

RNT Consulting Inc.  
823 County Road 35  
Picton, Ontario, Canada  
K0K 2T0

Phone: 613 476 7994  
URL: [www.rntconsulting.net](http://www.rntconsulting.net)



## **STATEMENT OF QUALIFICATION TO CONDUCT A VULNERABILITY ASSESSMENT, HABITAT SUITABILITY EVALUATION FOR AQUATIC INVASIVE SPECIES IN LAKE CHELAN**

**Prepared for Chelan County Natural Resources Department**



**Prepared by: Renata Claudi MSc., Tom Prescott MSc, P.Eng.  
and Leonard Willett**

**Date: August 23, 2018**

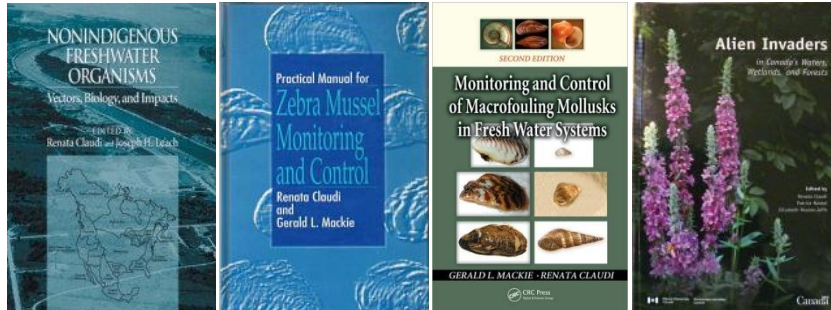
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## 1.:Introduction

There are thriving quagga mussel populations in Nevada, Arizona and Southern California. Zebra mussels are now present in the Red River in North Dakota and have infested Lake Winnipeg in the province of Manitoba in Canada. At this time there appears to be no indication of an infestation of Quagga/Zebra mussels in Washington State but the transfer of quagga or zebra mussels from infested water bodies into Washington State is possible if precautions are not taken. Chelan County Natural Resources Department has requested a proposal for vulnerability assessment and habitat suitability evaluation for aquatic invasive species which could become introduced and possibly established in Lake Chelan given the high level of recreational activity on the lake.

RNT Consulting Inc. is an independent consulting company established in 1998. Our primary area of activity is the control and mitigation of biofouling, as well as addressing other issues caused by aquatic invasive species. We apply both proven and innovative technologies appropriate to a given situation. We are considered experts in this field in North America. With more than 50 years of combined experience, four text books authored, and focused studies across the continent and overseas over the past 15 years; RNT represents the industry authority on dreissenid mussel research, monitoring, assessment and control as well as in-depth knowledge of other invasive species.



The company has been engaged in contract work for various clients including Environment Canada, Transport Canada, Agriculture Canada, Ontario Power Generation, Ontario Federation of Anglers and Hunters, U.S Army Corps of Engineers, U.S. Bureau of Reclamation, Central Arizona Project, Salt River Project, Southern Nevada Water, California Department of Water, and Brazilian and Spanish Power Utilities.

For carrying out vulnerability assessments, we have developed a concise methodology to assess various structures, facilities and water bodies for their vulnerability to primarily mussel infestation. Vulnerability assessments have been done for a number of clients as documented by the report titles which follow. Vulnerability assessments allow clients to focus on the protection of assets most likely to be severely affected by mussel infestation. The assessments also aid in selecting the most appropriate and economical

mitigation strategy. Reclamation has adopted our vulnerability assessment template for internal use by Reclamation staff when assessing all Reclamation assets. Our two latest projects involving vulnerability assessment of water bodies done at Lake Casita in California and at Parker, Colorado, at the Rueter-Hess reservoir.

## 2.: References and Selected Project List

### **CAP Central Arizona Project (CAP)**

**Scott Bryan** - Senior Biologist

Phone: (623) 869-2474 • Cell: (602) 376-5763 • email: [sbryan@cap-az.com](mailto:sbryan@cap-az.com)

Assessment of the potential impact of Quagga mussels on Central Arizona project western facilities and structures; recommendations for monitoring and control (2008)

Assessment of the Potential Impact of Quagga Mussels on CAP Southern Canal facilities and structures; recommendations for monitoring and control (2009)

### **Salt River Project**

**Lesly Swanson** - Senior Environmental Scientist, SRP Environmental Services

Phone: (602) 236-2893 • Fax: (602) 236-3407 • email: [Lesly.Swanson@srpnet.com](mailto:Lesly.Swanson@srpnet.com)

Assessment of the Cragin Water Project potential for infestation by Quagga and Zebra mussels, assessment of impact on civil and mechanical structures and recommendations for monitoring and control (2008)

Phase II Assessment of the Potential Impact of Quagga Mussels on Salt River Project Facilities and Structures; Recommendations for Monitoring and Control (2009)

### **U.S. Bureau of Reclamation**

**Sherri Pucherelli** – Biologist, Bureau of Reclamation, Phone (303)-445-2015 (Office) 720-646-8717 (Work Cell) [spucherelli@usbr.gov](mailto:spucherelli@usbr.gov)

Assessment of the Potential Impact of Quagga Mussels on Hoover Dam and Recommendations for Monitoring and Control (2007)

Assessment of the Potential Impact of Quagga Mussels on Hoover Dam and Recommendations for Monitoring and Control (2007)

Assessment of the Potential Impact of Invasive Mussels to Water and Power System Facilities and Structures for the following Facilities: East Portal Reservoir, Marys Lake, Pole Hill, Pinewood Reservoir, Flatiron Reservoir and Green Mountain Reservoir of the Colorado-Big Thompson Project (2009)

## California Department of Water Resources

**Tanya Veldhuizen** - California Department of Water Resources, O&M Environmental Assessment Branch, Aquatic Nuisance Species Program

Phone: (916) 657-3609 • Cell: (916) 539-6741 • email: [tanyav@water.ca.gov](mailto:tanyav@water.ca.gov)

Assessment of the Potential Impact of Quagga/Zebra Mussels on Selected Facilities and Structures of the California State Water Project; Recommendations for Monitoring and Control – Part 1 (2008)

Assessment of the Potential Impact of Dreissenid Mussels on the Citrus Pumping Plant and Recommendations for Mitigation/Control (2010)

Vulnerability Assessment and management of Dreissenid Mussels in the State Water Project – Part 2 (2013)

## Casitas Municipal Water District

**Carol Belser** - Park Services Manager, Lake Casitas Recreation Area

Phone 805-649-2233 x 111 • Cell 805-797-1517 • email: [cbelser@casitaswater.com](mailto:cbelser@casitaswater.com)

Vulnerability assessment of existing preventative measures which are in place to prevent infestation by dreissenid mussels and for the development of a Control and Management Plan should said mussels become established in Lake Casitas. The objective of the Control and Management Plan is to provide a road map forward on managing the mussel infestation in the reservoir, minimizing impact on manmade structures such as pipeline distribution systems and preventing the mussels from spreading from the reservoir to other areas (2015).

## Parker Water and Sanitation District

**Carolyn Rowton** - District Coordinator, 18100 Woodman Dr, Parker CO 80134,

•Phone (303)-841-4627 main • Cell (720)-842-4240 • email [crowton@pwsd.org](mailto:crowton@pwsd.org)

Parker Water and Sanitation District (PWSD) contracted RNT Consulting Inc. to review the vulnerability of the soon to be opened Rueter-Hess reservoir based on water quality and to suggest dreissenid mussel introduction prevention protocols (completed 2017).

### 3.: Proposed Work Plan

RNT Consulting Inc. has prepared the following proposal for carrying out a vulnerability assessment of Lake Chelan to infestation by dreissenid mussels and other invasive species. First step in our study plan is to have our three person multidisciplinary team meet in person with the members of the Chelan County Natural Resources Department and other stakeholders in the area to review the scope of the study and collect relevant environmental data as well as data on the use of the reservoir; boat traffic, angler hours, type of fishing equipment used, water transfer events, if any, and fish stocking if any. During this visit we would plan to walk representative portions of the shoreline, note signage and access roads and familiarize ourselves with the geography of the area.

Following this orientation meeting, we plan to produce a draft report covering the following topics.

1. **Risk of Establishment; Environmental Variables** - collect all available water quality data to help determine the vulnerability of the reservoir to aquatic invasive species infestation. Data of interest:

- Calcium
- pH
- Water temperature
- Dissolved oxygen
- Chlorophyll
- Nitrogen
- Phosphorus
- Turbidity

Compare the data available to water quality likely to support dreissenid population and other selected aquatic invasive species (AIS) of interest. Estimate the potential size of the dreissenid population if establishment is likely. If additional environmental data is required, provide a data collection plan.

2. **Risk of Introduction** - examine all possible vectors of introduction which may introduce dreissenid mussels as well as other aquatic invasive species. This would include the following:

- Boating
- Fishing
- Diving
- Fish stocking
- Aquarium Trade
- Special events
- Peripheral Water Sources

- Fire Fighting
- Water Transfers
- Perimeter security
- Sabotage/vandalism

3. **Potential Impacts of Dreissenids and Other Invasive Species on the Reservoir and associated Infrastructure** - The impacts to be considered are broadly divided into four categories which do have some overlap.

- Ecological Impacts such as potential changes to fisheries and water quality
- Physical Impacts on manmade structures including any water distribution systems and any recreational facilities or structures
- Economic impacts of the infestation and the efforts of minimizing spread and/or eradication
- Recreational Impacts

### Recommendations

4. **Monitoring Plan for early detection of AIS.** The pre-invasion monitoring program is usually limited to detecting the presence or absence of various stages of the dreissenid mussels and other AIS. This task will recommend suitable monitoring steps if they are not already in place.
5. **Monitoring program should an invasion occur.** This program is designed to determine the level of infestation at different times of the year, the periods of reproduction and of settlement, and the periods of most and least intense infestation levels. Growth rates and longevities would also be part of the analyses. Post-invasion monitoring is important to adjust and optimize control strategies as well as assisting in evaluating containment measures and considerations of eradication. Monitoring will determine when larvae are arriving in the system, follow the changes in numbers of veligers and attached adults, determine the effectiveness of a control program and minimize the costs of a control program. The following items would be part of the monitoring program:
- Periods of settlement
  - Densities of larvae and adults
  - Maximum sizes and biomasses of adults
  - Development rates of larvae
  - Growth rates of adults

## 6. Signage and Public Outreach

If required, suggest additional signage and public outreach material aimed at;

- Recreational Boaters
- Fisherman
- General Public

### Report of Findings and Recommendations

Once we complete the draft document, we plan to review our findings and recommendation with representatives of the Department and other interested stakeholders during a face to face meeting to verify that all the objectives of the scope have been met and recommendations which we propose can be implemented. Once broad agreement on the draft report is reached, we will proceed to prepare the final report.

If desired by the client, the final report can include an overview on the biology and ecology of dreissenid mussels. This overview is often helpful for the preparation of outreach materials, to assist in communication to internal staff and to develop/modify response strategies.

In addition, if desired by the client, the report will include a description of suitable control/eradication strategies and approximate costs. Mackie and Claudi (2010) describe a number of controls strategies for use both proactively and reactively. The choice depends on the circumstances, regulatory stance and management preference. Control strategies fall into the following categories;

- Cultural Controls such as public education
- Physical Controls
- Biological controls
- Chemical controls



## 4.: Quality Assurance / Quality Control

RNT is an independent company focused only on providing our clients with the best expert information possible to make decisions related to mussel issues that may affect the client. We test mussel related products for various vendors but we do not represent or promote specific vendors or products. Any assignments with vendors are done through non-disclosure agreements (NDA) solely to protect the vendors proprietary information. This approach makes us knowledgeable about the efficacy, costs and applicability of a variety of solutions for our clients.

RNT takes a multidisciplinary approach to our investigations involving biology, engineering, chemistry, operations and statistics to assess the broadest possible risk areas for our clients. For example RNT pioneered the use of evaluating historical environmental parameters as part of our assessment. This has saved clients in New York, California and Arizona millions of dollars in avoiding needless capital outlay.

RNT participates in conferences, interest groups and a network of personal contacts to keep up to date and share the most recent information about mussel related issues.

All our reports are peer reviewed internally and vetted by our client before issue. We encourage review and feedback from our client before issuing reports as the variety and complexity of each setting can clearly benefit from the depth of operational experience at a particular site.

We offer to our clients the option to name a technical contact for ongoing telephone consultations following completion of our assignments. This person or persons becomes part of RNT's ongoing network for information exchange.

## 5.: Schedule

Once the contract is awarded, an orientation meeting can be planned to take place within three weeks of the award date at the convenience of the client. During this time relevant data may be gathered by all parties to facilitate the meeting.

Following the orientation meeting a draft report for this project will be delivered to the client within 12 weeks.

Draft report review meeting can be scheduled at the convenience of the client following the submission of the draft report.

Once the review meeting has been completed, the final report will be delivered within four weeks.

**6.: Budget Price**

<b><u>Labour</u></b>	
Attend at site for orientation/kick-off meeting, collect and analyze data, prepare draft report	<b>\$19,500</b>
Post draft report client review meeting, edit and issue final report	<b>\$10,500</b>
<b><u>Travel Expenses</u></b>	
All air fare, car rental, accommodation, meals and any miscellaneous travel costs for two trips to site	<b>\$7,980</b>
<b>Total Price</b>	<b>\$37,980</b>

## 7.: Company Background, Projects and Experience

RNT Consulting Inc. is an independent consulting company established in 1998.

Our primary area of activity is the control and mitigation of biofouling, as well as addressing issues arising from aquatic invasive species. We apply both proven and innovative technologies appropriate to a given situation. We are considered experts in this field in North America. The company has been engaged in contract work for various clients including Environment Canada, Transport Canada, Agriculture Canada, Ontario Power Generation, Ontario Federation of Anglers and Hunters, U.S Army Corps of Engineers, U.S. Bureau of Reclamation, Central Arizona Project, Salt River Project, Southern Nevada Water, California Department of Water, and the Brazilian and Spanish Power Utilities.

Renata Claudi M Sc. and Thomas Prescott P Eng. are the principles of RNT Consulting. Leonard Willett is an RNT Associate, recently retired from the USBR where he served as the quagga mussel specialist for the Lower Colorado River Dams for more than 10 years.

As a team, Ms. Claudi and Mr. Prescott have carried out numerous assessments of risk from dreissenid infestation. These risk assessments usually include the evaluation of the available habitat for mussel colonization and the probability of the dreissenid mussels reaching certain locations. The following is a partial list of completed projects.

### Selected Projects in 2013:

1. Vulnerability assessments of the facilities, dam and hydro power for the California Department of Water Resources. This included selection of mitigation strategies appropriate for each facility.
2. Assessment of a full-scale Atlantium medium pressure UV system as a mitigation strategy for prevention of Quagga mussel settlement in cooling water systems of Davis Dam. This study was done for the US Bureau of Reclamation.
3. Assessment of a copper ion generator as means of eliminating settlement of Quagga mussel veligers. This study is still on-going and it is sponsored by the US Bureau of Reclamation.
4. Use of calcite index as a predictor of dreissenid mussel invasion success. This study was sponsored by the California Department of Water Resources.

- Selected Projects in 2012:
  5. Assessment of a small-scale Atlantium medium pressure UV system as a mitigation strategy for prevention of Quagga mussel settlement. This study was done for the manufacturer Atlantium Technologies.
  6. Assessment of a full-scale Aquafine medium pressure UV system as a mitigation strategy for prevention of Quagga mussel settlement in cooling water systems of Hoover Dam. This study was done for the US Bureau of Reclamation.
  7. Study to examine the impact of copper based algaecides on adult dreissenid mussels. This study was sponsored by the California Department of Water Resources.
  8. Study to examine the impact of Endothal based algaecides on adult dreissenid mussels. This study was sponsored by the US Bureau of Reclamation.
- Selected Projects in 2011 and earlier:
  9. Vulnerability Assessment for Quagga mussel infestation for San Diego County Water Authority Reservoirs and Facilities, including a prioritized list of viable control strategies and their costs.
  10. Study to examine the impact of chlorine use on dreissenid mussel veligers. The study was done for Rancho California.
  11. Study to examine the effect of high pH on dreissenid settlement and adult mussel survival. Sponsored by US Bureau of Reclamation.
  12. Study to examine the effect of low pH on dreissenid settlement and adult mussel survival. Sponsored by California Department of Water Resource.
  13. In 2010 we completed a study on the vulnerability of the California State Project System to dreissenid infestation, assessment of mussel settlement in the Central Arizona Project System and evaluation of irrigation system vulnerability for Agriculture Canada. We also consulted for Brazilian Utility on the impacts of the golden mussel, *Limnoperna fortunei*.
  14. In 2009 we completed a study on the effect of low pH on dreissenid mussel settlement and survival, funded by Central Arizona Project. For Rancho California we looked at the use of small pore self cleaning filters as a barrier to dreissenid spread. We also completed numerous vulnerability assessments for a number of different clients.
  15. In 2007/2008, we contributed to and edited the Zebra Mussel Response Plan for Lake Pueblo at the request of Colorado State Parks Agency

16. Projects in 2008 included evaluation of the risk Quagga mussels pose to the Central Arizona Project, the risk of infestation of a reservoir belonging to the Salt River Project and work on several projects for US Bureau of Reclamation.
17. In 2007 we evaluated the vulnerability of Parker Dam, Davis dam and Hoover Dam on the Colorado River for the US Bureau of Reclamation. In Spain we completed a vulnerability assessment of a nuclear power plant and assisted the client with immediate implementation of a control strategy.
18. In 2006 we carried out a vulnerability assessment of several dams for the Brazilian utility CEMIG. The infestation there is caused by a mussel called *Limnoperna fortunei*, commonly known as the golden mussel. Although this is not a Dreissenid mussel, the method of fouling is very similar and so are the controls.

## 8.: Resumes

### *Project Manager*

*Renata Claudi, M.Sc.*

### *RNT Partner and Chief Scientist*

Ms. Claudi is an environmental scientist with over 25 years of diverse business and technical experience. After more than 15 years in the electric power industry, where she established the mussel mitigation program for Ontario's largest electricity utility, Ms. Claudi formed RNT Consulting Inc. to respond to the broader industry need for expert mussel support. As aquatic nuisance species becomes geographically more widespread, Ms. Claudi has provided mussel expertise internationally on the various aspects of alien species invasions, including their economic impact, protection of assets, selection of appropriate control options, and installation of these control options.

### *Academic Background*

Master of Science, Biological Oceanography (McGill University)

Bachelor of Science, Marine Biology (McGill University)

### *Professional Experience*

#### **RNT Consulting Inc., Partner and Chief Scientist**

Consult on issues surrounding alien species biology, control, and impact

Perform vulnerability assessments on water distribution systems and facilities

Develop public outreach materials to help minimize the spread of aquatic invasive species

Various clients include Environment Canada, Transport Canada, Ontario Power Generation, U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, California Department of Water Resources, U.S. Patent Office, Brazilian and Spanish Utilities

#### **Ontario Hydro (Head Office), Senior Scientist, Water Section, Safety & Environment**

Responsible for assessment of the impact of Zebra mussels on operating stations, development of mitigation plans, interaction with other utilities and industries, organization of major scientific meetings

Developed strategic alliances and communication tools to improve information exchange and maximize effective use of research dollars

Managed specific research projects, delivered numerous presentations with varying technical content

Developed and taught a community college course on Zebra Mussels

### **Atomic Energy of Canada Ltd. (CANDU Operations), Marketing Team Member**

Member of a team charged with the marketing of engineering services

Participated in a site study to place a CANDU nuclear station on the shores of the Mediterranean in Turkey. This assignment involved a site visit, hands-on evaluation of consultant reports submitted to the Turkish Electrical Authority, and input to the design process of plant.

### ***Selected Activities and Achievements***

Invited to participate in the Aquatic Nuisance Species (ANS) Task Force Invasive Species Experts Database, 2010

Member of the convening committees for the 2001 - 2007 International Conference on Aquatic Invasive Species

Technical Program Chair and primary organizer of the 1990 - 2000 International Zebra Mussel Conferences

Invited member of a Scientific Panel of the National Sea Grant College Program; asked to evaluate research proposals for Zebra mussel impact and control submitted for funding in 1992

Invited member of the Great Lakes Panel on Exotic Species established in November 1991; the Great Lakes Commission received an official charter from the Secretary of the Interior to create the panel to advance research and coordinate monitoring and control activities targeted at the Zebra mussel and other aquatic nuisances in the Great Lakes Basin

Convener and co-chair of a Symposium on Exotic Bivalves at the Summer Meeting of the American Society of Limnologists and Oceanographers in Williamsburg, Virginia, June 1990

Invited member of a Utility Advisory Group on Zebra Mussels organized by the Electric Power Research Institute (EPRI), January 1990

Acted as an expert witness for technical review of a Patent Application for the U. S. Patent Office

### ***Selected Publications and Presentations***

- Claudi, R. 1990. *Effect of sodium hypochlorite on adult Zebra mussels at an electrical generating facility; case study*. NABS Conference, May 1990, Blacksburg, Virginia.
- Claudi, R. 1990. *Zebra mussels; Impact on Industry*. Presentation to the Ministry of Natural Resources Zebra Mussel Information Session, June 1990, Toronto, Ontario.
- Claudi, R. 1990. *Zebra mussel invasion of the Great Lakes*. R. Claudi, Presentation to the Canadian Nuclear Society, Golden Horseshoe Branch, October 1990, Hamilton, Ontario.
- Claudi, R. and D. W. Evans. 1990. *Chemical addition strategies for Zebra mussel control in once-through service water systems*. EPRI Service Water Conference, December 1990, Orlando, Florida. Published in *Zebra Mussels: Biology, Impact and Control*, Lewis Publishers, edited by T. Nalepa and D. Schloesser.
- Claudi, R. 1991. *Research into Zebra mussel control strategies at Ontario Hydro*. Presentation to the U. S. Army Corps of Engineers, May 1991.
- Claudi, R. 1991. *Control of Zebra mussels in once-through cooling systems*. AWWA Conference, June 1991, Philadelphia. Published in the proceedings of the Conference.
- Claudi, R. 1991. *Zebra mussel invasion of the Great Lakes and impact on industry*. Northeast Power Coordinating Council Meeting, October 1991, Toronto, Ontario.
- Claudi, R. 1992. *Canadian research in Zebra mussel control strategies*. Michigan Seagrant Extension Zebra Mussel Conference, January 1992, East Lansing, Michigan.
- Claudi, R. 1992. *Zebra mussels; impact on industry*. Scientists' Institute for Public Information, Binational Great Lakes Environmental Reporting Workshop, April 1992, Toronto, Ontario.
- Claudi, R. and J. D. Ackerman. 1992. *Post- settlement movements of juvenile Zebra mussels and their potential impact on plant systems*. National Association of Corrosion Engineers Meeting, May 1992, Nashville, Tenn. Published in the Proceedings of the Conference.
- Claudi, R. 1992. *Case study of biofouling species and their control*. Louisiana State University Zebra Mussel Conference, May 1992, Baton Rouge, Louisiana.
- Claudi, R. 1992. *Zebra mussels and their impact*. North American Lake Management Society Meeting, November 1992, Cincinnati, Ohio.
- Claudi, R. 1992. Description of practical methods for monitoring and control of Zebra mussels in industrial facilities. Water Quality Technology Conference, November 1992, Toronto, Ontario.



Claudi, R. and G. L. Mackie. 1993. *Practical Manual for Zebra Mussel Monitoring and Control*. Lewis Publishers.

Claudi, R. 1997. Potential for Sterilization of NOBOB Ballast Water Remnants with Organic Acid. RNT Report 9609 for DFO Canada.

Claudi, R. and J. H. Leach. 2000. *Nonindigenous Aquatic Organisms*. Lewis Publishers.

Claudi, R. 2002. Environmental and Economic Costs of Alien Invasive Species in Canada. Report prepared for Environment Canada.

Claudi, R. 2002. Quantification of Risks of Alien Species Introductions Associated with Alternative Area for Ballast Water Exchange in the Laurentian Channel of the Gulf of St. Lawrence. RNT Report 108 for Transport Canada 2002.

Claudi, R. 2004. *Potential Impact of *Limnoperna fortunei* on Brazilian Hydroelectric plants*. Report prepared for Brazilian Utility under contract to World Fisheries Trust.

Claudi, R. 2006. *Investigation of Sparker Technology for Control of Aquatic Alien species in Ballast Water*. Presented at the 14th International Conference on Aquatic Invasive Species in Miami, Florida.

### **Books Published**

*Practical Manual for Zebra Mussel Monitoring and Control*.  
R.Claudi and G.L.Mackie, Lewis Publishers 1993.

*Nonindigenous Freshwater Organisms*  
R. Claudie and J. H. Leach CRC Press 1999

*Alien Invades in Canada's Waters, Wetlands and Forests*.  
Edited by R.Claudi, P.Nantel and E.Muckle-Jeffs Natural Resources Canada 2002

*Monitoring and Control of Macrofouling Mollusks in Fresh Water Systems*,  
G.L.Mackie , R.Claudi, Taylor and Francis Publishers 2010

## ***Engineering Manager***

***Thomas H. Prescott, M.ASc., P.Eng.***

## ***RNT Partner and Chief Engineer***

Mr. Prescott has over 30 years of engineering and project management experience on design, installation, and testing of mechanical and process systems in various areas including military, petrochemical, and electric power production industries. Mr. Prescott has particular expertise in vulnerability assessments and pilot testing of control facilities for mussel biofouling control. He has experience with many clients throughout Canada, U.S.A., and overseas and is currently a partner and senior project engineer at RNT Consulting Inc.

## ***Academic Background***

Master of Applied Science, Mechanical Engineering (University of Waterloo)

Bachelor of Engineering, Mechanical Engineering (Royal Military College)

## ***Professional Experience***

Mr. Prescott has diverse experience in engineering including the following areas:

### **Design Engineering and Project Engineering**

Project Engineer for power plant vulnerability assessments posed by aquatic invasive species at hydraulic dams, power plants and pumping plants in Brazil and USA, and nuclear plants in Spain and USA.

Project Manager for installation and evaluation of Zebra/Quagga mussel control systems in nuclear and fossil plants in Ontario.

Project Engineer for design and installation of aquatic weed control system in a nuclear plant in Ontario.

Specified design and performance requirements for rotating pumping machinery for high reliability applications in nuclear power plant designs. Managed technical aspects of subsequent equipment contracts. The equipment contracts typically ranged from about \$ 0.1M to \$ 7M in value.

### **Construction Engineering**

Resident Engineering Manager at a nuclear power plant construction site in South America costing approximately \$600M

Construction Manager for a refractory engineering company that designed and supplied linings for high temperature process lines in existing and newly constructed petrochemical plants and pulp mills.

## Management

Business Operations Manager and Partner in a Consulting Engineering firm specializing in failure and loss analysis in the transportation industry.

Managed a Computer Aided Design and Drafting (CADD) operation for Atomic Energy of Canada Ltd. (CANDU Division), a large Canadian design and build engineering organization.

## Professional Memberships

Professional Engineer (P.Eng.), Association of Professional Engineers Ontario

## Publications and Presentations

*Vulnerability Assessment of Zebra and Quagga Mussels on Facilities from Intake to Discharge.* Presented at the Sligo Institute of Technology Water Quality Issues Conference, Athlone, Ireland. Prescott T.H. 2009.

*The Proposed Use of Continuous and Intermittent Ozone for Zebra Mussel Control at Ontario Power Generation.* Presented at the 10th International Aquatic Nuisance Species Conference, Toronto. Prescott T.H. 2000.

*Dealing with Engineering Experts.* Presented at the Osgoode Hall Law School Professional Development Program. Prescott T. H. 2008.

## ***Water Treatment Specialist***

### ***Leonard Willett***

#### **RNT Associate**

Water treatment specialist with 35+ years of experience providing supervision, leadership and oversight skills for Federal and Municipal governments in distribution/collection systems, environmental engineering, hazardous materials handling, invasive species, project management, and water/wastewater treatment. Validation expert for AIS treatment technologies.

## ***Training / Certification***

- Arizona Water Treatment & Distribution Operator c., 2003
- Montana Water Treatment & Distribution Operator /
- Wastewater Treatment & Collections c., 1978-1980
- Nevada Water Treatment & Distribution Operator /
- Wastewater Treatment & Collections c., 2003
- Federal Contracting
- Project Management Association Certification
- Project Leadership, Management, and Communication

## ***Experience***

#### **RNT Consulting**

Associate, AIS Treatment Specialist, Oct. 2017 – Present

Water treatment specialist supporting Industrial and Hydroelectric facilities with the implementation, testing, and service of AIS, disinfection, and dechlorination treatment systems.

#### **Bureau of Reclamation - Hoover Dam**

Environmental Compliance Manager, Nov. 2009 - Sept. 2017

Supervisory Engineering Technician, Oct. 2003 - Nov. 2009

- *Directed Invasive Species Research efforts and served as the task force leader that supported and installed control barriers for Reclamation facilities dealing with mussel invasion.*
- *Directed and developed policies and programs for the Environmental Compliance*

*Group at Lower Colorado River Dam's Office.*

- *Supervised the Engineering & Planning Group for Lower Colorado River Dam's Office for 5+ years.*

### **Previous Experience**

Superintendent- City of Helena, Jan. 1977 - Oct. 2003

Consulting Services- Enviro-Tek, Feb. 1992 - Sept. 2003

### ***Presenations-Publications/ Affiliations/ Awards***

- AWWA, ICAIS and HydroVision / Journal AWWA and HydroReview
- Member of American Water Works Association, Water Environment Federation
- AWWA Operator's Meritorious Service Award, 15+ awards from Bureau of Reclamation

## 9.:Resource Material

*Monitoring and control of macrofouling mollusks in freshwater systems.* CRC Press.  
Mackie, G.L. and R. Claudi. 2010.

Practical Manual for Zebra Mussel Monitoring and Control, Lewis Publishers. R.Claudi  
and G.L.Mackie, 1993.