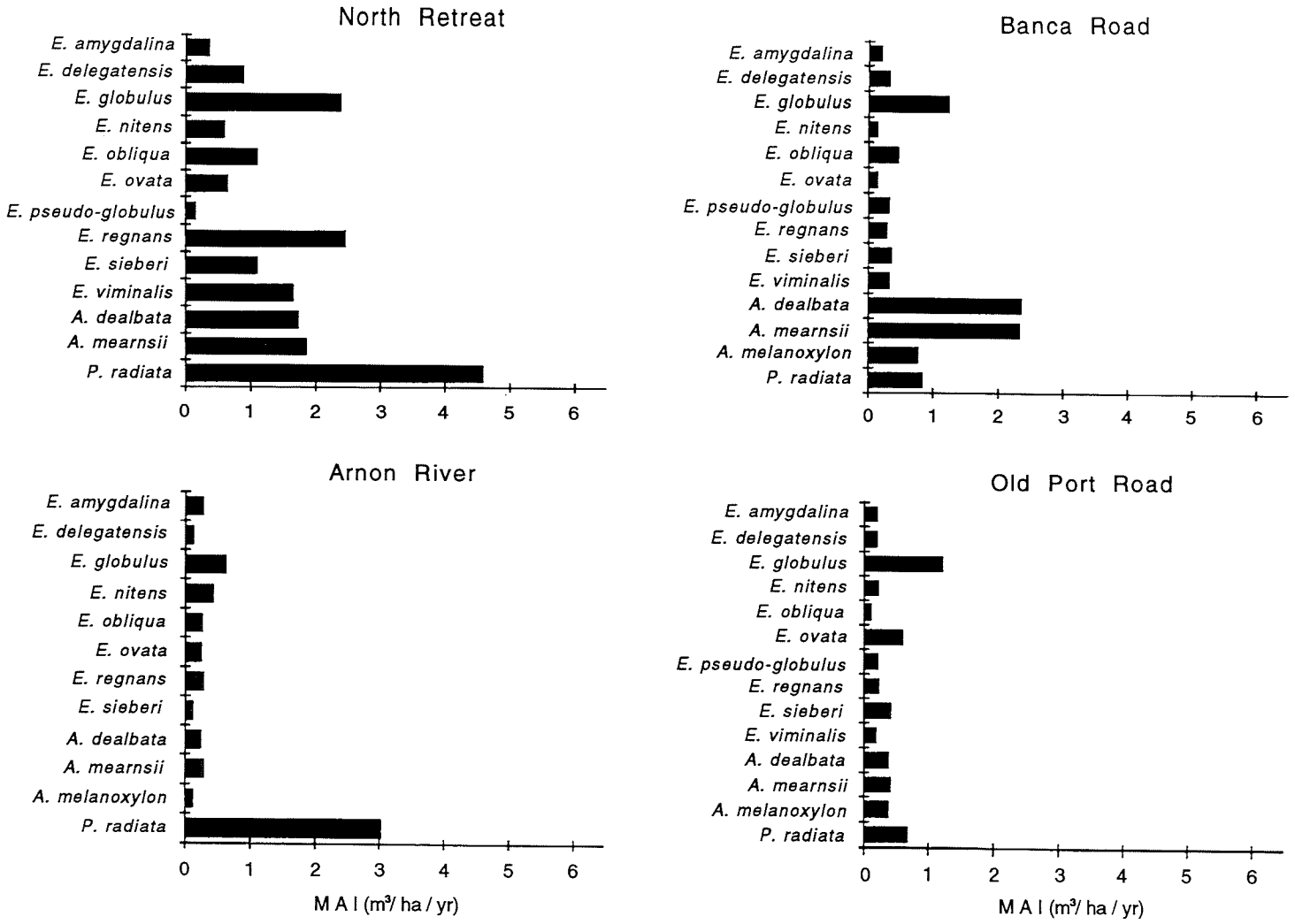

Figure 2. Mean annual increment at age 8-10 for selected species at each trial site.

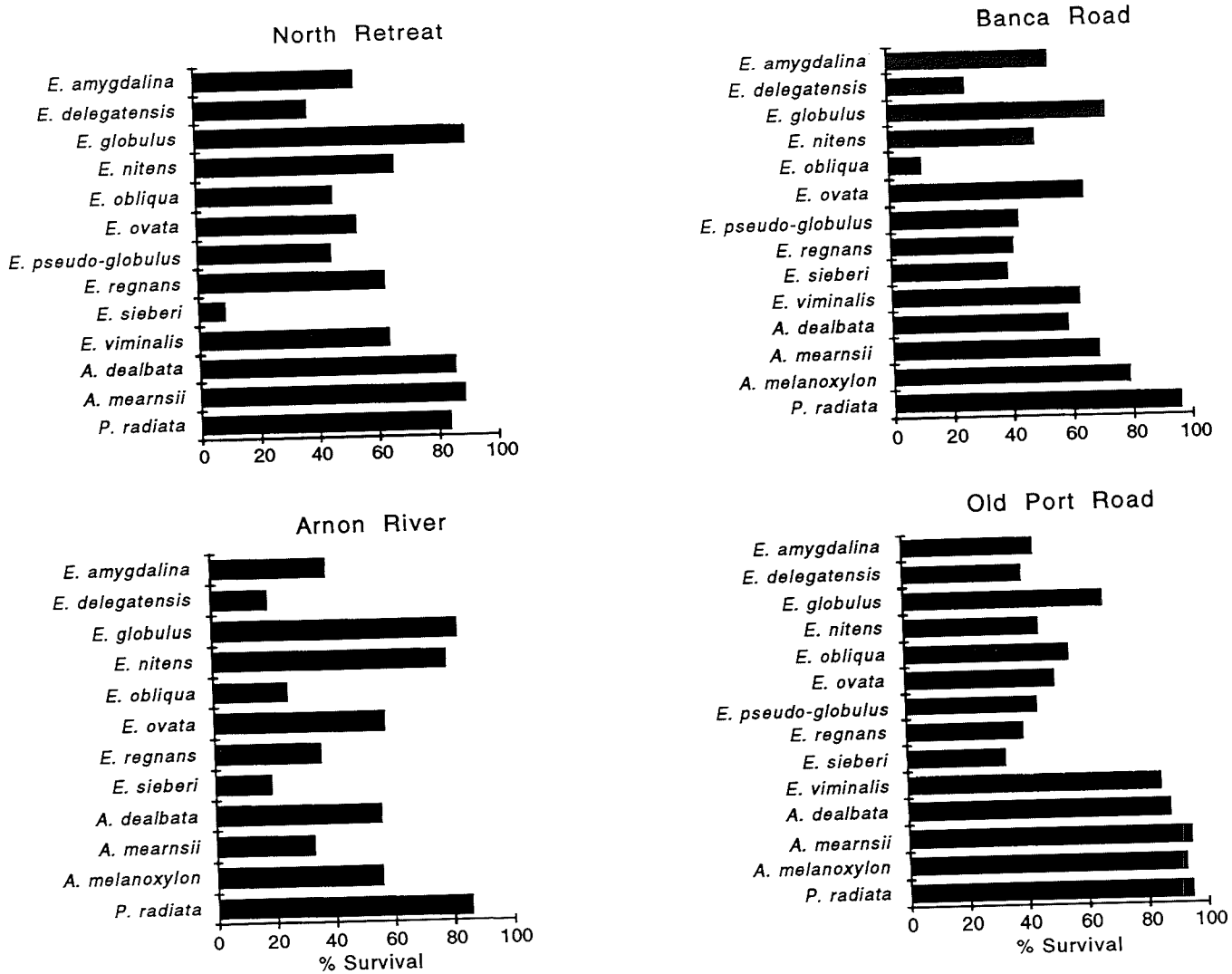

Figure 3. Percentage survival at age 8-10 for selected species at each trial site.

relative performance varied from site to site. *P. radiata* was the best performer at North Retreat and Arnon River while *E. globulus* and *A. dealbata* exhibited the highest MAI at Old Port Road and Banca Road respectively. In general, these species performed much better than *E. amygdalina* and other eucalypts native to the particular trial sites.

The growth rates of all species in the trials are unacceptable for plantation forestry. For an investment at establishment of $1500 to $2000/ha, a yield of about 100 t/ha would be obtained after a 30-year period, from a plantation with a MAI of 3.5 m^3/ha/yr, representing a gross return of approximately $1500/ha at current prices (Neilsen 1990). Economic evaluation of similar sites has demonstrated the uneconomic nature of stands producing less than 10 m^3/ha MAI, even close to the market (Wilkinson and Neilsen 1985).

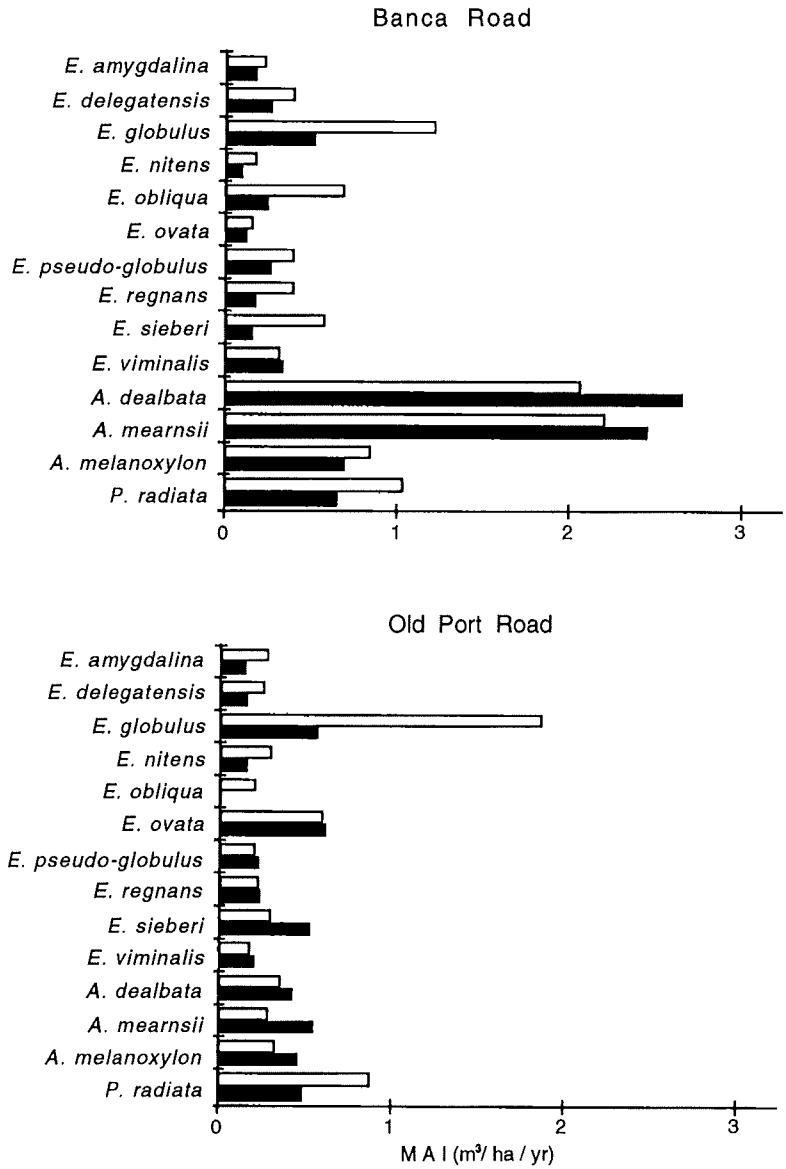

Figure 4. Response of selected species to additional fertilization at Banca Road and Old Port Road.

Although there is potential for significant increases in growth with improved establishment and water conservation techniques, improved economic returns at an acceptable cost are unlikely on these soils (Neilsen and Wilkinson 1990). The planting of eucalypts on areas with soils of low nutrient status and also in areas of low rainfall, such as the 'Barrens' can be considered to be a poor economic investment and should be vigorously avoided.

Acknowledgements

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