
VISIT OF CONSERVATOR AND PARTY TO THE KIMBERLEYS.

by G. E. Brockway.

Period of visit.

From 8/8/58 (arrival at Derby by air), until 27/8/58 (departure from Wyndham by air).

Personnel.

Mr. A. C. Harris (Conservator of Forests)
Mr. G. E. Brockway (Regional Superintendent)
Mr. R. J. Donovan (District Forester, Goldfields)

Objects of the Visit.

The visit followed suggestions made by the local Parliamentary representative, and also was considered necessary in view of the information sought from this Department at various times on technical aspects of forest regeneration and utilisation in the region.

The objects may be summarised as follows:-

(1) To examine at first hand forest resources and forestry potential of the Kimberley area.

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(2) To consider the possibilities of making fuller use of native timbers, particularly Callitris pine, and the practicability of regenerating this species and thereby providing gainful work for natives.

(3) To examine riverine vegetation and consider what protection should be afforded it in the event of more intense utilisation of the region for agricultural crops grown under irrigation.

(4) To examine the conditions of tree growth generally in the region in the light of the changes known to be taking place elsewhere in the pastoral areas of Australia.

(5) To consider indigenous or exotic species likely to be useful for arboriculture or forestry purposes and for planting in association with irrigated crops.

Route followed.

Derby via Liveringa, Fitzroy Crossing and Hall's Creek to Wyndham and westward of Forest River Mission.

Forest Resources in the Kimberleys.

Conflicting reports have been received of the forest resources of this region, and while these were generally acknowledged to be limited, the only first hand knowledge held by Departmental officers was that obtained by Brockway in the Fitzroy Basin and Hall's Creek region some 13 years ago.

Briefly, past utilisation of timber has been confined to limited quantities of Cypress Pine (Callitris intratropica) and a few of the species occurring on the river banks, particularly Cadjuput, Leichhardt Pine and some of the figs, which have been sawn for use in station buildings. Several of the Eucalypts have been used for stock yards and fencing. The Coolibah (Euc. microtheca) has proved a durable stockyard timber, while the Bloodwoods are normally used for fence posts.

Under present conditions, with the very limited population in the area, the forests cannot be considered of great significance from the timber point of view, and while they provide fuel for the local population, this demand is confined to areas in the immediate vicinity of towns and stations. However, with the more intense cultivation of the alluvial flats a much denser population of the area can be expected, when the local tree growth could assume a considerable measure of importance. Thus, in comparable areas of West Pakistan most woody vegetation has long since been utilised and every piece of wood fuel there has famine value, so that strenuous efforts are now being made to remedy the position.

Forest Potential.

The section of the Kimberleys visited has not, under present conditions, a great forestry potential, as some consideration of the climate of the region would indicate. With the exception of a 50 mile wide generally inaccessible coastal strip (which was not visited) which stretches for about 400 miles from a point on the coast about 100 miles North of Wyndham to a point on the Northern end of King's Sound North West of Derby, the climate of the region would by world standards be classified as Steppe. (Accepting Coppen's classification). This classification takes into account mean annual temperature, total rainfall and seasonal incidence of rainfall. Very broadly, in its relationship to the Humid Zone and the Desert Zone the region examined would be comparable to that portion of the Southern part of the State extending from Northam to Kalgoorlie with Hall's Creek comparable with Kalgoorlie. Within this region considerable deterioration of tree stands was noticeable.

The only trees which attain millable size are:-

(1) A few along the rivers, viz. River Gum, Leichhardt Pine, Chestnuts (Terminalia spp.) Figs (Ficus spp.), Cadjuput, but the low proportion of good quality logs, the scattered and attenuated nature of their distribution and the necessity to preserve these river species as an erosion control measure would make their exploitation uneconomic and undesirable.

(2) Native Pine (Callitris intratropica). This species is very fire tender and a large proportion of it has already been destroyed by fire, its growth rate is extremelyslow - about one-tenth of an inch in diameter per year - and it appears incapable of regenerating even on burnt areas under present conditions.

As the number of trees occurring per acre is low, increment in stands of this species would be negligible.

Fire protection of such low grade forest would be out of the question, hence the only thing that appears practicable, is to utilise, where possible, what timber is still available and dismiss all thoughts of attempting to regenerate it.

Forest Utilisation.

The only place visited where utilisation by sawing was taking place was at the Forrest River Mission. An examination of the product indicated that while it was not of high quality, it at least fulfilled some of the requirements for building at the Mission. Sawn timber production is difficult owing to rugged terrain, bad roads, long haulage, sparse stands, and small sized trees, and is only worthwhile in a locality where transport difficulties render the introduction of timber from the Southern part of the State even more expensive.

In view of the deterioration of the pine stands as a result of uncontrolled fires, the Mission Superintendent was advised to utilise the available timber as rapidly as possible and as far as possible to minimise damage to small trees remaining, by carrying out elementary top disposal.

Regeneration of Forest Species.

The most important forest species being the native pine, efforts were made to find evidence of its regeneration. This would be expected following the fires which have destroyed such a large proportion (about 75%) of the original stand. However, no trees less than about 20 ft. in height and about 25 years of age could be located. A quantity of pine seed was collected, and although this does not appear to be of very good quality, probably as a result of the unfavourable season, efforts will be made to raise seedlings in our nurseries.

River Forests.

Despite the great fluctuations in stream flow throughout the year, the main water courses are remarkably stable. This favourable condition can be attributed to the lush tree and shrub growth which binds the banks. I have no doubt that if this were removed, rapid changes in the rivers' courses, comparable with those seen in the rivers of the Punjab, would result. Any scheme of land utilisation by irrigation of the river flats must undoubtedly contain adequate provisions for the preservation of this river strip.

Conditions of Existing Tree Growth.

Gardner, in his botanical notes on the Kimberleys, recognises eight main plant formations. Our journey through the Kimberleys

brought us into contact with five of these, including the coastal and estuarine mangrove formations. The four types with which we are primarily interested are the Savanna forest, the Pindan, the river forests (already dealt with) and the grass lands.

The Pindan is a sandy formation prominent in the vicinity of Broome and Derby and extending inland for many miles. This formation appears to have suffered least from the soil protection angle, as although there is some evidence of fires occurring with some frequency, the regeneration of inedible short-lived Acacias and coarse grass following such fires establishes soil cover again quite rapidly. Mr. K. Rose of Liveringa Station mentioned that during the wetter portion of the year it is necessary to remove sheep from the river flats into the Pindan, and that as a result of this stocking the pastoral value had appreciably deteriorated.

Savanna woodland occurs generally on the higher ground and was seen over extensive areas between Hall's Creek and Wyndham, and also West of Cambridge Gulf. This formation has suffered less from grazing than have the black soil river flats, and soil cover is much less disturbed. This condition can be attributed to distance from water, rugged terrain and coarse vegetation, making it unattractive to stock. Ultimately, with heavier population in the region, this formation could have value in providing fuel and possibly tanning material.

There is evidence of the occurrence of fires and this was of some significance to the West of Cambridge Gulf where the native pine had been very badly burnt, although associated Eucalypts were practically unaffected. An examination of this Pine-Eucalypt stand disclosed that about 75% of the pines had been killed, the damage in many cases taking place in stages. The start may consist of butt scarring, after this the tree may be killed by one fire, have its bark and small branches burnt off by the next, after which only blackened skeletons remained, which may take a number of years to ultimately disappear.

The Grass Land Formation.

The grass lands occupy the black soil alluvial flats along the rivers. These, because of their proximity to river water supplies, their flat nature which enables stock to move easily about them, and the palatable nature of their vegetation, are most subject to overgrazing and consequently water erosion. The greatest damage to the Kimberleys is undoubtedly taking place on these, the most valuable sections of the country. The concentration of grazing animals on these flats and the regular removal of these to the meat works season after season over a long period must represent a considerable removal of soil and nutrients, leading to site deterioration, quite apart from the actual physical destruction of edible species and mechanical removal of soil by water.

The most prominent shrub or small tree of these areas is the Bauhinia, which produces edible beans which are relished by stock. We were, however, unable to find any young regeneration of this or other edible species. Regeneration of Coolibah, however, which is presumably unpalatable to stock, was noticed at a number of points.

The black soil of these plains has been shown to be eminently suitable when irrigated for the growth of rice and other crops, so that any intensive development of the region would be largely concentrated on these. Their present over-grazed condition can only result in erosion in its various forms, a general soil deterioration and a silting of water ways.

While I visited the Kimberleys primarily as an officer of the Forests Department, I found it impossible to remain insensible to other aspects of the position. As the Forests Department [illegible] A

representative on the Soil Conservation Advisory Committee, I was naturally interested in the ecological changes taking place as a result of the biological upset to the natural balance through the introduction of great numbers of grazing animals. My recent observations, in a somewhat similar climatic environment overseas, of the long term effect of human activity, particularly in the pastoral field on such areas, do not give me grounds for much optimism as far as the Kimberley Region is concerned, if the present state of conditions continues for any length of time.

While the effect of uncontrolled grazing, including the selective removal of the more palatable species insofar as they apply to the annual grasses, etc. is primarily a pastoral problem, the effect of the removal of this protective soil cover also comes very much within the scope of soil conservation. When one considers that the rain falls in a comparatively short period after a considerable annual drought and that the clay soils cannot quickly absorb it and that 20" of rain represents over 2,000 tons of water falling on an acre, the magnitude of the forces at work can be realised. The most noticeable feature, however, from the ecological viewpoint is the complete absence of young regeneration of most of the trees and shrubs. Actually top feed is being browsed from the original tree population established prior to settlement, and as these die they are not being replaced. Briefly, the exploitation of the plant capital of the region is being carried out on a purely extractive basis, and from a long term point of view such land use cannot be anything but self-destructive.

Pastoral settlement in isolated regions far distant from markets is particularly prone to this self-destruction, as there is no satisfactory means of getting rid of surplus stock when seasons are bad, and considerable damage can be caused to the environment by retaining their numbers at a high level during such periods. To judge from the reports of the numbers of wild donkeys and scrub cattle which exist, one must assume that the control over actual stock numbers is, at the best, on many stations decidedly tenuous. Reference is sometimes made to the part played by the innumerable useless sacred cattle in India, which by their destructiveness add more misery to a poverty stricken country, but it seems that the failure to destroy useless animals in the Kimberleys could ultimately become equally serious.

Investigational work into the effects of controlled grazing and pasture establishment are being carried out by the Department of Agriculture, and while this undoubtedly points the way, we saw little evidence of any widespread application of the methods which they are developing. In fact, on one station visited, establishment of a fodder grass had taken place along furrows which they had ploughed, but instead of allowing the grass to extend, grazing was already taking place.

Broadcasting of the seed of Kapok bush is also being carried out, but in proportions which can only be regarded as tokens.

One pastoralist, Mr. K. Rose, of Liveringa, expressed his awareness of the damage pastoralists had done to the country, but unfortunately many of the stations are company owned and under such conditions immediate financial returns, rather than the ecological maintenance or the rehabilitation of the vegetation, can be the primary consideration. In other words, the land is being managed on the basis of economic expediency and in very general disregard of the physical and ecological laws to which it is subject.

While it may appear trite to refer to the history of soil deterioration and ultimate collapse of ancient civilizations following intense exploitation of the natural vegetation in the older settled parts of the world, I feel that we are heading in the same direction despite our greater scientific knowledge and with much less excuse for doing so. Older civilizations were forced along by their endeavours to feed their own people; we are doing it to sustain an export market.

Discussions with C.S.I.R.O. officers at the Kimberley Research Station indicated that they hold somewhat similar views to myself regarding the progressive deterioration of the natural vegetation.

Investigations in grazing control in various parts of the world indicate that when properly applied it does not necessarily mean a reduction in the number of stock carried. However, in order that such control could be ensured, considerable improvements in the way of fencing and water supplies would be essential.

While plans for the more intensive settlement of the Kimberleys envisage the ambitious construction of large and expensive dams, which with the present condition of the catchments would, in my opinion, quickly silt up, some consideration of methods used in the elevated plains in the foothills in West Pakistan and Northern India would appear warranted. Such methods entail -

(1) Terracing of sloping land and utilisation of the rainfall in situ.

(2) The damming and diversion of streams with cheap barrages of rocks mixed with brush wood.

(3) The diversion of water through inundation canals during periods of high stream flow.

Whether such methods would be economical under Australian conditions, or whether the physical discomforts of irrigation agriculture in a tropical climate will be acceptable to Australian nationals still remains to be determined.

My impressions of the Australian inland and Northern woody flora are that it is less able to withstand abuse by excessive grazing than the vegetation of similar areas in the Middle East and Southern Asia.

Our woody vegetation has never, under natural conditions, had to stand up to heavy browsing and consequently when subjected to it tends to collapse, whereas vegetation in such areas as Northern India which has developed in association with heavy grazing over countless centuries, is able somehow to continue to exist. This persistence of some of the overseas vegetation is, with many species connected with their extensive root systems and their ability to reproduce vegetatively by means of root suckers, layers, etc. I could not see any evidence of this with our own Northern species, but my observations were not sufficient to enable me to be definite on that point.

Trees for Shade, Shelter, Fodder, etc.

Several native species show promise for arboricultural use and fodder production. For shade and shelter purposes several of the Eucalypts warrant attention. Euc. camaldulensis is already wellknown in this connection. While Euc. miniata, Euc. papuana and possibly Euc. spenceriana and Euc. microtheca could also be considered.

Euc. papuana is the most attractive tree, but seed supplies were not available. Seeding, vide Mr. Langfield at Kimberley Research Station, is at infrequent intervals - twice in ten years to his knowledge.

The two Cadjuputs (Mel. leucadendron and Mel. argentea) are attractive trees and have some timber value, but require plentiful water supplies, as do other river species such as Leichhardt Pine, Ficus spp., Terminalia spp., etc.)

The Baobab has been used to some extent as an ornamental around towns, homesteads, etc. Its very grotesqueness attracts attention. Specimens of one of the local Owenias at the Kimberley

Research Station were attractive and showed the beneficial effects of extra water.

Also, what appeared to be a local Eremophila was prominent as small shade trees at the Camballin rice project.

The most universally occurring small tree of the region is Bauhinia, which is attractive both when flowering and fruiting. This appears to have some fodder value.

A number of introduced trees from various tropical regions, including Northern India, were seen. In making introductions it is essential to exclude those with undesirable characteristics. Two such undesirables which should have been excluded, were encountered, viz. Prosopis juliflora (Mesquite) and Parkinsonia aculeata (Jerusalem Thorn). The latter is becoming quite common in the Wyndham district, both near the town (at the 3 mile) and on the way to and near the Ord River. It was also seen at one station as an ornamental, and at the Forrest River Mission.

Introduced ornamentals seen included the following:-

Delonix regia (syn. Poinciana regia)	Flamboyant, Gold Mohr.
Poinciana gilliesii	Dwarf poinciana
*Cassia fistula	Golden shower, Amaltas Indian Laburnum
Cassia nodosa	
*Albizzia sp.	
Tamarindus indica	Tamarind
*Leucanea glauca	White popinac (undesirable)
Pithecellobium saman (syn. Samanea saman)	Rain tree
*Moringa pterigosperma	Chinese candle nut or Horse radish tree.
*Melia azederach	Cape lilac, White Cedar, Persian lilac, Bakain, etc.
Peltophorum	
*Manganifera indica	Mango
*Nerium oleanda	Oleander
*Lawsonia inermes	Mehndi, Henna Plant
*Calotropis procera	Ak.
*Tamarix articulata (syn. T. aphylla)	Athel tree, Farash.

The species indicated with an asterisk are common to the Punjab and other parts of India. Other species occur in other tropical regions. Most of these occur as ornamentals, but in view of their suitability for our Kimberley climate the introduction of more useful species from the same region would appear a practical proposition. These could include:-

Dalbergia sissoo	Shisham
Acacia arabic	Kikar or babul
Albizzia lebbeck	Siris
White mulberry	Morus alba
Azederchta indica	Nim tree
Bombax malabaricum	Simal

FOREST DEPARTMENT OF WESTERN AUSTRALIA

FOREST NOTES

NUMBER 1. FEBRUARY, 1959.

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