IRES Annual Report

Fostering Sustainability in Human and Natural Systems
Another exciting year has passed. The University Sustainability Initiative (USI) was launched in March 2010 after a year of intense discussions among faculty and students across UBC, with the goal of facilitating for students to take courses across campus and for teachers and researchers to collaborate across disciplinary and administrative structures. IRES faculty members played a key role in this strategic development and one of our faculty members, Dr. John Robinson was in April appointed as USI’s first Executive Director (p 36). The USI involves not only students and scholars from different disciplines and Faculties, but also UBC operations. The goal is to use UBC as a ‘Living Laboratory’ to have students and teachers drive the university towards more sustainable solutions and at the same time use the campus as a place for learning and research, from a technical, geographical and organizational perspective. Kai Chan’s course RMES 500z Ecosystem Services is a lucid example where a group of students jointly with UBC’s sustainability office have developed a framework to help prioritize among competing values and include ecosystem perspectives in development projects (p 58).

IRES faculty members continue to run collaborative projects with partners in various Faculties across Campus, other universities and non-academic partners. Our warmest welcome to our new faculty members: Dr. Leila Harris (p 32) who works with social, political and cultural dimensions of environmental issues, particularly in the developing world and generally with a focus on water issues. Water issues are also in focus in the Soil, Water, Air Laboratory (SWAL, p 54) which is a university-wide initiative with IRES faculty members in the core and in the Water Governance program (p 52), two examples of the kind of interdisciplinary, collaborative initiatives that signify IRES.

Over 30 students graduated from the RMES program between 2008 and 2009 and 13 students have graduated so far in 2010 on topics varying from Certification of aquacultures, to Biofuels and land-use, in for the flight. From an administrative perspective, this is messy. The same ‘mess’ adheres to research grants and visiting scholars. Add to the mix that our graduate program has tripled in size over less than a decade with a parallel increase in the number and size of research grants, all administrated through an entirely manual filing system and it is easy to understand that administration is a challenging task. As collaboration is the very heart of IRES, we decided to create administrative structures that support the kind of flexible and creative activities that are our insig-nia. Administration is usually a mute point in annual reports. During the past year, the staff team has jointly developed processes and procedures to efficiently handle challenging issues. We have made considerable progress and I dare say that we soon will be able to compete for an award in admin efficiency – if such an award existed. No doubt – we’re ready for a new exciting year.

Front cover image taken by Tashi Tsering, whilst on fieldwork in Spiti. The woman is holding a “Tirping” a tool used to channel irrigation water. The head of the Tirping is made of ibex horns for good luck.
IRES proudly hosts the RMES program, which is one of UBC’s largest, with about 80 doctoral students and 40 masters students. The program is highly competitive with an admission rate of about 15% and we attract highly qualified students from across Canada, as well as from various countries around the world. As we admit promising students in any area that fits with our mission statement, provided that we can provide supervision, the topics are highly variable. Graduation is of course the icing on the cake. During the period of 2008-2010, 43 of our students successfully graduated of which 26 were doctoral students, 11 Master of Science and six Master of Arts. Among the studies were, for example, Natalie Ban’s study on novel approaches to the identification of marine protected areas, Charlie Wilson’s study of the drivers of energy efficient renovations and Jane Lister’s thesis on environmental certification in the forest industry.

### RMES Graduates

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<tr>
<th>Student</th>
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<th>Supervisor</th>
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<td>Jana Hanova Msc</td>
<td>Environmental and techno-economic analysis of ground source heat pump systems</td>
<td>Hadi Dowlatabadi</td>
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<tr>
<td>Megan Moody MSc</td>
<td>Eulachon past and present</td>
<td>Tony Pitcher</td>
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<tr>
<td>Sheena Pappas MSc</td>
<td>An assessment of historical changes in aquatic biota, water and sediment</td>
<td>Hans Schrier</td>
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<tr>
<td>Natalie Ban PhD</td>
<td>Multiple perspectives for envisioning marine protected areas</td>
<td>Amanda Vincent</td>
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<tr>
<td>Minam Bixby PhD</td>
<td>Evaluating social welfare implications of forestry policies when economic and environmental values matter in a British Columbia context</td>
<td>Kathy Baylis</td>
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<tr>
<td>Jamie Donatuto PhD</td>
<td>When seafood feeds the spirit yet poisons the body : developing health</td>
<td>Terre Satterfield</td>
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<tr>
<td>Maria du Monceau de Bergencial PhD</td>
<td>The political ecology of indigenous movements and tree plantations in Chile : the role of political strategies of Mapuche communities in shaping their social and natural livelihoods.</td>
<td>Terre Satterfield</td>
</tr>
<tr>
<td>Rasha Maal-Bared PhD</td>
<td>Comparing the distribution of pathogenic bacteria and common indicator microorganisms in biofilms on different surface types in an agricultural watershed in British Columbia</td>
<td>Karen Bartlett</td>
</tr>
<tr>
<td>Raul Pacheco-Vega PhD</td>
<td>An integrated assessment of the effect of environmental regulation, land use changes and market forces on the Mexican leather and footwear industries restructuring</td>
<td>Hadi Dowlatabadi</td>
</tr>
<tr>
<td>Charles Wilson PhD</td>
<td>Understanding and influencing energy efficient renovation decisions</td>
<td>Hadi Dowlatabadi</td>
</tr>
<tr>
<td>Liu Yajie PhD</td>
<td>An analysis of the management and economics of salmon aquaculture</td>
<td>Rashid Sumalia</td>
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## RMES Graduates 2009

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<tr>
<th>Student</th>
<th>Thesis Title</th>
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<tbody>
<tr>
<td>Jennifer Ardiel</td>
<td>The introduction of safe and sustainable agriculture certification: a case study of cherry growers in the Southern Interior of British Columbia</td>
<td>Milind Kandlikar</td>
</tr>
<tr>
<td>Laura DeVries</td>
<td>What's at stake on uncommon ground? The Grand River Haudenosaunee and Canada in Caledonia, Ontario</td>
<td>Junita Sundberg</td>
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<tr>
<td>Har-Rajandep Singh</td>
<td>Disaster Resilience of the Vancouver Health Care System to Pandemic Influenza</td>
<td>Stephanie Chang</td>
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<td>Kieran Fndiater</td>
<td>Biofuels and land use: global requirements and local impacts</td>
<td>Milind Kandlikar</td>
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<tr>
<td>Lara Hoshizaki</td>
<td>What a difference a map makes: including ecosystem services within systematic conservation planning</td>
<td>Brian Klinkenberg</td>
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<tr>
<td>Zhi Ying Lin</td>
<td>Trends in aquaculture production and its role in meeting human protein needs</td>
<td>Robert Blake</td>
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<tr>
<td>Veronica Lo</td>
<td>Underwater aliens: quantifying propagule pressure of aquatic invasive species in Canadian shipping ports</td>
<td>Colin Levings</td>
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<tr>
<td>Alex Russell</td>
<td>Everything but the moo: a stakeholder analysis of livestock waste tissue disposal options in British Columbia</td>
<td>Hadi Dowlatabadi</td>
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<tr>
<td>Benjamin Starkhouse</td>
<td>What's the catch: uncovering the catch volume and value of Fiji's coral reef-based artisanal and subsistence fisheries</td>
<td>Rashid Sumalia</td>
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<tr>
<td>Nathan Vadeboncoeur</td>
<td>On the implications of governance institutions for sustainability and climate change adaptation: a study of Whitehorse, Yukon</td>
<td>Ralph Matthews</td>
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<tr>
<td>Tihut Asfaw</td>
<td>Gender, justice and livelihoods in the creation and demise of forests in North Western Ethiopia's Zeghie Peninsula</td>
<td>Terre Satterfield</td>
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<tr>
<td>Sarah Burch</td>
<td>Local responses to climate change: an exploration of the relationship between capacity and action</td>
<td>John Robinson</td>
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<tr>
<td>Sharon Chang</td>
<td>Forest policy in northeast British Columbia from the 1990s to the early 2000s: comparing approaches to explaining policy change</td>
<td>George Hobberg</td>
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<tr>
<td>Negar Elmieh</td>
<td>Public health responses to West Nile virus: the role of risk perceptions and behavioral uncertainty in risk communication and policy</td>
<td>Hadi Dowlatabadi</td>
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<tr>
<td>Roslyn Forrest</td>
<td>Simulation models for estimating productivity and trade-offs in the data-limited fisheries of New South Wales, Australia</td>
<td>Tony Pitcher</td>
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<td>Shannon Hagerman</td>
<td>Adapting conservation policy to the impacts of climate change: an integrated examination of ecological and social dimensions of change</td>
<td>Terre Satterfield, Hadi Dowlatabadi</td>
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<td>Shinan Kassam</td>
<td>Debt and Cotton in Post-Soviet Tajikistan</td>
<td>Richard Barichello Sumeet Gulati</td>
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<td>Jennifer Jacquet</td>
<td>Fish as food in an age of globalization</td>
<td>Daniel Pauly</td>
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<td>Alyssa Joyce</td>
<td>Risk and opportunity in British Columbia shellfisheries: the role of limited property rights in aquaculture development</td>
<td>Tim McDaniels</td>
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<td>Patricia Keen</td>
<td>Seasonal dynamics of tetracycline resistance genes and antibiotics in a British Columbia agricultural watershed</td>
<td>Ken Hall</td>
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<td>Jane Lister</td>
<td>Co-regulating corporate social responsibility: government response to forest certification in Canada, the United States and Sweden</td>
<td>Peter Dauvergne</td>
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## RMES Graduates 2010

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<tr>
<th>Student</th>
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<tr>
<td>Lenore Burke</td>
<td>When there’s nothing left to give: social capital, informal economy and fisheries management in the Nuxalk Nation</td>
<td>Ralph Matthews</td>
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<tr>
<td>Andrew Devlin</td>
<td>Evaluating how urban form impacts greenhouse gas emissions in the Lower Mainland: the role of the built environment in local climate change reduction strategies</td>
<td>Lawrence Frank</td>
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<tr>
<td>Nathalie Maurer</td>
<td>Agricultural Water Demand and Management in the Okanagan Basin: Apples to Golf and Grapes</td>
<td>Hans Schrier</td>
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<tr>
<td>Donna Pettipas</td>
<td>Dwelling and Tourism at the Wildland-Urban Interface: A Bowen Island Case Study</td>
<td>Les Lavkulich</td>
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<tr>
<td>David Boyd</td>
<td>The Environmental Rights Revolution: Constitutions, Human Rights and the Environment</td>
<td>Terre Satterfield</td>
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<tr>
<td>Zofia Brown</td>
<td>Occupant comfort and engagement in green buildings: Examining the effects of knowledge, feedback and workplace culture</td>
<td>Raymond Cole</td>
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<tr>
<td>Eny Buchary</td>
<td>Fisheries Management in Developing Country Context</td>
<td>Tony Pitcher</td>
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<tr>
<td>Arnold Elias</td>
<td>High potential: how a framework of criteria for a unified energy system can initiate a sustainable electricity grid and transportation system</td>
<td>William Rees</td>
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<tr>
<td>Sarah Foster</td>
<td>Is Bycatch a Big Problem for Small Fish?</td>
<td>Amanda Vincent</td>
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<tr>
<td>Gakushi Ishimura</td>
<td>Fisheries Resource Economics and Management Sciences</td>
<td>Rashid Sumalia</td>
</tr>
<tr>
<td>Eric Mazzi</td>
<td>An integrated Assessment of Climate Mitigation Policy, Air Quality and Traffic Safety for Passenger Cars in the UK</td>
<td>Hadi Dowlatbadi</td>
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<tr>
<td>Marivic Pajaro</td>
<td>The Biological, Social and Economic Indicators of Effectiveness in Community-Managed Marine Protected Areas</td>
<td>Amanda Vincent</td>
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<tr>
<td>Veronica Wahl</td>
<td>Why People Help: Motivations and Barriers in Stewardship Volunteering</td>
<td>Patrick Mooney</td>
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Critters like sea squirts and green crab don’t sound very threatening – but they can wreak devastation on the scale of Davey Jones, the slithery, tentacled villain in Pirates of the Caribbean II. If only they were as mythical as Jones.

Unfortunately, sea squirts and green crab are making themselves comfortable in BC waters, and they don’t have any intention of leaving. They are part of a growing contingent of species that are either accidentally or deliberately introduced to new areas they haven’t had a history of occupying. These non-native species become invasive in their introduced ecosystems if they persist and spread, predating on or competing with native species for food and habitat and ultimately altering ecosystem functioning.

A major vector for aquatic invasive species (AIS) is the commercial shipping industry. Introductions can occur through the uptake and discharge of ballast water (necessary for vessels during rough seas and to replace cargo weight), and through hull fouling, which occurs when organisms attach to the vessel hull and other surfaces.

What causes an introduced species to become established in its new environment? While the characteristics of species (size, reproduction) and recipient ecosystems (level of disturbance, resource availability) can certainly be important, scientists are increasingly recognizing propagule pressure as a major factor in establishment success. Propagule pressure is defined as the number of propagules (organisms) introduced in an event (i.e. ballast water discharged in a harbour), and the frequency of these events.

But the big question is: How do we quantify propagule pressure? This knowledge can have important implications for management. Identifying ports/regions, ship categories, or seasons where propagule pressure is highest can aid in targeted AIS prevention measures.

But it’s difficult and costly to count all the organisms in a cubic metre of ballast water. One way to avoid that is to use other measures of propagule pressure instead. In our study, we quantified vessel arrivals and ballast discharge volumes in Canadian ports over space and time to estimate the potential propagule pressure of AIS introduced by ballast water. To quantify hull fouling propagule pressure, we calculated total wetted surface area of vessels. Our results showed that these different measures of propagule pressure (arrivals, wetted surface area, and ballast discharge), are significantly correlated across ports and vessel categories. We identified key pathways of potential propagule pressure - top shipping ports that receive the highest quantities of ballast water and hull fouling.

This study is a first attempt at quantifying potential hull fouling and ballast water propagule pressure of AIS in Canada from the commercial shipping industry. Further studies relating potential propagule pressure (estimates of ballast water and WSA) to actual and effective propagule pressure (actual numbers of individuals and model-based predictions of how many will survive) will increase our understanding of the factors underlying the establishment success of AIS. As the global shipping industry is expected to double by the year 2020, this understanding will become increasingly important in the future.
Conor Reynolds and Andy Grieshop

Autorickshaw emissions in India

Conor Reynolds, a PhD candidate, and Andy Grieshop, a post-doctoral fellow, traveled to Delhi to measure pollutant emissions from real-world autorickshaws in September 2009. This work was part of a larger research program that aims to better understand the local and global impacts of vehicle emissions on air quality and climate change. The measurement campaign took place at the International Centre for Automotive Technology (ICAT), a state-of-the-art vehicle testing facility run by the Indian Government on the outskirts of Delhi. The IRES researchers also collaborated with academics at the interdisciplinary Transportation Research and Injury Prevention Program at the Indian Institute of Technology in Delhi. The research was primarily funded by the AUTO21 Network of Centres of Excellence “Life Cycle Environmental Assessment and Policy” project, the UBC portion of which is co-led by professors Milind Kandlikar and Hadi Dowlatabadi.

Auto-rickshaws are three-wheeled motor vehicles that operate as taxis, and provide an important service as part of India’s public transportation sector. These lightweight vehicles are common in many developing countries in Asia and elsewhere, and are manufactured with different fuel systems and engine options, making them ideal vehicles for testing. The specific aim of the research project was to quantify emissions from vehicles of different vintages, operating on natural gas and gasoline, and with different engine technologies (2-stroke and 4-stroke engines). Measurements of gaseous- and particle-phase emissions, with a special focus on the chemical composition and size of carbonaceous particulate matter (PM), will provide needed data about the pollution these vehicles produce.

There are substantial uncertainties in the links between poor ambient air quality and the potential contribution from transportation emissions. The fact that transportation exhaust is a major contributor to the climate-forcing emission burden only adds to the complexity of the problem. This research will provide guidance as to the most efficient ways to reduce vehicle emissions in rapidly industrializing countries. Reducing harmful pollutants in these countries may provide a win-win (co-benefits) opportunity for people across the globe. Developing countries benefit from reduced transportation emissions because it improves air quality in urban areas, while climate impacts can be mitigated through the reduction of pollutants that have strong warming effects, such as methane or black carbon particles.

The project data is currently being analyzed, and will be used by international decision-makers and researchers to examine how reducing transportation emissions can have health and climate co-benefits. Indian policy-makers and government officials are especially interested in the results of this work because it offers new insights into the implications of a bylaw introduced in Delhi in 1998 (and implemented in 2002) that required all taxis, auto-rickshaws and buses to convert to operation on compressed natural gas. Policies such as this one may help address the poor air quality in rapidly developing cities, but it is critical for its effectiveness to be evaluated before it is widely adopted elsewhere. Such an assessment relies on the availability of high-quality emission data from in-use vehicles. Detailed characterization of PM emissions will feed into future efforts to determine the dominant sources of PM air pollution in Indian cities.
In February, Tom carried out a comparative research project for BC Hydro on pursuing electricity conservation and efficiency as a societal level strategy. The objectives of the research were to first answer eight questions posed by BC Hydro’s Electricity Conservation and Efficiency Advisory Committee regarding intentional societal-level transitions toward sustainability, and second to develop a practical framework to help BC Hydro understand the process of intentional societal-level change toward sustainable energy use.

In June, he delivered a paper at the First European Conference on Sustainability Transitions in Amsterdam. The paper looked at the institutional challenges of operationalizing BC Hydro’s long-term energy efficiency and conservation goals.

In October, Tom received a one-year award from MITACS BC for $45,000. The award is to support his research on how BC’s long-term energy efficiency and conservation objectives are being coordinated within the province. The project will give particular attention to the planning efforts being carried out by BC Hydro, the Ministry of Energy, Mines & Petroleum Resources.

Stefan Storey PhD

Stefan Storey is researching interdisciplinary sustainable building science. His thesis project is a dynamic life cycle sustainability analysis of the Centre for Interactive Research in Sustainability (CIRS) at the University of British Columbia. This work involves integrating life cycle costing, life cycle environmental analysis and social impact evaluation of sustainable commercial buildings to quantify building impacts, adaptability and resilience with respect to social and economic change over intergenerational periods of time. He is currently developing new metrics that will enable decision-makers to evaluate the quality of sustainable solutions for building design.
Nichole Dusyk PhD

Nichole successfully defended her proposal and achieved candidacy for her PhD. Nichole made three research visits to the communities of Fort St. John and Dawson Creek undertaking a total of 2 months of field research. She also presented a paper at the 2009 Annual Meeting of the Association of American Geographers in Las Vegas, Nevada.

Meg O’Shea PhD

In this academic year, doctoral candidate Meg O’Shea completed her thesis project fieldwork with members of a recycling initiative in Vancouver’s downtown east side. Employing a qualitative methodology called photovoice, project participants took photographs of their experiences within the recycling project, and completed interviews with Meg about their role in the recycling project, and as photographers. The photographs will be displayed in an exhibit in the downtown east side, and at a campus location to be determined. Meg hopes to be completing her thesis and defending in the next academic year. Meg also organized the CFIS/RMES Professional Development series of seminars and workshops from January to April, 2010.

Sylvia Coleman PhD

Sylvia was co-author of 4 articles (first author on 2 of them) on green building-related issues, for GLOBE-net (the online portal of the GLOBE Foundation) fall 2009 bibliography:


Also, Sylvia was co-author on:


The new sustainability building under construction. March 2010
### RMES Masters Students

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<td>Emily Anderson</td>
<td>Agroforestry for Climate Change Mitigation and Rural Livelihood Improvement in Industrializing Countries</td>
<td>Hisham Zerriffi</td>
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<tr>
<td>Jacqueline Belzile</td>
<td>Lessons on Adaption from Oz to the Okanagan: Sustainable Water Use &amp; Conservation in a Changing Climate</td>
<td>Gunilla Öberg</td>
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<tr>
<td>Lenore Burke</td>
<td>When there's nothing left to give: social capital, informal economy and fisheries management in the Nuxalk Nation</td>
<td>Ralph Matthews</td>
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<td>Laura Cornish</td>
<td>Visioning and Backcasting for Local Climate Planning</td>
<td>Stephen Sheppard</td>
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<tr>
<td>Sara Elder</td>
<td>Social and Environmental impacts of Fair Trade Certification on Small-Scale Producers</td>
<td>Hisham Zerriffi, Philippe LeBillon</td>
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<tr>
<td>Susanna Haas-Lyons</td>
<td>Collaborative environmental governance; deliberative democracy; sustainability decision-making; e-democracy and online public participation</td>
<td>John Robinson</td>
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<tr>
<td>Kelly Harrell</td>
<td>To be determined</td>
<td>Terre Satterfield</td>
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<tr>
<td>Kim Lau</td>
<td>Policy issues regarding regulation of energy services.</td>
<td>Hadi Dowlatabadi</td>
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<tr>
<td>Claudia Morgado</td>
<td>To be determined</td>
<td>Charles Mensies</td>
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<tr>
<td>Lindsay Nathaniel</td>
<td>A Visitor’s Perspective of Sustainability at Whistler: How to engage visitors in Sustainability</td>
<td>Ralph Matthews</td>
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<tr>
<td>Jeremy Osborn</td>
<td>Consumer Values, Organizational Behavior and Car Sharing: A Case Study of the Co-operative Auto Network</td>
<td>James Tansey</td>
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<tr>
<td>Julia Reckermann</td>
<td>Centre for Interactive Research on Sustainability: Green building occupant behaviour</td>
<td>John Robinson</td>
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<tr>
<td>Darlene Seto</td>
<td>Sustainable Development Councils: Institutional Viability in Canada?</td>
<td>Kathryn Harrison</td>
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<tr>
<td>Jordan Tam</td>
<td>Climate Change Adaptations in Parks: Attitudes, Values and Public Preferences</td>
<td>Timothy McDaniels</td>
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### RMES MSc Students

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<tr>
<td>Mathieu Beaulieu</td>
<td>To be determined</td>
<td>Gunilla Öberg</td>
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<td>Brooke Campbell</td>
<td>To be determined</td>
<td>Daniel Pauly</td>
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<tr>
<td>Andres Cisneros</td>
<td>Ecological and Economic Implications of Ecosystem-based Marine Recreation</td>
<td>Rashid Sumaila</td>
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<td>Marleen de Ruiter</td>
<td>To be determined</td>
<td>Stephanie Chang</td>
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<tr>
<td>Maria Espinosa</td>
<td>Using Ecosystem models to advise management</td>
<td>Kai Chan</td>
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<tr>
<td>Liz Ferris</td>
<td>To be determined</td>
<td>Gunilla Öberg</td>
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<td>Candace Francis</td>
<td>To be determined</td>
<td>Ken Hall</td>
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<td>Laura Grant</td>
<td>Source determination of organism matter and metals: a water quality evaluation of Chapman Creek</td>
<td>Hans Schreier</td>
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<td>Kirsten Harma</td>
<td>Changing with the Flow: An evaluation of water futures in Central B.C Watershed</td>
<td>Mark Johnson</td>
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<tr>
<td>Claudia HoLem</td>
<td>Climate Science, Equity and Development: The Role of International Institutions in Capacity Building for Climate Change</td>
<td>Hisham Zerriffi, Milind Kandlikar</td>
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<tr>
<td>Sarah Klain</td>
<td>Quantifying Nature’s Bounty: The Contribution of Marine Ecosystems to Local Communities</td>
<td>Kai Chan</td>
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<td>Michael Lathuillere</td>
<td>Water modeling in Brazil</td>
<td>Mark Johnson</td>
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<td>Gerald Singh</td>
<td>Considering supporting ecosystem services of a keystone predator</td>
<td>Kai Chan</td>
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<tr>
<td>Liesbeth van der Meer</td>
<td>Fish Retail sector Contribution to the Global Economy</td>
<td>Rashid Sumaila</td>
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<tr>
<td>Penny White</td>
<td>Biogeography and Ecosystem Services of Lha’ask (Porphyra Abbottiae) in British Columbia</td>
<td>Christopher Harley, Sandra Lindstrom</td>
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<tr>
<td>Julie Wilson</td>
<td>Cumulative Effects Assessment in watersheds with mixed land uses</td>
<td>Hans Schreier</td>
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RMES PhD Students

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<td>Nedzad Ajanovic</td>
<td>Economics of tuna fisheries in the Western and Central Pacific Ocean</td>
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<td>Megan Bailey</td>
<td>From cradle-to-grave at the atomic scale: environmental risk and the governance of emerging nanotechnologies</td>
<td>Milind Kandlikar</td>
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<td>Christian Beaudrie</td>
<td>How Can Large-scale Transitions Toward Sustainability be Steered</td>
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<td>Thomas Berkhout</td>
<td>Barefoot doctors with satellite phones: Can rural communities become more disaster resilient through the use of technology?</td>
<td>Tim McDaniels</td>
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<td>Gerard Chew</td>
<td>Legal Legacies &amp; institutional Arrangements in two Canadian Water Governance Regimes</td>
<td>Karen Bakker</td>
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<tr>
<td>Sylvia Coleman</td>
<td>Transitions to Sustainability: an Architecture of Social Change</td>
<td>John Robinson</td>
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<tr>
<td>Christina Cook</td>
<td>Examining the health effects of geogenic fluoride and arsenic and the potential for migration through water resource management</td>
<td>Timothy McDaniels</td>
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<tr>
<td>Nichole Dusyk</td>
<td>Biofuel crops and Land-use</td>
<td>Milind Kandlikar</td>
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<tr>
<td>Angela Eykelbosh</td>
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<td>Edward Gregor</td>
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Canie Hoover: Ecosystem Modeling: Antarctic Peninsula  
Rosetti Imo: To be determined  
Maria Infante: Can we estimate a value at risk for the world’s ecosystem services? Building a conceptual framework for an ecosystem services value at risk for sustainable resource management.  
Danika Kleiber: Women in Fisheries in the Phillipines: the impact of conservation in the invisible workers  
Sonja Klinsky: Across Years, Lands and Oceans: Justice & Scale in Climate Change Policy Decision Making  
Janalyn Kotaska: Considering Aboriginal Rights - Resource Management Decision-making and Decision makers in Post Delamuukw, British Columbia  
Reza Kowsari: Modelling rural household energy services  
Rajeev Kumar: Stimulation Modelling of Mille Lacs Lake Eco-systems in Support of EBM  
Wing Yee Lam: Global Fisheries Economics in face of change in Climate and Energy Process  
Jordan Levine: Sustainability, Justice and Democratisation of Science: Clayoquot Sound Biosphere Reserve  
Megan Mach: Invasive Species in Canada’s Ports  
David Maggs: To be determined  
Craig Mayberry: Measuring the Social Entrepreneur’s Impact of the Effectiveness of Non-Profits: Bridging the Culture Conflict between the Social and Business Sector  
Nicole Miller: Evaluating urban patterns for energy and greenhouse gas performance  
James Murphy: The potential of private enterprise and energy cost restructuring to accelerate energy efficiency investments in residential heating  
Megan O’Shea: From Compost to Choreography: How Sustainability Performed  
Marivic Pajarad: The Biological, Social and Economic Indicators of Effectiveness in Community-Managed Marine Protected Areas  
Anton Pitts: Appropriate Bases for the Management of Wildlife Viewing Tourism  
Conor Reynolds: Strategies to Control Transportation Emission in Developing Countries
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<td>Stefan Storey</td>
<td>Transitions to Sustainability: Green Buildings</td>
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<td>Wilfram Swartz</td>
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<td>A Sustainable Housing Study in the East Kootenay Area of BC - Present Situations, Gaps and Policy Recommendations</td>
<td>Kathy Baylis</td>
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Non IRES Students

Kai Chan
Christina Mak BSc (Anthropology)
Sarah Nyrose BSc (Environmental Science)
Cody Solomon BSc (Environmental Science)
Allison Thompson BSc (Environmental Science)
Carmen Ho BSc (Integrated Sciences)
Alexis Carter BSc (Integrated Sciences)

Stephanie Chang
Rajan Dharwal MA (SCARP)
Karthick Pathman MA (SCARP)
Martin Gregorian MA (SCARP)
Heather Fehr MA (SCARP)
Lauren Dawson MA (SCARP)
Eric Grant MA (SCARP)
Jose Fernandez MA (SCARP)
Jessica Shoubridge MA (SCARP)
Lily Yumagulova PhD (SCARP)
Dilnoor Panjwani PhD (SCARP)

Tony Dorcey
Janice Barry PhD (SCARP)
Omar Domínguez MA (SCARP)
Lucia Scodenibbio MA (SCARP)
Renee Couli MA (SCARP)
Christine Wenman MA (SCARP)
Darha Philpot MA (SCARP)
Susan Read MA (SCARP)
Spring Ord MA (SCARP)

Scott Hinch
Alison Collins MSc (Forestry)
Marika Gale MSc (Forestry)
Jenn Burt MSc (Forestry)
David Roscoe MSc (Forestry)
Todd Mathes MSc (Forestry)
Matt Drenner PhD (Forestry)
Mike Donaldson PhD (Forestry)
Ken Jeffries PhD (Forestry)
Kim Hruska PhD (Forestry)

Tim McDaniels
Megan Fitzgerald MA (SCARP)
Amanda Proctor MA (SCARP)
Sean Tyan MA (SCARP)

Gunilla Öberg
Erin Empey MA (Journalism)

John Robinson
Emily Davis PhD (Geography)

Terre Satterfield
Justin Page PhD (Sociology)
Over the past ten years we have witnessed the collapse of many salmon stocks along the west coast of North America. Understanding the causes of these declines such that we can reverse this trend is a pressing research need which has been undertaken by Dr Scott Hinch and his colleagues. For my doctoral research, I developed a procedure, in partnership with a postdoctoral colleague, to non-invasively biopsy migratory fish in the field, and combined this with telemetry in order to link the fate and behaviour of individual fish with their physiological state in terms of energetics, stress, and reproductive development. This procedure opened the door to research possibilities never before conceived with migratory animals (including the opportunity to integrate physiological genomics and animal behaviour across large scales). I sampled and tracked some 1000 salmon across distances up to ~2000 km – one of the largest studies of its kind on any large migratory fish and some of the first attempts to do so within the animal kingdom. In one study, I used time-release hormone implants which were injected into salmon that were caught in the open ocean and tracked with telemetry to their natal river in order to test hypotheses about the role of maturation rate on migration timing and success. One major finding was that anadromous fish migrations (fish which move between saltwater and freshwater, like salmon) are inherently very stressful and that natural physiological stress can reach lethal levels and result in migration mortality, perhaps as high as 20-30%. The discovery that salmon may perish ‘naturally’ at high levels during coastal migrations has provided new tools and results to understand an emerging crisis. Many factors have been implicated, in particular climate warming, but few can be specifically proved. In another study, I captured adult salmon after they entered the Fraser River and exposed them in a field laboratory to different thermal conditions over several weeks then released them and tracked them to study the role of river temperatures on migration success. The results showed how specific thermal levels caused migration mortality. These data were used to support testimony delivered by the research team at a judicial inquiry on missing sockeye salmon. The findings have re-adjusted the Pacific salmon fisheries management paradigm regarding the manifold influence of abiotic and biotic factors on salmon migration and this research into thermal influences has led to refinements to management models used to ensure that fisheries are conducted in a risk-adverse manner.

Glenn Crossin, is a recent PhD graduate with S. Hinch who won the Best Thesis award in the Faculty of Forestry for his doctoral dissertation on the behavioural physiology of salmon migrations and the endogenous and exogenous factors responsible for survival and mortality.
One of my most significant projects in 2009-10 was at the intersection of values and ecosystems, through the entry-point of “cultural ecosystem services”. The concept of ecosystem services—the processes whereby ecosystems render benefits to people—is quickly becoming central to the management of ecosystems and natural resources, although one major category of such services has received very little concrete attention (cultural services). This absence of attention by researchers is despite the widespread recognition of the importance of these non-material benefits associated with ecosystems.

Working with IRES Prof. Terre Satterfield and various international colleagues, I spearheaded a book chapter and a paper in press making the argument that the appropriate valuation of all ecosystem services has been hindered by the failure to recognize the various kinds of values at stake—where the differences in kinds of values implies differences in appropriate kinds of valuation. I presented this paper in February 2010 at Stanford University to an interdisciplinary audience including economist Ken Arrow, climate scientist Steve Schneider, and ecologists Hal Mooney, Gretchen Daily and Paul Ehrlich.

I’m following the implications of this argument in a team effort co-led by Anne Guerry of the US National Oceanic and Atmospheric Administration (NOAA) and the Marine Natural Capital Project. This team takes the form of an international interdisciplinary working group at the National Center for Ecological Analysis and Synthesis in Santa Barbara (including Satterfield, students Sarah Klain and Jordan Levine). We are fleshing out frameworks for characterizing and valuating these non-material values associated with ecosystems, with pilot application in Hawai’i, the Gulf of California (Mexico), and the west coast of Vancouver Island (B.C.). This work is directly linked to the development of Marine InVEST (the Integrated Valuation of Ecosystem Services and Tradeoffs tool), which will also be developed for application on the west coast of Vancouver Island with a regional decision-making board (West Coast Aquatic).

The management of ecosystems and natural resources will continue to be complicated by a wide range of conflicting and intangible values, but perhaps efforts like these will assist decision-making that is ecologically sustainable and socially just.
Stephanie Chang

My research seeks to advance understanding of community vulnerability and resilience to natural disasters. This year, together with an international group of collaborators, I began a study on “New Methods to Measure, Monitor, and Assess Disaster Recovery.” We are developing an approach to characterize communities’ recovery from disasters by drawing on multiple sources of information (remote sensing, satellite imagery, statistical data, and expert interviews). Our first case study is Punta Gorda, Florida, affected by Hurricane Charley in 2004. When the earthquake struck Haiti in January 2010, we secured funding from the U.S. National Science Foundation to extend our methods to the Haiti earthquake case.

One of my other ongoing projects concerns understanding the long-term dynamics of disaster risk in Metro Vancouver. With funding from SSHRC and NSERC, we have developed loss models for Metro Vancouver that estimate casualties, disruption to health care and transportation services in an earthquake. With these models, we have started to investigate how risk has changed over the last few decades, and how it is likely to change in the future.

This year, my collaborators and I also completed our multi-year project on “Analyzing Infrastructures for Disaster-Resilient Communities.” Major efforts involved extending our work from earthquake hazard to flood, and disseminating results to practitioners as well as academic audiences. I have presented this work locally and internationally.

The paper for that talk was selected for publication in the National Academy’s journal The Bridge: Linking Engineering and Society. The study produced a series of informational products and tools that are intended to help communities understand, characterize, and reduce the vulnerability of their infrastructure systems in disasters. These include: a searchable database on infrastructure failure interdependencies and their impacts; a synopsis of disaster vulnerability for two infrastructure sectors (health and transportation); a practical method for characterizing infrastructure vulnerabilities and interdependencies; an approach for developing regional priorities for infrastructure risk reduction; and two disaster scenarios (earthquake and flood) for Metro Vancouver. These outcomes are available through our project website and are documented through practitioner-oriented reports (in addition to academic journal articles).

Because infrastructure managers, emergency managers, and planners typically have very little personal experience with major disasters, we believe these informational tools will be helpful for learning from disasters experienced elsewhere. Infrastructure failure interdependencies are a particularly challenging problem because the linkages between organizations are poorly understood and rarely considered in risk reduction decision-making. In the case of Metro Vancouver, our project helped bring together infrastructure and emergency managers from a number of key organizations to develop shared understandings of the effects of potential disasters and develop priorities for planning. The methods we developed and demonstrated are, moreover, applicable to other communities and hazards across Canada.

Tony Dorcey

After almost 40 years at UBC I am thinking about transitioning in the nearer future to a part-time appointment at the University and eventually committing to other endeavours full-time. Last year I concentrated on enhancing my course offerings and working with my current students on their research. I continue to be very interested in strengthening graduate learning in the two units in which I am appointed, IRES and the School of Community and Regional Planning (SCARP). Good as it is to see the leadership of both units in addressing sustainability challenges, I feel an even more progressive approach is urgently needed and that this presents an immense opportunity for IRES, SCARP and the University. In a presentation to the IRES Seminar Series last fall, I argued for STRONG Sustainability, STRONG Professionals: Strengthening Graduate Learning (http://tonydorcey.ca/SusSurge.html). This conviction drives my thinking on the continuing evolution of my courses and work with graduate students on their research. Last year 4 of my 10 supervisees graduated, I taught 3 of my long-established 3-credit courses and introduced a set of 3 new 1-credit courses.

Two of my 3-credit courses are designed for students in IRES and SCARP and I have been steadily evolving them since they were first offered almost 30 years ago. Last year Negotiation, Facilitation and Mediation, which is both a skills and theory course, gave new attention to the growing debate about differing approaches to NFM and their implications for development of the fields and professions focused on reaching agreements and dispute resolution. Planning for Water Resources Management, which emphasizes principles and practices of transdisciplinarity, continued to assess the evolution of Integrated Water Resources Management around the world, in particular experience with the ambitious EU Water Framework Directive and its implications for reforming strategies, policies and institutions for water management in Canada.

My third 3-credit course, Omnibus: Becoming a Good Sustainability Planning Practitioner, is required for all incoming SCARP students. It introduces differing perspectives on the principles and practices of environmental, social and economic sustainability planning and professional practice in governmental, business and civil society organizations. A highlight of last year’s course was a most stimulating day in which we experimented with using Open Space Technology to compare sustainability planning in the developed versus the developing world.

During the year, I also designed and introduced three new 1-credit courses to assist planning students in preparing for professional practice:

• Getting a Job and Launching Your Planning Career
• Learning from Your Planning Internship
• Arranging and Planning for Your Planning Internship

I did not fully appreciate how valuable these courses would be to students until I began teaching them amidst the extraordinarily challenging employment situation this year. It has been most encouraging to see the students’ successes in obtaining internships and jobs as the term ends.

Full details on the agendas and materials for my integrated suite of courses and my evolving perspective on how to accelerate the transitions towards sustainability can be found on my web site (http://tonydorcey.ca). It also provides glimpses of the future endeavours to which I am transitioning.
Was it really another year already? My metronome beats to the steps of more students completing their degrees and launching their careers. Charlie Wilson, Shannon Hagerman, Negar Elmieh and Eric Mazzi all completed their PhDs. Charlie is now a faculty member at the Tyndall Centre on Climate Change, in East Anglia. He continues to forge ahead with new ideas of how we can promote energy efficiency investments. Shannon got an SSHRC post-doc and works with the Climate Impacts Group in the University of Washington. She is continuing with her focus on the challenge of how we should conceptualize and address biodiversity protection and climate change. Negar has just landed a faculty position at Quest University. She defended her PhD just as BC recorded its first human cases of lo-

IRES Annual Report

Hadi Dowlatabadi

Outside UBC, I continued with activities aimed at bringing about better utilization of energy resour-

IRES Annual Report

Eric Mazzi all completed their PhDs. Charlie is now a faculty member at the Tyndall Centre on Climate

IRES Annual Report

Leila Harris

I am very pleased to be the most recent arrival to join the faculty at IRES, with a joint appointment in the Center for Women's and Gender Studies (CWAGS). I am trained as a geographer and my work deals with the social, political and cultural dimensions of environmental issues, particularly in the developing world. Most of my research to date has focused on water issues in Turkey, tackling questions related to water and conflict in the Tigris-Euphrates basin, gender dimensions of transition to irrigated agri-

IRES Annual Report
During the past year, Dr. Mark Johnson has established a research program in ecohydrology based in the Institute for Resources, Environment and Sustainability. Together with graduate students and faculty collaborators from UBC and beyond, the research program was launched through significant funding from the Canada Foundation for Innovation, which provided support for the creation of the Integrated Watershed Analysis Laboratory (IWAL), chaired by Dr. Johnson. As a facility for the synchronous, coupled study of complex phenomena in terrestrial and aquatic environments, the goal of IWAL is to contribute towards identifying more sustainable management practices for land and water resources. As a significant first step, we have begun collaborating with a BC forest products company to identify fates and fluxes of nitrogen resulting from fertilizer application. Fertilizer use is a standard management practice in the forest products industry. The next steps in this research will focus on reducing nitrogen leaching to streams and wetlands while also minimizing production of nitrous oxide (a potent greenhouse gas) on the landscape.

While still in the build-out phase, IWAL has already acquired cutting-edge research and analytical instrumentation for field and laboratory-based studies. These include field-based laser absorption-spectroscopic instruments for high-frequency analysis of greenhouse gas fluxes in terrestrial and aquatic environments, and submersible UV-Vis spectrometers for real-time measurements of carbon and nitrogen fluxes in water. Laboratory-based equipment for environmental analysis is providing a means for establishing and strengthening collaborations with faculty and graduate student researchers from a broad range of faculties and departments at UBC. The lab facilities are housed in a collaborative research laboratory known as the Soil Water and Air Laboratory http://www.landfood.ubc.ca/swal/.

Graduate students are currently working on a number of research topics related to ecohydrology, including (to name just a few): considerations of interactions of land use change and climate change for water supply systems in BC’s Okanagan basin, implications of climate change on the water balance in the rapidly transforming state of Mato Grosso, Brazil, and interactions between groundwater extraction and human health in the semi-arid state of Aguas Calientes, Mexico. You can keep track of activities and progress made by Dr. Johnson and his research group at their website: http://research.ires.ubc.ca/ecohydrology/ .
This was a very significant year in terms of strategic initiatives related to sustainability at UBC. In particular, two major projects of mine—the Sustainability Academic Strategy and the Centre for Interactive Research on Sustainability (CIRS)—reached important milestones which have created new capacity for UBC.

Early in 2009, I was invited by the university executive to lead the Sustainability Academic Strategy (SAS) Working Group, which was established under the President’s Advisory Council – Sustainability (PAC-S) to provide a framework to guide the UBC community in ongoing planning, decision-making and resource allocation around sustainability. Membership in the Working Group included staff, faculty and students from both UBC Vancouver and UBC Okanagan as well as external community representatives. The SAS Working Group consulted widely to develop a comprehensive draft strategy which was grounded in the community experience. Members of the UBC campus communities were able to participate electronically and in-person through interactive processes.

The resulting report and recommendations were very well received by the university community, the senior executive, and the Board of Governors, and in January 2010 UBC President Stephen Toope announced the creation of a new sustainability strategic management initiative to lead the implementation of the SAS recommendations. The UBC Vancouver Sustainability Initiative (USI) will include a central team and three other groups, which will work together in a highly collaborative and integrated way: the Campus Sustainability Office which is responsible for the wide array of operational programs already in place, the Sustainability Teaching and Learning office which is responsible for working with existing programs across campus to develop and facilitate a new suite of sustainability teaching and learning options, and a Research and Partnerships group, responsible for fostering new forms of collaborative interdisciplinary research, and partnerships with the private, public and NGO sectors.

The CIRS building will be the home for this initiative, bringing to fruition the vision we have pursued for CIRS as a hub of sustainability research, teaching and operational activities and partnerships. I have been offered the opportunity to lead this initiative for the first six year term, and I moved into the role of Executive Director, Sustainability for UBC Vancouver in January. I will maintain my faculty appointment in the Institute for Resources, Environment and Sustainability and will continue to teach and supervise graduate students in the RMES and Geography programs.

Construction on the $37-million CIRS building began in last September, and the building is set to open in the summer of 2011 on Sustainability Street on UBC’s Vancouver campus. CIRS will be greenhouse gas-positive and a net energy producer, meaning that it will help UBC reduce the energy it uses and carbon it emits. All water will be sourced from rainwater, with wastewater treatment occurring on site. It will also serve as a living laboratory for sustainability research, development and practice. For example, building processes will be continuously monitored, including heating, cooling, lighting, equipment use, water harvesting and treatment, building occupancy, inhabitant behaviour and more. People working in the facility will be able to follow the proceedings on their desktop computers and vote on their usefulness.
Tim McDaniels was fortunate enough to be able to build a research partnership with CATIE (Centro Agronómico Tropical de Investigación y Enseñanza) of Turrialba, Costa Rica that will provide excellent opportunities for IRES and UBC in coming years, as the university focuses more on international linkages. CATIE is Latin America’s best known and oldest research center and graduate program concerned with tropical agriculture and forestry. In recent years, CATIE has redefined its mission to focus on sustainable land use, climate adaptation and ecosystem services. CATIE is supported by the Organization of American States, and many other donors and research programs. It serves as a gateway for researchers interested in climate, land use and ecosystem services throughout Latin America. Tim began work with the Global Change program (Grupo Cambio Global) at CATIE in late 2007 on their major research project regarding climate adaptation in tropical forests, with a focus on land use, agriculture and erosion control, funded by the European Union.

Along with Kay Teschke and Michael Brauer of SOEH, Tim McDaniels submitted a proposal and won a renewal of financial support for the Bridge program, a unique interdisciplinary graduate training program linking health, engineering and public policy. The support from CIHR and other sources will provide interdisciplinary graduate training and funding to students for the next six years. Tim also served as the director of the Bridge program in the second half of 2009 while Mike Brauer was on leave. Several IRES faculty are mentors in the Bridge program.

My proudest contribution this past year is my forthcoming book ‘Interdisciplinary environmental studies – a primer’ to be published by Blackwell and Wiley which I started to write in 2004. I am also very happy that the paper “Learning in focus groups: an analytical dimension for enhancing focus group research” has been selected to be reprinted in a major reference collection as part of SAGE Benchmarks in Social Research Methods (Wilbeck et al., 2010) while the paper “Retention of chloride in soil” (Öberg and Sandén, 2005) is listed as the top-ten most cited in Hydrological processes: these two papers epitomize that it is possible to conduct high quality research in quite disparate fields.

I have become increasingly engaged in discussions with UBC Operations in relation to various sustainability issues, with a focus on performance assessment, energy systems, waste water management and biodiversity/ecosystem services. This has resulted in several projects, which are tied to either research projects or teaching/learning projects. One of these is the Integrated Energy and Water Project (IWEPR) which is a collaborative initiative with UBC operations, as well as researchers and students at UBC in dialogue with Metro Vancouver and waste water related industries as well as partners in Buenos Aires. I am very excited about the project which involves scholars with expertise in engineering, computer science and artificial intelligence (AI), decision theory, ecosystem services, economy and well-being, eco-hydrology, analytical environmental chemistry, risk perception, water governance and equity issues.

Another exiting experience from last year is that I started to develop a cross-faculty undergraduate course last spring, which was accepted by Senate in November. It is called “Applied sustainability: UBC as a living laboratory” and will be open for 3-4 year students in Applied Science, Science, Arts, Forestry, Land and food systems and Sauder School of Business. During the planning process, I was in close dialogue with the Deans of each of the involved faculties plus a group of professors with representatives from each of these Faculties as well as with staff members from the Sustainability Office. My graduate student, Liz Ferris, has been helping out in the planning process and has done a tremendous job in bridging between the operational and the academic sides of UBC. The curriculum has received considerable positive support and was moved with impressive speed through UBC’s glacial bureaucracy. I will be teaching the course for the first time in the spring of 2011.

I am the proud co-creator of the Soil, Water, Air Laboratory (SWAL) at UBC. It may sound strange, but research on soil is usually conducted separate from research on water which is conducted separate from research on air. The aim of SWAL is to act as a node at UBC for integrated research in these areas, with a biogeochemical bent, so to speak. The lab holds tremendous opportunities and is clearly moving toward an exciting future, not least because the majority of SWAL’s members are very collaborative and innovative spirits. Read more on page 30 and at http://www.landfood.ubc.ca/swal
Reactions to and development of nanotechnologies and GM cotton have as much to say about social, economic, and (de-)regulatory forces as they do about ‘culture’ – a necessary yet slippery concept that often serves as a catch-all explanation for a wide assortment of societal conundrums. For this reason, myself, Kai Chan and students Sarah Klein and Jordan Levine, along with partners at UCSB’s National Center for Ecological Analysis and Synthesis, continue to critique and develop methods for representing culture within an ecosystem services framework. Another related project in collaboration with May duMonceau (post-doc), Jana Kotaska (PhD student), Malcolm Scoble (UBC Mining Engineering), and Ginger Gibson seeks to investigate how Indigenous cultures are conceptualized, leveraged, and even financially accounted and compensated for in cases of admitted “cultural loss.” Related ideas also motivate work lead by former PhD student-now post doc, Shannon Hagerman, whose is exploring (in collaboration with Hadi Dowlatabadi and myself), expert perceptions of climate change as it effects the designation of protected areas and/ or the protection of biodiversity more broadly.

I would also like to congratulate David Boyd and Anton Pitts for the outstanding work and dissertations they produced this last year. It is equally satisfying to know that all six of you who earned doctorates last year have gone onto post-docs and full time employment in your fields; well done! I thank you all and, as always, I look forward to what I will learn from you next year.

The sustainable forest management Network funded for the past four years a major national project to explore the design of new forest tenure institutions in the FEPA research unit, which is affiliated with the IRES. It is clear that there is an emerging consensus that the forest sector is in a severe crisis. Unlike crises in the past this is the consequence of a long term structural shift in the social, economic and biological environments in which the forest sector operates. Dealing with this crisis requires the articulation of new visions for the forest and bold actions.

The recently completed FEPA project consisted of a series of case studies and national surveys of community leaders, policy makers and industry executives, econometric studies of policy change impacts, modeling and a sequence of workshops with foresters, government officials, First Nations representatives, community groups and industry executives. The results are highlighted in a new report (Vertinsky I and Luckert M 2010. Design for Forest Institutions: The Challenges of Governing Forests. Sustainable Forest Management Networks, Edmonton 36pp).

The report provides a critical overview of how tenure systems evolved in Canada, how they are working, what options might respond effectively to the challenges the forest sector faces and the potential of these options to the system. The options for change suggested in the report include a set of more conventional interventions that will improve the effectiveness of the sector in achieving the current economic, social and environmental goals as well as some bold options for change that are required if long term sustainability is sought. The report articulates the following options for immediate action: removal of operational constraints to increase efficiency, allowing tenure holders to make free choices with respect to products and input mixes, choices of technology, the allocation of capital and markets served. In particular, the elimination of mill appurtenancy, minimum cut and log export controls could help obtain the highest economic values for timber resources.

Recommendations included making tenure rights more divisible and transferable. We argued that environmental regulations should be made more flexible when results based regulations can be effectively enforced, allowing tenure holders to choose the means to achieve environmental objectives. We suggested that regulatory systems based on economic instruments such as “cap and trade” can achieve efficiently higher environmental standards (as demonstrated by one of the field experiments conducted as part of the project in Alberta). Separate markets may need to be established for different ecosystem types and different environmental objectives. More reliance should be placed on credible environmental certification systems or their approved SFM certifiers.

The conclusion of our study was that though in the short term the consequences of the introduction of these reforms were disappointing the long term impacts are likely to be positive - though not sufficient to revitalize the industry. Bold options are needed to bring systematic change which might create new visions, culture and business models for managing the forests. During 2009/10 these ideas were presented to various governments encouraging debate on the governance of the forest.
IRES continuously receives requests from visitors from around the world who wish to spend time with us and we welcome anyone who brings their own funding, conducts research in one of our relevant fields and has a champion among our faculty members. So far we have been able to provide office space for all who fulfill these criteria and during 2008-2009, we had the pleasure of hosting 5 post-docs, 1 visiting scientist, 4 visiting professors and 10 visiting scholars who have been visiting for periods of a few weeks up to a couple of years. Below follow the highlights of three of our visitors.

### IRES Visitors and Post-Doctoral Associates

- **Stewart Barr, Visiting Professor**
  - April - June 2009
  - UK

- **Pascal Steingruber, Visiting Scholar**
  - March - August 2010
  - Switzerland

- **Guillaume Creusat, Visiting Scholar**
  - April - September 2009
  - France

- **Maria de Lourdes Fierro Jauregui, Visiting Scholar**
  - March - April 2010
  - Mexico

- **Armin Wink, Visiting Scientist**
  - June - August 2008
  - Switzerland

- **Teresa Svensson, Visiting Scholar**
  - March - December 2010
  - Sweden

- **Rebecca Martinone, Post-Doctoral Fellow**
  - September 2009 - September 2011
  - California, USA

- **Teresia Svensson, Visiting Scholar**
  - March - December 2010
  - Sweden

- **Julie Boye, Visiting Scholar**
  - March - August 2010
  - France

- **Guilia Bernardi, Visiting Scholar**
  - May - November 2010
  - Italy

- **André Grieshan, Post-Doctoral Fellow**
  - October 2008 - October 2010
  - Pennsylvania, USA

- **Gary Luck, Visiting Associate Professor**
  - May 2010 - May 2011
  - Australia

- **Suzanne Menzel, Visiting Scholar**
  - February - September 2008
  - Germany
IRES Visitors and Post-Doctoral Associates

Rebecca Martone is a postdoctoral research fellow with Dr. Kai Chan, co‐coordinating the British Columbia Coastal Ecosystem Services (BCCES) project. The main focus of BCCES is an interdisciplinary transdisciplinary project on coastal ecosystems and human communities.

Sea otters are returning to the West Coast of Vancouver Island, creating changes to coastal ecosystems and associated human communities, as well as a fascinating natural experiment. Sea otters are voracious predators of sea urchins, abalone, Dungeness crabs, geoduck clams, and other shellfish of commercial and cultural importance. But by preying heavily on these species, sea otters facilitate the large-scale expansion of kelp forests, which are one of the most productive ecosystems on the planet and a complex three-dimensional habitat for many shellfish and finfish, many of which are also of commercial and cultural importance. Sea otters therefore mediate this flip between systems resembling marine deserts and underwater equivalents of tropical forests—except that these underwater forests also seem to fertilize distant ecosystems through various kelp particles spread by ocean currents.

In the BCCES project we are striving to understand the ramifications of sea otters, kelp forests, and the many human activities that affect these and interacting organisms, including harvesting but also coastal development and pollution. We’re approaching this challenge through a variety of approaches (students listed are supervised by Kai Chan, with co‐supervisors noted, except where indicated otherwise):

1. Field surveys and experiments of many organisms both on shore in mussel beds and under water in kelp forests (RMES MSc student Gerald Singh, co‐supervised by IRES associate Chris Harley; Rebecca Martone; Russ Markel—Zoology PhD student soon to join IRES as a postdoctoral fellow; and various undergraduate students);
2. Field surveys of kelp particles and compounds, as they are distributed offshore from kelp forests near shore (EOS MSc student Brock Ramshaw, supervised by Evgeny Pakhomov);
3. Remote surveys and habitat modeling of kelp forests (RMES PhD student Edward Gregor);
4. Ecosystem modeling including all the species mentioned above and also fishing pressure, informed by J‐3 above (RMES MSc student Maria Espinosa; RMES PhD student Edward Gregor);
5. Surveys, interviews, and workshops with local constituents and stakeholders, in partnership with a regional management board (West Coast Aquatics), to understand the nature of the human benefits (through ecosystem services; see above) and values that will be associated with ecological change modeled in 4 (PhD student Jordan Levine and soon‐to‐be PhD student Jordan Tam, both co‐supervised by Terre Satterfield; and undergraduate Christina Mak).

Also associated with this project are numerous other students who have volunteered in the field (e.g., RMES students Megan Mach, co‐supervised by Colin Levings; Sarah Klein; and Andres Cisneros, supervised by Rashid Sumaila). It’s our intention to bring together these diverse kinds of research so that local and regional decision‐making reflects current understanding of social‐ecological interactions and their implications for things that matter most to people.

My main research goal is to help improve our understanding of “How biodiversity and ecosystems respond to disturbances and management.” By doing so, I hope to contribute to the responsible use, conservation, monitoring, and management of biodiversity. The following are my accomplishments in 2009: (1) I compiled and synthesized the published information on the causes and consequences of superabundant species that exhibited outbreaks in various ecosystems; (2) I completed assembling the global fishing effort database spanning from 1950 to 2009; (3) I published my thesis paper on “Spatial and temporal variation of abundance, biomass, and diversity within marine reserves in the Philippines (Diversity and Distributions, in press); (4) I co‐authored a technical report on “The impacts of overfishing on marine biodiversity and habitats,” and I joined the FAO/CBD/UNEP/IUCN meeting in Rome in September 2009; and (5) I presented the results of my PhD research in the University of Guadalajara‐CUCEA, Mexico. In 2010 I aim to publish my papers on superabundant species, global fishing and biodiversity, and marine reserves and biodiversity. I also aim to acquire funding for “Engaging local communities and relevant stakeholders in designing long‐term strategies for monitoring and managing biodiversity and the ecosystem services that biodiversity provides.”

Shannon completed her PhD at IRES in April 2009 (Hadi Dowlatabadi and Terre Satterfield, supervisors). Her thesis examined the challenges of designing and implementing new goals and strategies for biodiversity conservation given the impacts of climate and concurrent changes. At the same time, Shannon was awarded a SSHRC post‐doctoral fellowship, which she is now working on at the University of Washington (Climate Impacts Group) (with continued collaborations at IRES). Building on her PhD, one of the core objectives of this postdoctoral work is to quantitatively examine how the roles of values about nature, beliefs about ecosystem dynamics and views on uncertainty and decision making shape preferences for different conservation policy alternatives given climate impacts. Additionally, she continues to work with Terre and Hadi at IRES on a SSHRC Research Development Initiative grant in which ‘event ethnographic’ methods are used to better understand the design and evaluation of conservation policy alternatives as they are forged (and evolve) at a range of scientific and policy‐making settings. Shannon is delighted to have been selected as one of this years 34 DISCCRS scholars http://www.disccrs.org/. She is also happy to see the 5 papers from her IRES thesis now in print (or accepted).
IRES Seminar Series

The IRES seminar series runs on a Tuesday lunch and is open for the wider UBC community. The series followed a slightly different format during the 2009-10 year. Firstly, presentations were held bi-weekly instead of weekly to explore whether this led to larger and more consistent attendance of the Institute’s members. Secondly, each session was primarily designed around an IRES faculty or associate member’s research and the presentations and discussions involved, whenever appropriate, the students and other colleagues collaborating with them. This format resulted in a series this year that included many more people who are involved in the Institute’s research in making diverse presentations. It also resulted in audiences that were attracted by the particular topic from other departments on campus and organizations off campus. Overall, however, the new format did not noticeably increase the attendance by members of IRES.

The following talks took place during the 2009-10 IRES Seminar Series:

22 September 2009
What is “UBC as a Living Lab” and is it Realistic? Joint lecture with Liz Ferris (RMES student), Andrew Collins (Associate Director, Project Services, UBC Infrastructure development) and Gunilla Oberg (IRES Professor)

6 October 2009
Decision-Aiding for Climate Change Adaptation Within Social-Environmental Systems: Learning from Experience with Forestry, Fisheries and Biodiversity in British Columbia
Tim McDaniels (IRES Professor)

20 October 2009
Pathways Towards Disaster Mitigation Planning
Murray Journeay (Geological Survey of Canada), Sonia Talwar (Natural Resources Canada) and Stephanie Chang (IRES Professor)

3 November 2009
Can Copenhagen Deliver Climate Stabilization Without Vienna?
Hadi Dowlatbadi (IRES Professor)

17 November 2009
STRONG Sustainability, STRONG Professionals: Strengthening Graduate Learning
Tony Dorsey (IRES Faculty)

1 December 2009
BAX LAANKS Pulling Together
Charles Menzies (IRES Faculty Associate) and Jennifer Rashleigh (Ethnographic Film Unit UBC)

16 March 2010
Can Groundwater Development Be Sustainable?
Tom Gleeson (Earth and Oceans Sciences and Mark Johnson (IRES Faculty))

30 March 2010
An Interdisciplinary Living Lab Course: An Ecosystem Services Approach to Sustainability for UBC and Vancouver
Kai Chan (IRES Faculty), Sarah Klain and Megan Mach (RMES students) and Natasha Sihota (Earth & Ocean Sciences student).

13 April 2010
Getting the Story Straight: Trends and Issues for Fraser River Sockeye
Scott Hinch (IRES Faculty), Mike Lapointe (Pacific Salmon Commission) and John Reynolds (SFU)

Confabs

RMES students come from various academic backgrounds. Many have had some amazing professional and personal experiences in and outside of the program. In 2009, a group of students initiated the RMES Confabs as a space for fellow students to share their skills, knowledge and experiences in the format of a graduate student support group.

These informal meetings take place every other week and have included many topics ranging from sharing graduate school or professional experiences, information on uses of technology, and discussions on sustainability. This past year’s topics have been: student experiences from the Copenhagen climate talks, life satisfaction and economics, what to expect from graduate studies in RMES, experiences that led students to join IRES and electric bicycles.

The RMES confabs will continue in the fall with a new array of topics and experiences and will be scheduled on the off weeks of the IRES Faculty Seminar. Should you have a topic in mind, or would like to join the conversation board, please email Michael Lathuillière (mj@interchange.ubc.ca) or James Murphy (jmurphy@gmail.com).
IRES Annual Report

IRES faculty associates and collaboration across UBC

We have 31 faculty associates, who supervise our students, sit on their committees and participate in joint research projects. Our faculty associates come from across the UBC Campus with homes in the Faculties of Science, Arts, Applied Science, Sauder School of Business, Law, Forestry, Land and Food Systems as well as sister units in The College for Interdisciplinary Studies (CFIS). Notable for their contributions to a large number of our graduate students are for example Hisham Zeriffi and Milind Kandlikar at the Liu Institute for Global Issues, Amanda Vincent, Rashid Sumaila and Daniel Pauly at the Fisheries Centre (FC), Stephen Sheppard, Faculty of Forestry, and Ralph Matthews, Department of Sociology. Below follows highlights from three of our faculty associates and reports from two collaborative programs.

Zoran Nesic, Senior Research Engineer and Dr Rachpal Jassal, Research Associate in the SWAL Lab

Colin Levings

As an IRES Associate/DFO Research Scientist (now Emeritus) I have been working on projects related to the Canadian Aquatic Invasive Species Network (CAISN) (2006-2011) (www.caisn.ca). Funded by NSERC, DFO, Transport Canada and other sponsors and headquartered at the University of Windsor, the Network involves principal investigators (PIs) at universities and laboratories in BC, AB, ON, QC, NB, NS, and NL. The project focuses on three themes: vectors, factors affecting invasion success, and risk assessment. In addition to student research (described below), I had a major role in setting up and testing hypotheses relating to ballast water as a vector for invasive species and coordinated with the shipping industry to facilitate the collections in Vancouver. Managers were particularly interested in the role of mid ocean exchange - coastal water taken aboard cargo vessels is exchanged with mid ocean water as a procedure to minimize survival of foreign coastal species potentially brought into Canadian ports. With the superb help of DFO technicians and student assistants hired through IRES, water and sediment samples were collected from ballast tanks of 60 ships in Vancouver harbour – however about 300 ships actually had to be boarded because not all vessels were suited to the sampling protocol. This work was completed in 2009. Samples of bacteria, viruses, dinoflagellates, diatoms, and zooplankton were obtained for PIs at the various labs and shipped to them for analyses. In addition I managed the funding and helped coordinate diver collection of invasive species on ship hulls – 20 ships were sampled. Abundance data and information on ballast water, sediment volumes and ship hull surface area will be used by the various PIs across Canada to estimate effective propagule pressure (explained below) from the shipping vector. I also helped with coordination, funding, and logistics of the West Coast sample team which investigated invasive species in eight BC ports to estimate realized propagule pressure.

In addition I developed the start-up hypotheses and received CAISN funding to co-supervise two graduate students in IRES. Kai Chan and I co-supervise Veronica Lo (MSc) and Megan Mach (PhD). In 2009 Veronica defended her thesis - her project was an important cornerstone of the Network as she dealt with a comprehensive analysis of ballast water and shipping data on Atlantic, Great Lakes and Pacific coast (see below). Megan Mach is working on a project investigating invasive species in eelgrass beds in harbours in BC and NS. She is testing hypotheses relating to propagule pressure in her project. I also developed the start-up hypotheses for a study on zooplankton in ballast water – a project which was the thesis topic for MSc student Donald Humphrey in EOS.
The year 2009-2010 was remarkably productive for the multiple projects I am working on and collaborating on. The research on emissions from Indian auto-rickshaws took a giant leap forward when Conor Reynolds (RMES PhD student) and Post-Doc Andy Grieshop completed a six week long measurement campaign in October 2009. The project aims to understand how different fuel types and engine technologies can influence both Air Quality (AQ) and climate change. Andy and Conor brought 42 of these vehicles that are currently in-use to a state of the art research facility in Delhi and measured emissions of criteria pollutants (CO, NOx, PM 2.5), greenhouse emissions (CO2 and CH4) and aerosols while the vehicles were driven on a chassis dynamometer. The data are in and we are in the analysis phase: Conor is developing emission factors and assessing how climate and air quality co-impacts might be understood; Andy is characterizing the aerosols Organic (OC) and Elemental Carbon (EC) aerosols; Dan Boland (Mech E) is developing a physics based model of the auto-rickshaw validated using the data; and Christine Lagally (Mech E) is characterizing the size, shape characteristics of the emitted aerosols. On a related front, I am also collaborating with Mike Brauer (SOEH/UBC) and others to develop a Land-Use Regression (LUR) model for characterizing pollution sources in Delhi. Arvind Saraswat will work on the LUR model for his thesis.

The research on emerging technologies - Nano and Biotechnology is also coming along nicely. Unlike the AQ work on these projects I am wearing a social science hat as well. On the NSF-funded nanotechnology project front there were two papers of note. One in Nature Nanotechnology (with Terre Satterfield and PhD student Christian Beaudrie) did a meta-analysis of survey data on public risk perceptions of nano. We showed that people know little about the technology, and among those who do there is a strong belief that the risks outweigh the benefits. A second paper in ES&T analyzed the costs of testing of nano-materials and argued against a precautionary approach and for ‘tiered’ testing. We also have ambitious plans for assessing nanotechnology risks in the coming year, where Christian Beaudrie (RMES PhD student) will play a key role. The SSHRC funded project on GMO work in India also made strides; Terre Satterfield and I are field testing farmer survey on risks and benefits of GMOs with Indian partners. Julia Freeman (RMES PhD) is in the process writing up papers for her thesis based on several years of field work.

I also continue to work on climate and energy related topics. Research includes: a project on capacity building for climate change with Hisham Zerriffi (see Hisham’s writeup in this report for details); work on the carbon efficiency of subsidies for purchasing hybrid vehicles with Sumeet Gulati (Economics/LFS) to appear in JEEJ; Paul Tewehan’s (RMES PhD student) thesis related on the environmental implications of cloud computing; Kieran Findlater’s (RMES PhD student) Masters work on land use implications of the biofuel gold rush; and an assortment of work on climate mitigation and non-CO2 greenhouse gases. The second half of 2010 promises to be as busy as the first.

Along with a great group of graduate students and collaborators at UBC and globally, I have been continuing my research activities at the intersection of technology, environment and development. This past year has seen a couple of projects come to fruition. The first is a book project about the use of small scale electricity generation technologies for rural electrification in the developing world. The title is Rural Electrification: Strategies for Distributed Generation and it will be published by Springer in the fall. The other was an Energy Policy article on Global Environment Facility funding for renewable energy projects with my University of Minnesota colleague Elizabeth Wilson.

In addition, I am continuing a number of other activities related to rural energy, environment and development, including:

- Reza Kowsari (Ph.D. student, RMES) and I continue to work together to understand household level decision-making on rural energy and to explore aspects of biomass usage for energy. This includes the development of a new framework for understanding the energy transition process that accounts for the multiple dimensions of household energy demand.
- With my colleagues at Stanford University and the Indian School of Business, I am working on a project to assess commercial cookstove projects in India. A next phase of research will involve understanding household usage of cookstoves after they’ve been purchased.
- Sara Elder (M.A. student, RMES) has been working with Philippe LeBillon (Geography and Liu Institute for Global Issues) to understand the role of participation in fair trade cooperatives on farmer health, using Rwandan coffee farmers as a case and focusing, in particular, on the social determinants of health.
- Emily Anderson (M.A. student, RMES) and I have been examining the issue of the relationship between carbon credits and development in the agroforestry sector. Agroforestry projects have inspired hope for the realization of co-benefits for rural livelihoods, local environment and global climate. Interviews and focus groups are being conducted to document stakeholder understandings and expectations of costs, benefits and barriers to participatory agroforestry across stakeholders engaged at all levels of project implementation.

Another area of work has been on the issue of climate science capacity in the developing world. Milind Kandikar (Associate Professor, Liu Institute for Global Issues) and Claudia Ho Lem (M.Sc. student, RMES) and I recently completed a paper for the Wiley Interdisciplinary Reviews: Climate Change titled “Science, decision-making and development: Coping with climate variation in less-industrialized countries.” The paper addresses the role of scientific knowledge in decision-making with respect to climate variability and change in the developing world, with a focus on scientific capacity. Other current and future work on this projects includes a paper analyzing participation trends in the Inter-Governmental Panel on Climate Change (IPCC), a survey of international training programs on climate change geared towards developing country scientists (surveying both program managers and participants), and case studies examining some specific capacity issues.
IRES is the proud host of UBC’s Program on Water Governance, which is led by Professor Karen Bakker, who is one of our faculty associates. In 2008, the Canadian Water Network (CWN) awarded Dr. Karen Bakker, Director of the Program on Water Governance (PoWG) at UBC, a four-year grant to lead a team of researchers from five Canadian universities on a project to create tools designed to assist communities in improving water security. Environment Canada, Health Canada, Natural Resources Canada and the BC Ministry of Environment are among the 14 project partners.

The project, Developing a Canadian Water Security Framework as a Tool for Improved Governance for Watersheds, will create a Water Security Framework (WSF) that includes decision-support tools for water managers. The overriding objective of this research project is to create tools to support the improvement of water security in Canada, specifically through improving governance for source protection and land use. The WSF will be user-friendly and use data already available to many communities. The core components of the Framework are ecosystem health, human health and governance capacity. The WSF differs from other, similar frameworks as it is:

Comprehensive and integrated (e.g. incorporation of governance variables) sensitive to spatial variation (in some tools) and includes decision-support tools.

The WSF includes a composite Water Security Index (WSI), which will help assess and measure water security at a community level. The team is currently revising the WSI and plans to conduct field tests in Grand River, Ontario and Langley, British Columbia in spring 2010.

Current activities
Water security is an emerging concept and much of the first phase of our research has been exploring the concept and consulting with water practitioners. In November 2008, the team conducted a web-based survey of water practitioners (including utility managers, policy makers and NGOs) from across Canada to assess their views on water security. In Spring 2009, we conducted follow-up interviews. In September 2009, we hosted two water security workshops at UBC. The first was a core Water Security Team meeting, where we discussed the development of the Water Security Framework and associated water security tools. The second workshop included more than sixty water experts from across the country to discuss, more generally, the concept of Water Security in Canada. For further information, please contact: Gemma Dunn in room 439 AERL or email gemma.dunn@ubc.ca or water.security@ubc.ca.

Publications and knowledge translation
Knowledge translation is a key priority for the team members involved this project. We want to ensure that the research benefits water managers, policy makers and community watershed groups. To date, we have produced two policy reports on the topic of water security: Canadian Approaches to Assessing Water Security: An Inventory of Indicators and Water Security: A Primer. Three papers are currently under review in academic journals, which discuss the emerging concept of water security in Canadian water policy and report our findings to date. In addition, we have compiled an inventory of 365 freshwater-related indicators in Canada, the first of its kind.

Christina Cook (doctoral student): Integrating Land Use and Water Management in Canadian Provinces
My doctoral work examines the challenges of integrating land use and water management in Canada where a fragmented governance approach has long persisted. We know that land use has a direct impact on water management and yet rarely do planning laws and policies require consideration of water constraints. In addition, jurisdictional fragmentation is rampant – both across scales of government and within governments across agencies and departments. My contribution to the CWN project is to prepare a legislative protocol – a means for provinces to better understand how they can assist local levels of government to transgress jurisdictional fragmentation and work toward implementing water security in their communities.
The Soil, Water and Air Laboratory (SWAL) has recently been established as focal node for interdisciplinary research in environmental sciences, with substantial participation from IRES faculty members, postdoctoral fellows, and graduate students. SWAL is hosted at UBC by the Faculty of Land and Food Systems (LFS). On the one hand, it is a true bricks-and-mortar style laboratory, with a core analytical facility located in the MacMillan Building and equipped with state-of-the-art instrumentation for analyses of soil, water and air. On the other hand, SWAL provides a focal point for collaborative research among scientists and students from a diverse array of academic units at UBC. Faculties with direct participation in SWAL include the College for Interdisciplinary Studies and the Faculties of LFS, Forestry, Arts, Science, and Applied Science.

Research projects conducted under the SWAL umbrella address a wide array of topics, and provide training opportunities for students and scholars in a diversity of methodologies. By integrating research from traditionally segregated disciplines into one large research cluster has allowed for numerous synergies to develop. These conversations have already resulted in several significant research proposals that encompass the breadth of expertise and techniques needed to address complex environmental issues today.

SWAL counts among its growing number of members IRES’ professors Gunilla Öberg and Mark Johnson as well as emeriti Hans Schreier and Les Lavkulich.

More information about the centre can be found on the Soil, Water and Air Laboratory website at http://www.landfood.ubc.ca/swal/
# IRES faculty associates

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<tr>
<th>Name</th>
<th>Position</th>
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<td>Karen Bakker</td>
<td>Assistant Professor</td>
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<td>Richard Barichello</td>
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<td>Karen Bartlett</td>
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<td>David Close</td>
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<td>Raymond Cole</td>
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<td>Peter Dauvergne</td>
<td>Director, Professor</td>
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<td>Simon Donner</td>
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<td>Ian Townsend Gault</td>
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<td>Christopher Harley</td>
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<td>Kathryn Harrison</td>
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<td>George Hoberg</td>
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<td>Forest Resources Management Department</td>
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<td>Milind Kandlikar</td>
<td>Associate Professor</td>
<td>Institute of Asian Research and Liu Institute</td>
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<td>Brian Klinkenberg</td>
<td>Associate Professor</td>
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<td>Colin Levings</td>
<td>Research Scientist</td>
<td>Fisheries and Oceans Canada, West Vancouver Laboratory</td>
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<td>Ralph Matthews</td>
<td>Professor</td>
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<td>Charles Menzies</td>
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Post-doctoral fellow Andy Grieshop, preparing equipment to get samples of particulate matter for later analysis.
IRES mission is to foster sustainable futures through integrated research and learning about the linkages among human and natural systems, to support decision making for local to global scales. We engage actively in various ways with society and many of our students come to us because they want to achieve change. Keeping with our academic mission, we strive to foster an awareness of the necessity to balance between the wish to achieve change and the need to critically analyze alternative solutions. Among other things, this entails identifying academically acceptable strategies when navigating the reefs of engagement, advocacy, and activism.

All high-lights in this report are examples of the various ways our students and faculty members engage with issues of contemporary concern. Below follows three high-lights that specifically speak to these issues. Kai Chan (Assistant Professor) outlines the ideas behind his course 500Z Advanced Topics in Ecosystem Services, which is conducted in close collaboration with UBC operations to help drive the sustainable development at UBC; Tom Berkhout, (doctoral student), shares his thoughts on methodological challenges when conducting participatory research and Robin Naidoo (visiting scholar), shares lessons learned vis-à-vis the uptake of science by decision-makers drawing on his experience of community-based conservation projects in Namibia.

Course 500Z: Advanced Topics in Ecosystem Services
In fall 2009, Kai Chan taught a graduate project course entitled “Ecosystem Services from a City and University Perspective: An Approach to Ecological Sustainability”. This course involved working with both the University’s Sustainability Office and Vancouver’s Greeneast City Action Team in order to help UBC and Vancouver think more broadly and comprehensively about ecological sustainability. A group of us [myself, ten students (RMES students Emily Anderson, Sarah Klain, Jordan Levine, Megan Mach, Julia Reckermann, Gerald Singh, Jordan Tam; EOS students Cathryn Clarke Murray and Natasha Shihota; Forestry student Brent Chamberlain; Journalism student Erin Empey) plus Rebecca Martone (a postdoctoral associate), Caryl Evans (IRES staff) and IRES director Gunilla Öberg] sought to further their own learning and the academic literature, and to contribute to real-world decision-making with these two partners—a tall order indeed. The course began with a series of excellent guest lectures including UBC Professors Bill Rees (School for Community and Regional Planning), Peter Dauvergne (Liu Centre for Global Studies), James Tansey (Sauder School for Business); Scott Harrison of BC Hydro and the World Business Council for Sustainable Development; and David Boyd of RMES and the Greeneast City Action Team. Armed with a greatly enhanced understanding and sense of purpose regarding the niche to be filled, the group proceeded to produce a series of three reports for UBC’s Sustainability Office demonstrating how the concept of ecosystem services can provide a framework for understanding and weighing various sustainability efforts in terms of their implications for human benefits as well as biodiversity. The group also received great praise for their presentation at the Campus Operational Sustainability Plan workshop, and they are currently tailoring their work for a series of academic publications and follow-up reports for Vancouver and UBC.

Images courtesy of Susanna Haas-Lyons. All taken at CATIE in Costa Rica during May 2010 whilst completing PLAN 545 field course.
For my Ph.D., I am looking at ongoing efforts in British Columbia to pursue aggressive (and arguably transformative) energy efficiency and conservation targets over the next 20 to 30 years. A driving motivation for this research is to recommend to policy makers and planners practical and effective governance processes for steering complex, uncertain, and politically contentious efforts to foster societal-level sustainability. Throughout the research project I have worked closely with both BC Hydro and the B.C. Ministry of Energy, Mines and Petroleum Resources. Both organizations have granted me access to closed door stakeholder and internal planning meetings. At these meetings I sit in as an “observer-as-participant” (a middle-of-the-road observation approach that recognizes the influence of informal exchanges between an otherwise non-participating observer and those being observed). Working so closely with the individuals and organizations that I am ultimately trying to understand and evaluate has observed. Working so closely with the individuals and organizations that I am ultimately trying to understand and evaluate has allowed me to gain a much fuller understanding of what takes place behind the scenes of energy use planning. In addition, it has also helped to legitimize my research among the stakeholders and practitioners that I observe. Of course, taking a more engagement oriented approach also comes with its share of challenges. First among these is the time it takes to build relationships and hopefully trust between myself and the key gatekeepers of the processes that I observe. Another challenge is linking the work that I am interested in – the governance of long-term and large-scale transitions toward sustainability – with the more immediate and incremental day-to-day work of energy use planners (e.g., developing short-term operational plans, designing and implementing programs, and developing and/or refining regulations and policies). Finally, as an observer, it is difficult to know when and how I might influence a process that I am observing. On more than one occasion thoughts similar to ones that I have just shared with a participant during a casual coffee break chat are repeated by the same participant in the meeting that I am observing. Would the same opinion have been expressed by that participant had I not chatted with him or her prior to the meeting? How much weight, then, should I give to this opinion (which I obviously agree with) compared to one that is less in line with my perspective on the situation? Despite these challenges, working closely with the people that I am studying has been extremely rewarding. In the end, I only hope that I can give back to them in the way of my research findings and recommendations, as much as they have given me.

Robin Naidoo Conservation Science Program, WWF-US

A big part of my job as a Conservation Scientist with World Wildlife Fund is to provide research outputs and technical support for our field programs, which are located throughout the world, often in tropical, developing countries. For the past 4 years I have worked with WWF’s program in Namibia, an arid country in southern Africa, which is based primarily around supporting a successful community-based conservation initiative that has positioned Namibia as a global leader in locally-led conservation efforts.

WWF is the only international non-governmental organization (NGO) with substantial operations in Namibia, and works there at the invitation of the government. As such, WWF’s role is to support the efforts of national NGO’s, who in turn provide support to local communities engaged in the sustainable management of their natural resources.

Wildlife is an important natural resource on communal lands and is used in a variety of ways, including for meat, trophies, and as an input into ecotourism. As such, the management of wildlife is an issue of critical importance in ensuring a sustainable flow of benefits to local communities. However, local people often have relatively low levels of skill and education as related to wildlife management, and consequently a great deal of effort in supporting such management is expended by NGO’s, who are themselves often stretched to capacity by demands on their time and resources.

I have been involved in a project that is tracking the movements of African buffalo in and around communal lands; this has been my primary point of engagement with WWF in Namibia, the Namibian government, and local communities. From this, I have learned several important lessons vis-à-vis the uptake of science by decision-makers. The first of these has involved the importance of establishing relationships with key people at the various levels of decision-making noted above. Without taking the time to do this and establish personal credibility and relationships with the appropriate stakeholders, no amount of cutting-edge science will be able to influence decision-making. Secondly, the most valuable research from an applied conservation context is not necessarily (or perhaps, not even very often) the type that gets published in top-notch international science journals. Basic maps of the locations of individual buffalo (or fewer years has proved invaluable in convincing local communities of the value of zoning parts of their lands as wildlife movement corridors. Finally, it is important to be sensitive to the needs and aspirations of Namibians themselves and to act to support, rather than lead, an agenda developed by the people who are directly involved in the governance of their own natural resources. In the Namibian context this means stakeholder engagement at the earliest possible stages of the research process, and a constant need to liaise with locals and to adapt ongoing scientific research to emerging priorities as defined by communities themselves.
Research Grants

Project: Cross-system linkages and ecosystem services on the British Columbia coast
Principle Investigator: Kai Chan
Granting Agency: David and Lucile Packard Foundation
Period: October 2008 - August 2010
Total Amount: $121,652.00

Project: Ecosystem services in the Central Interior of BC: A GIS-based assessment of their value and sensitivity to change
Principle Investigator: Kai Chan
Granting Agency: SSHRC
Period: September 2005 - December 2009
Total Amount: $271,885.00

Project: Fuel choices and human welfare: an integrated assessment of the impacts of climate policy
Principle Investigator: Hadi Dowlatabadi
Granting Agency: ExxonMobil
Period: September 2005 - December 2009
Total Amount: $279,000.00

Project: Implications of irreducible uncertainties in climate change on decision-making: Regional resource management and Arctic cumulative impact assessment
Principle Investigator: Hadi Dowlatabadi
Granting Agency: National Science Foundation
Period: September 2004 - August 2010
Total Amount: $638,859.89

Project: Quantifying nature's bounty: the contribution of marine ecosystems to local communities
Principle Investigator: Kai Chan
Granting Agency: SSHRC
Period: March 2009 - February 2011
Total Amount: $9,540.00

Project: Coastal ecosystems services amongst tropic cascades
Principle Investigator: Kai Chan
Granting Agency: NSERC
Period: May 2008 - April 2011
Total Amount: $137,000

Project: Life cycle environmental assessment and policy
Principle Investigator: Hadi Dowlatabadi
Granting Agency: Auto 21
Period: April 2008 - March 2012
Total Amount: $557,142.00

Project: The Integrated Watershed Analysis Laboratory: a facility for the synchronous, coupled study of complex phenomena in terrestrial and aquatic environments
Principle Investigator: Mark Johnson
Granting Agency: Canada Foundation for Innovation
Period: April 2009 - June 2011
Total Amount: $271,885.00

Project: Environmental dynamics of chlorine in water and soil - transport patterns and transformation rates
Principle Investigator: Gunilla Öberg
Granting Agency: NSERC
Period: April 2007 - March 2013
Total Amount: $279,000.00

Project: Research Support for establishing a research office at CATIE
Principle Investigator: Tim McDaniel
Granting Agency: UBC VP Research Dev't Fund
Period: April 2009 - March 2011
Total Amount: $3,000

Project: Canadian Aquatic Invasive Species Network: West Coast sampling team
Principle Investigator: Colin D. Levings
Granting Agency: UBC Sustainability and UBC Land and Buildings Services
Period: September 2009 - December 2010
Total Amount: $40,000

Project: Regional resource management and Arctic cumulative impact assessment
Principle Investigator: Hadi Dowlatabadi
Granting Agency: National Science Foundation
Period: September 2004 - August 2010
Total Amount: $638,859.89

Project: Canadian Aquatic Invasive Species Research Network:
Theme 1: Vectors and pathways, 1.4. Baseline coastal port surveys
Principle Investigator: Colin D. Levings
Granting Agency: NSERC
Period: April 2006 - March 2012
Total Amount: $154,098.00
Project: Development of linkages between mitigation & adaptation in the intergovernmental panel on Climate Change’s Fourth Assessment Report
Principle Investigator: John Robinson
Granting Agency: Environment Canada
Period: September 2004 - March 2009
Total Amount: $56,000

Project: Centre for Interactive Research on Sustainability (CIRS) Planning and Analysis
Principle Investigator: John Robinson
Period: June 2007 - March 2008
Total Amount: $10,000

Project: CIRS: Advanced High-Performance Building Envelope System with Adaptive Monitoring & Controls System
Principle Investigator: John Robinson
Period: December 2007 - November 2012
Total Amount: $864,077.97

Project: Centre for Interactive Research on Sustainability (CIRS)
Principle Investigator: John Robinson
Period: June 2007 - March 2010
Total Amount: $220,578.00

Project: Dynamic Lifecycle Energy Analysis
Principle Investigator: John Robinson with Stefan Storey
Granting Agency: BC Hydro and Power
Period: December 2007 - August 2011
Total Amount: $100,000

Project: Evaluation of the coordination of transformative energy efficiency and conservation by BC Hydro and MEMPR
Principle Investigator: John Robinson with Tom Berkout
Granting Agency: Mathematics of Information and Complex Systems (MITACS) - Networks of Centres of Excellence (NCE)/Internship funds
Period: December 2009 - February 2011
Total Amount: $45,000

Project: Centre for Interactive Research on Sustainability
Principle Investigator: John Robinson
Period: April 2009 - March 2012
Total Amount: $10,364,754.00

Project: Dynamic Lifecycle Energy Analysis
Principle Investigator: John Robinson with Stefan Storey
Granting Agency: BC Hydro and Power
Period: December 2007 - August 2011
Total Amount: $100,000

Project: Event ethnography: exploring a new method for understanding the social process of adapting conservation policy to climate change
Principle Investigator: Theresa Satterfield
Granting Agency: SSHRC
Period: December 2009 - February 2011
Total Amount: $73,500

Project: CEIN - predictive toxicology assessment and safe implementation of nanotechnology in the environment
Principle Investigator: Theresa Satterfield
Granting Agency: National Science Foundation
Period: October 2008 - August 2010
Total Amount: $40,267.81

Project: Collaborative research and capacity building in new approaches to resource development on indigenous land (Lessons from Canada, New Zealand, Australia and Chile)
Principle Investigator: Theresa Satterfield
Granting Agency: UBC Martha Piper Research Fund
Period: April 2009 - September 2010
Total Amount: $24,650

Project: Centre for the Study of Nanotechnology in Society
Principle Investigator: Theresa Satterfield
Granting Agency: National Science Foundation
Period: January 2006 - December 2010
Total Amount: $103,178.33

Project: Representing the cultural concerns of three Aboriginal communities in risk-based policy contexts
Principle Investigator: Theresa Satterfield
Granting Agency: SSHRC
Period: April 2006 - March 2011
Total Amount: $120,632

Cotton pickers in India.
Picture courtesy of PhD student Julia Freeman
Publications

Referred Journals

Asfaw, T; Satterfield T; [in press] Beyond Local Justice: Gender Relations in Local-Level Dispute Settlement in Ethiopia’s Zeghie Peninsula. Human Ecology Review


Belzile J. and Öberg, G. (submitted) Where to begin? Grappling with how to use participant interaction in focus groups.

Bengtsson, P., Bastviken, D., de Boer, W., and Öberg, G. 2009 Possible role of reactive chlorine in microbial antagonism and organic matter chlorination in terrestrial environments. Environmental Microbiology 11: 1330–1339


Chang, S.E. 2009. “Infrastructure Resilience to Disasters,” The Bridge: Linking Engineering and Society, National Academy of Engineering, Winter, pp.36-41. (note: this journal is refereed, but my article was selected from among invited conference abstracts and not subject to further review.) Also reprinted in Engineers Media (Australia).


Donatuto, J., Satterfield, T., Gregory, R (in press) Poisoning the body to nourish the soul: Prioritizing health risks and impacts in a Native American Community. Health, Risk and Society


Hagerman, S; Satterfield, T. Conservation Adaptation at the WCC: Promotion, Ambivalence and Resistance. (in press). Conservation and Society


Hague, M., M., Ferrari, J., Miller, D., Patterson, G., Russell, A., Farrell, S., and Hinch. 2010. Modelling the future hydroclima-
ology of the lower Fraser River Basin and its impacts on the spawning migration survival of sockeye salmon. Global Change Biology, in press.


Book Reviews in Refereed Journals


Refereed Book Chapters


Reports

Kai Chan, Gunilla Öberg, Emily Anderson, Brent Chamberlain, Erin Empey, Carys Evans, Sarah Klain, Jordan Levine, Megan Mach, Rebecca Martone, Cathryn Clarke Murray, Julia Reckermann, Jordan Tam, Natasha Sihota, Gerald Singh. 2009. An Ecosystem Services Approach to Sustainability at the University of British Columbia. For UBC Sustainability Office. 87 pp.


Refereed Books


McDaniels, T., Longstaff, H. and McDaniels, D. 2010 “A decision framework to help guide development and implementation of Carbon Capture and Storage in Alberta and Canada” Monograph (85 pages) for Institute for Sustainable Environment, Economy and Energy, University of Calgary. In press (electronic publication to be released in April 2010)

Conferences and Presentations

Chan, Kai


Can environmental science save the world? at Killam Conversations. March 2010

Intercultural Transacademic Education for Sustainability: Ecosystem Services as a Case Study at NOW! Climate Action Conference, March 2010

Ecosystem services & impacts: local, remote, and global at Planning for Resilience Symposium. March 2010

Cultural Values & Ecosystem Services: Navigating Intangibility and Incommensurability Environmental Norms, Institutions and Policies workshop series Stanford University. February 2010

Sea Otters, Kelp Forests, and Coastal Communities: Disentangling Values and Ecosystem Interactions. UBC Fisheries Seminar. January 2010

What are cultural ecosystem services and how can they better be integrated into the concept of ecosystem services? Kerner von Marilaun Workshop: Landscape-based Cultural Ecosystem Services. At US National Science Foundation and Austrian Academy of Sciences, Luzn, Austria. November 2009.

Protecting ecosystem services and biodiversity in the world’s watersheds. At National Center for Ecological Analysis and Synthesis NCEAS Eco-lunch Seminar Series Santa Barbara, CA, USA. August 2009


How to Get past Doom & Gloom in the Environmental Movement: Advancing the Green Agenda. St. John’s College Environmental Lecture. April 2009


Chang, Stephanie


Dowlatabadi, Hadi


Climate Change and Vector Borne Diseases, keynote for BC Centres for Disease Control, Vancouver. April 2009


Rethinking Public Transit in GVRD, Invited presentation to Translink Sustainability Steering Committee, Burnaby BC. (co-authored by B Gouge, & F. Ries). July 2009

Waste Reduction and Carbon Taxes, Invited presentation at the Annual Meeting of the Saskatchewan Solid Waste Management Association, North Battleford. September 2009

Beyond Carbon Taxes: Webinar for Centre For Climate Decision-making, Carnegie Mellon University, Pittsburgh PA. October 2009

No Action Please: we are Canadian, Invited Presentation at the Inaugural Canadian Science Policy Conference, Toronto. October 2009

Potential Uses for the Wood Supply at Williston Lake, Tsay Keh Dene community gathering. BC. October 2009

Beyond Copenhagen, IRES Seminar, UBC, Vancouver. November 2009

Understanding the Jevons Paradox, US National Science Foundation Review Panel, Pittsburgh, PA. November 2009

Integrating mitigation and adaptation, US National Science Foundation Review Panel, Pittsburgh, PA. November 2009

Integrated Assessment of Emerging Zoonotic Diseases, Invited plenary for CFIAPHC Joint Workshop on Integrated Analysis of non-Foodborne Zoonotic Risk, Ottawa ON. January 2010

Estimating the exposure to particulate air pollution from an urban transit system – an intake fraction approach, Presented at the American Association for Aerosol Research, San Diego Ca, (co-authored by F. Ries & B Gouge). January 2010
Hinch, Scott


Johnson, Mark


McDaniels, Tim
McDaniels, T. 2009, "Climate Adaptation in Large Scale Social/Environmental Systems: forestry, fisheries and biodiversity examples" Climate Decision-making Center Annual Meeting, Carnegie Mellon University, Pittsburgh, May, 2009
McDaniels, T. 2010 "Decision aiding for climate adaptation in large scale social/environmental systems: three cases from British Columbia" PCICS at University of Victoria (also sponsored by Ministry of Environment). October, 2010.

Co-Organizer of major workshop for regional infrastructure owners and operators regarding the effects of floods on resilience of infrastructure systems in the Lower Mainland. One-day workshop, co-facilitator and co-designer. November, 2010
T. McDaniels, January 2010, Decision support for climate change adaptation in British Columbia, GCDE first Annual conference, Kyoto University, Kyoto Japan
T. McDaniels, January 2010, "Understanding Resilience in regional infrastructure systems: characterizing resilience and setting priorities", Disaster Prevention Research Institute, Kyoto University, Kyoto, Japan
T. McDaniels, March, 2010. "Decision aiding for climate adaptation - what do we need to know?" Doshisha University, Kyoto Japan

Robinson, John
John Robinson, "Accelerating Sustainability at UBC" presentation to Chemical and Biological Engineering CHBE599Z at UBC, Vancouver, BC, March 30, 2010
John Robinson, "Eco Communities: Designing a Sustainable Future" panel presentation at Globe 2010 Conference, Vancouver, BC, March 24, 2010
John Robinson, "Accelerating Sustainability at UBC" University of Montreal Seminar Series presentation, Montreal, Quebec, March 18, 2010
John Robinson, "A Systems View of Sustainability Indicators in Educational Institutions" presentation at CSIN conference, Toronto, Ontario, March 2, 2010
John Robinson, "Accelerating Sustainability at UBC" presentation to Applied Science 242 at UBC, Vancouver, BC, February 9, 2010
February 24 2010, "Interdisciplinary environmental studies" Invited lecture at the Research Institute Gino Germani (IIGG), University of Buenos Aires, Argentina.

22 September 2009 What is “UBC as a Living Lab” and is its Realistic? Joint lecture with Liz Ferris (RMES student), Andrew Collins (Associate Director, Project Services, UBC Infrastructure development) and Guinilla Oberg (IRES Professor)
September 16 2009, "On Water" presentation for Metro Vancouver and UBC’s joint committee

Öberg, Gunilla
John Robinson, “Accelerating Sustainability at UBC” presentation to Interdisciplinary Studies at UBC, Vancouver, BC January 20, 2010
John Robinson, “Accelerating Sustainability at UBC” presentation at BC Hydro Lead by Example Seminar Series, Burnaby, BC, January 19, 2010
John Robinson, “Chasing Sustainability” presentation to UBC’s Commerce Undergraduate Society, Vancouver, BC, November 6, 2009
John Robinson, “Sustainability at UBC: Centre for Interactive Research on Sustainability” presentation to UBC’s Science One Program, October 26, 2009
John Robinson, “Sustainability at UBC: Centre for Interactive Research on Sustainability” presentation to University of Toronto’s Centre for Environment, Toronto, Ontario, October 21, 2009
John Robinson, “Sustainability at UBC: Centre for Interactive Research on Sustainability” presentation at University of Toronto’s Sustainability Office Lunch ’n Learn Series, Toronto, Ontario, October 20, 2009
John Robinson, “Chasing Sustainability” presentation to Fraser Basin Council Board of Directors, Richmond, BC, October 8, 2009
John Robinson, “Accelerating Sustainability at UBC” presentation to UBC’s Green College Principal’s series, Vancouver, October 6, 2009

IRES Annual Report
Satterfield, Terre

“Emergence and the Anticipation of Perceived Risk in the Case of Nanotechnologies,” presentation at S-Net meeting, University of Washington, Seattle, September 10, 2009, authors Satterfield, T., Kandlikar, M., Beaudrie, C., Herr Harthorn, B., Pidgeon, N., and Conti, J.


“Risk Ranking for Nanomaterials Using Hazard and Intake Fraction Models,” presentation at Society for Risk Analysis Meetings, Baltimore, MD, authors Beaudrie, C., Kandlikar, M., Satterfield, T., and Ramachandran, G.


"Climate Impacts and Biodiversity Conservation: Examining Evolving Environmental Values, Scientific Uncertainties, and Policy Preferences," poster at DISCCRS: Interdisciplinary Climate Change Research Symposium, authors Hagerman, S., Satterfield, T., and Dowlatabadi, H.

Guest lecture at University of Western Ontario, "Rethinking Risk at the Intersection of Culture, Justice and Differing States of Nature", February 2010

“Reflections on Chasing the Elusive – Hope, Intention and Disruption in the Anticipation of Social Response to Nanotechnologies,” invited lecture at Institute for Resources, Environment and Sustainability’s Distinguished Speaker Series, March 2, 2010


Keynote, Advanced Nanomaterials Conferences, Morocco, September 12 -15, 2010