

Lloyd R. Rozema

Design and installation of constructed
wetlands for wastewater treatment



Education:

Niagara College, Horticulture, 1983

Brock University, St. Catharines, ON, Canada. B. Sc. (Hon.), Environmental Studies, 1996

Brock University, St. Catharines, ON, Canada. M. Sc., Limnology, 2001

Professional development studies:

University of Wisconsin - Madison, College of Engineering (creating and using wetlands
for wastewater treatment and water quality improvement, 1994)

University of Guelph, College of Engineering,
(On-site sewage installers and inspectors course, 2002)

Professional history:

AQUA Treatment Technologies Inc. St. Catharines, Ontario, Wetland design and
installation & President, 2002 to present

AQUA Treatment Systems, Campden, Ontario, Wetland design and installation &
President, 1997 to 2001

Sewage Waste Amendment Marsh Process Project (S.W.A.M.P.), Niagara-on-the-lake,
Ontario, Field Laboratory Director, 1992 to 1997

Owner/operator Highland Landscaping, 1983 - 1992, Campden, Ontario





Certifications:

Province of Ontario Certified Horticulturist, 1988

Province of Ontario Licensed Sewage Treatment System Designer, Installer and Inspector, 2002

Representative experience:

Mr. Rozema has been involved in the design and installation of constructed wetland systems since 1992. He has written and defended two theses (both his undergraduate and graduate thesis) on the design and performance of the Vertical Flow Constructed Wetland System. These academic achievements are complimented by a diverse practical experience in this field. As Field Laboratory Director on the U.S. EPA funded S.W.A.M.P. project he was responsible for the installation of the wetland treatment systems, the day to day operation of the research project as well as water sample collection and analysis. His experience in the landscape construction industry has resulted in a sound knowledge of construction practices and project management. These academic achievements, combined with the practical experience, has translated into the successful design, permitting and installation of twenty-seven full-scale constructed wetland systems for wastewater treatment in the Province of Ontario. In addition to this, six more constructed wetlands have received Ministry of Environment permits and are scheduled for construction in 2004. Brief descriptions of the projects that Mr. Rozema has designed and installed are outlined below:

Constructed Wetland Installations:

Sanitary Sewage treatment:

1) *Niagara Under Glass, 1998:* Mr. Rozema designed a closed loop irrigation and sanitary sewage wetland treatment system for this 10 acre greenhouse and tourism facility. All of the wastewater generated is collected and treated within a vertical flow constructed wetland (Wetland Biofilter System) and is re-used to irrigate crops and to flush toilets and urinals. The total daily design flow is 18,000 liters per day (~2,500 gallons per day). Ministry of Environment approval was issued for this system in the spring of 1998.

2) *Kortright Center, 1998:* Operated by the Metro Toronto Conservation Authority, the Kortright Center provides environmental education and awareness to the general public. AQUA Treatment Technologies designed and installed a Wetland Biofilter System to provide treatment to the domestic sewage generated by employees and visitors to the site. Treated water is re-used to flush toilets and urinals.





- 3) *The Toronto Waldorf School, 1999:* A wetland Biofilter System was installed as part of a larger treatment system to provide treatment of sanitary sewage generated by the employees and students at the school. Treated water is re-used to flush toilets and urinals.
- 4) *The Cumis Group, 2000:* A free water surface wetland was designed and installed to treat storm water run-off, contaminated with pesticides and nutrients, from this 25 acre property. Treated water flows into a municipal ditch.
- 5) *Pelee Island Winery, 2001:* A Wetland Biofilter System was designed and installed for treatment of 12,000 liters per day of sanitary sewage generated from the employee barracks and winery offices. Treated water is discharged into a gravel absorption system. Ministry of Environment approval was issued for this system in the spring of 2001.
- 6) *Peninsula Ridge Estates Winery, 2002:* A Wetland Biofilter System was designed and installed to treat 12,000 liters per day of sanitary sewage generated from the restaurant and winery building. Treated water is discharged into a gravel absorption system. Ministry of Environment approval was issued for this system in the spring of 2002.
- 7) *Eastdell Estates Winery, 2002:* A Wetland Biofilter System was designed and installed to treat 14,000 liters per day of sanitary sewage and high strength wastewater from the winery crush process and from the restaurant and winery building. Treated water is re-used within the restaurant to flush toilets and urinals. Ministry of Environment approval was issued for this system in the spring of 2002.
- 8) *Welland Golf and Country Club, 2002:* A Wetland Biofilter System was designed and installed to treat 15,000 liters per day of sanitary sewage generated from the clubhouse. Treated water is discharged into a gravel absorption system. Ministry of Environment approval was issued for this system in the spring of 2002.
- 9) *Vineland Estates Winery, 2002:* A Wetland Biofilter System was designed and installed to treat 14,000 liters per day of sanitary sewage and high strength wastewater generated from the restaurant and winery building. Treated water is discharged into an irrigation pond that is used to irrigate the vineyards. Ministry of Environment approval was issued for this system in the spring of 2002.
- 10) *Whitefish Lake First Nations, 2002:* Approved by Health Canada, this Wetland Biofilter System treats sanitary sewage generated by five homes located on the reserve. Treated water receives UV disinfection and is discharged into a nearby creek.



11) *Lunge Lodge, 2003*: a remote fishing camp situated on the Canadian Shield. This is one of two unique systems in that the entire system is perched atop a granite rock outcrop. The walls consist of pressure treated plywood forming with galvanized steel trussing providing support. This WBS is designed to treat 27,000 liters per day of sanitary sewage with direct discharge into the French River System. Ministry of Environment approval was issued for this system in the spring of 2003.

12) *The Georgian Bay Fishing Camp, 2003*: is located in northern Ontario on an island along the shores of Georgian Bay. All material had to be barged 27 Km by water to the site. This is our second 'raised system' in that the entire system is perched atop a granite rock outcrop. The walls consist of pressure treated plywood forming with galvanized steel trussing providing support. The WBS is designed to treat 22,000 liters per day with discharge into a gravel absorption bed. Ministry of Environment approval was issued for this system in the spring of 2003.

13) *Tawse Family Vineyards, Vineland Ontario, 2003*: This WBS is designed to treat 11,000 L/day of sanitary sewage as well as winery process water. Treated water is discharged into an irrigation pond to be used to irrigate vineyards as well as lawns and gardens. Ministry of Environment approval was issued for this system in the spring of 2003.

Agricultural wastewater treatment:

14,15,16) *RosaFlora Greenhouse, 2001 - 2002*: To ensure continued compliance with the Ministry of Environment management at RosaFlora Ltd. retained AQUA Treatment Technologies to design and install three separate Wetland Biofilter Systems to treat 400,000 liters of greenhouse irrigation leachate water per day. The treated water is re-used to irrigate greenhouse crops. Water testing at this site has shown that the Wetland Biofilter System is capable of a 100% removal of the organochlorine pesticide Endosulfan Sulphate from the leachate water.

17) *Hoeksema Farms, 2002*: Designed to treat 2,500 liters per day of liquid swine manure, this Wetland Biofilter System reduces nutrients while also eliminating odor from the swine manure.

18) *Rol-land Mushroom Farms, Blenheim, Ontario, 2003*: Designed to treat 118,000 L/day of leachate from the mushroom barns produced during irrigation of the manure/compost growing beds and cleaning activities such as floor washing etc. The treated water is re-used in the compost production process. Because this is a zero-discharge system, no Ministry of Environment approval was required.





19) *Essex-Kent Mushroom, Leamington, Ontario, 2003*: This Wetland Biofilter is designed to treat 185,000 L/day of leachate from the mushroom barns produced during irrigation of the manure/compost growing beds and cleaning activities such as floor washing etc. The treated water is re-used in the compost production process. Ministry of Environment approval was issued for this system in the Fall of 2003.

20) *Jeffery's Greenhouses, St. Catharines, Ontario, 2003*: This system is designed to test the efficacy of the WBS at reducing the organochlorine pesticide Endosulfan Sulphate from the leachate water produced during irrigation of the greenhouse crops.

Treatment of Landfill leachate:

21) *Cytec Canada, 2003*: this Wetland Biofilter System is designed to treat approximately 170,000 liters per day of leachate water from a landfill seep. The water contains elevated levels of ammonia.

22) *Delaware Solid Waste Authority, Felton, Delaware, 2003*: Two separate Wetland Biofilter Systems were installed during August 2003. This project is testing the efficacy of both the Vertical and Horizontal flow wetland systems, as well as a combination of the two, in treatment of landfill leachate.

23) *Waste Management, Narrowsburg, New York, 2003*: This Vertical Flow Wetland Biofilter System was installed in September of 2003. This wetland treats the effluent from a Zero Valent Iron system.

Small flow systems:

24,25,26,27) AQUA Treatment Technologies has installed four Wetland Biofilter Systems that treat sanitary sewage produced at individual homes or cottages.

Wetland Biofilter Systems that are permitted and scheduled for installation in 2004:

28) *Angels Gate Winery, 12,000 liters per day of sanitary sewage and high strength winery wash water, discharge to a gravel absorption system.*

29) *Kurtz Orchards and Fruit Market, 14,000 liters per day of sanitary sewage, discharge is to an irrigation pond used to irrigate a peach orchard.*





30) *Whitefish Lake First Nations, two Wetland Biofilter Systems* treating sanitary sewage from 3 homes and a cottage, discharge into a nearby stream.

31,32) *Oakrun Farm Bakery, Carlisle, Ontario, two Wetland Biofilter Systems* treating
1) 30,000 L/day sanitary sewage generated by the employees of the bakery and 2)
30,000 L/day of bakery process water (effluent from an aerated lagoon).

33) A WBS designed to treat 4,300 L/day of sanitary sewage with direct discharge into Georgian Bay.

Select list of publications and presentations:

Rozema, L.R. 1993. Sequestering of phosphorous by Lockport Dolomite and Queenston Shale substratum in a constructed wetland system, characterized by laboratory equilibrium experiments and the Langmuir Adsorption Isotherm. Bachelor of Science Thesis, Brock University. Supervisors - Dr. E.R. Lemon, Dr. Ian Brindle and Dr. Cam Lewis.

Rozema, L.R. 2000. The effect of plants (*Typha latifolia* sp.) and root-bed medium on the treatment of domestic sewage in a vertical flow constructed wetland. Master of Science Thesis, Brock University. Supervisors - Dr. E.R. Lemon, Dr. Ian Brindle and Dr. Cam Lewis.

E.R. Lemon, L.R. Rozema and I.D. Smith. 1995. Sewage waste Amendment Marsh Process Project, interim report.

E.R. Lemon, L.R. Rozema and I.D. Smith. 1995. Sewage waste Amendment Marsh Process Project, interim report. In the proceedings of The Water Environment Association of Ontario annual meeting. 1996. Toronto, ON.

E.R. Lemon, L.R. Rozema and I.D. Smith. 1996. SWAMP Pilot Scale Wetlands - Design and Performance. In the proceedings the Constructed Wetlands in Cold Climate Symposium, Niagara-on-the-Lake, ON.

Smith, I. Bis G.N., Lemon, E.R. and L. Rozema. 1997. A thermal analysis of a sub-surface flow constructed wetland. *Wat. Sci. Tech.* Vol. 35, No. 5, pp. 55-62.

Sewage Waste Amendment Marsh Process Project (S.W.A.M.P.) 1999. E.R. Lemon, L.R. Rozema and T. Braybrook. Cooperating agencies: U.S. Environmental Protection Agency, Environment Canada and the Ontario Ministry of Environment.

