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PROFESSIONAL PROFILE

- ◆ Professional Agrologist (P.Ag.), active in industry associations
- ◆ Reputable in Vegetation Management industry for knowledge, range of experience, combining financial accountability with ecological and environmental parameters
- ◆ Contributes clarity to problem solving, innovation and new interpretations combining technical, environmental and financial domains
- ◆ Envisions and designs research projects with relevance and direct applicability to field operations
- ◆ Translates ecological, arboricultural principles into action in implementation and communication strategies

EDUCATION

- 1977 **Bachelor of Science in Agriculture**, University of Guelph, Guelph, Ontario
- 1982 **Fundamentals of Financial Management**, Northern Alberta Institute of Technology, Edmonton, Alberta
- 1983 **Understanding Finance**, Banff Centre, School of Management, Banff, Alberta

EMPLOYMENT HISTORY

- 1995 - **President**, Ecological Solutions Inc. (Ecosync), Sherwood Park, Alberta
- 1985 - 1995 **Supervising Forester, Sr. Consulting Forester**, TransAlta Utilities, Sherwood Park, Alberta
- 1981 - 1985 **Vice President and General Manager**, Ace Vegetation Control Service Ltd., Nisku, Alberta
- 1977 - 1981 **Assistant Operation Manager**, Vegetation Control Service Limited, Dundas, Ontario
- 1975 - 1977 **Research Assistant**, University of Guelph, Guelph, Ontario
- 1974 - 1975 **Chemistry Technician**, Canada Agriculture, Health of Animals Branch, Guelph, Ontario
- 1973 - 1974 **Bacteriology Technician**, Canada Agriculture, Health of Animals Branch, Guelph, Ontario
- 1970 - 1972 **Research Assistant**, Horticultural Research Institute of Ontario, Vineland Station, Ontario

HIGHLIGHTS OF WORK EXPERIENCE

- ◆ Conceptualized an ecological approach to vegetation management for electrical utilities which simultaneously minimizes costs and tree related outages
- ◆ Developed a model to predict future vegetation management resource requirements

- ◆ Developed a method for determining the optimal clearance between electric lines and trees
- ◆ Developed a method to quantitatively measure the risk of tree-caused interruptions
- ◆ Demonstrated that tree-caused interruptions are correlated to tree exposure and developed a regression for managing tree-caused outage incidents to not exceed specified tolerable levels
- ◆ Demonstrated prescribed right of way widths to be an inefficient approach to ensuring electric reliability
- ◆ Developed a business decision tool permitting people without a financial background to make quick assessments of the value of current vegetation management practices vs. proposed alternatives
- ◆ Conceptualized financial interpretation of data arising from a work tracking system, permitting an assessment of the value of program choices, crew configurations, supervision, stability of work force, etc.
- ◆ Provided conceptual approach which led to the development of a practical protocol to quantitatively monitor changes in soil carbon arising from variable agricultural practices over broadly diverse landscapes
- ◆ Developed provincial estimates of the CO₂ sequestration potential of Alberta forest protection and renewal measures
- ◆ Developed methods to quantify, monitor and verify carbon sequestration in forestry and agricultural practices
- ◆ Supervised field staff in contract/contractor relationships, work planning, scheduling, evaluations
- ◆ Developed computer programs for tracking budgets, scheduling crews, monitoring reporting accuracy and uniformity
- ◆ Developed an Incentive Contract, which shared productivity gains with contractors and their field staff while ensuring safety, quality and customer satisfaction were not jeopardized

CONSULTATION

- ◆ Advises on least cost vegetation management by synchronizing economics and ecology
- ◆ Advises on vegetation management resource requirements
- ◆ Develops and advises on utility practice to reduce and manage tree risks to service reliability
- ◆ Advises on impacts of vegetation management program alternatives, modifications
- ◆ Facilitates for management, staff, contractors and stakeholders an actionable understanding of ecological principles and their impacts on vegetation management needs and costs
- ◆ Provides project management; review of programs and proposals
- ◆ Provides context for vegetation management, greenhouse gas mitigation measures in a competitive energy market
- ◆ Develops and advises on quantification, monitoring and verification of biotic greenhouse gas mitigation measures

PROFESSIONAL PROJECT EXPERIENCE

Nova Scotia Power, Halifax, Nova Scotia, November 2011 – February 2012

- ◆ Report on Reducing and Managing Tree-related Service Interruptions and training in the use of the Optimal Clear Width Calculator for progressive reliability improvement.

Transmission & Distribution World, Overland Park, Kansas, November 2010 – present

- ◆ Establishment of and Editor of the Vegetation Management Resource Center, the most comprehensive online collection of utility VM articles. Provide monthly editorials on utility VM topics.

National Grid USA, Waltham, Massachusetts, April 2009 – September 2009

- ◆ Development of a strategy for reducing tree-caused interruptions on transmission lines; evaluation and costing of several mitigation options for areas with above average interruption risk; derivation

of changes in side line tree risk over time due to tree growth and the attendant changes to maintenance costs for maintaining status quo reliability.

Puget Sound Energy, Inc., Bellevue, Washington, February 2008 – March 2009

- ◆ Provided a performance management audit of the vegetation management program. Made assessments regarding the tree-caused interruptions. Quantified the tree exposure for the transmission system; correlated outage experience to found field variables and developed regression equations to predict tree outages based on field conditions and wind intensity. Developed models to assess the reliability impact of electric transmission system storm hardening intervention strategies.

Bennett Jones, ATCO Electric, Edmonton, Alberta, June 2008 – September 2008

- ◆ Expert witness for defense of a 1997 power line initiated wildfire, for which claimants sought reparations for timber loss. Evaluation of claimants' expert testimony and recommendations for strategic response.

FortisBC, Trail, British Columbia, March 2008 – April 2008

- ◆ Audit and assessment of contractor tree pruning work quality, completeness, clearance achieved and compliance with standards. Statistical comparisons between crews, contractors, and geographic areas were made. Program efficiency and the extent of hot spotting were assessed.

AltaLink, Calgary, Alberta, March 2007 – May 2008

- ◆ To satisfy the recommendations set out in a report titled *Quantification of Vegetation Management Work, Risks & Resource Requirements* used to support a change in transmission tariffs accepted in 2007, extended the sampling for within and outside right of way work volumes to achieve a 95% confidence level. Re-calculated the annual volume increment, which must be removed to achieve a least cost, sustainable maintenance program, the cumulative workload liability and the projections for its elimination.

Pennsylvania Public Utility Commission, PECO, Philadelphia, PA, June 2006 – March 2007

- ◆ As a sub-contracted partner of Schumaker & Company performing a Stratified Management Audit of PECO, assessed PECO's vegetation management program for its cost effectiveness and ability to avoid and minimize tree-related electric service interruptions. Provided recommendations for vegetation management program improvement.

AltaLink, Calgary, Alberta, April 2006 – February 2007

- ◆ Supported AltaLink in a rate case requesting substantially increased vegetation management funding, based on work previously performed and detailed in the report *Quantification of Vegetation Management Work, Risks & Resource Requirements*. Provided responses to questions arising from the Alberta Energy and Utilities Board and interveners through the General Tariff Application process. The Alberta Energy and Utilities Board accepted all the quantification and recommendations of the aforementioned Ecological Solutions Inc. report including the recommended level of vegetation management funding.

Olive Waller Zinkhan & Waller LLP, Regina, Saskatchewan, July 2006 – October 2006

- ◆ Provided expert analysis of SaskPower vegetation management practices, procedures, and policies in the context of both a specific tree failure incident, which resulted in a wildfire and personal injury, and the utility vegetation management industry in general.

AltaLink, Calgary, Alberta, February 2006 – June 2006

- ◆ Developed a detailed work tracking and reporting system for right of way maintenance work comprised of a weekly timesheet and a database. The database yields reports on total expenditures and work units completed by activity type, line location, contract type, contractor, work order, productivity and unit costs.

AltaLink, Calgary, Alberta, June 2005 – February 2006

- ◆ To support a change in transmission tariffs, undertook studies to quantify AltaLink transmission system exposure to trees, current vegetation management workload inventory and its rate of change. Determined the annual volume increment, which must be removed to achieve a least cost, sustainable maintenance program. Developed a predictive model to forecast funding

requirements based on a range of investment scenarios. Examined the current tree risk levels and trends in the context of the total tree exposure and the current workload liability. Findings and recommendations were set out in a report titled *Quantification of Vegetation Management Work, Risks & Resource Requirements*.

AltaLink, St. Albert, Alberta, April 2005 – June 2005

- ◆ Developed and wrote a general standards and specifications document for the construction of new rights of way with a particular focus on the treatment of vegetation and its residues.

National Grid USA, Westborough, Massachusetts, January 2003 – March 2005

- ◆ Developed the protocol to quantify the current level of tree risk along the right of way edge. Coordinated the project involving three other contractors. Performed statistical data analysis, made projections for the exposure to tree risk for the entire transmission system, correlated the found average tree risk by voltage class to the historical interruption experience and developed mitigation strategies that will reduce transmission line tree-caused interruption risk 40% to 80% for 25-50% of the cost of traditional methods.

AltaLink, St. Albert, Alberta, March 2004 – May 2004

- ◆ Developed a contractor timesheet and an accompanying Activity Code Manual for tracking work type and units completed by location, crew, contractor, work order number, maintenance or hot spotting.

Kentucky Public Service Commission, AEP/Kentucky, Hazard, Kentucky, August 2002 – February 2003

- ◆ As a sub-contracted partner of Schumaker & Company assessed the role of trees and the delivered vegetation management program on the reliability of service within AEP/Kentucky's Hazard service territory, an area that has historically experienced a greater number of, and longer duration electric service interruptions than other AEP/Kentucky service areas. The total assignment involved six consultants in roughly 700 hours of effort during a 6-month period.

AltaLink, St. Albert, Alberta, May 2003 – November 2003

- ◆ Developed standards and specifications for AltaLink's vegetation management program.

Mathews - Daniel, Atco Electric, Edmonton, Alberta, June 2001 – September 2001

- ◆ Assessment of specific and general field practices for due diligence and reasonable care following a tree failure (Chisholm area of Alberta) that resulted in a forest fire.

Fire Protection Division, Alberta Environmental Protection, Edmonton, Alberta, October 2000 – December 2000

- ◆ North American survey of *Regulation to Limit the Risk of Power Line Caused Forest Fires*; assessment and recommendations for Alberta approach.

West Kootenay Power, Trail, British Columbia, December 1999 – March 2000

- ◆ Assessment of contractor tree pruning work quality, completeness, clearance achieved and compliance with standards. Statistical comparisons between crews, contractors, and geographic areas were made. Program efficiency and the extent of hot spotting were assessed.

Suncor Energy Inc., Calgary, Alberta, October 1999 – December 1999

- ◆ Identified potential feedstocks and drivers of availability and costs for North American alternate energy projects. Quantified the volumes and costs of the feedstocks.

TransAlta Corporation, Calgary, Alberta, October 1996 – October 1999

- ◆ Developed estimates of the greenhouse gas impacts of installing power line rights of way.

TransAlta Corporation, Nova Gas Transmission, Calgary, Alberta, October 1996 – September 1999

- ◆ Managed contract for research into the carbon pool effects of right of way installation and operation for various ecosystems.

TransAlta Corporation, Isobord, Calgary, Alberta, April 1999 – September 1999

- ◆ Calculated the net greenhouse gas balance for a strawboard facility.

California Public Utility Commission, San Francisco, California, February 1999 – March 1999

- ◆ Expert witness for the state of California in a suit against Pacific Gas & Electric Company alleging mismanagement of the vegetation management program.

West Kootenay Power, Trail, British Columbia, January 1999 – March 1999

- ◆ Assessment of contractor tree pruning work quality, completeness and compliance. Statistical comparisons between crews, contractors, and geographic areas.

Suncor Energy Inc., Fort McMurray, Alberta, September 1997 – December 1997

- ◆ Identified potential feedstocks for a Canadian alternate energy project. Quantified the volumes and costs of the feedstocks.

Bennett Jones Verchere, Alberta Power, Edmonton, Alberta, May 1997 – July 1997

- ◆ Assessment of specific and general field practices for due diligence and reasonable care following a tree failure (Mitsue area of Alberta) that resulted in a forest fire necessitating suppression costs approaching \$50 million.

TransAlta Utilities, Calgary, Alberta, March 1997 – June 1997

- ◆ Development and assessment of vegetation management strategies compatible with reliability centered maintenance.

SaskPower, Regina, Saskatchewan, October 1996 – February 1997

- ◆ Based on field data, compared ecological and economic effects of status quo vegetation management practices to other potential practices over a twenty-year time frame. Showed that the introduction of another vegetation management practice would save 66% over the current practices.

TransAlta Utilities, Calgary, Alberta, December 1995 – March 1996

- ◆ Provided a 12-year retrospective assessment of the degree of error inherent in the vegetation inventory, current inventory estimates and budget projections for the next five years. Provided system reliability projections based on operational options available.

TransAlta Corporation, Calgary, Alberta, January 1995 – March 1996

- ◆ Originated a conceptual approach on how to verify soil carbon changes over soils with broadly variable characteristics. This led to the development of a field sampling methodology (at Lethbridge Research Station, A&AFC), which received the endorsement of the western Canadian soil research community.

TransAlta Corporation, CASA, Calgary, Alberta, June 1995 – January 1996

- ◆ Identified forest management measures that hold the potential of decreasing Alberta's net CO₂ emissions. Quantified the potential size of the greenhouse gas mitigation effects of each measure.

TransAlta Corporation, Calgary, Alberta, January 1995 – January 2000

- ◆ Evaluation of international projects for their greenhouse gas offset potential as well as identifying weaknesses and recommending economically suitable monitoring and verification methods.

RESEARCH INTERESTS

- ◆ Initiated research into the risk associated with beyond right of way trees and the impact of natural tree mortality rates
- ◆ Initiated research in right of way ecology and wildlife impacts
- ◆ Researched efficacy of herbicides and adjuvants, growth regulators
- ◆ Researches effectiveness and develops costs of alternative vegetation management methods and equipment
- ◆ Conducted research into growth rates after brush mowing, tree trimming

ORGANIZATIONS

1978	Founding Member , Canadian Association of Railroad Applicators
1982	Founding Member , Utility Arborist course, Industrial Vegetation Management Association of Alberta
1985	Seminar Planning Chairman , Industrial Vegetation Management Association of Alberta
1983 - 1993	Government Liaison Committee , Industrial Vegetation Management Association of Alberta
1983 - 1985	Director , Industrial Vegetation Management Association of Alberta
1988 - 1990	Director , Industrial Vegetation Management Association of Alberta
1996 - 1998	Director , Industrial Vegetation Management Association of Alberta
1989 - 1990	President , Industrial Vegetation Management Association of Alberta
1986 - 1994	Summarizer , Non-crop brush & weeds, Expert Committee on Weeds, Western Section Member : Alberta Institute of Agrologists; International Society of Arboriculture; Utility Arborist Association, Industrial Vegetation Management Association of Alberta

PUBLICATIONS

- ◆ Herbicide trials on flowering annuals. Research Reports, Canada Weed Committee, Eastern Section, 1976
- ◆ Brush control. Research Reports, Canada Weed Committee, Eastern Section, 1977
- ◆ Brush control. Research Reports, Expert Committee on Weeds, Western Section, 1989, 1990, 1991, 1992, 1993
- ◆ Guggenmoos, S., H.J.W. Shaw, K. Teskey, R.N. Thiessen. 1987. *Herbicide Trials*. IVMAA Reporter, Winter 1987, p37.
- ◆ Guggenmoos, S. *Economics of Herbicides for Brush Control*. 1987. IVMAA Reporter, Winter 1987, p38, Spring 1988, p25.
- ◆ Guggenmoos, S. *The Canadian Dream*. 1988. IVMAA Reporter, Summer 1988, p5, Fall 1988, p4.
- ◆ Guggenmoos, S. *Evaluating Brush Control*. 1988. IVMAA Reporter, Winter 1988, p22.
- ◆ Guggenmoos, S. Evaluations Of Three Herbicides For Control And Regrowth Of Poplar. 1988. IVMAA Reporter, Winter 1988, p23.
- ◆ Guggenmoos, S. Enhancement of Phenoxy Effects on Brush by Addition of Assist. 1988. IVMAA Reporter, Winter 1988, p25.
- ◆ Guggenmoos, S. Securing the Good Life. Presentation to Spring General Meeting of IVMAA. IVMAA Reporter, Winter/Spring 1990, p3.
- ◆ Guggenmoos, S. *Late Season Foliar Metsulfuron Methyl For Poplar Control*. 1990. IVMAA Reporter, Winter/Spring 1990, p35.
- ◆ Guggenmoos, S. *Enhancement of Phenoxy Effects on Brush by Addition of Assist*. 1990. IVMAA Reporter, Winter/Spring 1990, p36.
- ◆ Guggenmoos, S. "...part of the solution or part of the problem". 1990. IVMAA Reporter, Winter 1990.
- ◆ Guggenmoos, S., K.G. Karpovich. *Cattle Grazing as an Alternative to Herbicides*. 1990. IVMAA Reporter, Winter 1990, p17.
- ◆ Guggenmoos, S. *TransAlta Utilities Reporting System-A Management Tool*. Journal of Arboriculture, 16(2), 1990.
- ◆ Geier, R.L., Guggenmoos, S., Thiessen, R.N.. *Ecological Aspects of Herbicide Usage on Power Line Rights-of-Way*. Journal of Arboriculture, 18(4), 1992.
- ◆ Guggenmoos, S. Poplar stem and root control comparisons for 2,4-D, diphenoprop, dicamba and triclopyr. 1992. IVMAA Reporter, Winter 1992, p16.
- ◆ Guggenmoos, S., A.L. Luey, I.K. Croy. *Effects of water volume variations on triclopyr efficacy*. 1992. IVMAA Reporter, Winter 1992, p16.

- ◆ Guggenmoos, S., A.L. Luey, P.J.R. Massier. *Metsulfuron methyl for poplar spp control*. 1992. IVMAA Reporter, Winter 1992, p17.
- ◆ Guggenmoos, S. *TransAlta compares girdling to triclopyr ester for poplar control*. 1995. IVMAA Reporter, Winter 1995, p9.
- ◆ Guggenmoos, S., R.N. Thiessen. *News From TransAlta Utilities*. Country Power, Winter 1995, p5.
- ◆ Guggenmoos, S., R.N. Thiessen. *News From TransAlta Utilities*. Country Power, Spring 1995, p6.
- ◆ Guggenmoos, S., R.N. Thiessen. *News From TransAlta Utilities*. Country Power, Summer 1995, p9.
- ◆ Guggenmoos, S. *New program controls tree management*. Electric Light and Power, 73(2), 1995.
- ◆ Guggenmoos, S. *Outage Statistics - As a Basis for Determining Line Clearance Program Status*. UAA Quarterly, 5(1), Fall 1996.
- ◆ Guggenmoos, S. *Herbicides, Not a Silver Bullet*. UAA Quarterly, 8(4), Summer 2000.
- ◆ Guggenmoos, S. *Managing Tree-Conductor Conflicts by Risk Assessment*. UAA Quarterly, 9(4), Summer 2001.
- ◆ Guggenmoos, S. *Effects of Tree Mortality on Power Line Security*. Journal of Arboriculture, 29(4), July 2003.
- ◆ Guggenmoos, S. *Understand Your Tree Liability*. Electric Perspectives, 28(4), 2003
- ◆ Guggenmoos, S. *Managing Trees to Improve the Bottom Line*. IVMAA Reporter, Fall 2003.
- ◆ Guggenmoos, S. *Managing Trees to Improve the Bottom Line*. EnergyPulse, April 2004. Energy Central Network http://www.energypulse.net/centers/article/article_display.cfm?a_id=688
- ◆ Guggenmoos, S. *Tree Management Stops Outages and Improves Profit*. Natural Gas & Electricity 21:5 p.10-15, December 2004.
- ◆ Guggenmoos, S. *Quantification of Vegetation Management Work, Risks & Resource Requirements*. Ecological Solutions Inc. for AltaLink Management Ltd. March 2006. Alberta Energy and Utilities Board, AML 2007-2008 GTA Volume 2 Appendices excluding Depreciation Study.
<http://www.altalink.ca/adx.aspx/adxGetMedia.aspx?DocID=231,4,2,1,Documents&MediaID=382&Filename=Volume2of2+Appendices.pdf>, Appendix F, April 13, 2006.
- ◆ Guggenmoos, S., T.E. Sullivan. 2006. *Side Line Tree Risk Assessment and Mitigation*. UAA Quarterly, 14(4), Fall 2006.
- ◆ Guggenmoos, S., T.E. Sullivan. 2007. *Outside Right-of-Way Tree Risk Along Electrical Transmission Lines*. Utility Arborist Association web site. Available at http://www.utilityarborist.org/professional_resources.htm
- ◆ Guggenmoos, S. 2007. *Increased Risk of Electric Service Interruption Associated with Tree Branches Overhanging Conductors*. UAA Quarterly, 15(4), Fall 2007.
- ◆ Guggenmoos, S. 2009. *Storm Hardening the Electric Transmission System*. Report produced for Puget Sound Energy, March, 2009. Available at <http://www.wutc.wa.gov/rms2.nsf/177d98baa5918c7388256a550064a61e/bc8c15a609dfb8882575b1000116d9!OpenDocument>
- ◆ Guggenmoos, S. 2009. *Managing Tree-caused Electric Service Interruptions*. UAA Quarterly, 17(4), 2009.
- ◆ Guggenmoos, S. 2009. *Managing Tree-caused Electric Service Interruptions*. EnergyPulse Weekly, Nov. 16, 2009. Energy Central Network http://www.energypulse.net/centers/article/article_display.cfm?a_id=2201
- ◆ Guggenmoos, S. 2011. *Storm Hardening the Electric System Against Tree-caused Service Interruptions*. Utility Arborist Newsline, Mar/Apr 2011, Vol 2 No. 2.
- ◆ Guggenmoos, S. *Tree-related Electric Outages Due To Wind Loading*. Journal of Arboriculture & Urban Forestry, 37(4), July 2011.

PRESENTATIONS

Industrial Vegetation Management Association of Alberta

- ◆ Calgary, Alberta 2011, *Outage Prediction Models and Methods*
- ◆ Banff, Alberta 2005, *From Electrical Blackouts to Success in Utility Vegetation Management*
- ◆ Edmonton, Alberta 2003, *The Role of Utility Arboriculture in a Competitive Electric Services Market*
- ◆ Edmonton Alberta 2001, *HERBICIDES: Not a Silver Bullet*
- ◆ Edmonton, Alberta 1993, *Right of Way Ecology*
- ◆ Banff, Alberta 1991, *Right of Way Ecology*

International Society of Arboriculture (ISA)

- ◆ Chicago, Illinois, 2010, *Outage Prediction Models and Methods*
- ◆ Minneapolis, Minnesota 2006, *Beyond Right of Way Trees: Quantifying Tree Risk and Mitigation*
- ◆ Montreal, Quebec 2003, *Effects of Tree Mortality on Power Line Security*
- ◆ Cleveland, Ohio 1996, *Outage Statistics As a Basis for Determining Line Clearance Program Status*
- ◆ St. Charles, Illinois 1989, *TransAlta Utilities Reporting System - A Management Tool*

Indiana Chapter ISA

- ◆ Indianapolis, Indiana 2000, *Economy through Ecology*

Pacific North West Chapter ISA

- ◆ Portland, Oregon 1991, *Benefits of Time & Materials Contracts*
- ◆ Boise, Idaho 2000, *Managing Tree-Conductor Conflicts And Associated Risks*

Western Chapter ISA

- ◆ Las Vegas, Nevada 2003, *Understanding & Managing Utility Tree Risk*

EI Natural Resources Conference

- ◆ Park City, Utah 2003, *Effects of Tree Mortality on Power Line Security*
- ◆ Palm Springs, California 2001, *Managing Tree-Conductor Conflicts by Risk Assessment*

International Right of Way Association

- ◆ Kansas City, Missouri 2003, *Influence of Right of Way Width on Tree-caused Power Interruptions*

Western Power Institute

- ◆ Victoria, British Columbia 2000, *Managing Tree-Conductor Conflicts And Associated Risks*

Wildland Fire Litigation Conference

- ◆ San Diego, California 2011, *Managing Tree-caused Electric Service Interruptions*
- ◆ Reno, Nevada 2008, *A System Level Approach to Managing The Risk of Powerline Contacts by Trees*

Environmental Concerns in Rights-of-Way Management

- ◆ Portland, Oregon 2009, *Outside Right-of-Way Tree Risk Along Electrical Transmission Lines*