Proceedings of the Conference

Reclamation, A Global Perspective

held in Calgary, Alberta, Canada

August 27-31, 1989

Organized by the

Canadian Land Reclamation Association/
Association Canadienne de R6habilitation des Sites Degrad6s

and the

American Society for Surface Mining and Reclamation

Compiled by

D.G. Walker, C.B. Powter, and M.W. Pole

Published by the

Alberta Land Conservation and Reclamation Council
(Reclamation Research Technical Advisory Committee)

1989

vii

...........................................Contents

Acknowledgements........... v
List of Sponsors ............... vi
List of Exhibitors ............. VI
Integrated soil and water improvement project, Egypt: Soil improvement program
L.A. Leskiw .... 1

Realities of undertaking reclamation activities within third world countries A.R. Scheibner
(Abstract only) ............................................................... 9

Reclamation in Australia's heavy mineral sands industry D.R. Brooks 11

Aspects of land reclamation in India, South Africa and Spain E.M. Watkin 27

Northern and High Altitude Reclamation

Factors affecting alpine grass seed germination in relation to their potential use in reclamation
S.N. Acharya 39

Impact of climate on reclamation success in the foothills/mountains region of Alberta, Canada
T.M. Macyk, Z.W. Widtman and V. Betts 49

Reclamation of severely disturbed alpine ecosystems: New perspectives
R.W. Brown and J.C. Chambers 59

Why are the grasses green in alpine meadows?
S. N. Acharya, R.N. Coleman, M.E. Neuwirth and M. Dalpe 69

First year results of revegetation trials using selected native plant species on a simulated pipeline
trench, Fort Norman, N.W.T., Canada L. Maslen and G.P. Kershaw 81

Revegetation in the Canadian North - A fifteen year perspective H. Martens and W. Younkin 91

Poker Flats Mine: Reclamation challenges at Usibelli Mine in Healy, Alaska L.P. Jackson 101

Advances in plant material and revegetation technology in Alaska S.J. Wright 107

Hollow fill construction at the Amos Ridge experimental practice
C.E. Zipper and W.L. Daniels 117
Fish & Wildlife and Rangeland Reclamation

Moose and deer habitat use and diet on a reclaimed mine in west-central Alberta N.A. Roe and A.J. Kennedy 127

Changes in fish populations and habitat at a reclaimed multiple right-of-way stream crossing J.H. Allan and A. Lees 137

Seasonal and spatial distribution of bighorn sheep at an open pit coal mine in the Alberta F.B. McCallum 141

The creation of a mountain lake sport fishery at Cardinal River Coals Ltd. G.B. Acott 151

Utilization of off-channel dredge ponds to increase juvenile chinook salmon rearing habitat C. Richards, P.J. Cemera, M.P. Ramey and D.W. Reiser 157

Wildlife habitat nutigation for the Oldman River Dam project, Alberta, Canada J.E. Green and A. Nilson 165

Grazing demonstration on reclaimed lands at the Black Thunder Mine, Campbell County, Wyoming R.L. Moore, Jr., W.R. Keanunerer and E.J. DePuit 175

Complementary grazing of reclaimed mined land and native rangeland pastures in Montana E.J. DePuit and J.G. Coenenberg 185

Water Reclamation of abandoned manganese mines in southwest Virginia and northeast Tennessee J.A. Muncy 188

Groundwater hydrologic regimes within reclaimed surface coal mined landscapes in Alberta S.R. Moran, M.R. Trudell and T.M. Macyk 209

Geomorphic responses of natural and reclaimed hiuslopes to precipitation events in Wyoming T.J. Toy 219

A combination of techniques for reconstruction of ephemeral stream channels in Wyoming S. McIntosh 229


Geochemical relationships between surface mine spoils, spoil groundwaters, and adjacent mine lakes J.P. Schubert (Abstract only) 247
Vegetated waterway linings reinforced with geomatrix matting – design methodology and performance G.I. Dodson 249

Herbaceous Revegetation

Promising native forbs for seeding on mine spoils A.J. Bjugstad and W.C. Whitman 255

Diversity and seasonal variety in reclaimed native grasslands D.J. Nilson and K.J. Hirsch 263

Productivity of agronomic and native plants under various fertilizer and seed application rates on a simulated transport corridor, Fort Norman, Northwest Territories K.E. Evans and G.P. Kershaw 279

Response of reseeded coal mine spoils to season and intensity of defoliation: Preliminary findings G.L. Wolters, E.F. Aldon and G.B. Donart 289

Using the Rhizobium-subteffanean clover association for reclamation of lignite mine spoil P.A. Harris and D.A. Zuberer 299

Grain sorghum as a test crop to reclaim prime farmland disturbed for coal mining R.I. Barnhisel and J.L. Powell 309

Woody Plant Revegetation and Succession

Determining optimal initial stocking densities during mine reclamation P.R. Guy and J.C. Bateman 317

Revegetation and ecological monitoring of an open cast rock phosphate mine P. Soni, H.B. Vasistha, 0. Kumar, V. Bhatt and M. Negi 327

Successional reclamation in western Canada: New light on an old subject D.F. Polster 333

First year evaluation of Excelsior pads on loblolly pine W.H. Davidson 339

Woodland reclamation within the Missouri Breaks in west central North Dakota D.J. Nilson 345

Use of organic fertilizer in reforestation of degraded alpine sites and revitalization of forest stands in Austria G. Glatzel, K. Katzensteiner, H. Sterba and K. Haselwandter 357

Industrial and Urban Sites
Revegetation of tailings from a phosphate fertilizer plant
W.E. Roberts Thome and R.D. Revel 363

Industrial site decommissioning and reclamation D.N. Graveland and A.E. Osborne 373

A technical and economic evaluation of sulphur based recovery and reclamation
L. England and S.A. Leggett 383

Establishing vegetation on landfill slopes T. Hilditch and J. Gould (Abstract only) 393

Reclamation of an industrial sewage lagoon
C.B. Powter, L. Kryviak, G. Balko and A. Watson 395

Relationships among soil deposition patterns, soil physical and chemical properties, and plant
metal uptake on an abandoned zinc-lead tailings pond
J.C. Chambers, R.C. Sidle and C.V. Grant 403

Bioremediation: Innovative applications of an established technology
J. League and J. Bogart 415

Volume 11

Problems & Solutions

The disposal system at Trombetas bauxite mine R.P. Lapa and F.V. Carraresi 421

Recent trends in phosphate mine reclamation in the United States W.R. Marion 441

Mining and reclamation of prime farmlands in western North Dakota
J.D. Friedlander 447

Possibilities de utilisation et de rainancement de mines abandonnes souterrames; considerations
géologiques et environnementales (Geological and environmental considerations in abandoned
underground mine reuse and rehabilitation) D.J. Boivin 459

An overview of two decades of regulation on surface coal mining and reclamation in North
Dakota W.E. Dodd, J.R. Deutsch, E.J. Englerth and N.M. Safaya 471

Economic considerations affecting habitat reclamation in Florida's phosphate mining
Industry T.P. King and W.R. Marion 481

Sodic and Saline Materials

Subsoil thickness effects on crop yield and soil water when reclaiming sodic spoil T.A. Oddie, E.A. Osbome, D. N.Graveland and L.A. Panek 495

The use of bottom ash as a physical amendment to sodic spoil S. Landsburg 505

Improvements of fly-ash reclamation with organic, organo-mineral and mineral amendments H. Insam 517

Corn response to deep tillage on surface-mined prime farm land in western Illinois R.E. Dunker, I.J. Jansen and S.L. Vance 523

Battle River Soil Reconstruction Project: Five year results of the Torlea soil experiment L.A. Leskiw 531

Salt tgs - the ultimate saline reclamation challenge R.T. Hart 543

Effects of phosphogypsum and magnesium choride amendments on abandoned bentonite mine spoils S.C. Smith and D.J. Dollhopf 555

Soils and Overburden__

Revegetation potential of overburden materials from Kittanning Coal Mines J.C. Sencindiver, N.C. Thurman and R.J. FugiU 563

Current reclamation approach at the Syncrude Oil Sands Plant T.S. Dai and M.Y.P. Fung 575

Coal nu'ne soil and overburden surveys and reclamation planning A. Schori, W.J. Hastle, D.K. McQueen, G.V. Minning and E.C. Wenzel 579

Spatial variability in the chemical and physical properties of regraded mine spoil G.A. Halvorson 589

Weathering of siderite (FeCO3) from lignite overburden N.M. Frisbee and L.R. Hossner 597

Physical and chemical characteristics of coal prep plant wastes from southwest Virginia B.R. Stewart and W.L. Daniels 607
The factors influencing cone penetration resistance as a measure of compaction in Minespoils. D.J. Thacker and R.L. Johnson

Acid Generating Materials. Characterization of leachate produced from sulphur-contaminated soils. S.A. Leggett and D. Parkinson

Effects of phosphatic amendments on yield and elemental composition of corn grown on acid minesoils. J.C. Sencindiver and D.K. Bhumbla

Utilisation de substances organiques des fins de mise en vegetation de rejects miniiers acides (The use of organic substances in the revegetation of acid mine tailings). A. Karam and L.M. Azzaria

Design considerations for the passive treatment of acid M'M drainage. E.A. Howard, T. Wildeman, L.S. Laudon and S.D. Machemer

Ecological engineering measures developed for acid generating waste from a copper/zinc concentrator in Northern Ontario. M. Kalin, M.P. Smith and R.O. Van Everdingen

Microbial sulfate reduction for the treatment of acid mine drainage: A laboratory study. R.W. Hammack and R.S. Hedin

Bacterial acid generation in pyritic shales and remedial measures. R.G.L. McCready


Overview of tailings reclamation in eastern Canada. T.H. Peters

Overview of tailings reclamation in western Canada. P.F. Ziemkiewicz and R. GaUinger

Design and reclamation of mine waste facilities to control acid mine drainage. J.P. Barton-Bridges and A. MacG. Robertson

A case history of an acid generation abatement program for an abandoned copper mine. P.M. Healy and A. MacG. Robertson

Gold tailings reclamation in South Africa. J.J.P. van Wyk

Conflicts in the reclamation of abandoned metauiferous mine sites in the LTK. I.G. Richards
Asbestos tailings reclamation in southern Africa J.J.P. van Wyk 759

Mine tailings reclamation in Australia - An overview L.C. Bell, S.C. Ward, E.D. Kabay and C.J. Jones 769

Techniques for reclaiming metauiferous tailings in Wales J.P. Palmer 783

Serpentine tailings reclamation J.J.P. van Wyk 793

Appendices

French Abstracts........................................................................................................... 801

Alberta Reclamation Research Reports........................................................................ 841