

FOREST LAND RECLAMATION ON VANCOUVER ISLAND¹

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INTRODUCTION

Forest land restoration has become a significant focus of the forest industry in British Columbia since the introduction of the Forest Practices Code (FPC) and the establishment of the Forest Renewal program (FRBC). Recognition of the ecosystem damaged caused by past harvesting practices has led to demands by the public and subsequently by the regulatory agencies, for tighter controls on harvesting practices and for restoration of damaged systems. The science of silviculture, and hence reforestation, is reasonably well understood in situations where forest soils are intact and damage is restricted to loss of the original tree cover. However, where sites are significantly disturbed through construction of roads, landings and other industrial activities or by landslides, traditional silvicultural systems have failed to restore the forest cover and the function of the forest ecosystems.

Damaged and/or degraded forest ecosystems can have a significant impact on other resource values. Aquatic habitats and productivity have been significantly impacted by upslope harvesting. Heavy sediment loads resulting from erosion of upslope roads, trails, landings, landslides and other disturbances can bury spawning gravels and destroy fish habitat. Suspended sediments can affect community watersheds while changes in upslope hydrologic function can create flashy peak flows and scour otherwise stable riparian vegetation. Changes in the vegetation cover following harvesting can alter traditional wildlife use patterns and can affect the habitat of plants. These and other impacts place a strain on forest ecosystem balances and can have a drastic effect on other land and resource uses.

Restoration of forest lands seeks to establish a balance in the new forest ecosystems and thus the return of ecosystem function, both for the health of the forest and for the other values the forest ecosystems support. Steep slopes, heavy rainfall and low nutrient soils provide a challenge for restoration of forest lands on Vancouver Island. This paper explores a strategy for restoration of damaged forest lands based on natural successional processes. Successional reclamation (Polster 1991) seeks to restore the natural successional process which, given enough time, serve to revegetate disturbed sites. The establishment of an initial pioneering cover of vegetation is critical to the subsequent establishment of later successional species. Bioengineering, which is the use of living plant materials to perform some engineering function, can often be used to provide this initial cover by solving the physical problems which are preventing vegetation from establishing.

INITIAL COVER ESTABLISHMENT

Natural revegetation of naturally disturbed sites is often a slow process as pioneering species slowly gain a toe-hold in the generally harsh conditions following the disturbance. Although this process

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is generally slow, with pioneering plants such as mosses and lichens slowly building soils or species such as alder (*Alnus* spp.) and others ameliorating harsh site conditions, the processes which occur are essential to subsequent plant establishment. Successional reclamation seeks to identify those site features which are slowing or preventing the establishment of vegetation. On coastal forest sites these conditions typically include:

- 1) Excessive rainfall and rapid erosion which may wash seeds and young plants from the slopes before they can become firmly established.
- 2) The lack of soil or soil like materials, low nutrient status or excessive compaction may prevent or slow the establishment of vegetation.
- 3) Slope instabilities can prevent the establishment of vegetation through burial by materials coming from above or by continually sliding down the slopes prior to plants becoming fully established.

Amelioration of any or all these adverse conditions is the first prerequisite for successful plant establishment. Where soils are reasonable and slopes are stable, timing of the initial cover establishment can be critical to success. Traditional seeding programs must be scheduled to allow the seeded vegetation to become firmly established prior to heavy winter rains. Erosion rates of 300 to 400 tonnes/ha/year may be experienced on coastal sites and can result in loss of poorly established vegetation (Gray and Leiser 1982). Careful evaluation of long term climatic records can provide an indication of when there will be sufficient moisture for plant establishment and growth and when cool temperatures and/or heavy rains might prevent successful establishment (Environment Canada. 1993).

Sites where soils are lacking or where compaction or low nutrients are resulting in poor initial establishment can be treated in a variety of ways to provide an initial vegetation cover. Sites where previous erosion has resulted in loss of soil materials and the substrates consists of inert gravels and sands or exposed bedrock can be treated using pioneering species such as willows (*Salix* spp.), cottonwood (*Populus balsamifera* L.) alder and mountain avens (*Dryas* spp.) which can survive under very harsh conditions and will help restore a reasonable soil. On coastal sites, red alder (*Alnus rubra* Bong.) is particularly useful as a healthy mature stand of red alder can fix up to 80 kg/ha/year of nitrogen (Haeussler et al. 1990). De-compaction by ripping or other mechanical means can be the key to vegetation establishment on compacted sites (Moore 1994) while the use of fertilizers and species which enhance the nutrient status of the substrates can help on low nutrient sites.

Unstable sites must be stabilized for successful vegetation growth. Stabilization may entail significant geotechnical work on the site (Moore 1994). Bioengineering (Schiechl 1980) can provide an effective means of stabilizing forest sites where instabilities are relatively minor. Wattle fences, which are short retaining walls built of living plant materials, can be used to stabilize steep, unstable slopes. Live pole drains, which are like "French drains" built of living materials, can provide drainage and assist in stabilizing moisture related instabilities. In both of these cases, the living materials used in the bioengineering construction sprout and grow, adding to the initial stability and providing conditions which foster establishment of later successional species.

Seeding is typically used in the establishment of an initial cover on drastically disturbed sites. The seed mix which is used must be balanced by seed weights so that the species composition allows for establishment of subsequent species (Polster 1991). This initial cover must provide space, both in the physical as well as ecological sense, for subsequent plant establishment and growth. Dense sod forming

mixes may be effective in controlling erosion, but may prevent the growth of woody species (Green 1982). Balancing seed mixes avoids this problem.

LATER SUCCESSIONAL SPECIES

The establishment of later successional species on the disturbed sites is relatively easy once the initial cover has been established and the natural successional patterns are re-established. In many cases, later successional species will quickly invade without further intervention if the sites are suitably prepared by the initial vegetation. In some cases, planting can be used to establish forest tree species. The work of the initial cover is to provide a suitable site for later successional species. Once this work is well under way, these later successional species can be easily established. Suitable sites for later successional species can be created by understanding the vegetation limiting problems associated with the site and mimicking the natural successional solutions to these problems. Once the site problems have been solved, natural successional processes will provide a self-sustaining, productive vegetation cover.

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*Conservation and Reclamation:
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Canadian Land Reclamation Association's
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TABLE OF CONTENTS

LIST OF SPONSORS	vi
INDUSTRIAL FACILITIES	
Industrial Site Decommissioning in Alberta	1
Walter J. Ceroici	
Changing Knowledge Needs for Wellsite Reclamation	3
Jim Smith	
The Orphan Facilities and Pipeline Program: An Industry/Government Responsibility	7
David Lloyd and David Sandmeyer	
In-Situ Amelioration of Sodic Mine Spoil Using Sulfur, Gypsum and Crop Management ...	11
Jeff J. Sansom, M. Anne Naeth, and David S. Chanasyk	
Bioremediation of Contaminated Sites	13
Christopher Schneider	
Contaminant Metal Concentration in Alberta Soils Under Different Land Uses	17
Gerry Lutwick, Gordon D. Dinwoodie, David Gower and G. E. Nason	
Waste Disposal Guidelines from a Testing Lab's Perspective	19
John Ashworth	
Reclamation of a Former Heavy Oil Plant in Northeastern Alberta	23
Tim R. Bossenberry, J. Jeffrey Wilson, David Evans, Darrell Chollak and George Walker	
Nutrient and Metal Levels and Dynamics on a 30-year Revegetated Copper-Nickel Tailings Site at Copper Cliff, Ontario	27
Jeremy Niemi, John Giffen and Keith Winterhalder	
FORESTS	
Land Application of BCTMP Mill Waste Research in Alberta	31
Terry M. Macyk	
Reclamation to Native Forest Ecosystems in the Oil Sand Region	33
Steve Tuttle	
Land Capability Classification for Forest Ecosystems	37
Leonard A. Leskiw, Steve Tuttle and Earle Anderson	
Forest Land Restoration on Vancouver Island	39
David Polster	

Lichen Diversity in the Reclaimed Areas of Sudbury, Ontario	43
S. Wainio and Peter Beckett	

MOUNTAINS

Application of Population Biology, Conservation Biology and Succession Theory to the Reclamation of a High Elevation Coal Mine	47
Clint R. Smyth	

Plant Community Changes in Response to Anchor Chaining and Seeding on Pinyon/Juniper Sites in Central Utah	51
J. Gregory Sutor	

Tailings Disposal and Reclamation at the Coal Valley Mine	53
Dane McCoy	

In-Pit Disposal Program for Acid Generating Waste Rock	57
Jamie Quesnel and S. W. Stogran	

Reclamation, Trans Canada Highway Twinning, Banff National Park	63
Otto Hammer	

GENERAL ISSUES

Railway Reclamation: Issues and Opportunities	67
Chris B. Powter and David A. Lloyd	

Experiences in Reclaiming Railways Under Alberta's new Reclamation Guidelines	71
Mark Polet	

Pipeline Abandonment: A Discussion Paper	73
Karen Etherington	

Legal Perspectives on Land Reclamation	75
Gilbert Van Nes	

Liability for Reclamation: Enforcement at Common Law	77
Adrian Currie	

WATER AND WETLANDS

Coursier Reservoir: The Planning and Costs Associated with the Reconstruction and Revegetation of a Subalpine Lake	81
J. Leah Jackson	

Spray Lakes Reclamation Project	85
Margwyn R. Zaccaruk	

The Pine Coulee Project: Linking Reclamation Planning to Impact Assessment	89
Ron Middleton	

Design and Construction Management Aspects of Constructed Wetlands	93
Bernard Amell and Kim Eastlick	

Natural Revegetation of an Alberta Peatland after Horticultural Peat Extraction	97
Wayne S. Tedder and Larry W. Turchenek	

RUNOFF/EROSION

Computer Modelling of Soil Erosion from Reclaimed Land	101
Les Sawatsky, Wes Dick and Senarath Ekanayake	

Runoff and Sediment Yield under Grazing in Foothills Fescue Grassland of Alberta	103
M. Anne Naeth and David S. Chanasyk	

Runoff Curve Numbers for Two Reclaimed Watersheds in Central Alberta	107
Ted E. Harms and David S. Chanasyk	

Vegetation Characteristics, Grazing Disturbance and Soil Erosion	111
Suzanne I. Gill, M. Anne Naeth, David S. Chanasyk and V. S. Baron	

PRAIRIE

Renewing the Ecological Integrity of Disturbed Native Prairie	113
Heather S. Gerling	

Mixed Grass Prairie habitat Restoration Project: Landscape Restoration in the Moist Mixed Grass Prairie	117
Dean Nerberg	

Native Prairie Regeneration After Pipeline Construction: A Comparison Between Topsoil Stripping versus No Topsoil Stripping During Construction	119
Gordon Dunn and Gina Fryer	

Restoration of Native Sandhills Vegetation after Pipeline Construction in the Great Sand Hills Region of Saskatchewan	123
David G. Walker, Laurier Kremer and Wayne Marshall	

The Effects of Grazing, Mowing, Glyphosate and Burning on Smooth Brome in Fescue Grassland	125
D. J. Brown and M. Anne Naeth	

VEGETATION

Avoiding Downy Brome When Buying Seed	127
Kerby Lowen and Sarah Foster-Stubbs	

Biodiversity and Reclamation: How Many Species do we Need in a Seed Mix?	131
Dana Bush and M. Anne Naeth	
Germination and Survivability of Selected Native and Introduced Grasses and Legumes	133
William E. Pelech and M. Anne Naeth	
Road Maps for Repairing Ecological Damage	135
Andy Hammermeister	
Ecovar Developments in Western Canada	137
Les Wetter and Brent Wark	
Plant Growth on Aggregated Oil Sands Processing Wastes	139
Xiaomei Li, Jim Storey, Paul Y. P. Yeung and Martin Y. P. Fung	
The Clover Bar Landfill: A State of the Art Landfill Reclamation Process	141
Ann Smreciu, Nolan Turner and Don Barron	
BULK DENSITY	
A Method of Characterizing the Bulk Density of Compressible Particulate Material	145
D. Guenther, Stacy Schaub and J. Leonard	
Near-Surface Compaction Under Grazing of Annual and Perennial Forages	149
Dennis Twerdoff, David S. Chanasyk, M. Anne Naeth and V. S. Baron	
Grazing Impacts on Bulk Density and Soil Strength in the Foothills Fescue Grasslands of Alberta, Canada	151
David S. Chanasyk and M. Anne Naeth	
Computer Modelling of Soil Erosion from Reclaimed Land	155
Les Sawatsky, Wes Dick and Senarath Ekanayake	

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