The adequacy of soil dispersion testing – a comparison of field test methods.

Introduction.

The requirement to undertake soils dispersion tests as part of pre-logging investigations for the then, Environment Pollution Licence (EPL), was first introduced in late 1995.

Harvesting plans for fourteen compartments (map at Appendix 1) were available and of these only 2 compartments, namely 2051 and 2052 in Murrah State Forest were found to have dispersible soils.

In contrast soil landscape mapping[1] for the compartments indicates they are all located on either the Murrah or Yellow Pinch soil landscapes which, laboratory analysis has found have dispersible soils.

The EPL specifies a single test that must be used to determine soil dispersion however, the regular finding of non-dispersible soils suggests either that the test or its implementation is inadequate.

Soil samples were obtained from Compartment 2001 currently being logged and according to the Harvesting Plan found to have no-dispersible soils.

Methods

The EPL requires the following -

> **STEP 1: Method**
> a. Select three air-dry aggregates from each layer of the soil at whichever site is being tested;
> b. Place approximately 75 millilitres of deionised water in a clean, wide-bottomed container. Place the three aggregates in the container of deionised water, spaced equally around the side. The deionised water must completely cover the aggregate. Do not stir, or otherwise disturb; and
> c. Record the degree to which the soil aggregates have dispersed and/or slaked at 10 minutes and 2 hours from when [they] were placed into the water.

A second field method[2] developed by the Australian Academy of Science (AAS) was also employed, requiring a larger soil sample and the following method -

- From each surface and subsoil sample weigh 100 grams of soil into a clean 600 millilitre glass jar with lid.
- Measure out 500 millilitres rainwater or distilled water to give a 1:5 ratio of soil to water. Making up a ratio of 1:5 soil to water (100 grams of soil and 500 millilitres water).

---

[1] Tulau, M. (1997) Soil Landscapes of the Bega-Goalen Point 1:100,000 Sheet, Department of Land and Water Conservation, GPO Box 39, Sydney, NSW 2001.
[2] http://www.science.org.au/nova/035/035act01.htm

- Gently pour this water down the side, without disturbing the soil at the bottom.
- Invert the jar slowly and gently once and then return to its original position (avoid any shaking). Then let stand for 4 hours, with no vibrations or bumping.
- Check the suspension above the sediment at the bottom of the jar and score the amount of cloudiness using the photographs for comparison. Make up another soil suspension and repeat the process if unsure.

Two of the samples were taken from 'in situ' soils at 0-100mm (A) and 250mm (B) and a third (C) at approx 400mm from exposed soils in a road cutting. The three samples were air dried for three days prior to testing as indicated in the following image showing from left to right samples B, A and C. At this point aggregates from sample C were the hardest and seemed most cohesive.

Results

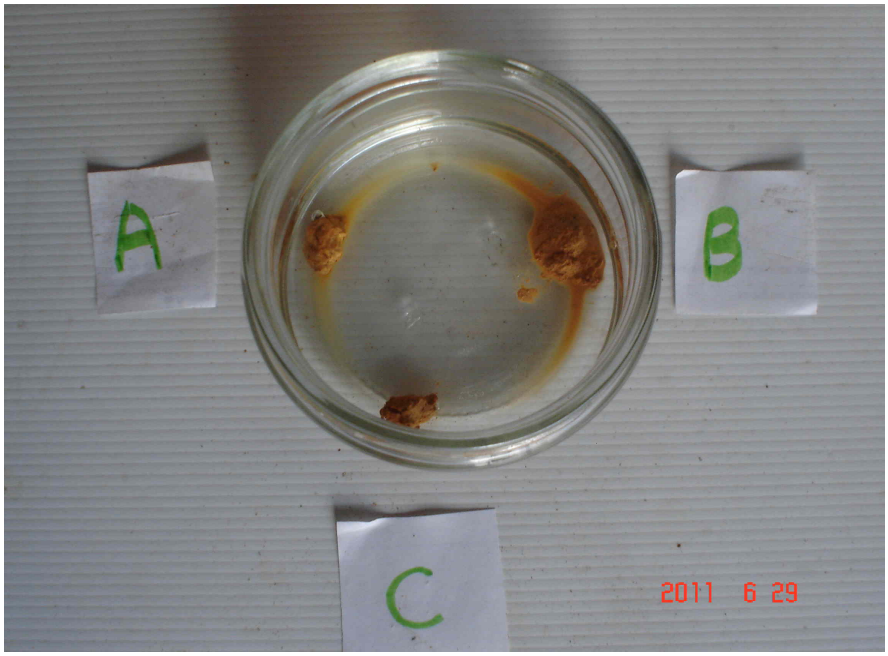
The EPL provides the following rating system for soil dispersion.

STEP 2: Dispersibility rating
a. Once the behaviour of the soil aggregates has been recorded in accordance with step 1, determine the dispersion rating, as follows:

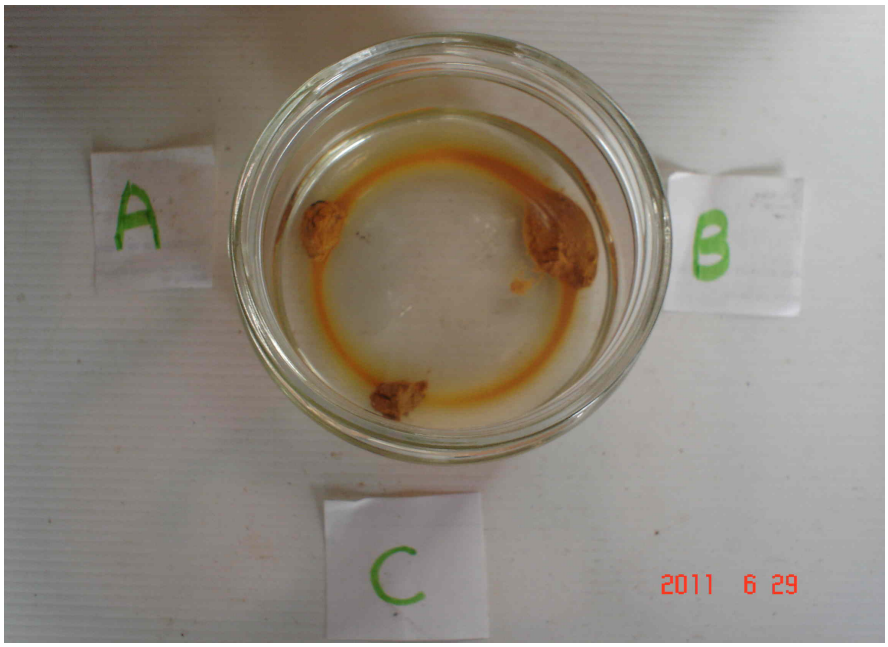
Score **0** for no dispersion within 2 hours;
Score **1** for slight dispersion within 2 hours;
Score **2** for slight dispersion within 10 minutes or complete dispersion within 2 hours;

Score **3** for strong dispersion within 10 minutes or complete dispersion within 2 hours; or
Score **4** for complete dispersion within 10 minutes.

The following graphic shows the three aggregates ten minutes into the EPL test. At this time sample A scored a 2 and sample B either a 3 or 4.



The next graphic shows the samples at 2 hours, sample A has begun to collapse, sample B has completely dispersed but sample C had only slight slaking.



The AAS provides the following rating system for soil dispersion-

1. Clear or almost clear – not sodic
2. Partly cloudy – medium sodicity
3. Very cloudy – high sodicity

A white plastic spoon or spatula, that reflects light, when placed in the centre of the suspension can help identify the level of turbidity. Estimating turbidity using spatula visibility.

1. Plastic spatula visible – not sodic
2. Plastic spatula partly visible – medium sodicity
3. Plastic spatula not visible – high sodicity

As indicated in the following graphic using this field test found all of the soil samples to be highly sodic and dispersible.

Comment

While it is possible that soil samples gathered by Forests NSW are largely taken from road cuttings, of greater concern is that the negative impacts of sodic and dispersible soils are still not factored into forest management.

The EPL only requires consideration of stream crossings if dispersible soils are located and since the introduction of the dispersion test there has been no advance in understanding the sodic soil issue.

This lack of understanding is a particular concern given the likely association between sodic/dispersible soils and dieback associated with Bell-miners (BMAD) and dry weather and drought (DAD).

Soil sodicity, like salinity, is a significant management issue but the area of land affected by sodicity is far greater than that affected by salinity.

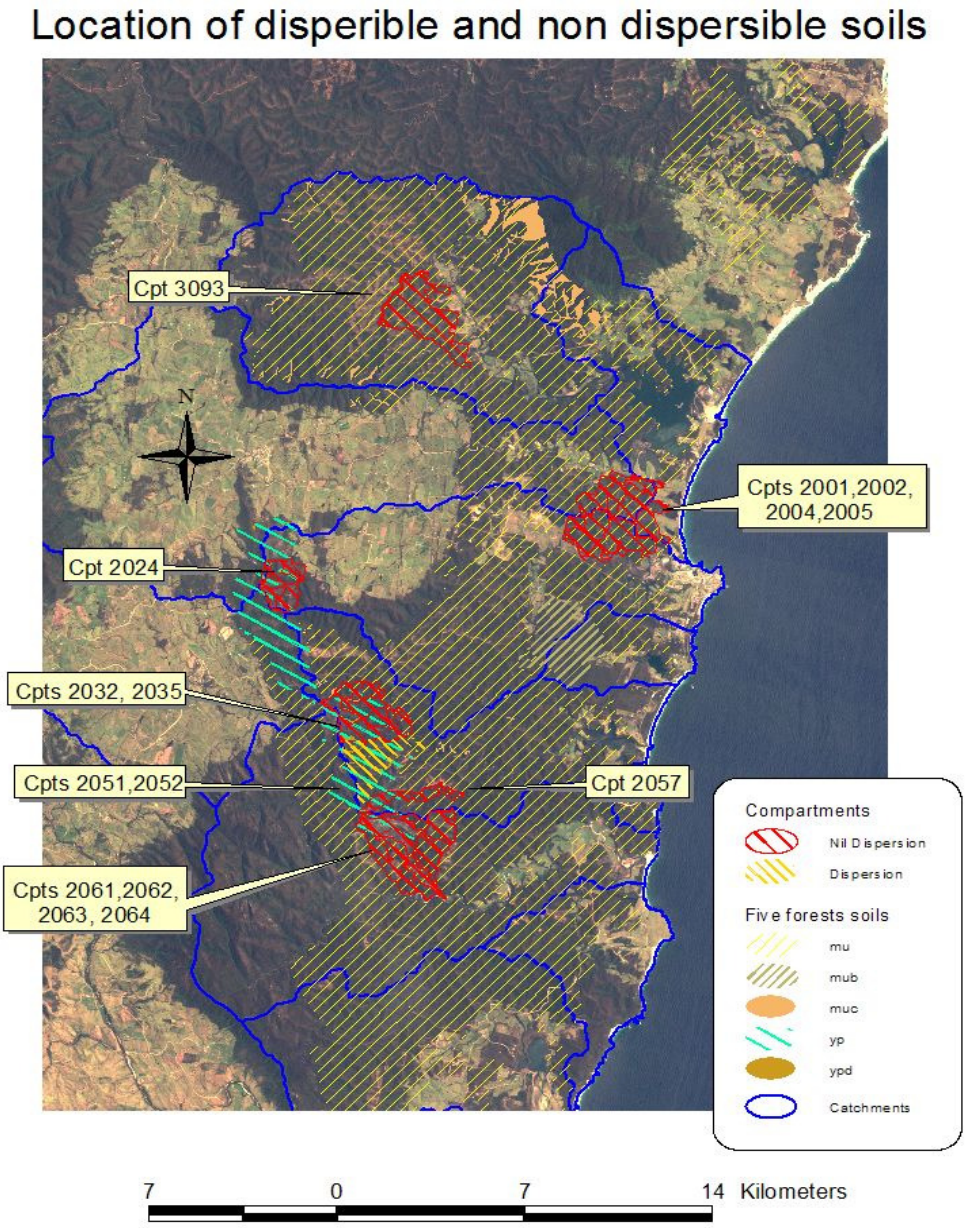
The Regional Forest Agreements are supposed to have ushered in 'adaptive management' however this aspect of the agreements is not legally enforceable. A prescriptive approach that has not changed in 16 years is totally inadequate given the national scale of the problem.

As soils host 80% of biodiversity the failure to adequately consider their limitations confirms that current forest management is unsustainable.

Robert Bertram

3 July 2011

Appendix 1


Location of disperible and non dispersible soils
Cpt 3093
N
Cpts 2001,2002, 2004,2005
Cpt 2024
Cpts 2032, 2035
Cpts 2051,2052
Cpt 2057
Cpts 2061,2062, 2063, 2064
Compartments
Nil Dispersion
Dispersion
Five forests soils
mu
mub
muc
yp
ypd
Catchments
7 0 7 14 Kilometers