

RMA

The Resource Modeling Association is an international association of scientists working at the intersection of mathematical modeling, environmental science, and natural resource management. We formulate and analyze models to understand and inform the management of renewable and exhaustible resources. We are particularly concerned with the sustainable utilization of renewable resources and their vulnerability to anthropogenic and other disturbances.

RMA Newsletter

Spring 2014



Registering Now for the Vilnius Conference *by Harry Gorfine*

The Resource Modeling Association invites you to attend the 2014 World Conference on Natural Resource Modeling which will be held July 8 – 11 at Vilnius University in Vilnius, Lithuania. “Modeling our way back to the future” is the theme of this year’s conference.

Every conference has some kind of back story and the forthcoming RMA meeting in Vilnius is no exception. In this case ‘Why Vilnius?’ and ‘What’s so special

about Lithuania?’ are questions that you and other colleagues may well ask. The response lies at the heart of the RMA tradition of holding its conferences in locations that showcase exemplars of what motivates mathematical modellers to apply their skills to studying the complex dynamics of diverse natural systems. In simple terms Lithuania, despite occupying a small area of the world map, abounds with renewable natural resources.

Lithuania is a small largely agrarian nation of some 3 million or so inhabitants with an archaeological legacy of artefacts dating back to the Bronze Age and a millennium long cultural history evidenced today by medieval castles and buildings from the Gothic, Renaissance, and Baroque replete with antiquities from those periods. Once a Grand Duchy with lands extending from the Baltic to the Black Sea, Lithuania has been

continued on page 2

2015 RMA Conference in
Bordeaux, France | p. 8



Inside

President’s Column	5
Fisheries Ecology in Lithuania.....	6
RMA Conference in Bordeaux.....	8

The 2014 Vilnius Conference

continued from page 1



variously occupied and re-occupied by adjoining nations including Sweden, Poland, Russia and Germany. The last occupation was by Soviet Russia, ending during 1991 as a consequence of the policy of Perestroika that developed under the administration of former Russian President Mikhail Gorbachev. Lithuania was the first of the three Baltic States to reclaim its independence and become an emerging democracy that today sees it as an active member nation of the EU and NATO.

Lithuanian agriculture dates back to the Neolithic and many Lithuanians grow their own vegetables, herbs and fruit in kitchen gardens, and most residential properties have a šiltnamis (greenhouse) in which are grown cucumbers, tomatoes and bell peppers. On a commercial scale 3.5 million or 54 percent of the 6.5 million hectares within Lithuania's boundaries is used for agricultural production, 84 percent of which is classed as arable. The central plain in the middle of the country is the main arable area and comprises nearly 50 percent of the agricultural land. Large dairy herds were traditionally maintained in this

area, with forage crops providing the rotation with arable crops. Cereals, legumes and sugarbeet are the predominate commodities of arable crop production. Aside from areas devoted to agricultural use, much of the land remains forested, especially in the southwest, with pine, spruce and birch providing a source of timber essential for building and heating in the many rural villages. The capital Vilnius in the southeast, not far from the border with Belarussia, is surrounded by forests and straddles the 510 km long Neris River, of which the final 235 km flows through Lithuanian territory.

Lithuania's food production may be sufficient to sustain the population, but when it comes to energy Lithuania is not without its challenges. Until New Year's Eve 2010 the Ignalina Nuclear Power Plant (NPP) in the northeast supplied more than two-thirds of the country's demand for electricity. The economic and social consequences of closure of the Chernobyl-style plant with its two Soviet-built RBMK-1500 reactors include a substantial rise in the cost of living due to increased dependency on Russian gas

supplies, and more locally, increased unemployment in the nearby dormitory town of Visaginas due to several thousand plant workers becoming redundant. Closure of the plant has not only meant an increase in the price of electricity throughout Lithuania, but also a loss of cheap heating for the now unemployed residents of Visaginas; an example of the knock-on effects in a social context.

Although wind farms are springing up close to the coast in the west of Lithuania, these are nowhere near as prolific as in other countries. Meanwhile the port at Klaipėda is being deepened to accommodate a LNG storage facility which it is hoped will ease dependency on Russian gas, but unlike LNG in countries such as Australia, natural gas is not cheap, regardless of the source. In the meantime, apartment dwellers rely upon an uninterrupted supply of expensive gas piped across Belarussia by the Russian behemoth Gazprom, with limited or no alternatives other than heavy blankets. Often the monthly heating bill during winter exceeds the charge for rent.



These examples illustrate that although Lithuania has a level of self-sufficiency in renewable natural resources such as water, timber, and food, it suffers from dependency on an external supply of non-renewables. This should be of more than passing interest for delegates when comparing and contrasting Lithuania's situation with natural resource availability in their own countries.

Apart from a uniquely interesting natural heritage and cultural backdrop, there are also logistical and financial advantages in holding the conference in Vilnius. Although it is not a hub airport and is relatively small, Vilnius Airport is a modern well serviced facility with a much older elegant facade that is only 6 km from the city centre. Micro buses and taxis are accessible directly at the front of the terminal entrance, and there is a dedicated airport train only a short walk from the terminal building that takes less 10 minutes and costs less than USD\$1 to travel to the main railway station in Vilnius. In the city the bus and railway station are diagonally opposite each other, and the Old Town with its abundance of hotels and hostels is readily accessible on foot or trolley buses.

The Vilnius University venue has awe-inspiring architecture as well as a bell tower that commands the best 360-degree views over the city. To access the superb panorama one has the choice of earning the cepelinai and alus consumed at lunch by scaling the 200 ancient steps or, for those less active or not on a diet, taking the modern glass-walled lift that was recently installed for tourists. The auditoria we have chosen are distinctive and ornate; the larger one, Theatre Hall, has rich dark grain wooden pillars and gallery complemented by deep red upholstered seating. In contrast, our other auditorium, called the Aula Parva or small hall, has white marble columns and crimson-red walls. During the day we have provided lengthy lunch breaks to facilitate delegates walking to the nearby cafes and restaurants with ample time to order their meals, dine unrushed, and engage in small group discussions. Delegates will literally step out of the campus gates adjacent to the University Tower and walk 60 metres eastwards to Piles gatvė. This is an inexpensive alternative to catering and will enable those who are limited

to only staying for the duration of the conference to experience various aspects of the Old Town environment whilst sampling a range of the local cuisine.

As well as scaling the University bell tower on foot, the more energetic among the delegates can either go for a run or stroll along the many paths that flank the Neris River or the parklands or head up various trails that criss-cross the steep hills above the Bohemian precinct of Užupis on the east-side of the Vilnia River. For those whose knee joints can't handle pounding the pavement or whose thighs are not up to tiger-walking the hills, there are a number of municipal bike stations where one can commandeer a bright orange iron horse with a swipe of one's kredito kortelė (credit card) and start peddling.

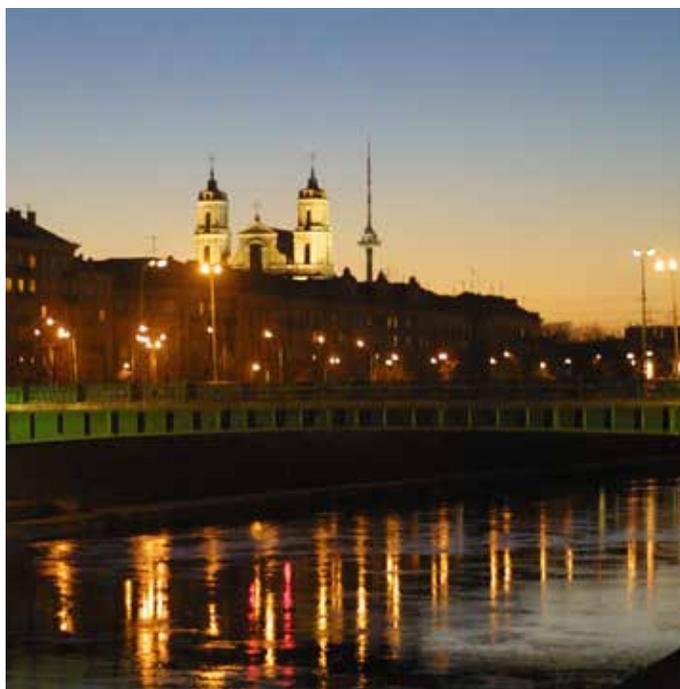
Vilnius also caters for those whom daily exercise is restricted to sedate walks to a museum, art gallery or opera house. Lithuanians are a highly creative lot and are particularly fond of carving out sculptures from wood and stone. Large totems and statues feature in the many parklands and smaller versions that may just fit into a suitcase are available as souvenirs. There is an Opera House within an easy walk of the conference venue and many richly decorated cathedrals that might as well be art galleries.

Characteristically, we are also holding the formal dinner at a venue close to the city that typifies many of the Lithuanian traditions, including building structures from timber and stone beside a stream of flowing water. The Belmontas Entertainment and Recreation Center dinner venue is of post-and-beam construction with granite block walls, and is situated almost astride the Vilnia River. At Belmontas delegates will taste the delights of local cuisine complemented

by traditional entertainment. Those who are sufficiently uninhibited, and perhaps others who can derive enough courage from the consumption of local beverages, will have the opportunity to test the null hypothesis that both feet of the average mathematician move sinistrally when attempting to move them in response to music. Of course the raconteurs among you who are scheduled to deliver talks the following morning would be wise to moderate consumption, as there will be another opportunity to cut loose at the Farewell Dinner on Friday evening and plenty in-between for that matter.

About town Vilnius is a very safe city, although like any metropolis, it has its underbelly. The same applies to Lithuania in general. Indeed the tongue-in-cheek comment in the 'Vilnius In Your Pocket' guide book is that crime is rampant in Lithuania but visitors are safe because it is confined to the parliament or Siemas. When walking about the city one may find, somewhat disconcertingly, that people in the street do not smile or acknowledge you as they pass. Although this is true of many larger cities worldwide, in Lithuania it belies a wariness of strangers after years of oppression in which being denounced was an ever-present reality under Soviet rule. Once introduced personally, most Lithuanians are as friendly and as jovial a bunch as anywhere.

If you have the chance to spend more time exploring, then there are a heap of things you can do visiting the lakes district to the northeast, the Neringa coast with its parklands to the west or the riverine and spa areas to the southwest. Highlights include the



*Support your association and come to Vilnius.
We look forward to seeing you in July!*

Hill of Crosses at Šiauliai, hill forts at Kernavė, especially during festivals recreating medieval times, Grūto (Soviet) Parkas at Druskininkai, health resorts and spas at Druskininkai and Birštonas, the historic Port of Klaipėda, and the huge sand hills near Nida.

Summer is a great time to be in Lithuania, so we encourage you to consider enjoying an inexpensive working holiday making the most of what this little known and often overlooked country offers aside from what promises to be a fantastic conference that we are putting together for you as RMA members.

Many of us leave decisions and more importantly actions about conference attendance to the last minute, sometimes because it is out of our control, but often because we procrastinate. Conference organisers and scientific panels are then inundated with abstracts and transactions in the last hectic month prior to the event. If you can make your decision now and are able to act upon it then we would greatly appreciate you helping us out by attending to it sooner rather than later. Like the rest of you, the conference committee and scientific panel members have daytime jobs, so spreading the

workload will make it easier on all of us.

For information about registering, lodging, invited speakers, social events and a schedule of the sessions, visit the conference website at www.resource modellingconference2014.com.

Sponsors



Lietuvos mokslo taryba



PRESIDENT'S COLUMN



Join us in Vilnius, Lithuania

First, I would like to thank Harry Gorfine (University of Melbourne) for all his hard work in organizing the upcoming RMA meeting in Vilnius, Lithuania, and I look forward to being there and handing over the presidential reins to John Hearne (RMIT, Melbourne).

After nearly two years at the University of Ottawa, I am pleased to have had success in encouraging students and academics in the interests of the Resource Modeling Association through their research. Specifically, Dan Lane and I are supervising graduate students in the Systems Science Master's Program at the Telfer School of Management associated with the C-FOAM and C-Change programs of research. We have developed a System Dynamics (SD) design modeling framework to analyse community environmental, social and economic capital profile changes in response to coastal storm surges in Charlottetown, PEI. This model will be used in the M.Sc. thesis of Shima Beigzadeh entitled "System Dynamics and Statistical Modeling of Severe Storms: The Case of Charlottetown." We hope in the future to build on this framework. We have found that STELLA is a creative medium for collaboration in natural resource modeling. Both Dan Lane and I will be presenting two papers on this work at the Conference.

As mentioned in an earlier president's report, Professor Dan Lane is a Director at the University of Ottawa in the two research programs C-FOAM and C-Change. In C-FOAM the Canadian Fisheries, Oceans, and Aquaculture Management Research Group are interested in policy analysis in the marine

environment (www.c-foam.management.uottawa.ca). C-FOAM members specialize in integrating science and social science as pertains to operational management and strategic research questions in marine fisheries, oceans, and aquaculture with the objectives of ecological sustainability, socioeconomics and coastal community stability, economic viability, and administrative efficiencies in the delivery of good management.

C-Change is an International Community-University Research Alliance (ICURA) project funded by the International Development Research Centre (IDRC) and the Social Science and Humanities Council of Canada (SSHRCC). C-Change (www.coastalchange.ca) is concerned with managing the adaptation to environmental change. Vulnerable coastal communities can increase their adaptive capacity to climate change by linking national and regional institutions resources and services with local community knowledge.

I invite you to join me in Vilnius, Lithuania this July for the 2014 World Conference on Natural Resource Modeling, which is jointly hosted by Dr. Linas Lozys from the Institute of Ecology of the Lithuanian Nature Research Centre and Professor Osvaldas Rusksenas from Vilnius University's Faculty of Natural Sciences. This will be a very interesting meeting whose theme 'Modelling our way back to the future' will attract high-quality papers crossing disciplinary boundaries of computer science, resource economics, environmental science and engineering.

– Rick Moll, *RMA President*



Fisheries Ecology in Lithuania

by Harry Gorfine

With the 2014 conference to be held in Lithuania you may be interested to learn a little about some of the research in which I've collaborated with scientists from Institute of Ecology of the Lithuanian State Nature Research Center (NRC) during the past five years. I am indebted to Dr Linas Ložys, the Head of the NRC Laboratory of Marine Ecology, who has included me as part of his team during each of my visits since we were first introduced in 2008 by Professor Osvaldas Rukšėnas, Dean of Natural Sciences at Vilnius University.

Like many countries in northerly latitudes which go into deep freeze mode over winter, in Lithuania every opportunity for fieldwork during the relatively brief summer season is precious. In 2008 I made my first visit to the Curonian Lagoon staying at the Hidrobiologinė stotis (hydrobiology research station) at Ventės Ragas, a small cape on the western shoreline adjacent to the Nemunas delta. The Curonian Lagoon is quite large, covering an area of 1584 km² (612 sq. miles) and is connected to the Baltic

Sea through the 500 m-wide Klaipėda channel. It has an average depth of 3.8m (12.5 feet) and in this sense it is similar to Galveston Bay in the US. Surrounding land use is mostly agriculture and forestry, with a small number of wind farms and several tourist resorts. Substantial inputs of nutrients occur from the 914 km (568 mi) long Nemunas River (Europe's 14th longest river) that empties into the Lagoon near Vente Ragas. During summer the waters of the Lagoon acquire a pine green colour from the dense blooms of phytoplankton to the extent that the yellow sands on the shoreline look like they have been coated with green paint and the wake behind the research vessel resembles lime Kool-Aid.

There are a number of topical research issues all of which are associated with anthropomorphic mediated changes in the ecological interactions among species. These changes have led to negative consequences for resource users, specifically recreational anglers and commercial fishers. Exponential increases in the numbers of Great

Cormorants have led to a view among fisheries that cormorant flocks are responsible for declining catches; the exotic spiny-cheek crayfish (*Orconectes limosus*) that was introduced from North America into Europe more than a century ago has led to declines in native crayfish populations and complicated eel restocking programs; and range expansion and population increase of the round goby (*Neogobius melanostomus*) in the Baltic Sea threaten the food availability for native fish.

Among the many conflicts that arise in fisheries worldwide, those involving cormorants seem ubiquitous except in the Far East where fishermen train these birds to catch fish for them. Lithuanian fishermen blame Great Cormorants (*Phalacrocorax carbo sinensis*) for reduced catches of European perch (*Perca fluviatilis*) and roach (*Rutilus rutilus*), overlooking the possibility that the impacts they ascribe to cormorants may well have arisen from their own fishing activities. Reconstructed size distributions of prey species from regurgitated pellets collected from a colony that roosts in a pine forest at Juodkrantė on the Curonian Spit show that there is negligible direct competition. Any competition that may exist would be indirectly expressed as reduced recruitment to the fishery; however, evidence for this is equivocal. Previous studies in Scandinavia have shown such impacts to be demonstrable only for small water bodies.

A former PhD student, Dr Žilvinas Pūtys, for whom I was an advisor, completed much of the contemporary work on Lithuanian cormorant predation for his thesis "Great Cormorant *Phalacrocorax carbo sinensis* Diet and its Effect on Curonian Lagoon Fish Populations and Their Community in The Eutrophic Curonian Lagoon Ecosystem", which he successfully defended in 2012.

Declines in pikeperch (*Sander lucioperca*), a higher order predator responsible for keeping populations of Eurasian ruffe (*Gymnocephalus cernua*) in check in the Lagoon, have led us to postulate that overfishing of this species has provided an abundance of prey for Great Cormorants enabling their colonies to flourish. Flocks from the Juodkrantė colony are substantial, and many of the pines in which they roost have died as a result of the guano from their feces, leaving behind a small valley of completely defoliated ghost trees. Sampling in the forest is a challenge given the climbing skills required to access nests to obtain chick feathers for isotope measurement and the ever-present risk of regurgitated stomach contents landing on one's head or back of the neck. My colleagues forgot to mention the need to wear old clothing and a hat during my first foray into the colony.

Like many ecological conflicts the cormorant versus fisher issue has become politicized, which is precisely why we received funding to investigate the topic, and like many ecological puzzles, the answer remains somewhat more elusive and will remain so without further research. Perceived versus actual effects of cormorant populations on fishable stocks can cause unnecessary concern for commercial fishers. Understanding the wide range of ecological processes at play is critical to future management of their fishery.

The noble crayfish (*Astacus astacus*) is a widespread native species inhabiting inland lakes and waterways of Lithuania that has undergone significant population decline and is now listed as vulnerable on the IUCN Red List. Among the causes of decline is a pathogenic water mould (*Aphanomyces astaci*) carried by the non-indigenous spiny-cheek crayfish *Orconectes limosus* that results in

the native crayfish dying within a few weeks of becoming infected. Spiny-cheek crayfish were introduced to Europe in the 1890s to replace depleted populations of the native crayfish and have since expanded greatly in number. Complicating the issue is the implications for restocking programs of the European eel *Anguilla anguilla*. Eels prey on young native crayfish further depleting their populations, so there is some controversy over prohibiting eel restocking into those water bodies where native crayfish abundance has declined.



A third topic is expansion of populations of the invasive round goby *Neogobius melanostomus*. Round gobies are a native to the Caspian Sea, and have become established in the Polish part of the Baltic Sea. More recently they have been observed in increasing abundance in Lithuanian waters where they deplete beds of the blue mussel (*Mytilus edulis*) which is an important component of the diet of native flounder (*Platichthys flesus*).

The PhD student whom I currently advise, Ms Eglė Jakubavičiūtė, is undertaking a project on "The role of sticklebacks in the Baltic food web - sticklebacks as a vector connecting offshore and coastal areas, interactions with offshore planktivores and coastal fish" under the supervision of Linas. Clearly much of the NRC research centers on trophodynamics for which modeling can play a role, but this is an area where NRC need strengthening

by encouraging young mathematics graduates to take an interest in the ecology of aquatic ecosystems. I see my role as one of facilitation in this area, but I am an invertebrate fisheries biologist not a mathematician. It is my hope that by bringing the RMA conference to Vilnius I will spark an interest in several students of mathematics to undertake graduate studies and to tempt accomplished mathematical scientists to also see the potential community benefits in applying their skills to improve practical outcomes for sustaining Lithuania's natural resources in the long term.

Collaborating on research projects in Lithuania has provided unique opportunities to visit locations away from the typical tourist routes and to develop an appreciation of the diversity, richness and scenic beauty of the landscape. It has enabled me to see beyond the tourist myopia to the underlying ecological challenges faced by Lithuania in common with much of the developed and developing world. Each successive trip enables more layers to be peeled back to reveal further observations that enrich the experience and provide a deeper understanding about the variety of ways that humans exist within contemporary ecosystems. I am indebted to NRC for the opportunities provided to me and for getting behind this year's conference. In this regard I am especially appreciative of the support that I've received from the current Director Dr Habil. Vincas Būda and his predecessor Dr Habil. Mečislovas Žalakevičius. NRC research spans a wide range of disciplines of relevance to the RMA encompassed within its three institutes of Botany, Ecology, and Geology & Geography. The Laboratory of Marine Ecology, with which I am associated, is one of 29 specialist laboratories within the NRC.



2015 RMA Conference in Bordeaux, France

by Luc Doyen

The 2015 international conference of the Resource Modeling Association will be held from June 17– 19, 2015 in Bordeaux, France. The theme of RMA 2015 is the “Modeling and sustainability of biodiversity and ecosystem services.” It will be jointly hosted by the University of Bordeaux and the CNRS (Centre National Recherche Scientifique). The event will be especially organized by the research center GREThA in cooperation with the French Laboratory of Excellence (Labex) COTE and the Institute of Mathematics of Bordeaux (IMB). GREThA (www.gretha.fr) is a joint research unit between the University of Bordeaux and the CNRS dedicated to theoretical and applied economics with an important axis on environmental economics. GREThA is a member of the LabEx COTE: Continental to coastal ecosystems: evolution, adaptability and governance (cote.labex-univ-bordeaux.fr). The LabEx COTE associates specialize in all fields in environmental sciences including

ecology, economics and modeling to analyse interactions between ecosystems and predict ecosystems responses to human induced changes. The administrative head of GREThA is camille.poiraud@u-bordeaux.fr.

Bordeaux is located in France, one hour by flight from the International airport of Paris connected to main European and world cities (including low-cost flights) and three hours by train from Paris. The Gironde wine region is the oldest vineyard for fine wines in the world. Margaux, Saint-Estèphe, Pomerol, Saint-Emilion and Sauternes are just some of the world famous prestigious appellations in the region, along with the names Cheval-Blanc, Haut-Brion, Pape-Clément, Petrus and Yquem. The Gironde region is also famous for oysters from the Arcachon bay and the Cap Ferret peninsula.



RMA MEMBERSHIP INCLUDES:

- Subscription to the journal *Natural Resource Modeling* (NRM)
- RMA Newsletter
- Reduced registration fee for the annual world conference of the RMA
- A 25% discount on all Wiley and Wiley-Blackwell product lines

*The official newsletter of the
Resource Modeling Association*

Bob Fray, editor
bob.fray@furman.edu

Mathematics Department
Furman University
3300 Poinsett Highway
Greenville, South Carolina 29613