MINE LAND REFORESTATION IN THE
ST. REGIS FOREST MANAGEMENT AREA
HINTON, ALBERTA

Papers presented by:

NEIL DUNCAN
ENERGY RESOURCES CONSERVATION BOARD

(Paper not available)

ERIC BERESFORD
UNION OIL

- Planning for post-mining reclamation within a forest management area,
  Obed-Marsh Project, Hinton, Alberta

AL KENNEDY
ESSO MINERALS CANADA

- Reclamation Monitoring at the Judy Creek test pit site

RICK FERSTER
LUSCAR LIMITED

(Paper not available)
PLANNING FOR POST-MINING RECLAMATION WITHIN A FOREST MANAGEMENT AREA

OBED-MARSH PROJECT, HINTON, ALBERTA
by Eric Beresford

INTRODUCTION

Neil Duncan has just outlined the overall picture of the various mine developments planned within the St. Regis Forest Management Area.

The total area under forest management is some two million acres with logging for the pulp mill commencing in 1956 in the Obed project area.

The Alberta government has leased this same piece of Crown real estate to a variety of commercial interests, taking royalties, lease rentals and revenues from all parties.

In the project area I am concerned with, the land has been leased for oil and gas exploration, seismic lines, pipelines, power lines, roads, coal development, sand and gravel pits, and superimposed over all of this, is the forest industry. And that's on only 15,000 acres!

Each user has been given either approval to construct a well site, road, or conduct numerous exploration right-of-ways, or a licence of occupation, so it is little wonder that the St. Regis company feels threatened from all sides.

The Obed project is the first coal project approved under the Alberta Coal Policy of 1976 which is entirely within the Forest Management Area and therefore must be returned to a commercial forest after mining. Cooperation with St. Regis and the preplanning necessary to ensure successful tree growth are therefore of prime importance.

PROJECT DESCRIPTION

The project area comprises some 15,000 acres in two coal blocks, the Obed and Marsh Blocks, located approximately 17 miles from the town of Hinton. The town of Hinton has a population of 8,000 people which currently work at the St. Regis pulp mill and two existing coal mines.
The development is planned for the extraction of 4.5 million tonnes of raw coal or three million clean tonnes per year, from the two lease areas for some 35 years, all by surface mining methods. The mine will employ 450 people, has long term overseas contracts for this thermal coal, and will contribute substantial revenue to Canada, the Province and the local economy.

The coal seams are flat, lying under a ridge approximately 5,700’ in elevation.

The overburden will be mined by large draglines, with assist equipment as necessary, and the coal extracted by shovels. The coal requires washing to remove the shale and clay partings in the seams so a preparation plant, with workshops and office facilities is required.

The clean coal will be conveyed from the plant by a seven mile long overland conveyor to a loadout on the main CN line. The project requires a new access road to the mine, separate from the existing logging road.

The land required for the mine operation will be taken out of the Forest Management Area for 35 to 40 years and amount to some 350 acres of forest land. The mine will be successively reclaimed at a rate of 150 to 200 acres per year after the initial start-up period.

The Development Reclamation Permit states that the land must be returned to commercial timber production equal to or better than before disturbance.

PLANNING - INITIAL EXPLORATION

In the early exploration phases of a coal property the disturbance is relatively minimal with a series of access roads being built to drill sites.

During the exploration program it is routine to take some bulk samples for coal testing. These samples are taken from either small open pits or adits into the seam.

After completion of a year's program, the sample pits, drill sites and often also access roads are reclaimed, seeded and put to bed. It is in
everyone's best interest to reclaim these early disturbances quickly and to a high standard.

In addition, the reclamation of these early sites gives a good indication of any problems that may develop in the mining phase, and varying techniques can be used and monitored very early on in mine planning.

PLANNING - MINE DEVELOPMENT

The project area has been extensively logged since 1956 and is at various stages of reforestation. The commercial species area white spruce and lodgepole pine.

Early in the mine planning stage it is mandatory to produce an Environmental Impact Assessment and identify areas of concern. This study obtains information on vegetation, wildlife, water resources, soils and climatic conditions. In our case, the study was concentrated on forest productivity, soils and water resource management, although all other impacts were recognized.

It is fundamental to any mine plan and subsequent reclamation plan to determine the soil type and quantities and nature of sub-soil and overburden rock present in the area.

Field work necessary to obtain this information included digging pits by backhoe and auger drilling. Laboratory work included determining the chemical composition of each material and noting any high sodium areas.

The resulting soil map at a scale of 1:5 000 formed the basic planning map used by the project mining engineers.

Soils in this area have developed on glacial till which lie in a mantle of 15' to 30' over bedrock strata.

With this basic information available a reclamation plan was developed to meet the objective of restoring an "equal to or better than" soil profile. The plan included selecting those soil and subsoil materials which were required for the reclamation program and developing a mining system which will satisfy the reclamation objectives.
The mining system which was developed, included grubbing and clearing forest slash and debris by windrowing into piles by a bulldozer. This is followed by removing the A and B soil horizons and by selectively removing the C horizon and a subsoil layer of till to a predetermined depth.

Because the rainy season at Hinton is in the spring and summer months, the removal of the soil/subsoil material can only be carried out with scrapers in a fall and winter operation of approximately six months each year.

In order to restore the site to productive forest land the soil/subsoil material will be placed to an average depth of 1.3 m over the levelled dragline spoil piles; and the forest trash debris will be spread over this area.

The introduction of this forest debris restricts erosion and forms micro-sites in which small container trees can flourish.

It has been found through experience on the site since 1973/74 that tree growth success is guaranteed when this procedure is followed.

However, this reclamation method is expensive. In an attempt to find a less expensive way of growing trees on a post-mining area, replicated design field trials have been set up at Obed.

These test plots were set up in 1980 and simulate various reclamation techniques that can be statistically and scientifically measured. The results from these plots will likely produce modifications to the previously outlined approach.

Experiments have been designed to determine if the forest debris can be removed at the same time as the soil/subsoil material instead of separating the two materials as described.

Other test plots have been set up to determine tree growth differences on North- and South-facing slopes with varying depths of soil.

Soil temperature and moisture cells were also set in the plots and this information will be correlated with tree growth measurements. An
automatic-recording weather station has also been set up at the plant site.

These test plots have been constructed in an area not scheduled for mining for 20 years, and it is hoped that foresters will have become convinced that successful reforestation can be accomplished on mined-out land well before these plots are taken out.

In conclusion, I would like to say that a good spirit of cooperation has been built up between St. Regis and Union Oil, and each industry can benefit from a non-renewable resource activity such as coal mining followed by restoration of healthy tree growth on mined-out lands.

As we say, we are only borrowing the land for a short while and giving it back for future years of productive timber growth.
INTRODUCTION

This paper presents an overview of Esso Minerals Canada's reclamation monitoring program in progress at our Judy Creek test pit site. Details and data on reclamation at Judy Creek are available upon request from Esso Minerals Canada.

The Judy Creek test pit is located approximately 5 km southeast of Swan Hills, Alberta. The site can be termed a "boreal forest" with the typical complement of vegetation communities common to northern boreal ecosystems.

During December 1978, operations began at the pit site with construction of the access road and clearing of timber and vegetation.

In January 1979, the pit was constructed and approximately 10,000 tonnes of bulk coal samples were taken to Wabamum, Alberta for a test burn in the Transalta Utilities thermal power plant. Following these operations the pit site was backfilled and recontoured to reclamation specifications using previously stockpiled surface material, and shale and till overburden. A total area of 19.3 ha was disturbed of which 1.5 ha was required for the pit itself.

Reclamation activities such as fertilizing, seeding and the planting of conifer seedlings as well as the gathering and planting of deciduous stem cuttings were carried out on the site between May and June 1979. Within the area of clearing, five separate studies were established for ongoing evaluation.

RECLAMATION STUDIES

I would now like to describe the five reclamation studies being carried out at the test pit and highlight some observations from these studies which have been monitored for three growing seasons.

The first study is designed to examine the effects of 70 cm, 30 cm, and 0 cm of surface soil over till on the establishment and growth of a grass/legume seed mixture and reforestation species. Surface soils at
Judy Creek are generally orthic grey luvisols over a loose sorted glacial till. The three treatments were replicated three times making a total of nine study plots. Plots 1, 2 and 3 have 70 cm of soil, Plots 4, 5 and 6 have no surface soil and Plots 7, 8 and 9 have 30 cm of surface soil.

Each plot was seeded in a similar manner, that is, with a 15 kg grass/legume mix. However, on Study No. 1 plots, 99 lodgepole pine and 44 deciduous stems (willow and balson poplar) were planted on one half of each plot. Plots were examined for growth in August 1979 and June and August 1980 and 1981. Monitoring results indicate that 70 cm of soil appears to be least suitable for establishment of seeded cover, 30 cm of soil is moderately suitable, and 0 cm appears to provide the best growing media. Establishment of pine seedlings is similar on all plots but survival is slightly poorer on 70 cm of soil. Deciduous cuttings have done poorly on all sites.

The objective of the second study is to analyze the effect of different grass and legume seeding mixtures and application rates on establishment and growth of pine and spruce seedlings. Twenty-four plots were established and seeded with 15 kg/ha and 30 kg/ha of bunch forming grass/legume mixes and grass-only mixes. Fertilization rates were identical throughout the plots.

Monitoring results to date indicate that the seed mixture or application rate has little effect on the survival of outplanted pine and spruce seedlings. Variation in moisture regime seems to be a more important limiting factor to tree establishment on these plots. I do have the details of the various seed mixes and would be pleased to discuss them with interested persons after the presentation.

The third study was established to determine the potential for natural revegetation to occur on the test pit site. Three study plots were topped with 70 cm of soil and left without fertilization or seeding treatments. After three growing seasons, there has been little or no natural plant establishment on these plots. This is thought to be due to sheet erosion caused by heavy rainfalls each spring.

The fourth study consists of six plots which were established to compare the growth and survival of coniferous trees on undisturbed soil with those growing on disturbed soil (for example, those in Study Plot 1).
On average, tree seedling survival was greater on the undisturbed plots than on the disturbed sites in Study No. 1.

The fifth reclamation study consists of three plots, with 70 cm, 30 cm and 0 cm of surface soil placed over 1 m of shale overburden. Plots were revegetated with the same seed mix and reforestation rate used for the general site reclamation. The depth of surface soil over shale does not appear to have a marked effect on plant establishment and growth. However, revegetation species appear to grow at a lower rate when no surface soil is provided.

Two plots were established during May 1980 to compare the survival and growth of one year old versus two year old outplanted lodgepole pine. Monitoring results indicate that one year old seedlings have a higher survival rate. However, survival rate appears to be more related to planting techniques than environmental factors such as soil condition or vegetative cover.

In addition to the soils and vegetation studies that I have just described for Judy Creek, a program of wildlife monitoring is also been carried out. The objectives of the wildlife studies are to clarify the rate of recolonization of the test pits by various wildlife species.

Results to date indicate that a small mammal population is established on the pit site and some damage to new outplanted seedlings can be attributed to these animals. During 1981 the population level of mice, particularly meadow voles increased substantially. Correspondingly, the mortality of conifer seedlings was observed to increase from 14.8% to 34%. Moose and deer are beginning to use the test pit and are browsing on outplanted deciduous shrubs. However, damage to these shrubs from browsing is not presently observable.

CONCLUSIONS

Monitoring studies are planned to continue at Judy Creek annually for two more years and once every three years thereafter to 15 years. We believe the information gained from the Judy Creek test pit monitoring will be beneficial to our reclamation planning for the proposed Judy Creek mine and hopefully can be used in reclamation planning for other Esso Minerals coal properties in Alberta such as the Hinton east property.