

## **PART III**

### **THE INFLUENCE OF SETTLEMENT**

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## **PRESENT USE OF THE LAND**

### ***WATER SUPPLY***

The average annual flow of the Kiewa River at Kiewa township is 512,000 acre feet, (State Rivers and Water Supply Commission pers. comm. 1971) and Yackandandah Creek adds another 29,000 acre feet. This is an average annual yield from the whole of the gauged area of a little under 1,000 acre feet per square mile.

Calculations based on empirical formulae indicate that as much as 2,500 acre feet per square mile per annum may be yielded from the country, above 5,000 feet. Because much of the winter precipitation falls as snow, which may not melt for up to 4 months or longer, run-off is delayed in the alpine sections of the catchment, and this tends to prolong the river flow in the dry part of the year.

There is at present no irrigation storage on the Kiewa River, but its summer flow contributes to the flow of the Murray River above Albury, and it therefore comes under the control of the River Murray Commission. The average flow of the river at Kiewa from October to April inclusive, the usual irrigation season, is 232,000 acre feet. About 8,700 acre feet per annum is committed for use by diverters within the catchment. (State Rivers and Water Supply Commission pers. comm. 1971). Most of this is used during the period of December to March inclusive.

Water from the high country in the south is used for the generation of electricity in the State Electricity Commission's Kiewa Hydro-electric Project. This scheme has a developed capacity (1961) of 184,000 kilowatts and an average annual production of electricity of about 340 million kilowatt-hours. "Power from Kiewa". S.E.C. booklet).

The scheme is centred on a 23,000 acre feet storage in Rocky Valley with full supply level at 5,338 feet elevation. The waters of Pretty Valley Creek are diverted, and together with water from the Rocky Valley storage are piped to the McKay Creek power station. After passing through the turbines the water is discharged into Pretty Valley Creek and flows via the Lake Guy pondage at Bogong to the Clover Power Station and thence into Clover Dam pondage. From there it is conducted through a tunnel to the West Kiewa Power station where it augments water diverted from the West Kiewa River. The water is finally passed into a regulating pondage at Mount Beauty and is then released into the Kiewa River.

A number of high-elevation race lines is used to divert water from adjacent catchments into the hydro-electric system. The headwaters of the Bundarah River and Middle Creek, both tributaries of the Mitta Mitta River, are intercepted by long race lines and channelled across the catchment boundary into Pretty Valley via Cope cut, and into Rocky Valley via Langford's cut. A shorter race line diverts water from the head of the Big River near Spion Kopje into Nels Creek North which flows into Rocky Valley Creek above Lake Guy.

Within the upper Kiewa catchment, a small raceline conveys water from near the Niggerhead into Pretty Valley, others on either side of Rocky Valley Creek bring water back into the storage, and an extensive race taps the upper Bogong Creek catchment and diverts the water through Clover Power Station.

Although present development is extensive, future development could increase the electrical generating capacity of the system to over 300,000 kilowatts with an annual production of over 800 million kilowatt-hours of electricity ("Power from Kiewa"). This would involve the construction of a large storage in Pretty Valley, construction of another power station and possibly diversion of the headwaters of the West Kiewa River via a tunnel through the Fainter ridge to the new power station.

### ***FORESTRY***

The most valuable eucalypt forests are located in the higher-elevation country in the south of the catchment, and this is the area in which the most intensive commercial utilisation occurs at present.

The average quantity of saw-logs derived annually from the catchment over the period 1968-1970 was a little over 2¼ million super feet of alpine ash and just under 3¾ million super feet of other eucalypt species. One saw-mill at Tawonga processed about 80 per cent of the alpine ash and about 7 per cent of the mixed species logs. A mill at Stanley used about 60 per cent of the total mixed-species log production. Other mills using eucalypt logs from the catchment are at Glen Creek, Yackandandah and Rutherglen.

The softwood output from the Stanley plantation averaged, over the same period, about 4½ million super feet of saw-logs and 1¾ million super feet of pulpwood. Round posts are also an important product, averaging about 12,000 per annum over the period 1968-70 (Forest Commission of Victoria pers. comm. 1971).

The extensive alpine ash forests in the East Kiewa are largely regrowth from fires, probably in 1926 and 1939, and are generally not yet ready for milling. They are largely within the Crown Grant area of the State Electricity Commission and their future use is not yet clear.

Replanting of logged pine areas and the establishment of pines after clearing of low-quality mixed-species eucalypt forest are carried out by the Forests Commission in the Stanley area.

Current regeneration practice in alpine ash forests requires that the logged area be burned in autumn to provide a suitable seed bed for seedling regeneration. Artificial re-seeding from light aircraft is becoming accepted practice in alpine ash areas.

Fire protection is another important forestry activity. The State Electricity Commission maintains a summer fire lookout tower on Mt. McKay, and others operated by the Forests Commission on Mt. Hotham, Mt. Porepunkah and Mt. Stanley provide good visual coverage of the catchment. The essence of successful fire protection is to attack before the fire gets too big. To this end, early discovery of fires from the towers is complemented by a network of forest roads, which enable fire-suppression crews to rapidly reach fires.

Construction of roads, both for logging and fire protection purposes, is one of the main activities of forestry organisations. Fire-access roads are generally located on top of or high up on ridges and spurs. Usually they are built to a minimum standard as they are infrequently used. Roads for access to logging areas are often located in the bottoms of valleys or are cut in the slopes below the area to be logged. There is also a tendency to build these roads to a minimum standard where they are to be used for only a short period. Roads which provide access to forests which can supply logs for a number of years are usually better constructed.

Because roads cut across natural drainage, both surface and sub-surface, and are maintained in a bare, compacted condition, they constitute a major source of concentrated surface run-off, and may contribute considerable sediment to streams during heavy rain. In water-supply catchments, road location, design, construction and maintenance are extremely important and should be subjected to much more skilled attention than has been the practice in the past.

Another forestry activity, associated with the protection of valuable forests, and life and property from wild fire, is fuel-reduction or "protection" burning. This is usually a low-intensity fire in strategic areas, generally to the north and west of areas to be protected. Its purpose is to reduce the amount of inflammable material in the forest. The areas burned are usually the poorer-quality mixed species forests, particularly on dry and exposed aspects where suitable conditions for burning occur earlier or later than in the more valuable forests.

## ***GRAZING AND AGRICULTURE***

Grazing and agriculture are largely confined to the residual hills, and the slopes, terraces and flats of the valleys, with some development of plateaux and the more hilly country.

The Stanley plateau is the most extensive and the most intensively developed of the plateaux. State-owned plantations of exotic conifers (Plate 19) take up a large proportion of the plateau, but much of the remaining area is planted to orchards (Plate 20). Apples are the major crop, with pears and small areas of walnuts. Potatoes are also grown on a commercial scale. Small flocks of sheep for meat are grazed on predominantly native pastures. The small plateaux on the Baranduda Range, the Murramurrangbong Range and at the head of Commissioners Creek north of Yackandandah (Plate 21) are the only others developed for agriculture. The plateaux on the Baranduda Range and the Murramurrangbong Range are used for beef cattle and sheep grazing, on native pastures. The Commissioners Gully plateau is also used mainly for beef cattle and sheep grazing, but pastures are more highly improved and are often cut for grass hay in the spring.

Although the range of rainfall, from 28 inches in the north to over 45 inches in the southern valleys, means that conditions for pasture growth vary considerably, the main land industries in the valleys are the grazing of beef cattle and dairying (Plate 22). The most intensive dairying area is in the Kergunyah-Dederang section of the main valley where rainfall of 30 inches to 38 inches per annum, and generally suitable temperatures, provide good pasture growth at the right times. In the somewhat drier northern area around Bonegilla, grazing of sheep for meat tends to predominate over both beef cattle grazing and dairying. Further south, where temperatures are cooler and rainfall is higher, beef cattle grazing predominates although dairying is still common. Sheep grazing is not as popular in the southern areas.

Figures derived from Commonwealth Bureau of Census and Statistics for the year 1965-66 (1967) show that in the Shire of Yackandandah, which covers the greater part of the agricultural land in the catchment, sown pastures make up about half of the total freehold land. Of the remaining areas about 6 per cent. remains uncleared.

These statistics indicate that superphosphate at an average rate of a little over 1 cwt/acre was applied to more than 60 per cent of the pasture areas.



*Plate 19 - Pines growing on a sluiced area at Stanley. This is part of an extensive area of State plantation.*



*Plate 20 - Apple orchards in the Stanley area*

About 4 per cent of the farmed land is sown to crops, of which a large proportion is oats which is cut for hay. However, grass and clover pastures form the bulk of the area cut for hay. Lucerne is grown for both hay and for green fodder on a number of properties, particularly in the main dairying areas. Small areas of other fodder crops such as maize, turnips and pumpkins are grown, mainly on the flats where they may be spray irrigated from the adjacent stream. In recent years tobacco has become a major crop on the lower terraces and on some of the rolling slopes around Mt. Beauty, Tawonga and in the Mountain Creek valley (Plate 23). Restrictions on the use of water from streams for irrigation will place limitations on the area which can be planted to tobacco. This will also limit any increase in areas of irrigated fodder crops or pastures.

The high-mountain grasslands and herbfield have been used as summer grazing, mainly for beef cattle, for many years. As the environment of these areas became better understood, it was realised that uncontrolled grazing had caused deterioration of the vegetative cover, and the hydrologic condition of these areas had suffered. The more widespread realisation of the value of these areas for water supply purposes has gradually lead to the institution of a system of control of grazing on high land.

A committee of management was set up in 1945 to regulate the grazing on the Bogong High Plains and its environs. The present Committee consists of representatives of the Soil Conservation Authority, the State Electricity Commission, the Lands Department and graziers. It sets dates for entry and removal of cattle (sheep are not permitted) and decides on the total numbers of stock to be

grazed on the area in any season. These decisions are based on considerations of seasonal conditions. Dates of entry vary around late December and dates of removal vary around late March or early April. About 6,000 to 7,000 head of cattle are grazed in these areas which include parts of the adjacent catchments of the Ovens and Mitta Mitta Rivers.



*Plate 21 - The plateau at the head of Commissioners Creek, which has been included in the Big Ben land system*



*Plate 22 - A dairy herd grazing improved pastures on the lower terraces of the Kiewa River near Dederang*

## ***TOURISM***

Because of the natural beauty of the valley and the high country, the pleasant climate and the interest created by the Kiewa Hydro-electric scheme, the area has a considerable appeal to tourists.

The readily-accessible and extensive snow fields of the high plains have led to the development of a ski village at Falls Creek near the Rocky Valley dam. The village is operated under a Committee of Management on which State Electricity Commission, Soil Conservation Authority and skiing interests are represented. Private and commercial lodges are operated within the village and a number of ski-tows are operated.

Guest house and motel accommodation are available at Mt. Beauty and there are hotels at Tawonga, Yackandandah and Dederang.

The main access road between Mt. Beauty and the high plains was built by the State Electricity Commission for the hydro-electric development and is now maintained by the Country Roads Board and kept free of snow up to the Falls Creek village. The southern part of the catchment is readily reached by good sealed road from Wodonga, Yackandandah and Myrtleford. A winding

mountain road provides access from Bright in the adjacent Ovens valley. A road from the Omeo Highway near Shannonvale to the road system on the high plains provides summer access from the south.



*Plate 23 - An extensive area of tobacco on the valley slopes at Tawonga*

## **PRESENT CONDITION OF THE LAND**

In the agricultural areas there is little erosion. The area is favoured by a moderate climate, and the early settlement resulted in holdings of sufficient size to allow development relatively free of the need for severe exploitation.

Slumping has occurred, usually in wet winters, on the steep southerly aspects in the Leneva area but this does not appear to be a severe problem.

Stream-bank erosion is not generally a serious problem. Some sections of the upper reaches of the Kiewa River have been unstable in the past but the construction of groynes and willow planting appears to have arrested the erosion. (Plate 24). Parts of Middle Creek and Kinchingtons Creek have unstable banks and these may be the most serious examples of stream-bank erosion in the catchment. Snagging of the river has sometimes resulted in erosion of the beds and banks and sedimentation of point bars downstream. These problems are being combated by a River Improvement Trust.

The Yackandandah Creek at and upstream of Allan's Flat was dredged for gold, and large areas of tailings and several dredge holes remain. Sluicing for gold was carried out in ancient alluvium, generally on or near the tops of rises, to the south of Yackandandah. Much otherwise sound agricultural land in the Yackandandah area is scarred by the deep holes left from sluicing. Sediment from these activities has been deposited along the lower levels of the Kiewa river flats.

Similarly, in the Stanley area, many of the major drainage lines have been sluiced or mined for gold and much of this land is now overgrown with blackberries and provides harbour for rabbits. Some of the extensively surface worked areas have been planted to pines which have generally been sufficiently vigorous to suppress the blackberries.

The high plains section of the catchment is the area in which the most serious deterioration has occurred. Although soil erosion has occurred and stony erosion pavements on exposed ridges are undesirable in themselves, the corresponding deterioration in the hydrologic properties of this area must be considered as more serious. The damage to the vegetative cover, whether by cattle grazing, fire, insect attack or engineering activities results in exposure of bare soil. Because the soils in the area are highly organic, they are light and friable and very rapidly eroded by wind. The combination of severe frost action and wind erosion results in progressive loss of soil, and if measures are not taken to arrest it, deterioration may continue until a stony pavement is produced. The decline in infiltration and water-holding capacity of the soils which have lost their organic horizon may be considerable. Studies carried out in the Snowy Mountains area by Costin et. al. (1960) show that significantly increased run-off and soil loss occurred from areas where ground cover was incomplete.



***Plate 24 - Willows growing in a bend of the Kiewa River maintain stability of the banks***

Probably the most serious deterioration which has occurred in the whole catchment concerns the bog vegetation and association peats of the high plains. Where once more-or-less continuous bog and peat in the shallow drainage lines slowed the flow of drainage waters, the present-day condition, almost lacking any healthy bog vegetation, consists of well-defined stream channels which freely drain the surrounding country. The numerous cut-off meanders which are now bypassed by the straightened stream channel, indicate the earlier condition of at least some of the main streams on the high plains.

Increased run-off from the surrounding country and the deposition of erosion-debris on the bogs could have contributed to the deterioration. There seems little doubt that uncontrolled grazing and fire have played an important part.

Much of the vegetation of the high-elevation country has been changed by the activities associated with settlement. Fire has been the most important factor. Periodic burning encouraged the establishment of dense leguminous scrub in much of the wet sclerophyll forest. Prolonged fire protection has resulted in the scrub becoming so dense that it constitutes a considerable fire hazard, and in many areas, makes access other than by specially cut tracks almost impossible.

The character of the snow gum woodlands of the sub-alpine areas has been changed by fire. The old, large-crowned woodland-form trees have been replaced by dense thickets of multi-stemmed mallee-form regrowth. The dead parent trunk is often still standing in the centre of the clump of stems. A few areas which have escaped burning indicate the prior condition of these snowgum areas. Costin et. al. (1961) have demonstrated the value of the open woodland form of snow gum in inducing snow-drift development and delaying snow melt.

There is evidence that the presence of abundant shrubs in the grassland and herbfield vegetation is not the climax condition. Carr (1962) claims that the shrubs are the primary colonisers of bare ground in these alpine areas and their extensive presence indicates that the grassland and herbfield sward must have been considerably depleted to have allowed the shrubs to become established in such numbers. This change would probably not be very serious from the point of view of water-suppliers if there were not indications that the presence of the shrubs induces early snow-melt, which is undesirable.

The extensive earth-works associated with the Kiewa Hydro-Electric Scheme have posed a considerable conservation problem. Much effort has been expended on revegetating the exposed soil on race-lines, road batters and borrow-pits in the alpine country. This has not always been successful because of the harshness of the environment and the persistent attention given the developing grass cover by uncontrolled cattle in summer.

Langfords Cut, a large channel cut through the catchment divide to bring race-line water into Rocky Valley dam, has posed problems of stability of both the bed and banks of the channel.

The construction of access roads results in the interception of surface and sub-surface drainage, and its channelling through roadside drains and culverts onto vegetation, which is often unable to withstand the prolonged wetness or the sedimentation which sometimes also occurs. Death of the vegetation and the development of a scour have followed.

The excessive use of the bulldozer blade in constructing minimum standard tracks for temporary access or fire access is a common occurrence which is considered undesirable and unnecessary.

The considerable changes which have occurred in the high-elevation country are attributed to the difficult environment and a lack of understanding of the environment by those people who have been active in the area.