

From beech to coal, and back

G. Mew and C.W. Ross*

Both mining and forestry are ways of life on the South Island West Coast. In the past they were largely incompatible land uses, and mining destroyed forest. The local attitude was "the bush will come back". In many instances this is demonstrably true; regrowth forest clothes a number of former mining sites, both coal and hard-rock gold. However the many hectares of bare boulders and stones, the tailings from the big gold dredges, still testify to the inability of indigenous forest to colonise all old mining sites, at least over a time frame that is acceptable to foresters and conservationists.

The oldest tailings, where separation of the fines from the larger gravels was much less efficient than in modern dredges, commonly have some forest cover, but it is poorer in species than surrounding bush, and it is known to have established with less pressure from competing gorse and wild browsing animals than there is today.

Techniques for restoring exotic forest to mined sites have been developed largely by creating a suitable growth medium for the West Coast; they are now mainly successful, as materials can be made more uniform, drainage can be improved and fertilisers applied at known rates for optimal growth. However, the means of restoring indigenous forest to mined sites, in such a way that the former ecosystem complexity can be redeveloped as soon as possible, have yet to be fully worked out.

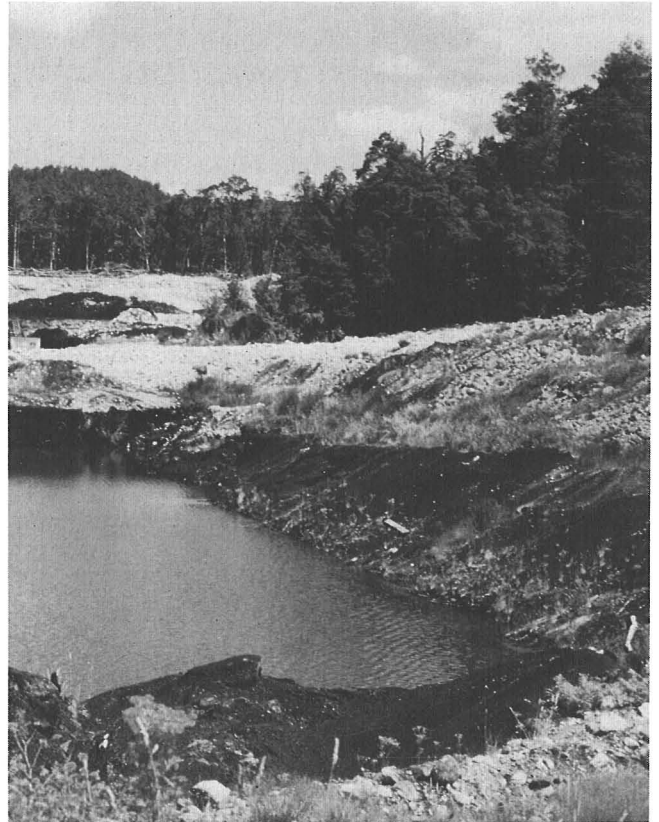
Need for indigenous restoration

Why is there a need to restore indigenous forest on mined sites? The Department of Conservation has a mandate to ensure that as much of its estate as possible remains under a cover of natural vegetation, with the soils, animals and other features that go with it. If mining is permitted within the DOC estate, then conditions ensuring ecological restoration after mining will have to be met.

In 1989 DOC began funding a scientific study of beech forest restoration after mining near Reefton on the West Coast. Research scientists from the Institute of Forestry and Wood Products, and Landcare Research are collaborating on trial work involving a wide range of growth materials and local forest species.

A primary consideration was the need to categorise the site prior to mining, to establish baseline conditions against which future changes can be monitored. Two teams made reconnaissance surveys of the vegetation and soils respectively. The soils team established ranges and means for thicknesses of organic layers, topsoils and subsoils. There has been considerable debate in the past about the ability of the miners to strip these layers separately, or actually to recognise them in some instances. Representative profiles were also analysed to determine some of the physical and chemical characteristics of the soil materials.

Full-size beech trees like those at Giles Creek take at least 80 years to develop. While canopy closure will be at a much younger age, we are not sure when the beech forest will achieve comparable diversity, or even become a "stable ecosystem", if such a thing exists. Should we try to hasten the stages to maturity as much as possible? Or should we push the clock



Giles Creek opencast coal mine in beech forest. Site of a soils and forest restoration trial. Photo: G. Mew

back for the site and let natural colonisation (by similar or the same species) take its natural course? It is far easier for the miners not to have to worry about soil survey, segregation, stockpiling, stumping, weed control and restoration. But, in these days, a sea of gorse, steep-sided, water-filled pits, and rusting heaps of machinery are not acceptable environmental outcomes when judged against surrounding native forest. The best we can do is set the scene so that the options of future generations are not compromised. Both forests and soils have taken a very long time to develop. We are attempting to return our mined sites to a state as close to that before mining as we possibly can.

Site characteristics and importance

The mining site, beside Giles Creek, is unusual in the West Coast context as it is an opencast coal mine at low altitude in a valley bottom. Giles Creek has a narrow floodplain flanked mainly on the southern side by low glacial outwash terraces covered in beech/podocarp forest. About 5m of gravels overlie coal measures rocks. Two steeply-dipping coal seams lie within the coal measures not far below the gravel interface. Many alluvial gold mining sites are in valleys similar to that of Giles Creek. The gravels, and the soils developed in them, are similar to quite a number of other localities, so trial results will be able to be extrapolated. In addition, some of the over-

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Mixed stripped soil materials being dumped on compacted gravels at Giles Creek coal-mining site. Photo: G. Mew



Stripped soil being loaded for transport at the Giles Creek coal mine. Photo: G. Mew

burden that the miners must strip consists of coal measures, rocks that have markedly different physical and chemical properties from the mainly granite-derived gravels. Therefore there are additional research opportunities for monitoring growth and performance of indigenous species on these different materials. The beech forest differs somewhat between the floodplain and the low outwash terraces because of natural fertility differences. More red beech trees occur on the floodplain; red, hard and silver beech occur on the terraces, with scattered podocarps. The main podocarp component (rimu) was removed by selective logging in the 1980s, but with minimal canopy disturbance for the most part. Regeneration has been vigorous in the gaps that were created. The area is currently designated as part of a wildlife corridor by DOC.

Scope of trial

The most extensive part of the trial is a series of plots established last summer with the help of the miners to test differences in plant survival, establishment and growth rates on three different growth media. These are: a fully restored soil profile (forest organic layers, topsoil, and subsoil over gravels, to average thicknesses), all soil materials mixed together, and gravels to the surface. The trial design tests growth on either compacted or non-compacted materials. All gravels were laid down by earthmoving machinery. Half the trial area was then ripped. Remaining materials were subsequently placed by

hydraulic excavator. We were particularly impressed by the skills shown by the mine machinery operators in stripping and respreading the soil materials for this trial. They proved that it was possible to separate 10-25cm thicknesses of forest organic layers using large hydraulic excavators, as well as the more "normal" (and uniform) mineral soil horizons, with virtually no mixing.

There have been a number of small step-out trials to test a range of likely influences. Among these were the possibility of wild animal damage (found to be negligible), the potential needs for nitrogen or phosphorus fertilisers in non-soil materials (some response), and an estimate of quantities of viable seeds in natural litter (many exotic weeds germinated and only a few natives). Other experiments have been with broadcast seed from selected indigenous species and planting established shrubs and small trees on overburden dumps.

Some philosophical questions

The purpose of the major trials at Giles Creek is to find satisfactory ways of restoring indigenous vegetation to mined sites with similar characteristics. Eventually it is hoped that the methods will be documented in the form of prescriptions that can be followed by miners. They may also become part of the conditions under which licences are issued to mine in indigenous forests. However there are a number of uncertainties about what will happen, and what we as foresters and/or conservationists want to happen.

CONSULTANT RECOGNITION

The following have applied for recognition as general forestry consultants in New Zealand and overseas:

Barry Poole	Auckland
Colin McKenzie	Auckland
Owen Springford	Christchurch
Alan Laurie	Waimate

The following have applied for recognition as specialist forestry consultants in New Zealand and overseas:

Neil Cooper	Wellington
David Jervis	Masterion

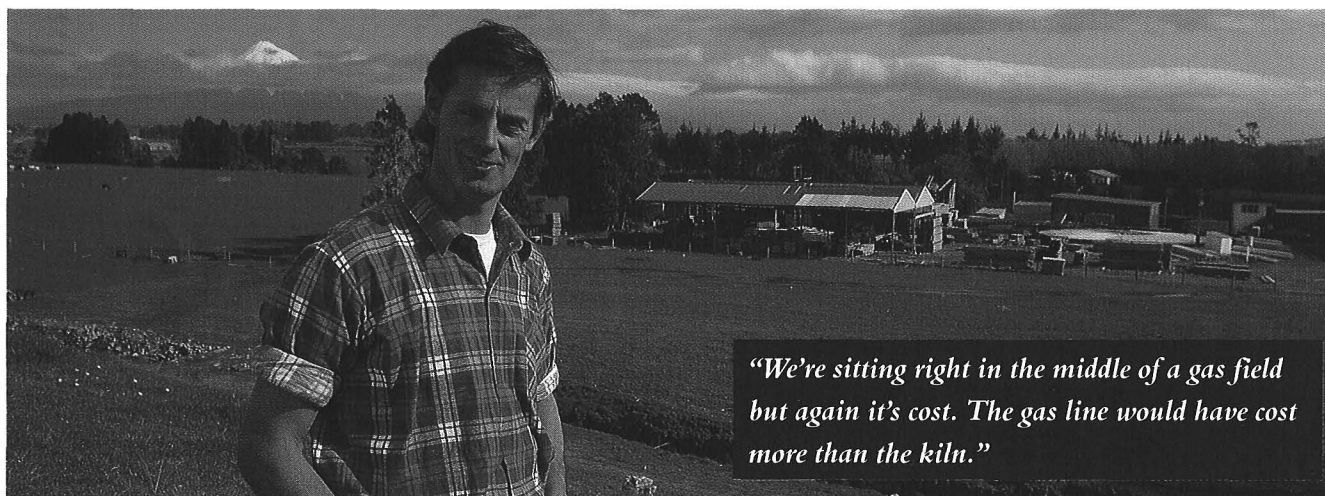
Under the NZIF constitution, any members of the Institute may send objections in writing to the Registrar of Consultants, NZ Institute of Forestry, PO Box 19840, Christchurch.



About five metres of gravels overlies coal measures in beech forest at Giles Creek. Photo: G. Mew

WHY IS THE TIMBER INDUSTRY TURNING TO COAL?

Even though Rodney Green and Trevor Turner's Inglewood sawmill is located right in the middle of Taranaki, gas wasn't a realistic option because of the cost involved.



"We're sitting right in the middle of a gas field but again it's cost. The gas line would have cost more than the kiln."

It has been a year since a group of timber processors were invited by CoalCorp to evaluate first-hand the performance of coal-fired kiln drying at Orini.

The visitors were obviously both impressed and reassured by the evidence they saw.

Rodney Green, for example, has since installed a high-tech coal-fired kiln to cope with his mill's growth rate of 80% per year. He is now planning a second coal-fired kiln for 1994.

For John Standeven of Paynters Profiles the trip to Orini made his company more comfortable with the decision to go with coal.

"Coal was the obvious choice. Gas wasn't available and our experience with electricity is that it's expensive."

John was already running twelve

electricity kilns, but they just weren't giving him the right temperature.

Paynters have now completed a million dollar investment and installed a new Maxitherm coal-fired boiler and two medium temperature kilns.

"Hopefully, we'll have two more kilns next year."

Trevor Benson of Hautapu Pine Products has recently installed a coal-fired steaming cylinder to prepare pine posts instead of air drying them.

With turnover up over 30% already, the new coal-fired steamer appears to have performed beyond Trevor's expectations.

"When we first went into this I thought maybe we'd put in a second steaming cylinder ten years down the

track. But I can see that happening within a two or three year period."

"Our costings to date indicate \$4.50 per cubic metre of round wood processed. That's pretty impressive."

Other people within the industry are also facing similar long-term investment decisions as timber volumes and markets increase dramatically.

Many timber processors throughout the country have been genuinely surprised at just how much advantage coal has over other fuel options.

But then good news usually travels fast, doesn't it?



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