2. METHODOLOGY

Field work and interviews were undertaken between March-August 2004.

Two replicate farms within the range of GGE distribution have been selected for study. The first farm is located on the alluvial and colluvial grey clay soils at Jumbunna and the second one is located in the red Basaltic clays near Warragul. Only the first is considered in this report. On each farm, the distribution of the GGE will be determined and correlated with past and present land use factors, and topographical and hydrological features.

In the first property at Jumbunna, the following was undertaken:

1. The distribution of GGE was mapped by surveying for GGE burrows or the gurgling sounds made by the GGE while moving through their burrows.

2. Current and historical aerial photographs of the study site for the past 50 years were examined to ascertain changes in landscape.

3. The landowner was interviewed via questionnaire and discussion to obtain present and historical information of land management.

4. Detailed analysis of topographical features at GGE and non GGE sites including aspect and microtopography of terracettes and other surface irregularities were undertaken to determine site dynamics. Orthorectification of most recent vertical aerial photograph. Qasco Vic Image was contracted to prepare an orthorectified colour digital aerial photograph overlain by 10 metre contours, and a 1947 image of the same areas was also prepared.

5. Information from tasks 1-4 was integrated to investigate the possible effects of past and present land management practices on GGE distribution.

2.1 Identification of suitable habitat

The study site was examined on foot and via aerial photographs to identify areas of suitable GGE habitat. While precise habitat parameters for the species are unknown, several factors that characterise potential GGE habitat have been identified (Smith and Peterson 1982, Van Praagh 1994). These include proximity to water, soil moisture and soil type. The earthworm is often associated with creek banks, in particular smaller tributaries, soaks or wet south facing terraced slopes but is generally absent from areas where there is a high level of waterlogging and compaction. The species is generally found in acidic, silty clay loam soils, generally blue grey or red in appearance of the Strzelecki, Warragul and Ripplebrook associations described by Sargeant (1975) and is absent from soils with a high coarse sand content.

2.2 Detailed Surveying areas of suitable earthworm habitat

Sites identified as suitable habitat were surveyed to establish the presence of the earthworms. The most reliable way of locating the GGE is by digging and looking for burrows. This involves digging soil quadrats of approximately 50 cm x 50 cm. Burrows are easily identified and, if wet, represent burrows that are occupied. If the ground is wet, presence of the worms can also be established by banging the ground with a spade and listening for gurgles, the sound that is made when the worms retreat down their wet burrows.

2.3 Study location

This study was conducted at Jumbunna on the property of Cheryl and Brian Embon. Jumbunna is situated approximately 8 km south of the township of Korumburra, South Gippsland. A detailed description of the geology and geomorphology of the study area can be found in Appendix 1.

The Embon farm property lies on the upper reaches of Foster Creek, a major tributary of the Powlett River (Fig 1). The two major upper tributaries of the creek join just outside the northern boundary of the farm. The property encloses diverse terrain and includes representative examples of the major landforms that occur across this section of the Strzelecki Ranges. A variety of slope form, angle and aspect is represented. Elevation ranges from below 100 metres along the Foster Creek channel to more than 220 metres on the ridge and summit along the farm western boundary (Fig 2; Fig 3). Maximum relief and steepest slopes (locally in excess of 30^0) with southeast to southerly aspect are along the western and northern boundaries above the creeks. The rest of the property has gentler, broadly convex to straight slopes. Flat surfaces are restricted to the floodplain and alluvial terraces bordering the creeks and to the ridge crests. Rock outcrop is restricted and exposed only along part of the Foster Creek channel, in farm track side-cuts, at the base of a major slope failure and as a natural scarp high on the upper western boundary slope. Surface materials, and the parent materials of soils are of limited variation. There is only a single bedrock lithology present (the volcanogenic sediments), and soils are derived directly from this or from residual and modified rock material transported down slopes or along the stream channels.

The original property of approximately 42 ha was purchased by Brian Embon's father in 1947. Brian Embon purchased the property in 1976 and extended the farm with the addition of 2 adjoining properties in 1978 and 1982, taking the total area of the farm to its present size of 148 ha.

2.4 Geomorphology

The geomorphology of the property is described as a series of slope units, defined principally on the basis of elevation and slope morphology. These units are described in Appendix 2 and illustrated as profile diagrams on Fig 4. The investigation for evidence of GGE for this project concentrated on the lower slopes and colluvial and alluvial terrain adjacent to the streams, (the lower part of unit MS and units CF, AT, MF). All these units are areas where alluvial and colluvial processes have increased the thickness of regolith and soil.

Unit MS

The lower slopes of this unit face south to southeast and have a complex surface developed from past and contemporary slope movement. Soils are of variable thickness and include rock fragments that have fallen from outcrop upslope. There is active soil creep, particularly in areas of seepage. This unit grades laterally into the colluvial footslope unit (CF).

Unit CF

These are more stable slopes and have a greater soil and regolith thickness. Seepage occurs at sites of lower slope.

Unit AT

These are the areas of thickest regolith. They are former floodplains comprised of silty clay with lenses of fine sand and silty sand. The surfaces are flat to gently sloping with shallow depressions marking the course of prior stream channels. They are deeply incised with narrow, active channels draining from the surface and seepage from the adjacent slopes. Upslope they merge with the CF unit, while the downslope edge is marked by a distinct low escarpment above the modern floodplain or creek channel.

Unit MF

This is a narrow unit bordering the stream channels. The soils are broadly similar to those of the alluvial terraces but are more variable with gravel lenses and wood fragments.

2.5 Landform Dynamics

Landscape processes are determined by the rapid rate of rock weathering, high annual rainfall and steep slopes. Exposed or buried rock is already deeply weathered and rock fragments are readily broken down. There are minimal areas of surface stone and not much stone in the soil profile. A major, active slope failure occurs on a steep slope on the northern property boundary where a deep rotational slump above Foster Creek has developed an elongate hummocky toe. Surface soil creep, as indicated by terracette development, is widespread but not universal, and is best developed on steeper slopes with south to southeast aspect. Soil creep is episodic and appears here to be a result of soil moisture loading causing lateral movement, rather than a result of soil heaving with wetting and drying. Soil creep may also result from rising water tables causing soil saturation. Soil creep movement affects the upper soil rather than the whole soil profile and the rate and extent of movement appears to decrease with soil depth.

Fig 1 Topography (Digital Terrain Model) and drainage of the Strzelecki Ranges around the study site

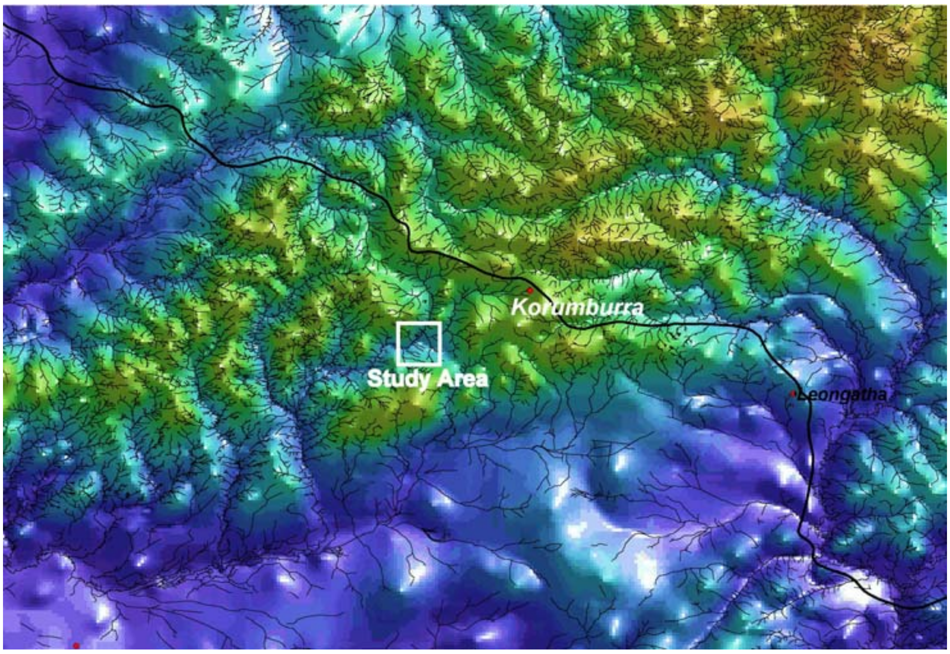

Fig 2 Topography of study site shown by 10 metre contours. Cross section is drawn along line A-B

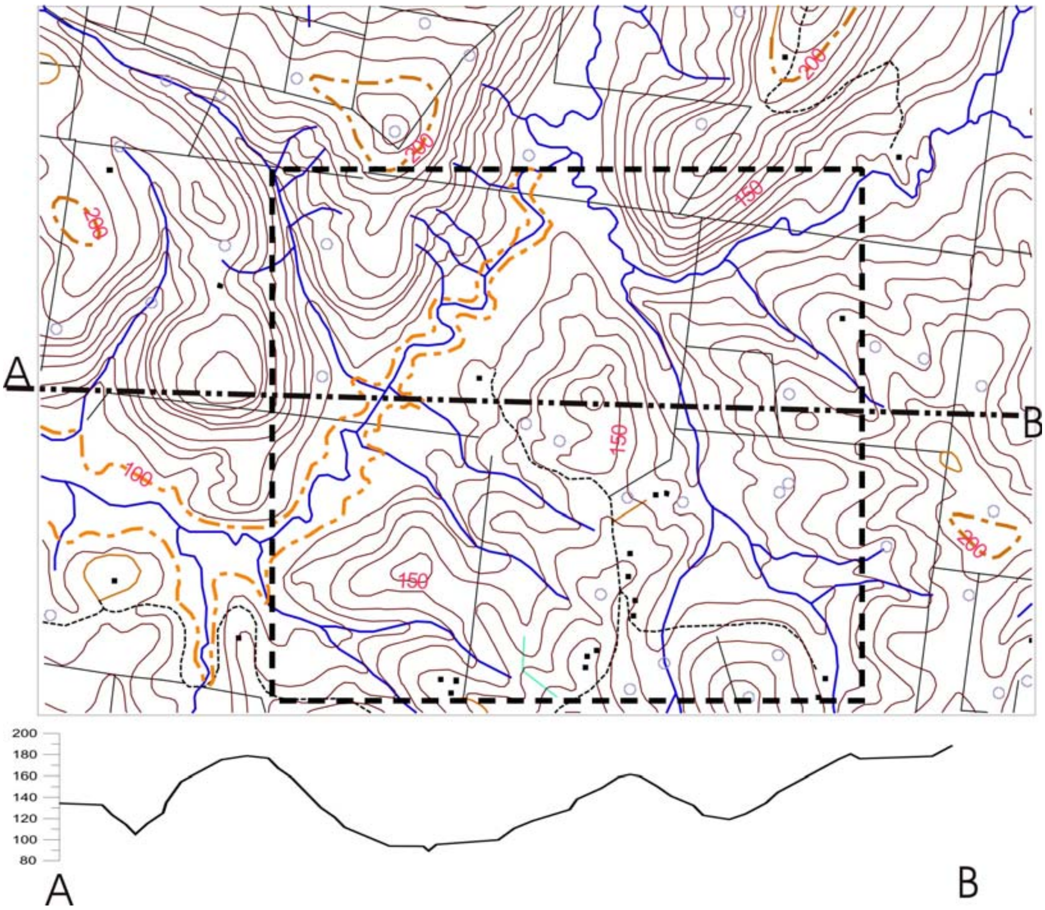

Fig 3 Orthorectified vertical aerial photograph taken November 2002, showing 10 metre contours and drainage lines.

Fig 4 Geomorphological units shown by on a topographical profile (see also Figure 2).