

# Addressing the North American and Pacific Rim Invasive Insect and Arthropod Species Challenge

## Overview:

Invasive species—arthropods in particular—pose global threats to agricultural production, trade and economic development, and ecological stability. Yet many people, including policy makers, the media, the general public, and even many scientists, remain unaware of the scope of the problem, the ways in which humans are assisting with their invasions, and the overall impact that the invaders have on our world. The issue is of critical importance but is rarely discussed beyond academic circles. Invasive species neither recognize nor respect geopolitical borders or agreements, and they affect everyone.



As a significant and growing problem recognized by scientists, non-government organizations, and governments alike, most countries have regulations to prevent the unintended introduction of nonindigenous organisms. The spread of plant pests is addressed on a global level by international treaties such as the International Plant Protection Convention and regional plant-protection standard-setting bodies such as the North American Plant Protection Organization (NAPPO). And yet, despite the collective efforts of many organizations, the problem continues. Causes for this rise in invasive species vary and include a changing climate as well as increases in global trade, travel, and transport. Funding and other resource challenges mean that current efforts to prevent the spread or respond to the incursion of potentially harmful invasive species within and between nations are stressed to the limit.

A significant and costly global challenge, invasive organisms are predominantly and inadvertently transported by humans. The impact of invasive species is felt particularly along shipping routes such as ports and the coastal region. The Pacific Rim and Great Lakes regions areas, with their many international ports and ever-increasing movement of goods and people, are prime examples of ports of entry for invasive species. Invaders may be plants, microbes, or animals (including arthropods), and their presence has threatened agriculture and food security, trade agreements, forest health, ecosystem services, environmental quality, public health, and recreation. Additionally, invasive species are a major threat to biodiversity—second only to habitat loss in impact. Approximately 42 percent of threatened or endangered species are at risk primarily due to invasive species.



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To address the critical threat posed by Invasive Insect (and other arthropod) Species (IIS), the Entomological Society of America (ESA), the Entomological Society of Canada (ESC), and the Entomological Society of British Columbia (ESBC) will host a summit to generate new thinking and explore ways in which members of the entomological community can work together and establish meaningful lines of communication as they work toward future solutions.

Mitigating the damage caused by IIS is a priority to the partnering societies and a core tenet of the Grand Challenges Agenda for Entomology (GCAFE) initiative, which seeks to foster meaningful and impactful contributions from entomology and entomologists toward solving three major issues[i]:

1. Vector-borne diseases and their impact on human health
2. Invasive insect species – global trade, biodiversity, bioscape, and climate change
3. Sustainable agriculture – global hunger, food security, and natural resources protection

The summit will take place on Saturday, 10 November 2018, immediately prior to Entomology 2018, the Joint Annual Meeting of ESA, ESC, and ESBC, which will run from 11 November to 14 November in Vancouver, BC, Canada. Satellite meetings of related societies with complementary missions will be encouraged to further the dialogue and impact of the summit and conference.

### **Statement of the Problem:**

The cost of predicting, preventing, and managing IIS is high and increasing.

Invasive species continue to spread at a high rate, with an enormous and increasing economic impact on food security, human health, and the environment worldwide. In the U.S. alone, IIS incur estimated control costs of more than \$2.5 billion per year and cause losses to crops, forests, structures, and urban landscapes totaling at least \$18 billion per year, estimates that do not include the impacts to natural systems or human health and well-being[ii]. These impacts are reflected similarly in Canada.

Prevention approaches to the IIS challenge are inadequate.

Despite national and international efforts to limit their introduction and spread, environmental and human factors are creating additional pathways for the introduction of potentially harmful IIS and opportunities for them to thrive in new habitats. Prevention, early detection, and rapid response (intervention) are the major regulatory approaches to limiting invasive arthropods but many of the current approaches do not account for the changing political, economic, and ecological landscape in which IIS move and establish. Furthermore, regulatory frameworks often focus on the risk to human-valued commodities such as crops and livestock, while risk assessments and regulation in relation to disease vectors, non-agricultural plants, and other groups of organisms and ecosystems are often not a priority.

As with many other international challenges, the responsibility is of a greater scope than any individual federal agency and requires extensive international cooperation and commitment. International agreements, such as the Agreement Concerning Cooperation in the Quarantine of Plants and Their Protection Against Pests and Diseases,[iii] establish targets to which most of the world's governments are bound. However, some governments are less equipped with the expertise and resources necessary to effect those agreements and meet the targets.

Development of management and restoration efforts requires continued investment.

Each new IIS requires a new management approach, and often new technologies need to be developed to monitor and manage the species. It is also essential to support and maintain systems to mitigate harm from IIS that become established. Ideally the community will be able to foster and develop resilient systems that can withstand their invasions. Foundational to these efforts is the research, development, and capacity-building necessary for evidence-based solutions, including Integrated Pest Management (IPM) programs and restoration efforts. Without sufficient funding, legislative defense barriers, and increased public awareness, the economic impact of invasive species will continue to grow. Only through truly coordinated efforts among university, private industry, non-government organizations, and all levels of government will we be able to stem the tide and prevent or manage invasive species.

### **Critical Issues:**

#### ***Collaboration***

One could argue that the world has never been more connected than it is today. While this level of

connectedness has surely contributed to the IIS problem, it can also be a part of the solution by fostering increased collaboration. The development of adaptive management partnerships involving federal, provincial, state, and municipal governments (including Invasive Species Councils) as well as research institutions, private industry, non-government organizations, and other stakeholders, including international organizations, is clearly necessary, but the question of how these become not only established but functional and authoritative needs to be explored.

Invaders freely cross borders, making it imperative that efforts to contain and control them are international efforts. The challenge is often convincing national leadership of the peril. Regulations in one nation can have a profound impact on control efforts in other parts of the world. We must work together to influence policies on a global scale to recognize the threat of IIS and fund the fight. New threats are difficult to detect and identify, and often the biology of the invader is poorly understood—particularly in the new environment. The community of entomologists must bind together to inform global leadership on the importance of the IIS challenge and to provide expertise to inform proposed actions.

The network of those involved in seeking solutions must be expanded. Invasive species threaten all of us: farmers whose crops are destroyed by invaders with no known control measures, office workers dealing with nuisance pest incursions, exporters losing money on shipments quarantined with pests, and pregnant women concerned about the health of their fetus due to insect-vectored diseases, such as the Zika virus—the list could go on and on. All of us are impacted by invasive insect species, and the burden of management must be shared broadly.

### ***Foster Innovation:***

Gaps exist in the tools and techniques needed to combat IIS. Invasion biology is just one such little-understood and significantly underfunded subject. We need to better understand invasion biology so that we can get better at predicting invasions before they occur. Risk assessment provides focus in preventing invasions but is neither a complete solution nor an infallible safety net. We need to increase our ability to detect early invasions through continued research to improve traps, lures, bar coding, and molecular tools, as well increased training of monitoring and border control staff. As new invasion pathways develop, the tools needed to mitigate the threat must evolve to keep pace with changes in technology.

### ***Sustained Funding:***

Sufficient and sustained funding is instrumental for the successful prevention, early detection, and rapid response programs for IIS. As national budgets on both sides of the Canada-U.S. border are constricting, increased pressures are placed on border control personnel to do more with fewer resources.

Increased funding for IIS research should be made available to allow better understanding of the biology of invasive insects and other arthropods and all steps of the invasion process, and it should include emphasis on systematics and identification (taxonomy), pathway management, ecology, evolution, risk assessment, pest management, and social science. Funding is also needed for research universities, non-government organizations, and those government agencies responsible for the prevention, detection, and rapid response to new incursions so that they will be able to effectively implement the new technologies. Investments should be targeted toward not only research and innovation but also human resources, to develop the next generation of experts and provide career paths for highly qualified personnel.

### ***The Questions:***

- What are some meaningful first steps to address gaps in current knowledge, regulation, infrastructure, and human-resources for management of IIS?
- How can society improve its ability to predict invasions before they occur?
- What can we do as entomological societies and interested partners to foster meaningful and impactful contributions from entomology and entomologists that can address the IIS Grand Challenge for North America and the Pacific Rim?
- What lessons can be learned from other invasions and the management tactics used to address them?

- What international agreements and actions need to be taken to address this global concern?
- How can we produce a citizenry who is informed of and responsive to the ISS challenge? What networks exist to educate the public and what more can be done?
- What must be done to stop the human-assisted movement of invasive species?

### **The Summit:**

The location of the summit in Vancouver, BC, underscores the importance of the port city in the IIS challenge. Vancouver is one of the busiest ports in the Americas and is among the top 30 busiest ports in the world. It is also connected to the world as a major hub for international flights to and from North America.

The purpose of this IIS summit will be to address these questions and others. Many groups are working on this challenge, including plant-protection organizations such as USDA APHIS, CFIA, AAFC, NRCan Canadian Forest Service, and the National Invasive Species Council (NISC)[iv]. Working with the partnering societies, NISC, federal and provincial (state) agencies, academic institutions, corporate leaders, and other stakeholders, the GCAFE coalition hopes to outline potential avenues for partnerships to raise awareness and seek solutions to the invasive species challenge.

The summit will include a mix of plenary sessions, breakout conversations, scientific posters, and other methods of scientific presentation, in addition to networking opportunities. Input from attendees will be sought to shape the agenda and outcomes. We seek to explore key aspects of the IIS crisis, learn what existing initiatives and funding organizations are already active in this area, and identify the best opportunities for the entomological community to make a meaningful and lasting contribution.

All entomological societies, related federal agencies, and corporate interests are encouraged to send a representative to the summit.

### **The Program Chairs:**

The Summit will be co-chaired by a representative from each of the three hosting Societies:



**Dr. Sandy M. Smith,**  
University of Toronto



**Dr. Tracy Hueppelsheuser,**  
British Columbia Plant  
Protection Advisory Council



**Dr. Frank G. Zalom,**  
University of  
California – Davis



[i] <https://entomologychallenges.org/initiatives/>

[ii] [http://www.entsoc.org/sites/default/files/files/EntSocAmerica\\_PolicyStatement\\_InvasiveSpecies.pdf](http://www.entsoc.org/sites/default/files/files/EntSocAmerica_PolicyStatement_InvasiveSpecies.pdf)

[iii] <http://sedac.ciesin.org/entri/texts/quarantine.of.plants.1959.html>

[iv] <https://www.doi.gov/sites/doi.gov/files/uploads/2016-2018-nisc-management-plan.pdf>