THE USE OF VEGETATION IN LOCATING SOLONETZ SOILS IN QUEENSLAND.

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The use of vegetation in determining soil characteristics is often fraught with errors, but in reconnaissance survey work as is carried out by the Bureau of Investigation any correlation between soil type and the vegetation which it carries is valuable in making a preliminary assessment of the possible utilization of the land.

Plate 1.

"Sandalwood" (*Eremophila mitchelli*) country, Burdekin Valley.

"Sandalwood" as an Indicator.

Eremophila mitchelli has a wide distribution in Queensland. It is found from the western edge of the Darling Downs westwards to Thargomindah, and extends from the New South Wales border to the Norman River, in the Gulf of Carpentaria area. It reaches the coast at Rockhampton. It is known locally as "sandalwood," "false sandalwood," "rosewood," "sandalwood box," and "buddah," and is being used in place of the true sandalwood for shipment to the East. The tree usually grows to a height of 10–15 feet. It occurs as a consociation, typically in the form of isolated

thickets each one-half to one acre in area, or in extended association with broad-leaved box (*Eucalyptus populifolia*), brigalow (*Acacia harpophylla*), wilga (*Geijera parviflora*), or gidgea (*Acacia cambagei*). Its occurrence in a consociation is the subject of this note.

Hubble (1941), in his soil survey work for the Queensland Cotton Stimulation Committee, referred to the "sandalwood" area as follows:—"The presence of fairly thick sandalwood is usually regarded as indicating what are known in these areas as "spewy" soils . . Apparently this character is an expression of poor internal drainage on these soils. It is said that

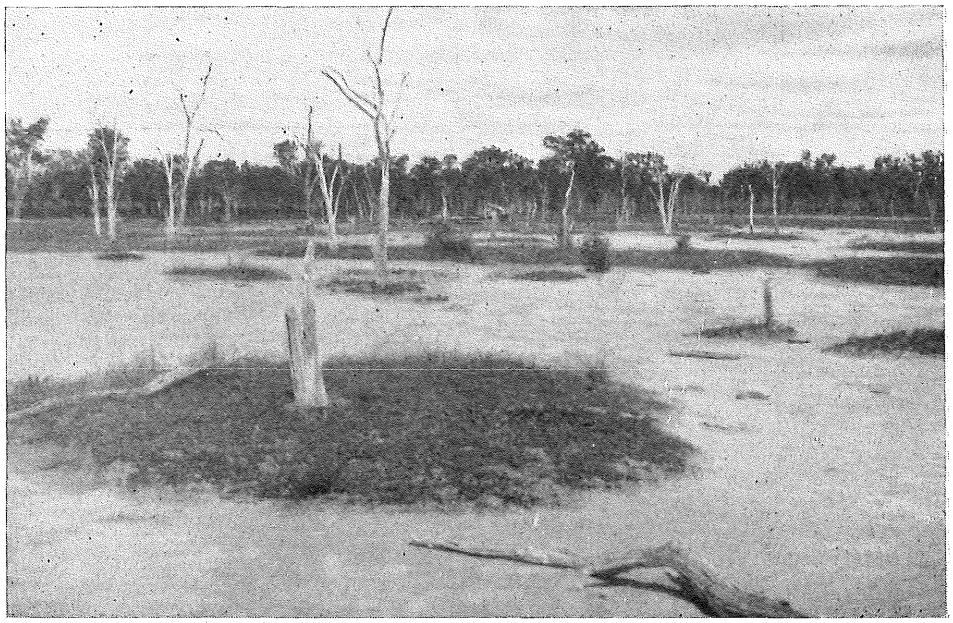

Plate 2.

"Sandalwood" between channels of the Belyando River. Note claypan formations.

following heavy prolonged rain, spewy soils are so soft that stock walking on them sink in, causing the whitish sub-surface soil in a semi-liquid state to be squeezed up on to the surface." He also observed that sandalwood was shallow-rooted.

The typical soil profile on which sandalwood develops as a consociation consists of a surface horizon varying from 6 to 12 inches of a very fine sandy loam, overlying 1–3 inches of a bleached fine sandy loam somewhat cemented, and then a clay horizon often blocky in structure and somewhat mottled. Variations in this profile occur. The fine sandy loam is very powdery and often blows away under stocking to leave bare claypans.

The bleached horizon overlying the clay probably indicates some lateral leaching, and it is this horizon which is brought to the surface by the passage of cattle when the soil is waterlogged. The clay horizon is relatively impermeable to water, hence the "speviness" of the waterlogged surface soil and the leaching of the A_2 horizon.

Plate 3.

Green "sandalwood" patch, Ward River, Charleville.

The impermeability of the clay horizon is due to the high percentage of sodium in the exchangeable cations. Cassidy (1944) has indicated that where the exchangeable sodium constitutes more than 15 per cent. of the total exchangeable cations adverse physical effects might be experienced in handling the soil for cultivation. Although it is as yet too early to dispute this figure, the behaviour of some of the soils in the field would indicate that even below this figure some adverse effect might be expected under irrigation.

These solonized patches are comparatively widespread throughout the habitat of " sandalwood " and occur usually on the outwash from hills or in the channels of or adjacent to inland streams, indicating that " cyclic " salt has accumulated as a result of drainage from higher lands. There is no connection in this case with rocks which are inherently charged with salt, e.g., the Walloon sandstones.

The following table gives the percentage of sodium in the total exchangeable cations from soils in various parts of Queensland, with particular reference to "sandalwood" areas:—

Location of Sample.	Depth.	Percentage of Na in Total Exchangeable Bases in "Sandalwood" Patch.	Highest Percentage of Na in Total Exchangeable Bases in Adjacent Soils not Growing "Sandalwood."
Theodore No. 10 type soil	4″–20″	13·0	9·0
Moura No. 7 type soil	6″–18″	11·4	5·9
Cunnamulla	0″–12″	13·7	8·7
Charleville, Ward River	0″– 6″	19·0	..
St. George, Balonne River	0″– 2″	21·0	5·0
Burdekin River near Kirknie Creek ..	4″–14″	22·0	.
Burdekin River near Kirknie Creek ..	30″–36″	44·0	..

Other areas where such patches occur, in which field texture tests indicate solonization, can be found within the channels of the Belyando River near Alpha; in the Gibber Gunyah area, near Theodore; and along the Macintyre River, in New South Wales.

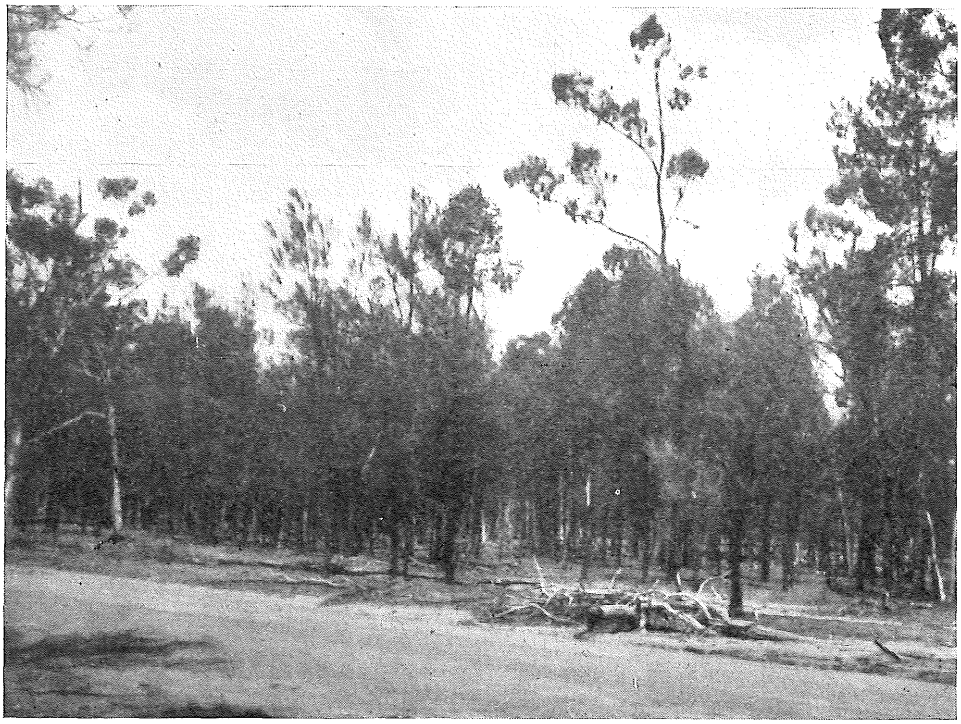

Plate 4.

Bull-oak (*Casuarina leuhmanni*) country, Condamine Highway. Odd cypress (right) and box trees (left).

Where "sandalwood" occurs in a general mixed flora such as box, "sandalwood," wilga, &c., the soil analyses show that the soil sodium is not unusually high. Evidently these associated trees cannot compete when the soil sodium exceeds about 10 per cent.

Bull-oak as an Indicator.

Another interesting association is that provided by the bull-oak (*Casuarina leuhmanni*). A large stretch of this country occurs in the Dalby-Miles-Condamine triangle west of Wilkie Creek, in which bull-oak and cypress pine (*Callitris glauca*) alternate in dominance. The country has long been known as very poor to almost useless grazing land. A soil profile in a bull-oak patch and one in a bull-oak-cypress association showed the following interesting features:—

Location.	Depth.	Horizon.	Percentage of Total Exchangeable Bases.			Colour and Texture.
			Ca.	Mg.	Na.	
1 mile west of Columboola, near railway line.	0″– 3″	A_1	42·0	41·0	10·0	Grey-brown sandy loam.
	3″– 4″	A_2	24·0	50·0	22·0	Bleached grey sandy loam.
	4″–30″	B_1	9·0	41·0	48·0	Grey coarse sandy clay with yellow and reddish-brown mottling. Gritty.
	30″–48″	B_2	4·0	42·0	52·0	Bluish-grey clay with red and yellow mottling. Gritty and soapy when wet.
	48″–60″	B_2C	5·0	39·0	54·0	Grey clay with red mottling. Friable; soapy when wet.
Condamine Highway	0″– 8″	A	28·6	34·3	1·7	Sandy loam.
	8″–15″	B_1	5·2	85·0	7·6	Sandy clay. Gritty.
	15″–24″	B_2	3·0	87·0	8·7	Sandy clay, slightly mottled.

In the former case the calcium in the subsoil has been replaced by sodium, and in the latter by magnesium chiefly, with some rise also in the percentage of sodium.

Somewhat similar bull-oak country occurs in less extensive patches in the Burdekin Valley south of Scott's Creek, on the Ayr-Bowen road, in the Selma area west of Emerald, and in a number of other localities.

General.

Each of the above vegetation associations indicates soils generally too infertile for general agricultural and pastoral use, and unsuited to irrigation development by reason of poor drainage.

Acknowledgement.

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