

2017 Invasive Species Research Conference

TURNING SCIENCE INTO ACTION

CO-HOSTED BY:



Conference
Report



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S. McCann

June 20 – 22 | Thompson Rivers University | events.BCinvasives.ca

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Acknowledgements

Many thanks to the Invasive Species Research Conference Planning Committee, Conference partners, co-hosts, sponsors and funders:

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1.0 Conference Objectives

The Invasive Species Council of BC convened the first “Invasive Plant Research in BC: Current Projects and Future Trends” Forum in 2008. The Research Forum was deemed successful for both academic researchers and practitioners by linking science with operations.

Thompson Rivers University (TRU) and the Invasive Species Council of BC co-hosted the Invasive Species Research Conference – Turning Science into Action, June 20 - 22, 2017 in Kamloops, BC. The objectives of the Conference included to:

- » Build upon the work of the 2008 and 2011 Invasive Plant Research Conferences
- » Share of invasive species research findings from any taxonomic group
- » Encompass scientific research both completed and underway across the Pacific Northwest
- » Facilitate networking and relationship building between invasive species researchers and practitioners
- » Enable linkages between invasive species science and operations
- » Identify invasive species research priorities for British Columbia

2.0 Conference Highlights

The Invasive Species Research Conference took place June 20 - 22, 2017 at Thompson Rivers University in Kamloops, British Columbia. This Conference included 2 keynote speakers; concurrent themed sessions with 40 oral presentations including lightning talks; 17 poster presentations; a focused, facilitated discussion on future research priorities for BC and a series of optional field trips in the Kamloops area.

DAY ONE, JUNE 20TH, 2017

Dr. Alan Shaver, President and Vice-Chancellor; Thompson Rivers University provided the first official welcome and introduced Elder Margaret Hyslop for a welcome and blessing. Brian Heise, Chair of the Invasive Species Council of BC provided the official welcome. Rob Higgins, Co-Chair of the Invasive Species Research Conference Planning Committee, introduced the first Keynote Speaker, Dr. Simberloff, who presented on Managing Invasives: Progress, Problems, and Polemics.



A 'hot topic' research presentation on "Utility of unmanned aerial vehicles for mapping invasive plant species: a case study on Yellow flag iris (*Iris pseudacorus* L.)" by Garrett Whitworth followed the keynote presentation. Two themed sessions of concurrent presentations followed: "Ecological Restoration Following Invasion" and "Social Aspects of Invasion". A series of eight rapid fire five minute presentations, called lightning talks, concluded the morning's proceedings.

After the lunch break concurrent sessions took place on "New Approaches to Invasive Species Management" and "Risk Assessment of Invasive Species".

On the evening of June 20th, attendees learned and networked amongst 17 poster presenters during the Poster, Nibble and Network session.

BAT FIELD TRIP

An optional night time bat observation field trip was held on June 20th. Participants departed TRU by bus to a rural location, approximately 20 mins from Kamloops, where a colony of bats lives. Participants were able to see bats flying at dusk between barns, and observed experts mist-netting and measuring bats. Bat detectors on site also enabled participants to hear the echolocation calls of bats.



DAY TWO, JUNE 21ST, 2017

Matthias Herborg, Co-Chair of the Invasive Species Research Conference Planning Committee, opened day two and introduced the second keynote speaker Dr. Ricciardi who presented on “Predicting Impact: A Challenge for Invasive Species Risk Assessment”.

Cathryn Abbott provided the hot topic presentation on "Building DNA reference libraries to enable the development of eDNA metabarcoding tools for invasive species detection". The final morning themed session “Molecular Approaches to Invasion Biology” featured three presenters.



Dr. Anthony Ricciardi
Photo credit: Dustin Melan

Following lunch and networking, Pam Giberson of Natural Sciences and Engineering Research Council of Canada (NSERC) presented on NSERC Research Partnership Grants. Following the presentation, all Conference attendees participated in a dedicated facilitated workshop funded by NSERC, on research priorities and connections. Working in small groups on specific themes, attendees had in-depth discussion about the priorities for invasive species research in Western Canada.

The final concurrent presentations were on the themes of “Tracking Invaders: Where are they?” and “From just taking up space to an invasive meltdown”. Following the Conference adjournment, there was an optional Wine Tasting Tour with al fresco dinner.

OPTIONAL FIELD TRIP - DAY 3, JUNE 22ND, 2017

On this field tour, participants visited Lac Du Bois and discussed the grassland community types as well as water conservation and utilization issues.

After 'setting the stage' in Lac Du Bois, the field trip headed to Kenna Cartwright Park to look at 'management in action'. These efforts include tree canopy thinning, biocontrol, goat grazing, and fire regime.



Photo credit: Dustin Melan

3.0 Key Themes

The core component of the Conference was a series of concurrent themed sessions:

- » Environmental DNA and the Detection of Invasive Species
- » Ecological Restoration Following Invasion
- » Social Aspects of Invasion
- » New Approaches to Invasive Species Management
- » Risk Assessment of Invasive Species
- » Tracking Invaders: Where are they?
- » From Just Taking up Space to an Invasive Meltdown

On Day One, the Conference featured lightning talks - a series of five-minute long presentations. This was a popular component of the Conference and attendees had the opportunity to connect with the lightning talk presenters during lunch and additional refreshment breaks.

On both days of the formal program, attendees had the opportunity to provide input on future invasive species research priorities during each session. Each of the themed sessions of research presentations concluded with input from attendees on what more research was needed in that area.



Photo credit: Dustin Melan

4.0 Research Priorities Workshop

On day two of the Conference, all attendees participated in a dedicated facilitated workshop, funded by NSERC, on invasive species research priorities and connections.

Based on outcomes from the 2008 Invasive Plant Research Conference, six research themes were determined as key to determining future needs and priorities for invasive species research relevant to BC. These themes were used to initiate conversation and stimulate ideas as participants were asked to choose an initial table/theme for a given duration and to work through the following three questions:

1. What are the top 3 priorities in invasive species research, under this theme
2. Suggest who could be involved in these three areas of research (from Western Canada) – universities/colleges, companies, organizations etc.
3. What more needs to be done to help establish research partnerships

The top priority for each theme was then written on flipcharts and participants moved on to two other themes of their choice. The workshop concluded with a facilitated review of the top research priorities by theme.



Photo credit: Dustin Melan

RESEARCH PRIORITIES BY THEME

The top priorities per theme determined in the workshop are listed below. Priorities in bold were determined by two or more groups.

Restoration Options

- » Social science research on how to recruit volunteers for restoration.
- » How to maintain restoration efforts in the long-term (realistic expectations for input required after planting).
- » Pre and post inventory required for habitat affinities (including soil chemistry, post

treatment and monitoring).

- » BMPs after restoration or treatment e.g. grazing practices with respect to climate change; restoration and management priorities.
- » Seed bank establishment for native species or agronomics that prevent weeds (banking of fish eggs etc. as well).

There was discussion on the need to understand what the end goal of restoration is.

Pathways of Invasion and Vectors of Spread

- » Identify and prioritize vector/pathways for invasive species as we don't know them all.
- » Pathway risk assessments to prioritize pathways and vectors of spread.
- » Researching the target audiences for the best or most efficient education.
- » Risk assessment for exotic species sold in pet stores/horticulture.
- » Anticipating future and emerging pathways e.g. Arctic pathways.

Management Tools

- » The use of unmanned aerial vehicles for detection, mitigation, monitoring and treatment of invasive species.
- » A format is needed to enable managers and researchers to connect.
- » New treatment trials with different control options (updated regularly and shared widely and accessible).
- » Treatment tools in or near water bodies (i.e. herbicides).
- » Research capacity is needed in order to approve more bio-control agents.

There was discussion around the need for more support for biocontrol research as currently there are only two federal biocontrol researchers for all of Canada.

Biology and Ecology of Invasive Species

- » Movement of invasive species related to climate change.
- » The rapid evolution and adaptation of invasive species - why do some species suddenly become invasive or disruptive?
- » More background on micro-biome for most invasive species.
- » Evaluate limiting factors and community interactions of invasive species in their native range that will not be detected in short time frames.
- » Research on long term outcomes following invasion to detect responses to treatment.

- » Risk assessment on likelihood of preventing the spread of new invasions

There was discussion of the need to understand the potential of biomes as a tool that could reduce spread of certain species (e.g. viruses used as treatment). The Biology and Ecology of Invasive Species is a very broad category and as such common themes should be identified to narrow this category.

Best Management Practices

- » Develop provincial and regional BMPs on soil management, monitoring, disposal, what's being done, what to prioritize, monitor effectiveness, design of BMPs, links to species research specific BMPs.
- » In depth risk analysis of management actions, in different contexts to prevent unintended consequences.
- » How to motivate people to use BMPs and turn that into reality (e.g. detailed info sheets for landowners)

There was discussion of the need to get buy in from people so that they actually want to make BMPs a reality. This would include changing behavior and building resources. Incentives could be provided to get more buy-in e.g. environmental farm program. There is a need for a way to translate complex invasive species research information into something useable for the public, such as BMPs.

Social and Economic Impacts

- » What is the cost of not addressing invasive species?
- » Research into promoting ownership responsibility i.e. everyone doing their part.
- » Investigate the correlation between socio-economic and ecological impacts.
- » Broad based modelling to measure impacts.
- » Should positive values associated with invasive species be shifted, and if so, how do we shift that view?

WHO COULD BE INVOLVED IN THE RESEARCH?

Workshop participants suggested the following parties could be involved in the research:

- » Post-secondary institutions
- » Academics
- » Economists
- » Social scientists
- » Non-government organizations including international organizations e.g. CABI
- » First Nations

- » Industry including mining, transportation, ranching, land managers
- » Local, regional and provincial government
- » Industry associations
- » Federal agencies e.g. CFIA, DFO, Environment Canada

WHAT MORE NEEDS TO BE DONE TO FACILITATE RESEARCH PARTNERSHIPS?

The following recommendations were made by participants on what more is needed in order to facilitate research partnerships:

- » Communication tools (most frequent response)
- » Digital platform for communicating and networking
- » Better sharing of information, making research results accessible to all
- » More regular research conferences/forums
- » Invasive species/research centre in Pacific North West
- » Funding
- » Networking opportunities – especially between managers and researchers
- » Model [Hydronet](#) tailored for invasive species related industry and academia to connect
- » Raise awareness among industries about invasive species and funding opportunities for research
- » Establishing priorities
- » Intra-jurisdictional collaboration
- » More input from practitioners to researchers
- » Cross-agency collaboration
- » Leadership



Photo credit: Dustin Melan

5.0 Conference Outcomes & Next Steps

CONFERENCE

The Conference drew 110 attendees, from diverse backgrounds and locations including researchers, practitioners, stewardship groups, and local, provincial and federal government and included presenters from as far as Wales (UK), New York, Alaska, Tennessee, Quebec and the Yukon.

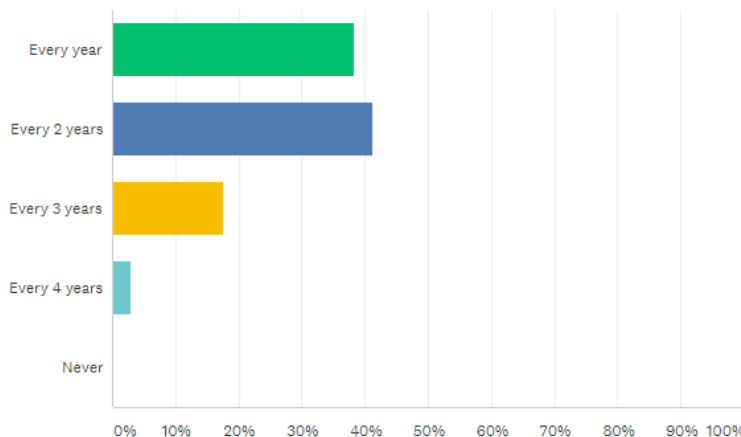
Feedback on the Conference via evaluations was very positive indicating attendees found the Conference well organized and of benefit to them.

Participants recommended that future research conferences include more applied research results that could help inform management techniques. Additional time for networking was recommended and the inclusion of a session similar to “speed dating” between researchers and managers was suggested as a way to facilitate connections and partnerships.

Participants commented most on liking the keynote speakers. Many positive comments were made on the variety of topics, the lightning talks and networking opportunities.

Participants recommended more workshops and panels be incorporated along with more separate/concurrent sessions. Aquatic and terrestrial topics were recommended to be themed in separate concurrent sessions in future Conferences so that attendees would not miss talks in their field of study. It was suggested that while practitioners may not have research results, presentations on their practical experiences could be incorporated. Timing of the Conference coincided with field work which may be a consideration in future Conference scheduling.

The most popular response regarding frequency of the Conference was every two years.



NSERC

A final report was submitted to and approved by NSERC. As a result of the research partnership activities, which included a webinar, survey and the workshop, discussions were held by ISCBC with two companies interested in research grants. The company contacts were introduced to Pam Giberson of NSERC and introductions to relevant invasive species researchers were facilitated by ISCBC.

In the survey of attendees, there were many positive responses about the networking opportunities the event offered, especially through the workshop. Specifically, attendees found the discussion on research priorities and the opportunities for networking between researchers and practitioners to be of most benefit.

NEXT STEPS

The Invasive Species Research Conference Planning Committee held a review meeting on June 26th 2017 and produced a list of recommendations for changes and items to retain for future Conferences.

The post-Conference attendee survey indicated that attendees would like to see the Conference repeated every two years.

Workshop participants were in agreement on the overall need for better communication between practitioners and researchers, ranging from communicating research needs to the sharing of research results. In particular, digital tools and more conferences were recommended.

ISCBC will lead the development of an online research hub for the province that would enable connections to be made between researchers and managers. The hub will also facilitate the sharing of research needs and priorities and the sharing of research results. The hub will include additional information such as useful links and research funding sources such as those available from NSERC. Existing research catalogues are to be shared with practitioners. Updates on the hub will be emailed to all Conference attendees.

ISCBC will work to secure funds to incorporate the networking aspect in the digital hub that will allow researchers to connect directly with practitioners on research topics of collective interest.

ISCBC staff will summarize the research priorities determined in the workshop and they will be provided on the research connections website. All Conference participants will receive a link to the research priorities once they are live online.

Appendix 1: Additional Resources

Please click on the links below to view the following resources:

- » [Conference Program Featuring Abstracts and Bios of Presenters \(including Poster Presenters\)](#)
- » [Conference Presentations \(in PDF\)](#)
- » [Conference Highlights with Photographs](#)
- » [Conference Video](#)

Appendix 2: Presentation Summaries

DAY 1 – TUESDAY JUNE 20TH, 2017

8:45 am - Welcome & Blessing

Brian Heise hosted the opening session. Dr. Alan Shaver, President and Vice-Chancellor; Thompson Rivers University provided the first official welcome and introduced Elder Margaret Hyslop. Brian Heise provided the official welcome on behalf of the Invasive Species Council of BC. Rob Higgins, Co-Chair of the Research Advisory Committee introduced the first Keynote Speaker.

9:10 am - Keynote Speaker: Managing Invasives: Progress, Problems, and Polemics; Dr. Daniel Simberloff, University of Tennessee

New findings in invasive species biology include ecosystem type impacts as a result of invasive species (*Myrica faya* fertilizing soil), rats altering soil biology

Whether or not introduced species are harmful was reviewed. Impacts of introduced species can be subtle and can develop into larger problems over time. Others make large, direct impacts right away

“Social construction of the science” was discussed. Some view actions towards invasive species as xenophobic. There’s a tendency for the public to ignore the detrimental impacts of invasive and introduced species on native species.

Efforts to contain invasive species are futile. Invasive species management is a new field, yet we are making progress. We have now had numerous successful eradication projects (i.e. Polynesian Islands has eradicated feral cats and rats on several small and large islands).

In some cases, climate change will lessen the problem (bat white-nose syndrome). In response, act quickly to tackle invasive species. Adaptation – moving and transporting species into new areas as a result of changing climates - is likely a bad idea. To prepare for climate change and adaptation, respond quickly to newly found introductions that we would have otherwise ignored.

There is an issue in education on invasive species. Governments lack funding for educational purposes and use it as an excuse. Lack of knowledge and a lack of will are the two major problems facing invasive species management.

9:55am - “Hot Topic” Presentation: Utility of unmanned aerial vehicles for mapping invasive plant species: a case study on Yellow flag iris (*Iris pseudacorus L.*); Garrett Whitworth, Thompson Rivers University

Benefits of using UAV for YFI treatments include: lower man-hours, surveys are conducted quickly, there are reduced safety concerns and ecosystem damage is mitigated.

10:40 AM - CONCURRENT SESSION 1 – MOUNTAIN ROOM: ECOLOGICAL RESTORATION FOLLOWING INVASION

10:40 am - Effects of fire and herbivore exclusion fencing on native and non-native plant populations in a Garry Oak Ecosystem on Salt Spring Island in British Columbia: A role for deer grazing in novel ecosystem management? Jennifer Grenz, University of British Columbia

Fire is used traditionally by First Nations to grow camas, then Garry Oak came in following. With the deer crisis on Vancouver Island, a population estimate of approx. 170 deer/km² was observed. The influx of herbivory creates stress on native plant populations.

Conclusions: Fire is complicated! Alien plants may dominate due to changes in the ecosystem (i.e. changes in fire frequency and intensity). Understanding the historical land practices are key to developing a course of action. These are novel ecosystems created by First Nations (Garry Oak growth following burning of land for camas).

11:00 am - Implementing and maintaining ecological restoration efforts in urban estuary and riparian environments: a case study of MacKay Creek in North Vancouver; Julia Alards-Tomalin, Echo Ecological Enterprises

Issues in the estuary:

- » Weir blocked passages for fish (resulted in removal of weir, installed ripple pool channels)
- » Not enough large logs for habitat (installed root wads and scallop burms to promote aquatic plant growth)
- » Too many invasive plants (mainly manual removal)
- » Beavers becoming an issue (fences later added to avoid trees being cut down)

Dry sandy conditions in estuary, so had soil and organic material to help with native plant establishment.

Challenges include difficulty in finding funding for the maintenance of a restoration site. Sites will become overgrown quickly, and attempting to have volunteers pull weeds (i.e. blackberry) is difficult.

11:20 am - Round Table: What additional research is needed on this topic?

Attendees were asked to take five minutes to talk at their tables and document up to three topics of additional research recommended within this session's theme.

10:40 AM - CONCURRENT SESSION 2 – TERRACE ROOM: SOCIAL ASPECTS OF INVASION

10:40 am – Policy pitfalls and opportunities for marine invasive species management in Canada; Natascia Tamburello; ESSA

Technologies

Marine Invasive Species Management was reviewed:

- a. Recent Policy Development
- b. Need to bridge the gap from theory to practice
- c. MaPP has become a driving process in BC from theory to practice
- d. Haida Gwai Coastal Marine invasive species management

Objectives and Methods:

- » Find out where Canada stands on these policies
- » Create a unified overview

Prevention of Vectors of Dispersal:

Transportation

- » Management of transport by small and large vessels
- » Need to understand traffic patterns

Agriculture:

- » Transfer of seed and adults between agriculture zones

Other

- » Movement of coastal infrastructure
- » Marine debris
- » Trade

Early Detection:

- » Public reporting to DFO

Rapid Response of Spread Stage:

- » Grant authority of guardians and programs

Methods for Reducing Colonization:

- » Chemical treatment
- » Enclosure

Mitigating Impacts:

- » Difficult to identify appropriate mitigation because species are not well known

Moving forward:

- » We need to make a strong push
- » Operationalize genetic detections methods
- » Research and seek pre-emptive control

- » Close policy acts

Provincial regulations were reviewed. There are some provincial programs in place and federal implementation of treatment is anticipated to come into place by September. This will allow vessels to treat ballast in transit.

11:00 am – Socio-economic predictors of invasive plant species occurrence in urban green spaces of Metro Vancouver; Woongsoon Jang; University of British Columbia

Urban area and green spaces:

- » More than 80% of population in Canada is in urban area
- » Green spaces are very valuable, and thus the invasion of these spaces by invasive species is a huge issue in these urban areas
- » Human impact is the biggest vector of invasive species introduction

The research objective was to assess the impact of socio-economic factors on invasive plant species occurrence. The study area targeted the following invasive species in Surrey:

- » English ivy
- » Knotweed
- » Lamium

Data collection focused on park and natural areas. One problem is that this kind of data is presence-only data

- » Lack of information about absence
- » Pseudo-absence problem
- » Alternative: point processing modelling

Poisson point process modelling: models the intensity of presences:

- » Tested variables
- » Each one tested separately to avoid correlation of variables
- » Pulled them all together and analyzed

Results for different species allow us to know where different cities or areas should manage the weeds based on correlations. Predictors differed by target species and cities because of different developmental histories.

11:25 AM – MOUNTAIN ROOM: LIGHTNING TALKS

Lightning Talks were a series of rapid fire 5 minute research presentations with no time allocated for questions.

11:30 am - Examining soil legacy of Spotted knapweed; Matthew Coghill, Thompson Rivers University

Knapweed changes the chemical composition of the soil, it has a continuing effect on the ecosystem even after removal (AKA 'Legacy Effect'). Activated carbon is used as a soil amendment to extract the chemicals released by the knapweed.

11:35 am - The effect of time since burning on stem density of Dalmatian toadflax (*Linaria dalmatica*), Yellow toadflax (*L. vulgaris*), and Spotted knapweed (*Centaurea maculosa*); Gabrielle Hindley, Simon Fraser University

Study located in Kenna Cartwright Park, where fire suppression has occurred since late 1940's. Prescribed burning applied to the landscape after MPB outbreak.

11:40 am - Assessing the effectiveness of fisheries compensation habitats for the Port Mann Highway 1 Improvement Project; Stephanie Cavaghan, Triton Environmental

Proper soil conditions are key for the establishment of native plants. Invasive plant removal two times per year during the growing season has shown to be successful.

Support for seedlings and plantings is essential in order for the plants to reach an adequate height (supplemental planting and watering when needed). Plant near native vegetation when possible.

11:45 am - Drought and invasiveness on temperate grasslands in the Southern Interior of British Columbia; Janelle Paulson, Thompson Rivers University

There is concern that non-native species are tolerant to drought, which is likely to occur in grasslands. How does long-term drought impact native and non-native plants? Goal of project is to examine how extreme drought has on native vs. non-native plants, as well as assess the risk on invasive species.

11:50 am - Problematic persistence of common carp and innovative measures to eradicate from a pond environment; Darryl Arsenault, Golder Associates Ltd.

Carp were stocked into a pond to control the algae growth. Previously, rainbow trout were present. Electrofishing was used to tackle the larger fish, although thousands of small fish remained. Acetic acid was used to deprive the oxygen which then killed the remaining common carp.

11:55 am - Effects of the invasive plant, Spotted knapweed (*Centaurea maculosa*), on grassland arthropod communities and genomic barcoding solutions for ecosystem reclamation management; Jordann Foster, Thompson Rivers University

This research is investigating how insect functional groups are being impacted by spotted

knapweed (at varying densities along a gradient). DNA barcoding of specimens is being used to identify invertebrates. This can advance restoration efforts.

12:00 pm - Kootenay Boundary bullies: Protecting Northern leopard frogs through bullfrog eradication; Morgan Sternberg, Central Kootenay Invasive Species Society

There are only three known populations of Northern leopard frog in BC, and bullfrogs negatively impact them by disease transfer, competition, and direct predation.

Prevention (outreach and education), early detection (song meter, eDNA, eye shine and call play back) and rapid response (eradication = fyke netting, rifling, electro-frogging/modified electro fishing tool).

Song meter works well, although small window during mating season. eDNA renders ineffective due to length of time to conduct and analyze.

Electro-frogging and fyke netting is the most effective control method.

12:05 pm - Comparing conventional and alternative control of *Linaria genistifolia* ssp. *Dalmatica* in a semi-arid grassland of British Columbia's southern interior; Jacob Bradshaw, Thompson Rivers University

High reproductive potential and rate of spread. Manual removal of toadflax resulted in 79% to its control conditions. Broadcast spraying offers a good option for high density sites and spot spraying for low to med density sites. Manual removal is not recommended.

1:25 PM CONCURRENT SESSION 3 - MOUNTAIN ROOM: NEW APPROACHES TO INVASIVE SPECIES MANAGEMENT

1:25 pm - Potential for glyphosate resistance in Bohemian knotweed (*Fallopia x bohemica*); Matthew Strelau, Trinity Western University

AN overview of Knotweeds was provided.

Ecological and economic consequences of knotweeds include lowering property value and issues when Knotweeds enters ditches and streams.

Is Knotweed the perfect weed? It grows rapidly and becomes a large competitor in ecosystems

Currently in North America Japanese and Giant knotweed are hybridizing to produce Bohemian knotweed

- » Viable seeds produces aggressive long distance growth
- » Large genotype with a large variety of genetic variations
- » Main advantages of Bohemian Knotweed:
 - Growth

- Adaptation
- Selection

Research looked at resistant traits. The herbicide Glyphosate or "Round Up" is currently used in treatment. The research is exploring:

- » Will resistance or tolerance pop up in the species?
- » Are there any resistance traits in Bohemian Knotweed in BC?
- » Controlled glyphosate use: different amounts of active ingredients used is different within each municipality

Methods:

- » Seeds, seedlings and rhizome fragments were studied:
 - Polynomial trend line to find dosage and lethality of the plants.

Moving forwards, study dose response test: increase dosage and look at the response to produce log logistic curve

1:45 pm - Bacterial diversity and virus detection in the invasive Yellow crazy ant; Meghan Cooling, Victoria University of Wellington

Population collapses of invasive species were reviewed:

- » Often for unknown reasons
- » Example Giant African land snail
- » Characteristic pattern of explosion, maintenance and decline of populations
 - Bacterial invasion/ pathogen but evidence is seldom available
- » Introduced species often have increased risk of infection

Pathogens in Ants

- » Red important fire ant - Fungi, microsporidiosis, bacteria and viruses
- » Yellow Crazy ant
 - Native range unknown
 - Influences crab populations and subsequently forest floor character
 - Some healthy population decline and disappear for no obvious reason
 - Many discrete populations mean there is possibility for comparison between populations

Research aims:

- » Identify pathogens and mutualists infecting yellow ants

Viruses and bacteria in yellow crazy ants

- » Viruses interesting for biocontrol because they are highly specific
- » Bacteria also of interest because they can be mutualistic as well as pathogenic

Methods

- » High, medium, and low density populations were studied
- » Illumina sequencing on 5 queens from each site

Results for RNA sequencing

- » 95% eukaryotic, <5% from bacteria, 0.004% from viruses

Viruses in yellow ants

- » Designed primers for unidentified viral sequences and performed RT-PCR
- » Found all samples had potentially novel virus and black queen cell virus
- » Sometimes the viruses are in the gut, but Queens had gut dissected

Next step: find out if viruses are replicating and identify them.

Bacterial community

- » No significant difference in bacterial community structure
- » Larger sample sizes needed

Rhabdochlamydia only in High density sites

- » Also *Serratia marcescens*
- » And *Cardinium* (more abundant in low density sites)

Potential mutualists

- » *Enterococcus*
- » *Fructobacillus*
- » *Lactobacillus* (more prevalent in low and medium density)

Conclusion: Persistence of these groups of mutualists and pathogens still need to be confirmed, perhaps by PCR. No obvious patterns indicating different microbiological communities and correlations to declines.

2:05 pm - Anti-Pd activity: Can environmental microorganisms be used against *Pseudogymnoascus destructans*, the causative agent of white-nose syndrome? Naowarat Cheeptham, Thompson Rivers University

This research is looking at what can be done when we have fungal infections in bats and how do we manage and control this:

- » White nose syndrome caused by PD fungus has jumped the continent

- » There is a noticeable white fungal presence on the bodies of the bats

White-nose syndrome (WNS) overview:

- » Systematic infection
- » Produces mass mortality
- » Bats do not die because of fungal presence but instead their homeostasis becomes off balance; they wake up earlier and thus die because of lack of resources in Canadian winters.

Why is the fungus so successful as a pathogen in the bat populations?

- » The fungi grow at a low temperature, thus, caves and bats (15°C) present a great habitat for the fungi
- » Optimal fungi growth is 12-15°C

There have not been any devastating cases of WNS in native bats in Europe. Could there be an issue in the immune system of North American bats?

Treatment and Prevention of WNS:

- » Biological control agents
 - Natural products produced by microorganisms
 - Bacteria

Objectives:

- » Isolate bacteria and fungi from three different and unique environments and grow PD and see the reactions
- » Isolate and purify strains to test them against PD
- » Establish if isolates can be produced that can treat the bats

Testing is being carried out on captive bats first to see if the probiotic would work. Hopefully, this would allow for further funding and work on further methods.

2:25 pm - Round Table: What additional research is needed on this topic?

Attendees were asked to take five minutes to talk at their tables and document up to three topics of additional research recommended within this session's theme.

1:25 PM - CONCURRENT SESSION 4 - TERRACE ROOM: RISK ASSESSMENT OF INVASIVE SPECIES

1:25 pm - Assessing the risk of Pacific Fisheries Regulation Schedule VIII Species; Thomas Therriault, Fisheries and Oceans Canada, Pacific Biological Station

There are a number of aquatic taxa that are prohibited from live import into BC – this is outdated.

Screening process for ranking invasive species by the risks they pose is called CMIST. Higher risk species were found to be temperate freshwater fish. CMIST can be applied to temperate PFR Schedule VIII species to ID higher risk species that could be considered in future changes to prohibited species in regulation.

There's currently no risk threshold for CMIST and should be the main focus for future work. In the future, the researcher hopes to create a database of high risk species that would be accessible.

2:05 pm - *Phragmites australis* niches for other biota are similar on three continents; Erik Kiviat, Hudsonia

Common reed is considered to be an abundant species worldwide. Is used as a shelter for large herbivores (i.e. elephants), and food for domestic livestock (favourable forage), nesting birds, nesting bees and wasps, as well as leaf mining insects. Similarities exist between N. America, Europe and Africa in terms of roosting bird species, foraging for arthropods inside of the reed.

Hypothesis: A habitat function present on one continent would occur on the other continents.

The plant is extensive in the three continents observed/studied, and appear to function similarly in different world regions. Intercontinental approach is a great tool to use in terms of assessing risk of invasive species.

2:05 pm - Evaluating movement of marine infrastructure as a pathway of aquatic invasive species spread; Josephine Iacarella, Institute of Ocean Sciences, Ecosystem Sciences Division

Non-propelled structures (i.e., buoys, aquaculture gear, floating lodges and docks) are all vectors of invasive species spread

- » Shellfish gear is not as well-regulated as the finfish (which is highly managed)
- » Derelict vehicles are a concern, as they do get towed around (19 events identified) often through the Strait of Georgia
- » Docks are the most prominent issue off of the BC coast

Conduct dock surveys before and after transport to see how much plant material has been lost (% cover, composition).

Next step is community-wide before/after dock towing study.

2:25 pm - Round Table: What additional research is needed on this topic?

Attendees were asked to take five minutes to talk at their tables and document up to three topics of additional research recommended within this session's theme.

2:50 PM - CONCURRENT SESSION 5 - MOUNTAIN ROOM: NEW

APPROACHES TO INVASIVE SPECIES MANAGEMENT

2:50 pm - Suppression of invasive Northern pike in Box Canyon Reservoir of the Pend Oreille River in northeast Washington State, USA; Nick Bean, Kalispel Tribe of Indians

The pike have become introduced through illegal introductions into neighbouring waters. Increase angler exploitation, promote fishing contests that provide incentive for harvest, mechanical suppression is the biggest objective (intensive gill netting).

Gill netting is conducted in pre-spawning window (March-April to Early May). From 2012-2017 there have been 17,193 pike removed in total.

The majority of catches were in shallow water (<2m), sex ratio consistent throughout the project, no recruitment of young year classes therefore is a good tool to use. Relative abundance decreased by >98%

3:10 pm - Puncturevine (*Tribulus terrestris*) control in the South Okanagan; Ken Sapsford, BC Ministry of Agriculture

In Canada puncturevine only occurs in the Okanagan and Similkameen Valley, and is spreading upward in the Okanagan.

There is a biological control weevil available, although it cannot survive the winters in Canada. Currently multiple applications of glyphosate is used to treat Puncturevine in non-crop areas. Sandea, Chateau and Prism herbicides showed good levels of control, whereas Alion is a long-term residual product.

Applying 3 inches of mulch did a great job at controlling the puncturevine! After three years the mulch continues to be a good organic control method!

3:30 pm - Assessing benthic barriers vs. aggressive cutting as effective Yellow flag iris (*Iris pseudacorus*) Control Mechanisms; Catherine Tarasoff, Thompson Rivers University

Yellow flag iris is an 'ecosystem engineer'. Benthic barriers act as treatment for yellow flag iris because of the anoxic conditions. Yellow flag iris continues to respire when under stress rather than going dormant. Anaerobic respiration creates an accumulation of toxic substances. The aggressive cutting of plants is no different than no treatment.

Treatment best practices:

- » When covering the cut yellow flag iris, ensure that the mat has an overlap of 20cm to make sure that rhizomes do not escape.
- » Mainly use rocks to keep the mats down. We have switched to using pond liner rather than the conveyer belting, as the pond liner is easier to maneuver and install.

3:50 pm - Northern pike invasion and suppression in the Columbia River; Crystal Lawrence, Amec Foster Wheeler Environment & Infrastructure

History of legal and illegal pike introductions was reviewed.

The gill net suppression program was initiated in 2013 in Canada and 2015 in US. In Canada, 30-40% population removed during pre-spawning period.

Diet studies have shown that sport fish are targeted (rainbow fish, whitefish).

A study that is testing a control for Eurasian milfoil (applying fabric barrier) is also testing to see if pike habitat is reduced.

Next steps are to establish a transboundary Northern Pike committee, and to continue suppression efforts.

4:10 pm - Under the cover of rock snot: understanding the effects of Didymo algae in Yukon; Heather Milligan, Yukon Government Department of Environment

Didymo algae are historically rare and difficult to detect. They create dense algal blooms covering rocky stream bottoms. It first appeared in NA on Vancouver Island in the 1980s, and was thought to be spread by anglers (hence the ban on felt-soled waders). There is recent evidence that Didymo is native to North America, although there are indications that the species has invasive behaviour.

In 2011, a risk assessment was conducted on likelihood of survival in the Yukon and the consequences. Didymo was the highest risk species of aquatic organisms. It was detected in all major watersheds in the Yukon.

How are benthic invertebrates impacted by didymo?

- » Preliminary results: no change in species richness, the highest degree of didymo there was lowest richness of EPT. Shifted to higher abundance of small-bodied benthic invertebrates.
- » Prey switching may occur due to the changes in invertebrate communities.

Freezing is effective as a decontamination technique as the cells burst open.

4:30 pm - Round Table: What additional research is needed on this topic?

Attendees were asked to take five minutes to talk at their tables and document up to three topics of additional research recommended within this session's theme.

2:50 PM - CONCURRENT SESSION 6 - TERRACE ROOM: RISK ASSESSMENT OF INVASIVE SPECIES

2:50 pm - Modeling the risks and damages from a "potential" invasive

plant species: Yellow starthistle (*Centaurea solstitialis*); Sergey Tsynkevych, Simon Fraser University

This research is studying:

- » Impacts of Yellow star thistle impacts to BCs beef cattle industry
- » Optimal levels of cattle sticking, return differences with or without invasive (risk), how this impacts beef prices and tradeoffs.

Higher invasion, then ranchers will need to purchase more forage which will increase costs.

The model will:

- » Better inform policy makers where there is a need to establish targeted preventative programs.
- » Allow to integrate effects of climate change.

3:10 pm - Assessing the risk of marine invasive species in the Bering Sea; Amanda Droghini, Alaska Center for Conservation Science

The Bering Sea has an extensive continental shelf and is highly productive for fisheries. Few nonnative species exist and those that are there have been intentionally introduced. The Bering sea is a hub for arctic traffic (50% of arctic traffic)

Prevention and early detection are some of the best tools but need to know which species pose the greatest risk to the Bearing Sea.

- » Developed ranking system with 33 question across 4 themes and ranked 53 nonnative species using this tool.
- » Ranking 0-100 (100 is high potential of establishing in the bearing sea)
- » Species at the high end of ranking system include oysters, clams, barnacles and large crustaceans
- » Ranking system included impacts to fishery, human health, economics and ecosystem. Questions are weighted however ranking is same among all categories.
- » Developed habitat suitability maps

Of the 47 species they had data for/ 32 were able to currently exist in the bearing sea. High risk ports were identified: Dutch Port (suitable habitat), BC, and Washington (where species may be coming from). Next steps in modelling will include asymmetry in relation to depths.

3:30 pm - Predicting progressive ecosystem-wide impacts of invasive mussel establishment in a large lake; Patricia Woodruff, University of British Columbia

Patricia could not attend the event.

3:50 pm - How important is seed production in the spread of Japanese knotweed (*Fallopia japonica*)? Sharon Gillies, University of the Fraser Valley

Japanese knotweed is a very tolerant plant; native habitat is volcanoes (poor conditions).

- » Female Japanese knotweed can produce thousands of seeds- hybridizes with Giant knotweed and produces viable seed.
- » Most stands are a mix of Japanese and bohemian knotweed that produce pollen and have bees.
- » Seeds are about size of pepper grains (786 seeds per meter squared).

Seed production is important.

- » Every hybrid is a result of a germinating seed from a sterile female.
- » Site and year influence germination rates (amount of rain, temperature etc.) however every year, some level of seeds germinate.
- » Cold stratification increases germination rate (like cool winters)
- » Seeds germinate better below the parent plant because leaf litter from knotweed enhances germination rate.

Allelopathy noted:

- » Knotweed leaves delay germination of several other species.

4:10 pm - Introduced Yellow perch (*Perca flavescens*) in BC lakes: Feeding, movement and a possible control method; Carmen Tattersfield, Thompson Rivers University

Overview of Yellow perch:

- » Native east of Rocky Mountains.
- » Impacts to native fish species.
- » Diet generalists, predatory and omnivorous and adaptable

Seven lakes were studied between Kamloops and Kelowna.

Feeding ecology was studied (i.e. what are they eating)

- » Conducted diet analysis to see if they were generalist or choosing their prey.
 - Diet composition did vary significantly between lakes with 2/5 populations becoming specialists.

Studied movement by telemetry study in two lakes.

- » Calculated distance from shore.
- » Distance from shore increased with ice cover and moved closer to shore with ice

melt. Spawning began at 3.8 degrees Celsius (lowest temperature recorded in literature).

Control:

- » Developed artificial substrates to see if they could get trout to spawn on them and removed egg masses.

4:30 pm - Round Table: What additional research is needed on this topic?

Attendees were asked to take five minutes to talk at their tables and document up to three topics of additional research recommended within this session's theme.

4:45 PM – POSTER, NIBBLE AND NETWORK

Attendees viewed and discussed 17 different research posters in the Rotunda of the Campus Activity Centre. Appetizers and beverages were available and the evening concluded at 7 pm.

9:00 PM – NIGHT TIME FIELD TRIP

Observation and Mist Netting of Bats

This Field Trip was organized by Naowarat (Ann) Cheeptham of TRU, Cori Lausen of Wildlife Conservation Society Canada and Doug Burles.

Participants met at TRU and departed at 9:00 pm for a rural location approximately 20 minutes away. There were several barns located at the destination where two species of bats roost. Within 5-10 minutes of arriving the bats started to be observed.

An overview of the location, the bats and the process for mist netting, tracking and measuring the bats was provided by Cori Lausen and Doug Burles. It was explained that these efforts are being undertaken to establish a baseline of the bat populations before White Nose Syndrome (WNS) arrives and inevitably wipes out most of the populations. By researching characteristics of the surviving bats, efforts can be made to combat WNS.

Participants left the work in progress and returned to TRU at 11:30 pm.

DAY 2 – WEDNESDAY JUNE 21ST, 2017

9:00 am - Welcome & Blessing

Matthias Herborg, Co-Chair of the Invasive Species Research Conference Planning Committee, opened day two and introduced the second keynote speaker.

9:10 am – Keynote Speaker: Predicting Impact: A Challenge for Invasive Species Risk Assessment; Dr. Anthony Ricciardi, McGill University

Risk = probability of invasion x probability of impact. There's a tendency for the 'impact' component of risk assessment to be ignored. Indirect effects and synergy play a large role in

assessing risk, both of which are difficult to predict. They need to be well understood.

Impacts can vary from region to region, and can vary greatly over time and space. We can make better risk assessment predictions by looking at the impacts of invasive species elsewhere.

Management can be led by species context dependence. An example is the introduction of Mysis shrimp into Flathead Lake. The Kokanee population crashed once the shrimp was introduced, although in Kootenay Lake the Kokanee thrived due to the difference in lake qualities.

Invasive species that are currently believed to be high-risk species, often have a lack of data and have fewer publications. The more alien a species is to a community, the greater risk of negative impacts occurring. Insular islands are more vulnerable.

Largest impacts are caused by species where no similar species exist. The more invader species you have the more likely you are to have 'ecological surprises' or synergistic disruptions.

Discussion:

A lot of meta-analyses look at the mean effect size rather than state the context dependence. The error bars suggest context dependence. When you consider where error is, it can tell you the patterns that occur, despite the noise. We have to deal with uncertainty, and we have to express that to the public.

We used a lot of regression analysis, and the model will be continuously defined with increased in data. You can weight your data more accurately when you have an understanding of the variation in your data.

Predictive capability is difficult. Predictive models work well for species and evolutionary history. The basis of these models should be dynamic.

3) Predictive models are great with greater amounts of data but even small models will provide some insight.

9:55am - "Hot Topic" Presentation: Building DNA Reference Libraries to Enable the Development of eDNA Metabarcoding Tools for Invasive Species Detection; Cathryn Abbott; Fisheries and Oceans Canada

Complex sampling from communities are the start of the building of DNA reference libraries.

A short DNA sequence can link us to a particular species along a broad taxonomic range. DNA metabarcoding includes samples of mixed species, leading to bioinformatics. Species then get 'sorted' into species from the mixed sample.

Building DNA libraries requires background knowledge on the native species. A challenge is the large taxonomic breadth, may have multiple voucher specimens with varying degrees of genetic variation.

This process requires a tissue sample for genetic analysis, and a photograph for morphological features. Then, the genetic data collection and processing occurs.

10:40 AM - SESSION 7 - MOUNTAIN ROOM: MOLECULAR APPROACHES TO INVASION BIOLOGY

10:40 am - Development of an eDNA metabarcoding tool for detection of invasive freshwater fish in British Columbia lakes; Davon Callander, Fisheries and Oceans Canada

There are two pathways for eDNA detection:

4. Passive – identifies what species are present
5. Active – confirms presence of a specific species

eDNA detection offers early detection, increased speed with cost-efficient methods, hence the possibility of increased spatial scale of monitoring. eDNA is free floating in the water, and research on the degradation of the eDNA in the specific water body is important (i.e. seasonality and changes in lake chemistry and temperature).

Throughout the process, ensure that there are controls to help prevent the contamination of samples. In the sequence process, errors can occur in the forward and reverse part of the read, therefore creating an artificial reading or 'false hit'. Bioinformatic issues can also occur creating a false hit.

The development of a more complete eDNA reference library of freshwater Canadian fishes is in the works. This will provide the information necessary to distinguish between species.

11:00 am - Invasive rat colonization history and movement dynamics in Haida Gwaii; Bryson Sjodin; University of British Columbia Okanagan

Rats have been introduced to the islands and have caused declines in the seabird populations.

11:20 am - Identifying marine invasive species from environmental DNA: a tool to inform the management of shellfish aquaculture movements; Kristen Westfall; Fisheries and Oceans Canada

There are high risks associated with the transfer of cultured shellfish. Metabarcoding appears to be working well in the pilot experiments and provides excellent detection. Although, further validation is required.

When a sample is taken, zooplankton will likely be present as well. A species detected in one area could appear in another. If a species appears in the sample, further sampling could be taken to confirm presence.

11:40 am - Round Table: What additional research is needed on this topic?

Attendees were asked to take five minutes to talk at their tables and document up to three topics of additional research recommended within this session's theme.

1:00 PM – TERRACE ROOM - GUEST SPEAKER: RESEARCH PARTNERSHIP GRANT OPPORTUNITIES; PAM GIBERSON, NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL OF CANADA (NSERC)

The annual budget of 1.2 billion divided into:

- » People - scientists, engineers
- » Discovery - support fundamental research
- » Innovation - support research collaboration

Innovation Grants

- » Must have a partner that is doing something that is beneficial to Canada.
- » Not for profits can be partner if they are not solely support by other government funds, ability to absorb research through ongoing research mandate and ability to transmit research results to members.

How the process works

- » Company and researcher work in partnership and researcher applies to NSERC.
- » Money is provided by company and NSERC (not NSERC alone).

Engage Grant

- » Up to \$25k with in-kind contributions from company- any information coming from research becomes property of the company.
- » No application deadline and fast turnaround (4 weeks).
- » Engage Project examples:
 - Analysis of imported yeast to use at local brewery.
 - Mount Pauly and restoration of destroyed creek.

Engage Mitacs Combo

- » Simplified mechanism where both grants can be applied for at the same time. Allows for funding of a long-term project.

Engage Plus Grant

- » Project costs are shared between NSERC and company (NSERC matches company contributions up to \$12,500).
- » Example - work with KinderMorgan in developing a restoration plan

CRD Grant

- » \$80k Grant, multiple years
- » Focuses on the problem the organization is trying to solve.

- » NSERC matches cash and in-kind contributions
- » Longer turnaround time
- » Example- Bark Beetle Management technique (beetles).

Experience Grant

- » Helps companies cover the cost of co-op students.

Connect Grant

- » Supports networking events or travel for researchers
- » Targeted around research collaboration

Publication considerations: Data has to be publishable at some point. Time of release of published data is negotiable. Partner for this grant cannot be a government agency. They do not support secret research, and will be published at some point. The company cannot stop the researcher from conducting their research

1:25 PM – TERRACE ROOM – WORKSHOP: INVASIVE SPECIES RESEARCH PRIORITIES AND CONNECTIONS; JODI ROMYN, INVASIVE SPECIES COUNCIL OF BC (ISCBC)

Prior to and during the research conference, the ISCBC issued a research survey and handouts to gather information on current invasive species needs for BC. To continue on gathering this information, attendees were asked to provide direction on 3 of the 6 identified research themes. The first priority for each group was recorded at the front for discussion. The list of determined research priorities can be found in Appendix 3.

3:05 PM – CONCURRENT SESSION 8 - STUDENT UNION LECTURE HALL: TRACKING INVADERS: WHERE ARE THEY?

3:05 pm - Columbia River Invasive Northern pike - Exploring movements through physical and chemical means; Dan Doutaz, Thompson Rivers University

No summary available.

3:25 pm - White-nose syndrome in the west: updates and strategies; Cori Lausen, Wildlife Conservation Society Canada

No summary available.

3:05 PM – CONCURRENT SESSION 8 - TERRACE ROOM: FROM JUST TAKING UP SPACE TO AN INVASIVE MELTDOWN

3:05 pm - Shared experience of invasive grey squirrel management practice; Craig Shuttleworth; Bangor University (Wales)

Grey squirrels have significant impacts on the native red squirrel in Wales through virus transmission. Wales has 1 population of 1,000 red squirrels remaining in northern Wales, where grey squirrels are absent.

- » Plan to eradicate 10,000 grey squirrels over next 10 years although issues between politicians and practitioners on the ground.
- » Adenovirus in grey squirrel must be present to host squirrel pox - looking into antibody to kill the virus.
- » Need to screen animals during translocation for viruses.
- » Need baseline data in Canada on grey squirrel movement and ability to spread viruses. From there, you can do studies to test the impacts of invasive squirrels on native squirrels.

3:25 pm - Changes in age structure and diet of invasive centrarchid fish populations under management by electrofishing; Lungi Roberts; Trinity Western University

McMillan Lake has centrarchid fish and there is potential for them to spill over into a river that provides important spawning grounds for coho salmon.

This study featured:

- » Weighing female and male reproductive organs of bass and sunfish
 - Trends show decline in gonad mass
- » Collecting otoliths in bass and pumpkin seed and count otolith rings to age them

Overall findings: Bass changed feeding habits over years from eating sunfish to similar eating patterns of salmon

3:45 pm - Occasional and established introduced ants in Washington and Oregon; Laurel Hansen

Ants are a social insect and require a queen. On Hawaiian islands 44 species have been introduced in the last 100 years. Ants are introduced unintentionally through commerce

Many ants come from the tropics and because the climate is warming. Introduced ants are becoming more and more established.

After repeated reports of ants, the collection and identification of samples commenced over 2 years.

- » In Canada 332 samples sent in from 9 provinces for identification.
- » In BC only 4 ants identified were invasive/exotic.
- » 17,000 different species of ants were observed including:
 - Tramp ants - non aggressive queen, they have many nests, reproduce by budding and always moving around.

- Argentine ant - was told these were present in Washington and Oregon and has positive identified these in Seattle zoo (contained)
- Ghost ant - present in Portland zoo for 20 years. Probably won't survive outside of zoo.
- Odorous house ant - tramp ant that is native but is being moved around within the states.
- Velvety tree ant - 2 species in BC (wood destroying tramp ant) and Washington.
- Red Imported Fire Ant - from South America and small outbreak in Seattle (eradicated population). Has potential to extend up west coast through BC to Alaska.
- Little fire ant - stings and easily transported
- European red fire ant - found in Seattle, Vancouver and Vancouver Island. Likes very wet areas. Usually found on east coast of North America and now on the west coast. Have a vigorous bite.
- Impressica fire ant - present in Metro Vancouver and Southern Vancouver Island.
- Pavement ant - coming into pacific NW, including BC. Digs up piles of sand on pavement and stings. Present in Kamloops.

Notes: Education and outreach workshops are being conducted in Washington to identify (key out) ant species. There is a reliance on land managers to find ants and send them in for analysis and identification.

4:05 pm - Round Table: What additional research is needed on this topic?

Attendees were asked to take five minutes to talk at their tables and document up to three topics of additional research recommended within this session's theme.

4:10 pm - Day Two Closing Comments and Adjournment - Brian Heise, Invasive Species Council of BC

- » The Conference hashtag reached 318,430 Impressions with 293 posts on Twitter and Instagram
- » A prize was awarded to the Twitter hashtag contest winner: Columbia Shuswap Invasive Species Society (Robyn Hooper)
- » A debrief was given on the Winery tour
- » Thanks to sponsors and co-hosts
- » Brian commented that he had a great time and that this high energy conference with lots of great ideas. Also a lot of reference to keynote speaker Tony and Dan throughout the conference presentations.

» Conference was adjourned at 4:20 pm.

4:45 pm - Optional Social - Kamloops Wine Tasting Tour with AI Fresco Dinner

On the evening of June 21, Conference participants were offered an exclusive Winery Experience, with DiVine Tours of Kamloops, by executive coach, with the following itinerary:

At 4:45 pm the group departed TRU for Monte Creek Ranch Winery for wine tasting and tour. Our host provided an overview of the history of Monte Creek and the character on the wine bottle, who was a "nice" train robber who coined the phrase "Hands up".

At 6:30pm participants arrived at Harper's Trail Winery for wine tasting and Italian sun-set dinner on the patio - catered by Eats Amore. Attendees were free to sample the wines and then dine on the patio at leisure.

At 8:30pm participants were dropped off at TRU.

DAY 3 – THURSDAY JUNE 22ND, 2017

8:30 am - Optional Day Field Trip: Lac du Bois Grasslands Protected Area & Kenna Cartwright Park

Participants met by 8:30 am at TRU's Campus Activity Centre Entrance and departed by coach. This field trip was organized and facilitated by Catherine Tarasoff of TRU and AgroWest, Kirsten Wourms of City of Kamloops and Wendy Gardner of TRU.

Grasslands cover less than 1% of BC, house more than 30% of BC threatened or endangered species, and represent the most endangered ecosystem in Canada. Lac Du Bois is a provincially protected area approximately 16,000 ha located just north of Kamloops. This area encompasses three types of grasslands communities and incorporates a complex range use tenure system. Kenna Cartwright Park (KCP) is one of the largest (800 ha) urban parks in North America. A diverse history of utilization combined with high levels of visitor use make management of invasive species in this park a complex task. A variety of management tools have been utilized in KCP, many with dramatic effect.

On this field tour participants visited Lac Du Bois and discussed the grassland community types as well as water conservation and utilization issues. After 'setting the stage' in Lac Du Bois, the field trip headed to Kenna Cartwright Park to look at 'management in action'. These efforts include tree canopy thinning, biocontrol, goats, and fire.

Participants returned by 1 pm.