2 PHYSICAL CHARACTERISTICS OF THE LAND

2.1 Climate

The weather in the region is primarily controlled by easterly moving pressure systems. In summer these are centred to the south of the continent but, in winter they are more northerly, being between latitudes 30^0 and 35^0 south. Occasionally summer weather conditions are influenced by moist tropical air that has moved south (Bureau of Meteorology, 1974).

Generally summers are dry and hot, and winters cool and wet. There is a trend of warmer, drier conditions at low elevations, to cooler and wetter conditions at higher elevations, particularly in the south. The pronounced variation in topography and elevation in the region, however, produces significant local variation in rainfall and temperature, with changes often sharp.

There are few full meteorological recording stations in the region although rainfall data for the area covered by the Albury - Wodonga District Meteorological Survey (Bureau of Meteorology, 1974) were collected from a reasonably extensive network of rainfall stations. Even the more extensive rainfall network, however, is still insufficient for providing more than broad trends. Some indication of local temperature and rainfall regimes is provided by the native vegetation.

Available climatic data are given in Rowe (1967) and, for the north-west of the area, in the Albury - Wodonga District Meteorological Survey (Bureau of Meteorology, 1974). Figure 2.1 shows trends in average annual rainfall for the survey area. Isohyets in this map have been derived by the Centre for Land Protection Research from estimates of long-term mean annual rainfall interpolated to a 500 m grid cell resolution using the ESOCLIM (Hutchinson, 1991) software.

2.2 Geology and Geomorphology

2.2.1 Geology

The region is comprised primarily of Ordovician sediments that have undergone deformation, granitic intrusion and a phase of high grade regional metamorphism. There are local occurrences of Silurian and/or early Devonian acid volcanics. Quaternary colluvial and alluvial deposits are found in most of the major stream valleys particularly in the north. There are only very minor areas of Tertiary sediments.

The general distribution of rock types is shown in Figure 2.2 and a brief summary of the geological history is given in Table 2.1.

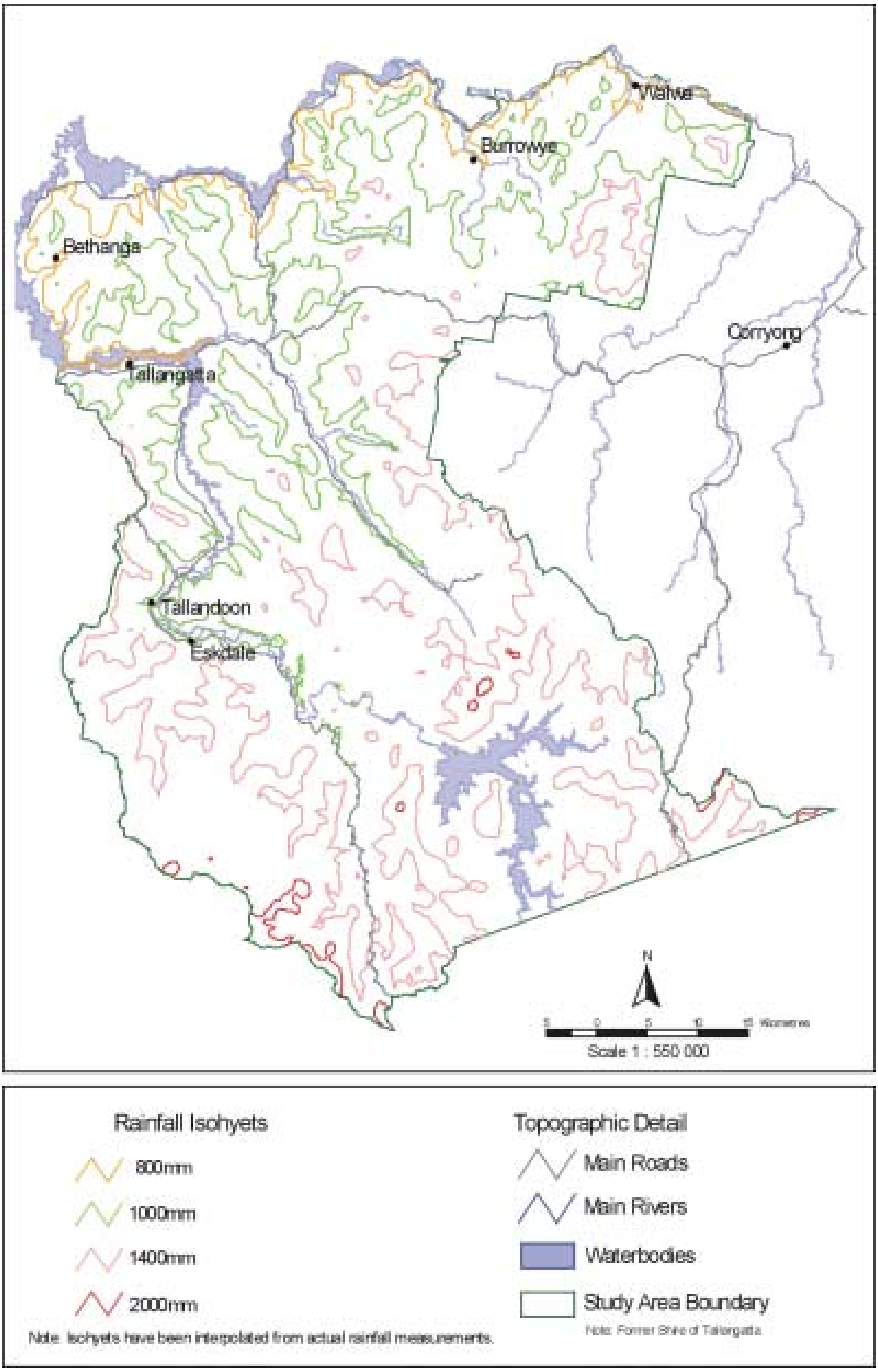

Figure 2.1 Climate: Predicted Annual Average Rainfall

Table 2.1 Summary of Geological Development

Period	Major events	Map symbol (Figure 2.2) and rock types
Ordovician	Sediment deposition in Wagga Trough	O - greywacke, quartzite, siltstone and slate. Local contact metamorphism to hornfels.
Upper Ordovician - Lower Silurian	Benambran deformation with periods of folding, regional metamorphism and granite intrusion	O-Ss - medium grade regional metamorphic rocks - schists and spotted phyllite. O-Sn - high grade metamorphic rocks - gneiss, migmatite; some granite and pegmatite. O-Dg - granite.
Mid Silurian - Lower Devonian	Extrusion of Mitta Mitta volcanics and deposition of the Wombat Creek group of sediments	Slv - dacite, rhyodacite, in Benambra - Mt Cravensville area; glassy rhyolite, rhyodacite and volcanic breccia. S - conglomerate overlain by limestone followed by mudstone and inter-bedded conglomerates and subsequently by sandstone with interbedded siltstone and limestone in the south, and by conglomerates in the north.
Upper Silurian - Lower Devonian	Bindian deformation with folding of the Silurian sediments and widespread igneous intrusion Volcanic and associated sub-volcanic activity	O-Sd - quartz diorite with a 2 km contact metamorphic aureole. S-Dg - granite with contact and regional metamorphic aureoles. Dmv - rhyolite. Dmg - pink granites, medium grained with quartz, plagioclase, perthite and biotite or fine grained with quartz perthite, orthoclase, oligoclase and a small amount of biotite.
Quaternary	Colluvial deposition along the major rivers in the north Alluvial deposits	Qc - Modern floodplains, sand, silt and gravel. Qs - Remnant terraces 3-4 metres above the modern floodplains; predominantly silt. Qra - poorly sorted gravel and coarse sand with some interbedded finer material.

Palaeozoic faults: Tallangatta Creek Fault and the north west trending faults in the Tallangatta area, Talgarno Fault, Tawonga Fault, Walwa Fault, Wombat Creek Fault and Morass Creek Fault.

Cainozoic faults: In the survey region movement during the Cainozoic period has generally been along older faults, the most notable being the Tawonga Fault.

Information source: Bolger and King (1976), 1:250 000 Tallangatta Geological map sheet (SJ55-3)

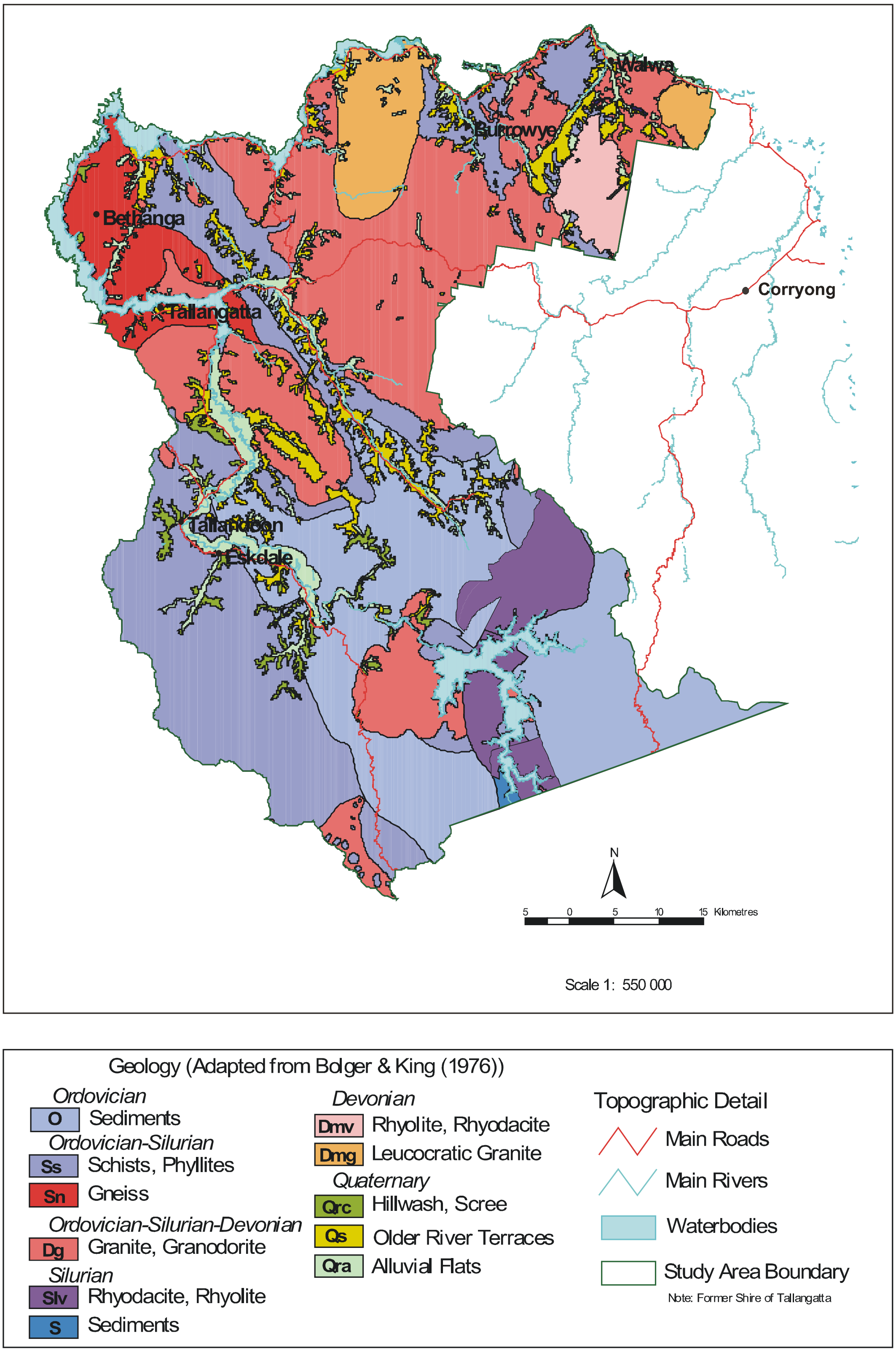

Figure 2.2 Geology

2.2.2 Geomorphology

The survey area is completely within the catchment of Lake Hume. Hills, mountains and plateaux are predominant with land of gentle relief at low elevation restricted to the central and northern river valleys.

Landform development is due mainly to differential erosion and the isolation of some areas from deep dissection. In the south, stream entrenchment has generally been in soft rocks. This has produced hills and mountains with ridge and ravine topography, typically with narrow crests, steep slopes and V-shaped valleys. In the north, coarse crystalline rocks are widespread and these have tended to resist erosion. Plateaux are more common than in the south, with many of the mountains and hills in the north having areas with very gentle slopes at high elevations. Several rivers have cut valleys along faults.

Spurs with crests at roughly concordant elevations are often found in some river valleys, for example that of the Mitta Mitta. They suggest an earlier, broader valley that has been incised and eroded.

On the basis of relief, elevation and slope, seven physiographic regions have been identified. They are described in Table 2.2 and shown in Figure 2.3.

2.3 Soils

The diversity of geology, topography and climate has resulted in a wide range of soils in the survey area. Many of the differences in the distribution of soil types are a result of different moisture regimes due to aspect and topographic position. Common soil types within each land type are given in Tables 4.1 - 4.17, while Appendix 3 gives profile descriptions and chemical data for fifteen selected soils. Other useful chemical data can be found in Rowe (1967).

Organically rich but generally shallow soils dominate the areas at highest elevation (subalpine and alpine) where climate has a dominant affect on soil development. Deeper soils, generally friable and structured, and occasionally with an A_2 horizon occur on the plateaux, particularly the forested plateaux [Factual key (FK), Northcote (1979): Gn3, Gn4; Australian Soil Classification (ASC), Isbell (1996): Red or Brown Dermosols].

A range of soils occurs on the mountain and associated hill map units and dissected plateaux. These range from shallow clayey sands to texture contrast (duplex) soils in the drier granitic areas (FK: Uc, Um & Dy; ASC: Tenosols, Kurosols & Chromosols) to moderately to strongly structured uniform and gradational soils (FK: Um & Gn; ASC: Tenosols & Dermosols). There is a similar trend on the sedimentary and metamorphic rocks, although there is less coarse sand than in granitic areas.

Similarly, low hills on both granitic and sedimentary rock have shallow, less developed soils on the steeper slopes (FK: Uc, Um; ASC: Tenosols & Dermosols) and deeper texture contrast soils (FK: Dy, Dr; ASC: Kurosols and Chromosols) on the lower, colluvial slopes and older upper, terraces.

The floodplains have soils that are generally recent in development and the result of aggradational processes. They range from well drained uniform and gradational soils (FK: Um, Uc; ASC: Dermosols) to poorly drained gradational and texture contrast soils (FK: Gn, ASC: Hydrosols, Chromosols). Examples of alluvial soils are given in Imhof *et al*. (1996) for the Tallangatta Valley.

While water is regarded as the major agent in soil formation and erosion, recent work by Rowe (1994) has indicated the importance of wind action in soil development in past (but geologically recent) climates, with significant accessions of dust in this area, particularly on lower slopes and plateaux.

Table 2.2 Physiographic Regions

Physiographic Region	Description
Flat to undulating plateaux	Level to undulating plains, undulating rises and low hills at highest elevations in the local landscape. These areas appear to be old land surfaces, isolated from current stream entrenchment and consequently not deeply dissected.
Dissected plateaux	Very steep to rolling hills in high landscape positions. Undulating to rolling low hills, undulating rises and plains occur in some valleys of these dissected plateaux, for example, at Koetong. Some benches also with gentle slopes. In these areas stream entrenchment, although greater than on flat to undulating plateaux, has been limited. This is probably due to relatively recent initiation of dissection and/or the presence of erosion resistant rocks.
Mountains	The mountainous areas have been divided into two subregions. (a) *Mountains with uneven (benched) slopes common — areas with coarse crystalline rocks* In the north and centre of the study area, mountains are generally lower and less extensive than in the south, with mountain regions being separated by broad river valleys. The bedrock is predominantly coarse crystalline rock and this appears to have affected dissection – slopes are often variable with gentle to moderate slopes recurring in association with steep and very steep slopes. (b) *Mountains with steep, relatively even slopes, narrow crests and incised valleys — ridge and ravine terrain* Mountains with steep to very steep slopes have developed principally on the schist and sedimentary rocks in the south. Valleys are usually V-shaped, particularly on the sedimentary rocks, and crests narrow.
Hills	North of the Tawonga Fault, relief is more subdued adjacent to the major rivers. This hilly terrain has been divided into two subregions, as for the mountainous areas. (a) *Hills with uneven (benched) slopes common — areas with coarse line crystal rocks sedimentary rocks, and narrow crests* Hills typically with variable slopes and rock outcrop common, occur on granite and gneiss in the northern part of the study area. (b) *Hills with steep, relatively even slopes, narrow crests and incised valleys — ridge and ravine terrain* Hills with steep, relatively even slopes, V-shaped valleys and narrow crests are relatively extensive on schist and sedimentary rocks.
Rolling hills	Rolling hills, occasionally very high, with rounded crests and valleys, occur on granite and gneiss in the north-west.
Low hills and undulating terrain	Steep to rolling low hills and rises, and level to undulating plains occur adjacent to the larger streams and floodplains throughout the northern and central parts of the region. This region is absent from the extreme south of the survey area. Some of the old alluvial terraces are now several metres above the modern floodplain.
Active floodplains	Relatively extensive floodplains occur along the Murray and Mitta Mitta Rivers and along the Walwa, Sandy, Tallangatta, Spring and Cottontree Creeks.

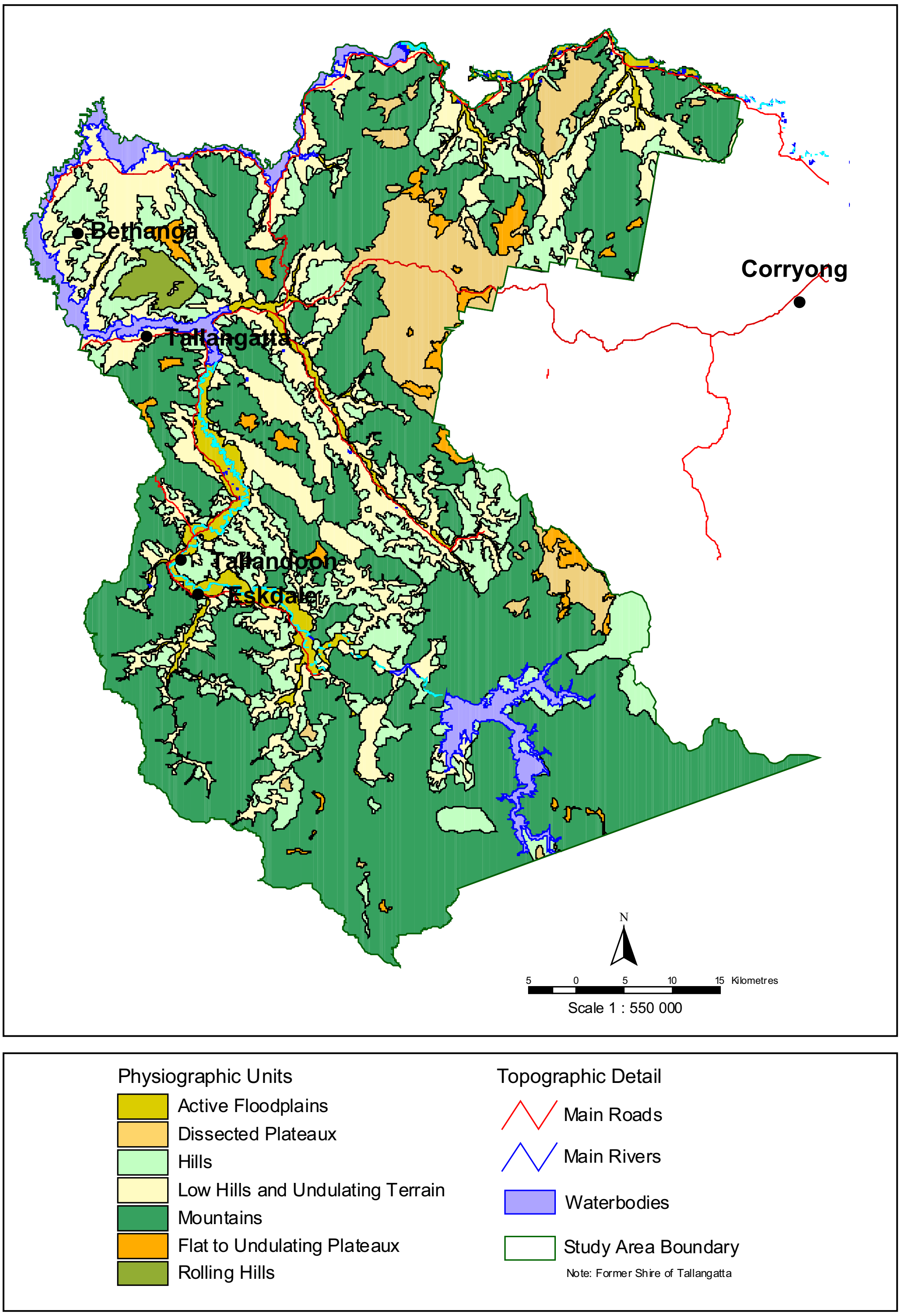

Figure 2.3 Physiographic Regions

2.4 Vegetation

The distribution of vegetation is strongly related to the local water regimes which are determined by the climate, topography, geology and soil. In fact, in this survey, vegetation type is used to distinguish components (humid and dry slopes) of some land types.

The vegetation classification used in this report is based on the structural vegetation classes of Specht (1970) but with height classes of the tree stratum the same as those defined by the (then) Victorian Forest Commission. These class heights are given below.

I	5 - 15 m
II	15 - 28 m
III	28 - 40 m
IV	> 40 m

These class heights are generally related to site water status. For example, Open Forest IV with Alpine Ash (*Eucalyptus delegatensis*) grows at higher elevations, usually on more protected aspects and deep well structured soils with good water holding capacity and good drainage. This forest generally has a broad-leaved shrubby understorey and a dense layer of tree-ferns, both of which are also indicative of a wet climate.

Recent vegetation mapping by the Department of Natural Resources & Environment (Adams 1997) has used vegetation classes (Ecological Vegetation Communities; EVC’s) based on species composition. The communities delineated by this classification technique also reflect the gradient between dry and humid environments. The mapping is at a scale of 1:100 000 and complements the vegetation mapping based on structure used in previous vegetation surveys.

On dry slopes, the predominant vegetation is open forest II, although class I also occurs. Major overstorey species are Red Stringybark (*Eucalyptus macrorhyncha*), Broad-leaf Peppermint (*E. dives*) and Long-leaf Box (*E. goniocalyx*). Mountain Gum (*E. dalrympleana*) occurs at higher elevations. The EVC's occurring on these slopes are mostly Grassy Dry Forest, Shrubby Dry Forest and Heathy Dry Forest. At higher elevations (mostly greater than 1000 m), these vegetation types give way to Montane Dry Woodland.

Slopes with eastern and southern aspects are generally more humid, and open forest III usually predominates. Common overstorey species on these slopes are Narrow-leaf Peppermint (*E. radiata*), Candlebark (*E. rubida*) and Blue Gum (*E. globulus*). Open forest IV with Mountain Gum (*E. dalrympleana*) or Alpine Ash (*E. delegatensis*) occurs on humid slopes at higher elevations (mostly greater than 900 m). Herb-rich Foothill Forest is the common EVC; restricted areas of Damp Forest are found in higher rainfall areas or on more protected sites. Montane Damp Forest occurs at higher elevations in the southern part of the study area.

At high elevations (1300-1700 m; Adams 1997) and on cold exposed sites, open forest gives way to sub-alpine woodland dominated by Snow Gum (*E. pauciflora*) with the occasional open grassland/heath at the highest elevations.

Chapter 4 gives further information on the vegetation associated with each of the land types.

Given the variety of land characteristics, the land resources can be classified in a number of ways depending on the particular characteristics chosen and the range of variation allowed within a characteristic, that is on the number of “classes” into which each characteristic is divided. Classification will also vary depending on the extent to which landscape processes are taken into account.

Generally, there is no “right” land classification for a particular area. Each possible classification will have advantages and disadvantages depending on the purpose of the survey. Classifications can be divided into two groups - those which are for a specific purpose, usually a specified land use, and those which are broad, general classifications designed to serve a number of purposes. Generally when the use is specified, the land classification process is simplified as the land characteristics to be used and their range of variation is set by the use. This is not so with general purpose classifications. In this case it is up to the judgement of the classifier to determine the characteristics and their range which will be most useful for a variety of purposes.

The former Victorian Soil Conservation Authority has used the Land System survey approach for general purpose classifications. Characteristics to be used in delineating land systems and the range of variation permitted within a land system were defined (see for example, Aldrick *et al.,* 1988*).* This was used both to aid the land classifier and also to standardise land system mapping.

3.1.2 Mapping in the western part of Towong Shire

There were several requirements for land mapping in the area covered by this survey. It was needed for assessing land capability for several uses, in particular *Pinus radiata* production and rural subdivision. Most importantly, it was needed to assess the relative potential of different areas for land deterioration, particularly soil loss. Soil loss was considered to have a high potential for influencing water quality and the Hume and Dartmouth water storage’s.

To meet these various requirements, a multipurpose classification was needed. The mapping approach adopted was similar to the land system methodology in that the same land factors, that is climate, topography, soils and vegetation, were considered in the delineation of land types. The variation permitted in these factors, however, did not follow the range defined for land systems.

Another difference between this and traditional land system surveys was the broad initial stratification of the land into physiographic regions. Although made on the basis of landform, this stratification was assumed to correlate with hydrological processes — whether water tends to move vertically or laterally, whether the land tends to receive water from other areas or to shed it, and whether stream transport capacity is sufficient to transport sediment away from local hills and slopes. These differences in hydrology are important factors in the susceptibility of land to soil loss and the potential of areas to affect water quality.

The physiographic regions delineated by this first stratification were further subdivided into land types on the basis of geology and topography. It should be noted that a particular land type can occur in more than one physiographic region. For example, hills on granite are a common component of the dissected plateaux in the vicinity of Koetong. These hills are a similar land type to the hills on granite adjacent to the Mitta Mitta River valley, though these latter hills are not part of a high elevation plateau and hence are in a different physiographic region.

During field work it was apparent that open forest I and II with abundant leaf litter and sparse ground cover occurred on shallow soils on exposed slopes. These vegetation and soil types are associated with a dry water regime. At the other extreme, open forest III and IV with dense understoreys were found on deep, mostly red, well structured soils which would be well drained with a high water holding capacity. These forests and soils reflect a relatively humid water regime.

These dry and humid forests were often found growing in relatively close proximity at similar elevations. Since forest and soil types reflect the local water regime they can be used as an indicator of it. They show the extent to which the water regime of an area is influenced by aspect rather than elevation, with aspect influencing both the amount of precipitation and water loss through evapotranspiration. Throughout the survey area, soil and vegetation were taken to be a more reliable indicator of the water regime of a site rather than the climate map.

The differences between these climate/soil/vegetation complexes within areas with similar geology and landform, are sufficient to warrant further subdivision of the land. This was not practical, however, as the two environments were often closely associated, with, for example, dry forests occurring on exposed northerly and westerly aspects and more humid forests growing on east and south facing slopes. As a result, substantial variation in soil and vegetation occurs within some land types.

3.1.3 Accuracy of the 1:100 000 Land Type Map and Land Type Descriptions

The following factors should be considered when using the land type map and descriptions.

Variability within the land types

The total variability in soils and vegetation within a land type has not necessarily been described. Time constraints for survey work meant that not all representative occurrences of a land type could be sampled in the field.

Land type boundaries

Geology has been a major land characteristic used to distinguish land types. All geological boundaries have been determined from the Tallangatta 1:250 000 geological map and the Cravensville and Talgarno 1:50 000 geological maps. There are, therefore, two possible sources of error where land types have been delineated on the basis of geology. One source is inaccuracies on the original geological maps. The other is inaccurate transfer of boundaries from the 1:250 000 to the 1:100 000 map. Boundaries between granite and gneiss or between schist and sedimentary rock are regarded as less important due to the similarities of these rock types.

3.2 Descriptions of Physiographic Regions

3.2.1 Flat to undulating plateaux

Characteristics

These areas appear to be old land surfaces, isolated or protected from current stream entrenchment and consequently not deeply dissected. Slope and stream gradients are therefore low.

Geology is variable, these areas occurring on granite, gneiss, schist, rhyolite and sedimentary rocks. Climate and consequently vegetation also vary. Subalpine woodlands of *E. pauciflora* occur at high elevations in the south while elsewhere open forest II or III is predominant.

Except for subalpine areas, soils are mostly deep. This can be attributed to the relative stability of these areas and their generally higher landscape positions and hence tendency to receive higher rainfall.

These regions have been subdivided into land types on the basis of geology and hence plateaux land types are: plateaux on granite (PG), plateaux on gneiss (PGs), plateaux on rhyolite and rhyodacite (PR), plateaux on schist (PS) and plateaux on sedimentary rocks (PSy).

Water movement and erosion

Flat to gentle slopes result in water moving into, rather than over, the land. This is also promoted by the high infiltration rates soils are likely to have as a result of well structured topsoils and subsoils. High water holding capacities and, in non-subalpine areas, forest vegetation would tend to result in infrequent soil saturation though this tendency would be countered to some extent by the lack of runoff, either surface or subsurface.

Depth to groundwater and groundwater recharge rates are, however, mostly unknown though the bogs on subalpine plateaux are regions of shallow water tables.

The tendency of water to move vertically combined with stability of soil aggregates, results in a low susceptibility of these areas to erosion. Low slopes and lack of an impermeable layer at depth limit any tendency deep percolation may have had in causing landslipping. Also, low stream gradients would limit the power of streams to transport sediment so that any eroded material would tend to be stored on these plateaux rather than be transported to the major water impoundments. As a result, these areas are regarded as some of the most stable in the study area, where land disturbance is likely to have little affect on surface water quality. The effect of clearing, however, on groundwater recharge and its potential for increasing flows in the major rivers is unknown.

3.2.2 Dissected plateaux

Characteristics

Stream entrenchment has been limited over large areas of the study area, particularly in the east, giving rise to dissected plateaux. In some mountainous terrain, small and relatively undissected areas are found part way up mountain slopes and these areas have been included in this region. Erosion resistant rocks are a probable cause of the lack of deep incision. Local stream base levels are well above lake level which results in low stream gradients.

Dissected plateaux occur on all rock types though granite, schist and rhyolite are the most common. Topography varies from steep hill slopes to undulating terrain and plains. The moisture regime changes from relatively wet to dry, the change being reflected in the vegetation and soils. Geology and topography are used to subdivide this region into land types. Land types include hills on granite (HG-DP), hills on rhyolite and rhyodacite (HR-DP), hills on schist (HS-DP), hills on sedimentary rocks (HSy-DP) and low hills and undulating terrain in high landscape positions (LHUH). Although the hills in this physiographic region are considered to belong to the same land type as hills of the same lithology within the mountain and hill physiographic regions, 'DP' has been added to the map symbol of hills which form part of dissected plateaux.

Water movement and erosion

Water movement is expected to vary between the different land types depending on the topography, geology and soils. Hills are expected to have similar pathways of water movement as described for the 'Mountains and Hills' region below.

On the undulating terrain, water tends to move into, rather than over, the land. The gradients of the major streams draining the plateaux are low. This results in reduced sediment transport capacity of the streams and tendency of any sediment that is produced to be stored within the drainage system rather than be transported to lower elevations.

3.2.3 Mountains and hills

The mountain and hill regions are described together as water movement tends to be similar. The subregions with coarse crystalline rocks, however, are described separately from those with sedimentary and schist bedrock. In the drier localities in particular, where soils are shallow, bedrock may influence water movement.

(a) *Mountains and hills with uneven slopes common — areas with coarse crystalline rocks*

Characteristics

Mountains and hills on coarse crystalline rocks and with predominantly steep slopes, often contain small flat to undulating areas. These are thought to be due to the presence of relatively fresh rock at shallow depths. Stream gradients are correspondingly variable.

This terrain is restricted to granite and gneiss, and is particularly characteristic of these rock types in the drier northern areas. In more humid regions, slopes tend to be more even, possibly due to more intense weathering of the bedrock.

Soils and vegetation vary depending on the local climate and its effect on water regime. The prevailing water regime can change over relatively short distances. Drier areas tend to have shallow uniform soils and low forests, mostly with relatively sparse understoreys and abundant leaf litter. In wetter localities, soils are generally deeper, well structured and gradational, often with high amounts of organic matter in the topsoil. Duplex soils are common on slopes with an intermediate water regime and lower gradient.

Subdivision into land types has been on the basis of geology and topography. The main land types in this physiographic region are: mountains and hills on granite (MG, HG), mountains and hills on gneiss (MGs, HGs) and mountains on leucocratic granite (MLG).

Water movement and erosion

Water movement is determined by both slope gradient and local soil. The massive nature of granites and gneisses, with relatively few fractures along which water can move, is also important where the soil is relatively shallow. Massive rock at shallow depth promotes rapid saturation of the soil and consequently overland flow. Where subsoils are clayey, saturation often results in land slipping. Massive bedrock also tends to produce lateral subsurface flow and development of seeps where the rock comes close to the surface.

Many of the soils on granite and gneiss have a tendency to surface seal with rainfall impact and trafficking by stock and vehicles. This would exacerbate the tendency for water to run off rather than infiltrate.

Slopes in this physiographic region are, therefore, regarded as having the capacity to generate considerable surface runoff, particularly following periods of high rainfall when soils are near saturation. The exception would be the more humid slopes where soils are well structured and deep. Slopes with these soils are expected to have a pattern of water movement similar to that described for mountains and hills with ridge and ravine terrain and humid forest.

Where stream gradients are gentle, the capacity of water flow to transport sediment is reduced and these areas would generally store most eroded material.

(b) *Mountains and hills with steep relatively even slopes - ridge and ravine terrain*

Characteristics

This terrain is characterised by narrow ridges and valleys and generally steep to very steep slopes. It occurs on softer and/or more weathered rocks where stream entrenchment has not been limited. Mountains and hills with ridge and ravine topography are particularly common on schist and sedimentary rock in the south of the survey area.

As with the other physiographic regions, climate varies considerably with local topography, the water regime varying from wet to relatively dry. Soils and vegetation are correspondingly variable.

Geology and relative relief have been used to delineate land types. Land types in this physiographic region are mountains and hills on rhyolite and rhyodacite (MR, HR), mountains and hills on schist (MS, HS) and mountains and hills on sedimentary rock (MSy, HSy).

Water movement and erosion

Steep slopes promote runoff rather than infiltration though soils as well as slope gradient will also influence the infiltration to runoff ratio.

In more humid terrain, soils are deep, well structured and gradational with high organic matter contents in the topsoil. Water would tend to infiltrate rather than runoff due to well structured topsoils, high porosity for considerable depth and high water holding capacities. Where slopes are very steep the probability of runoff is increased but it is thought that infiltration rates are probably high enough to outweigh this factor in all but the most intense storms. Stream flow in these areas would therefore be expected to result mainly from groundwater recharge. Clearing would be expected to result in raised water tables and, adjacent to streams, this could cause overland flow together with increased stream discharge following storms.

In drier areas, soils are shallow and would tend to saturate more rapidly, promoting runoff. Generally, however, ridge and ravine terrain occurs in drier areas on schist and sedimentary rock; these rocks tend to be well fractured and would allow downward water movement. Greater runoff may occur from drier slopes on rhyolite and rhyodacite. Consequently, although surface water flow would be expected, it may not be as great as where shallow soils occur on granite and gneiss. As in humid areas, clearing would probably also result in increased stream flows immediately following storms.

3.2.4 Rolling hills

Characteristics

Rounded crests and valleys and gentle to moderate slopes are typical of the rolling hills province although the origin of this landform pattern is unknown. Stream gradients also tend to be relatively low due to the close proximity of this terrain to the base level of Lake Hume.

Gneiss is the only rock type on which this landform has developed. The occurrence of this province is limited to a small area north of the Mitta Mitta arm of Lake Hume. Soils are commonly duplex though shallow uniform soils occur on steeper slopes. Native vegetation is generally an open forest **I** or **II**. These hills are mapped within the rolling hills on gneiss (RHGs) land type.

Water movement and erosion

The hydrology and stability of this region is similar to that of the mountains and hills with variable slope gradients. The generally more gentle slopes, however, would tend to increase the tendency of water to infiltrate rather than runoff.

3.2.5 Low hills and undulating terrain

Characteristics

Low hills, rises and plains are common in the north of the survey area, although they also occur in the south. They are characteristically regions of run-on from surrounding hills and mountains, particularly those on granite and gneiss. Sediment carried by run-on is deposited with change to lower slope gradient and hence parts of this terrain also tend to be areas of sediment accumulation.

This lower relief terrain is found along most larger rivers, irrespective of geology. Being at low elevations, the climate is generally relatively dry. Soils are developed both on colluvium and alluvium, and *in-situ* on rock. *In-situ* soils are similar to those of hill slopes on similar lithologies while those on depositional material are very variable and often have complex layering. The native vegetation is predominantly open forest II with some woodland II on alluvium. Species vary between the north and south.

Although base level is near that of Lake Hume, terrain in this province is considered susceptible to gully erosion particularly where there is accumulation of colluvium.

Two land types have been distinguished on the basis of underlying materials. The first is low hills and undulating terrain on granite, gneiss and derived colluvium and alluvium (LHUG). The second is low hills and undulating terrain on schist, sedimentary rock and derived colluvium and alluvium (LHUS).

3.2.6 Active floodplains

Characteristics

The modern river floodplains have active river channels and flow paths. Processes of deposition and erosion both occur.

Soils of the floodplains are variable and depend primarily on the age and texture of alluvium. Vegetation depends mostly on drainage but also partly on local climate. The variation, however, is encompassed within the one land type, active floodplains (A).

Water movement and erosion

Water and sediment movement is principally associated with river and flood flows. Consequently, land use practices which increase stream discharge from the hills and mountains, particularly through an increase in surface flow following storms, will increase erosion from river banks and channels. The transport capacity of the rivers would also be increased with an increase in discharge. This would result in sediment, both from within this region and that transported to it, being more likely to be moved through the river system to water storages. Clearing within this region, particularly along channels, will also increase channel erosion.