



**Presenter Abstracts and Biographies  
(In Alphabetical Order According to Authors Last Name)**

**Presenter: Jennifer Andreas**

***“Potential biocontrol options for flowering rush management”***

Jennifer Andreas, Washington State Biocontrol Specialist, Washington State University Extension; [jandreas@wsu.edu](mailto:jandreas@wsu.edu); [253.445.4657](tel:253.445.4657); 2606 W Pioneer Puyallup, Washington 98371

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**Abstract**

Flowering rush, *Butomus umbellatus* L., is an aggressive invasive plant that rapidly colonizes freshwater aquatic systems. It is becoming an increasing concern in many North American states and provinces and is poised to become a substantial problem in several major waterways, despite ongoing eradication efforts. Although appropriate chemical and mechanical control methods continue to be explored, they have thus far been relatively ineffective, creating concerns that the flowering rush populations will continue to expand and spread without restriction. In looking for possible alternative control methods, the Flowering Rush Biocontrol Consortium (FRBC) was formed and a biocontrol research and development program was initiated in 2013. Flowering rush is an excellent candidate for biocontrol because it is the sole genus and species within the family Butomaceae. This increases the probability of finding a host-specific biocontrol agent, and likely reduces the number of test plant species required for host-specificity testing. The FRBC consists of many state and provincial partners that have pooled resources to fund CABI Europe-Switzerland to conduct field surveys, host-specificity tests, and impact studies of potential biocontrol agents. Three potential biocontrol agents have been identified, including a rhizome- and leaf-mining weevil (*Bagous nodulosus*), stem/leaf-mining fly (*Phytoliriomyza ornata*), and white smut (*Doassansia niesslii*). Host-specificity tests have thus far indicated that *B. nodulosus* has a very narrow host range and final testing will likely to be completed in 2019. Additional field surveys and host-specificity testing will continue for *P. ornata* and *D. niesslii*.

**Speaker Bio**

Jennifer Andreas is an Associate Professor with Washington State University Extension and lead of the Integrated Weed Control Project (IWCP). Jennifer started working in biological weed

control in 1998 at Agriculture and Agri-Food Canada - Lethbridge Research Centre while completing her undergraduate degree at the University of Lethbridge. She continued with biocontrol research at CABI - Switzerland and then completed a Master's of Science in Entomology at the University of Idaho, where she investigated the environmental safety of the houndstongue root weevil. In 2005, she joined WSU and shifted her focus onto biocontrol implementation and education and is the primary biocontrol resource for Washington State. In addition to this work, Jennifer leads the Flowering Rush Biocontrol Consortium and conducts research for several weed-biocontrol systems. To learn more, please visit: [www.invasives.wsu.edu](http://www.invasives.wsu.edu).

**Presenter: Chuck Barger**

***“ABCs of Citizen Science and Data Sharing”***

Charles T. Barger, Director, Center for Invasive Species and Ecosystem Health, University of Georgia

Rachel L. Carroll, and Rebekah D. Wallace

Center for Invasive Species and Ecosystem Health, University of Georgia

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**Abstract**

Over the last few years, there have been a lot of discussions about invasive species data sharing, databases, and using citizen scientists to help document invasive species occurrences. In these discussions, many technical acronyms and terms are used, and one can quickly become lost in the weeds. This presentation will attempt to simplify this topic and explain what is important to land managers.

**Speaker Bio:**

Chuck has been with UGA for over 20 years where his work focuses on invasive species and information technology. Websites that he designed have received over 2 billion hits since 1999. Recently, Chuck has focused on mapping invasive species and tools for Early Detection and Rapid Response. He has led development of 76 smartphone applications including the first apps for the U.S. Forest Service and National Park Service. He was appointed to the National Invasive Species Advisory Council in 2013 and elected as Chair in 2018.

**Presentation 2**

Charles T. Barger, Director, Center for Invasive Species and Ecosystem Health, University of Georgia

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**Abstract**

The effectiveness of management actions often depends upon correct identification of biological factors—insects and diseases—and an understanding of the ecosystem in which they operate. Because these organisms can be small and inconspicuous, the availability of high-quality images aids greatly in their identification. However, ready access to quality correctly identified images of these organisms and their associated damage has long been a problem. Before digital photography, high-quality images of economically important organisms primarily existed as 35mm slides that were difficult to share. Bugwood was created to help alleviate this problem and began by scanning and databasing these slides in 1994. By the following year, the best of these images were released as photo CDs and distributed across North America. The archive of these images grew and in 2001, ForestryImages.org was released featuring 3,500 images. Users had full access to the entire archive and could download the images via the web for use in PowerPoint presentations and publications. The archive continues to grow and expand, with

new interfaces for different user groups including IPMImages.org, InsectImages.org, BarkBeetles.org and Invasive.org. It currently includes nearly 300,000 images, of those there are 98,492 images of insects covering 12,845 species. Bugwood expanded in 2006 when EDDMapS was released as a tool to map the distribution of invasive plants. EDDMapS currently maps all taxa of invasive species as well as their biological control agents across the US and Canada. This presentation will cover the 25 year history of Bugwood, where we are now, and our plans for the next 25 years.

**Speaker: Shawna L. Bautista**

***“Innovative Invasive Species Management in the US Forest Service”***

Invasive Plant Program Manager, Pacific Northwest Region, State & Private Forestry, USDA Forest Service

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**Abstract**

Invasive species management in the US Forest Service includes all taxa and all lands, with each of three branches of the Forest Service (National Forest System, State & Private Forestry, and Research & Development) responsible for different aspects of the issue. The Forest Service has perhaps the strongest and most comprehensive policy direction for invasive species management of any federal agency and this policy includes the activities of all three branches of the agency. Our Research & Development branch is the only part of the organization authorized to conduct actual research. Invasive species are one of the strategic program areas within R&D. The State and Private Forestry branch provides technical and financial assistance to landowners and resource managers to help sustain the nation’s forests. It is within this branch that we engage and support State, County, private, federal and tribal partners to address taxa that threaten the health of forest lands. The National Forest System branch is the one that manages the National Forests and the most well-known operation of the agency. Many invasive species prevention and control projects are implemented on and by the National Forests, in cooperation with, literally, thousands of partners.

Within each of these branches, the Forest Service is conducting and researching innovative ways to address the threats posed by invasive species. Some examples that will be discussed include use of unmanned aerial systems to distribute biocontrol agents and inventory invasive plants, the use of eDNA to inventory aquatic invasive species, studying herbicide impacts to rare plants, Adopt a Trailhead, Trail and other citizen science programs, use of Ecological Site Descriptions and State and Transition models to inform management decisions, and more than 70 consecutive years of aerial survey of forested land in the Pacific Northwest.

**Speaker Bio:**

Shawna Bautista is currently the Regional Pesticide Use and Invasive Plant Coordinator for the Pacific Northwest Region of the Forest Service in Portland, Oregon. She has been with the Forest Service for 29 years, starting as a Wildlife Biologist on the Angeles National Forest. It was on the Angeles NF that Shawna noticed the devastating effects of *Arundo donax* on endangered fish and bird habitat, and it sparked her passion for managing invasive plants. She received her B.S. in Wildlife Management from Humboldt State University and her M.S. in Zoology and Physiology from the University of Wyoming.

**Presenter: Jim Bean**

***“Plateau Herbicide for Invasive Weed Control: Do you really know how to use it?”***

Strategic Accounts Manager, BASF

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### **Abstract**

Plateau is a state of the art herbicide for a variety of invasive weed control programs, including Cheatgrass, Medusahead and Leafy Spurge. After almost 20 years of use there are still many misconceptions of how and when to use Plateau to achieve the best control. This presentation will discuss the mode of action of Plateau, the history of Plateau development and provide the best timing and use rates to achieve control of these difficult invasive weeds.

### **Speaker Bio**

Jim Bean is a graduate of West Virginia University with a B.S. in Forest Resources Management. For the last 39 years Jim has worked in vegetation management, including almost 10 years as a Transmission Forester for Appalachian Power Company and 29 years with BASF. Jim has held many positions with BASF including sales, sales management, and marketing. Jim currently lives in Cary, NC.

From 2004 to 2007, Jim worked with federal, state and local agencies and NGO's in the eastern U.S. to increase funding and to improve management of invasive weeds. Jim was a driving force behind the creation of CEIPSC - The Coalition for Eastern Invasive Plant Species Control

As Strategic Accounts Manager, Jim helps educate and serves customers in the Forestry, Rights of Way, Industrial Bareground, Roadside, Aquatics, Invasive Weed and Pasture / Rangeland markets across the U.S.

**Presenter: Belle Bergner**

***“NAISMA Weed Free Forage and Gravel Certification Program: Supporting Multi-jurisdictional Cooperation for Weed Free Regulations”***

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**Abstract**

Forage production and gravel pit properties can be large sources of weeds if they are not managed. To address this invasive species pathway, NAISMA has developed the only standards and training program for inspectors of producers of forage, mulch, and gravel pits in North America. Prevention of invasive species transport in forage, mulch, and gravel can be done quite effectively by training inspectors of production areas how to identify invasive species and follow specific standards of inspection. The WFFG standards provide a guideline to set minimum requirements for uniform participation of the various provinces and states in the program to ensure that forage, mulch, and gravel products are weed-free. The standards are designed to provide some assurance to multi-jurisdictional participants that forage certified through this program meets a minimum acceptable standard; to provide continuity between the various provinces and states in the program; and to limit the spread of federally listed noxious weeds through forage, mulch, and gravel. With currently 30 government partners in the US at the local and state-level and growing, this program is a model for how multi-jurisdictional cooperation can prevent the spread of invasive species.

**Speaker Bio**

Belle Bergner is the Executive Director of the North American Invasive Species Management Association based in Milwaukee, Wisconsin. NAISMA's programs include Weed Free Forage and Gravel Standards, PlayCleanGo, Mapping Standards, and Online Invasive Species Management Courses. Belle has 15 years of experience in nonprofit management and conference planning. Belle received her BA in Biological Sciences from Mount Holyoke College and her MS in Ecology and Evolution from the University of Pennsylvania with training in environmental management, law and policy. Her masters research focused on the impact of global warming on boreal forests. Prior to receiving her MS, Belle managed ecological research projects in Eastern forests and Midwestern prairie.

**Presenter: Robert Blair**

***“Drones for agriculture and invasive species use”***

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### **Abstract**

Are you interested in drones for agriculture and invasive species use? You will learn that and more in this dynamic and user point of view session. Robert Blair is respected worldwide on his views of precision agriculture and agriculture drone use brought to you from the field level. How can UAS make a difference? Listen to the ways he has incorporated UAS onto his farming operation and around the U.S. Robert will also talk about the challenges facing agriculture and commercial UAS use and adoption, culminating in specific examples that can be used for invasive species control and mitigation. This is a don't miss session from one of the longest practicing commercial UAS operators in the United States.

### **Speaker Bio**

Robert Blair is a consultant and a fourth generation farmer from Kendrick Idaho. The farm is situated on the edge of the rolling hills of the Palouse and not far from his Alma Mater the University of Idaho where he received his B.S. in Agriculture Business. His journey with precision agriculture started in 2003 using a PDA for simple mapping. That evolved into all different types of equipment, including Unmanned Air Systems (UAS) in 2006. Robert is the first U.S. farmer to own and use a UAS. His vision and advocacy of these technologies helped him become the Precision Ag Institute's 2009 International Farmer of the Year. Robert has been on the leading edge of the precision agriculture utilization and is recognized as a domestic and global leader. Robert received an Eisenhower Fellowship in 2011, taking him to South America for six weeks focusing on drones and precision agriculture. During the fall of 2012 he spent three weeks in Germany on a McCloy Fellowship for agriculture. In Idaho he was recognized as one of the most influential U of I College of Agriculture and Life Science (CALS) alumni, received the 2013 Governor's Award for Agriculture Technology and Innovation and was honored as a 2015 U of I CALS Distinguished Alumni. Robert's vision and leadership ability has been recognized by the positions he has held including president of the Idaho Grain Producers Association, chairman of the National Association of Wheat Growers (NAWG) Research & Tech Committee, chairman of the U.S. Wheat/NAWG Joint Biotech Committee, Idaho Farm Bureau Federation county president, an initial member of Idaho's UAS steering committee, an initial advisory board member of the Drone World Expo, and a member of the AGree Conservation and Crop Insurance Task Force.

**Presenter: Rachel Brooks**

***"Biological control of the invasive tree-of-heaven (*Ailanthus altissima*) and its progress towards registration"***

Plant Pathology Ph.D. Candidate in the School of Plant and Environmental Sciences at Virginia Tech

**Presenter: Paul Brusven**

***“The Nez Perce Tribe—Biocontrol Center Project Overview and Services Provided to Landowners/Mangers”***

Coordinator, Nez Perce Biocontrol Center  
Nez Perce Tribe

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**Abstract:**

Biological control of invasive weeds is a control option that has proven to be effective on the Nez Perce Reservation and throughout Idaho. Over the years, several releases of biological control agents have been made throughout the state and we are poised well to be recipients of some new agents once they are approved. This presentation will focus on the history and goals of the Nez Perce Biocontrol Center and will explain some of the invasive weed management challenges and strategies on the Nez Perce Reservation, in Idaho and beyond. Also you will learn how biological control of weeds is filling the needs for weed control on large landscapes. The agents currently being reared at the Center will be shown along with the new anticipated agents. Information will be shared on how the NPBC has increased its capacity to rear more biological control agents and its efforts to evaluate large landscapes for potential new releases. The talk will also show the results of continuous collaboration with all land managers in compiling agent release data annually to further agent/weed monitoring and conducting potential new research from past releases.

**Speaker Bio:**

Paul Brusven is a North Central Idaho native and is currently serving as the Nez Perce Tribe's Bio-control Center Coordinator. He works in Lapwai located in north-central Idaho on the Nez Perce Reservation where the Tribe's headquarters is located. For the past 29 years, Paul has worked for the Tribe and has been involved with many land management projects ranging from soil and water work to land use planning focusing on agriculture and pasture/rangelands management. For the past 15 years Paul focused his duties in coordinating efforts to rear and release approved bio-control agents that attack noxious and invasive weeds that persist across thousands of acres in Idaho and surrounding states. Paul received a Bachelor of Science degree from the College of Agriculture in 1990 from the University of Idaho. Paul maintains a personal balance by enjoying the great outdoors with his wife and managing their personal Christmas tree farm in Troy, Idaho.

**Presenter: Douglas A. Burkett, PhD**

***“Invasive Plant Management in the DOD”***

Environmental Biologist, Operations Division, Armed Forces Pest Management Board, Office of the Assistant Secretary of Defense (Energy, Installations and Environment) US Army Garrison Forest Glen, Silver Spring, MD

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**Abstract**

The U.S. Department of Defense (DoD) manages approximately 25 million acres of land across 525 installations, 344 of which have significant natural resources that require management through an Integrated Natural Resources Management Plan (INRMP). DoD's mission is to protect and defend our nation and its interests. Our installation natural resources and pest managers work to ensure that our soldiers, sailors, and airmen have the land, air, and water resources they need to conduct crucial testing, training, and operational activities. DoD requires high quality testing and training landscapes to conduct mission activities and must balance mission needs and environmental stewardship responsibilities through implementation of our primary land management driver, the Sikes Act. Non-native and other invasive species commonly impact the military's testing and training mission, force health protection, security, global movement of personnel and equipment, installation infrastructure, and natural resources. Presentation will provide a global overview of the most important invasive species impacting the Department of Defense.

**Speaker Bio**

Dr. Burkett is the Environmental Biologist at the Armed Forces Pest Management Board within the Office of the Assistant Secretary of Defense for Energy, Installations, and Environment in Washington DC. He is responsible for formulating policy guidelines and providing technical guidance for integrated pest management, invasive species, nuisance wildlife, and other biological / natural resources. In 2014, Dr. Burkett retired from 24 years on active duty in the Air Force as a medical entomologist. While on active duty, he served as the Chief of Conservation for the Air Force and worked various environmental issues on Air Force Ranges.

**Presenter: Justin Bush**

***“Urban Forest Pest Readiness: Increasing Preparedness to Introductions of New Invasive Insects and Building Connections between Municipalities, State, and Federal Agencies”***

Executive Coordinator, Washington Invasive Species Council  
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**Abstract**

With Farm Bill funding provided by U.S. Department of Agriculture Animal and Plant Health Inspection Service Plant Protection and Quarantine, the Washington Invasive Species Council recently completed a project to improve response readiness for detections of new urban forest pests in Washington State. A multiagency work group was developed for the purpose of creating a readiness plan focusing on building relationships and formalizing a network and response framework between cities and state and federal agencies. Beyond creating a typical response plan, the project team developed a Playbook-style system, in print with web-based features, of an assessment and checklist of prioritized actions that provides municipalities the information to self-assess readiness to new invasive pests, and shares actions to assist municipalities to become more prepared. Notably, municipalities that meet readiness standards receive a “forest pest ready” designation and join a network of other “forest pest ready” municipalities. Finally, the project included a readiness tabletop exercise in two stages that tested readiness and gaps to response. Justin Bush will share an overview of this project, the process and timeline, results and outcomes of the project as a template to be replicated in other jurisdictions.

**Speaker Bio:**

Mr. Bush was hired as the Executive Coordinator to the Washington Invasive Species Council in 2016. Mr. Bush has been working on invasive species issues since 2008 with federal, state, regional, and local organizations including King County, Skamania County, and the Lady Bird Johnson Wildflower Center at the University of Texas at Austin where he managed the Texasinvasives.org statewide partnership. During these years, he has been involved in various projects to prevent, detect, and control both aquatic and terrestrial invasive species and is passionate about reducing the threat they pose to the economy, native species and ecosystem services.

**Presentation 2**

***“Lake Roosevelt Enhanced Response Exercise: Taking Invasive Mussel Preparedness to New Heights and Building Connections between Tribes, State, and Federal Agencies”***

**Abstract**

With funding provided by U.S. Bureau of Reclamation, the Washington Invasive Species Council recently completed a rapid response exercise to improve readiness for detections of invasive mussels in Washington State at Lake Roosevelt National recreation Area. A

multiagency exercise planning was developed for the purpose of exercising and improving a readiness plan focusing on an operations-focused response exercise involving tribes, state and federal agencies using the Homeland Security Exercise and Evaluation Program (HSEEP) doctrine. While multiple discussion-based response exercises have occurred across the Western States, this project reached new levels of preparedness by focusing on field operations such as containment boom and curtain deployment, closures of boat launches, and rapid inspection and decontamination station deployment. Justin Bush will share an overview of this project, the process and timeline, results and outcomes of the project as a template to be replicated in other jurisdictions.

**Presenter: LaDonna Carlisle**

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Natural Resources Specialist

USDI Bureau of Indian Affairs

Hopi Agency, Kearns Canyon, AZ

**Presenter: James H. Castle**

***“Invasive Herpetofauna”***

Wildlife Biologist, U.S. Army Corps of Engineers, Walla Walla District Burbank, WA

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**Presentation 1**

**Abstract**

***“Invasive Herpetofauna”***

The Department of Defense Partners in Amphibian and Reptile Conservation (DoD PARC) network maintains a list of invasive and native transported herpetofauna (amphibians and reptiles) on its lands. The accidental or purposeful introduction of invasive species both on and off DoD lands creates interesting challenges for natural resources management. Resource managers need to understand if invasive species compete for food with native wildlife, become predators or prey of other species, displace other animals or have no ecosystem affect at all. I will provide several examples of different invasive herpetofauna species that demonstrate these scenarios. There have been a number of cases where introduced herpetofauna have had devastating ecological impacts, especially on islands. The take home message is that the introduction of a non-native species, whether accidental or purposeful by good intentions, may have lasting and significant consequences that may never be reversed or mitigated.

**Presentation 2**

**Abstract**

***“Organic Methods for Invasive Species Management”***

The concept of Integrated Invasive Species Management offers a variety of tools and methods that any one single method lacks. A single use method, for example chemical control, has been widely used for decades despite evidence of plant resistance and indirect detrimental effects to wildlife. Chemical (inorganic) methods combined with other organic methods (mechanical, organic chemical, competitive exclusion principle, and others) provide the Best Management Practices to solve future issues in invasive species management. Examples of these integrated methods will be presented for discussion.

**Speaker Bio**

Prior to joining the U.S. Army Corps of Engineers, Mr. Castle spent the past 25 years managing natural resources for several environmental consulting firms and working a number of positions with the federal government. Mr. Castle spent 6 years on active duty with the U.S Army Corps of Engineers as a construction and reconnaissance diver conducting projects and dives the world over. After the Army Mr. Castle remained in diving conducting research dives and later earned a B.Sc. degree from Humboldt State University in Integrated Biology and a M.Sc. Degree from Sonoma State University in Avian Behavioral Ecology and Conservation Biology. Mr. Castle is currently the Project Wildlife Biologist at the Tri-Rivers Natural Resource Office, Walla Walla District and Manages Habitat in 31 Habitat Management Units along 120 miles of the Lower Snake and mid- Columbia Rivers in eastern Washington State.

**Presenter: Bryce Christiaens**

***“Utilizing Science Advisory Panels to Inform Invasive Species Management Decisions”***

Chair, Montana Invasive Species Council

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### **Abstract**

The Montana Invasive Species Council (MISC) was created to identify priority invasive species issues and make recommendations to improve prevention and management to Montana’s Governor, legislature and resource management agencies. In 2017, the Montana Legislature passed legislation directing the Montana Invasive Species Council to identify, coordinate, and maintain independent science advisory panels that “inform Montana's efforts based on the current status, trends, and emerging technology as they relate to invasive species management in Montana.” In the two years since, MISC has conducted two science advisory panels. The first was to evaluate the use of environmental DNA (eDNA) for dreissenid mussel early detection and provide input and guidance to managers regarding its use. The second was to evaluate the feasibility of gaining approval to release *Mogulones crucifer* for biocontrol of houndstongue in the U.S. This presentation will focus on the process developed by MISC to conduct Science Advisory Panels, how topics were chosen and the results of each panel to date.

### **Speaker Bio**

Bryce has been working on invasive species issues for 19 years, beginning as a research technician for the University of Montana’s Conservation Lands Program. He has been the weed district manager for the Missoula County Weed District since 2011, and currently serves as the Chair for the Montana Invasive Species Council.

**Presenter: Shannon Clark**

***“Indaziflam effects on nontargets”***

Postdoctoral Researcher, Colorado State University

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### **Abstract**

Invasive winter annual grasses pose a major threat to native ecosystems by increasing fire frequency, degrading available wildlife and pollinator habitat, and decreasing native species diversity. Indaziflam is a newer herbicide option for pre-emergent control of winter annual grasses on rangeland and natural areas. Indaziflam has a mechanism of action not previously used in non-crop weed management, thus, there is limited information about the impacts of this active ingredient on native species when applied alone or in combination with other non-crop herbicides. The objective of this research was to evaluate native species tolerance to indaziflam and imazapic applied alone and with broadleaf herbicides. Replicated field plots were established at two locations in Colorado with moderate downy brome (*Bromus tectorum* L.) infestations co-occurring with a diverse mix of native forbs, shrubs and grasses. Species richness and abundance of the non-treated control plots were compared to plots where indaziflam and imazapic were applied alone and in combination with picloram and aminocyclopyrachlor. Species richness and abundance did not decrease when indaziflam or imazapic were applied alone; however, species abundance was reduced by treatments containing picloram and aminocyclopyrachlor. Species richness was only impacted at one site 1 year after treatment (YAT) by the broadleaf herbicide picloram. Decreases in abundance were mainly due to reductions in forbs that resulted in a corresponding increase in grass cover. Treatments including indaziflam were the only treatments which continued to provide downy brome control 2 YAT. Our data suggest that indaziflam will control downy brome for multiple years without reduction in perennial species richness or abundance. On sites with a remnant native plant community, the multi-year weed control provided by indaziflam may allow enough time to achieve native species recovery. If winter annual grasses are present with broadleaf weeds requiring the addition of herbicides like picloram or aminocyclopyrachlor, forb abundance could be reduced, and in some cases there could be a temporary reduction in native species richness.

### **Speaker Bio**

Shannon Clark is a postdoctoral researcher at Colorado State University working in Dr. Scott Nissen's lab. She completed her PhD at Colorado State University in Spring 2019. Her research focuses on evaluating herbicides for rangeland restoration, including invasive species management and impacts to nontarget species.

**Presenters: Alison Cohan and Caleb Wittenmyer**

***“Forward Looking InfrRed (FLIR)-enabled UAV use for detecting ungulates and guiding on-the-ground hunts in The Nature Conservancy’s Maui Nui forest program”***

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### **Abstract**

As UAV technology continues to grow and improve, the ability of resource managers to utilize this technology for various management activities radically improves. The Nature Conservancy has been using UAV technology for several years focusing on mapping and monitoring vegetation. The Conservancy has also utilized thermal imaging technology to identify ungulate presence via helicopters. Both technologies, used for very different applications, have proven extremely useful in helping guide management decisions. The landscape of *hunting* and technology is changing with the advent of *UAV’s and thermal cameras*. Now that these two technologies can be combined, UAV’s are being used by TNC’s Maui Nui Forest Program to effectively aid in ungulate control activities. UAV’s paired with a thermal imaging camera can now be used to spot game, plan hunting strategies, and assist hunting efforts in real time.

### **Speaker Bio**

Alison Cohan is the Director for The Nature Conservancy of Hawaii's Maui Nui Forest Program. She has a Master of Applied Science degree in Environmental Policy and Management from the University of Denver with a focus on Natural Resource Management, and a Bachelor's degree in Animal Behavior from Southwestern University. Alison's Master's thesis focused on climate change adaptation of East Maui's montane wet forests. Alison has been involved in conservation activities on Maui for almost 20 years, working for the preservation and conservation of both marine and terrestrial ecosystems. She is currently focused threat abatement across 100,000 acres on East Maui and 50,000 acres on West Maui, leveraging resources through Watershed Partnerships and other strategic collaborations. Originally from Texas but drawn to the ocean at an early age, Alison is happy in nature whether 100' below the surface or 10,000' above.

**Presenters: Sara Cowell and Susan Roe**

***“Canada’s Aquatic Invasive Species Regulations – Protect freshwater and marine ecosystems from the introduction or spread of Aquatic Invasive Species”***

### **Authors**

Sara Cowell

National Aquatic Invasive Species Advisor

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Susan Roe

National Aquatic Invasive Species Manager

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### **Abstract**

Aquatic Invasive Species (AIS) pose a serious threat to fish, fish habitat, use of said resources (i.e. fisheries, aquaculture, and recreational industries), and species at risk across Canada. Preventing AIS from establishing in Canada can lower the costs associated with control and management; prevent reduced fishing yields; support tourism and related activities; prevent the spread of diseases; protect biodiversity; safeguard intrinsic ecosystems values and functions; and prevent further national and international introduction and spread. The Government of Canada takes the issue of AIS very seriously and is committed to preventing the introduction and spread of AIS in Canadian waters through the implementation of the *Aquatic Invasive Species Regulations*. The *AIS Regulations* came into force in 2015 under the federal *Fisheries Act* to enable federal action and partnerships with provincial and territorial governments through a suite of regulatory tools. The *AIS Regulations* are a foundation to which new species can be added, prohibitions can be tailored, and enforcement powers can be used where there is risk and capacity. In order for the *AIS Regulations* to be effective, nationally consistent understanding and uptake are required. NAISMA provides an opportunity to further promote the regulations to a wider and potentially international audience. This will be conveyed by providing an overview of the regulations and their main elements (i.e. prohibitions, lists of prohibited and controlled species, exemptions, ministerial measures and directions, and compliance and enforcement); identifying who should be familiar with them and what they need to know to be compliant and protect Canadian and subsequently international freshwater and marine ecosystems from the threats of AIS.

### **Speaker Bio**

Sara Cowell is a National Aquatic Invasive Species Advisor for the Government of Canada’s Department of Fisheries and Oceans Canada. She works within the Aquatic Invasive Species National Core Program that implements the *Aquatic Invasive Species Regulations*.

**Presenter: David R. Coyle**

***“What have we done? The curious case of the callery pear”***

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**Abstract:** The Bradford pear, once the golden child of the horticultural industry, is rapidly becoming one of the worst invasive species in the eastern U.S. This tree has been planted in countless neighborhoods and yards across the region. Promoted as sterile, clearly – under certain conditions – it is not. As a result, wild callery pears have invaded old fields, roadsides, abandoned lots, and forests throughout the East. I will discuss the history of the Bradford and callery pear, why this plant is causing problems, and strategies we can take to combat the spread of this invasive plant.

**Speaker Bio:** Dr. David Coyle is an Assistant Professor in the Department of Forestry and Environmental Conservation at Clemson University. His Extension Forestry program focuses on forest health and invasive species management in forest types across the Southeast. Prior to Clemson, Dave ran the Southern Regional Extension Forestry – Forest Health and Invasive Species program, which provided hands-on training, electronic resources, and other services pertaining to management of native and invasive forest insects, plants, and diseases to forestry professionals throughout the southeastern U.S. Dave grew up on a farm in Harmony, MN and completed his B.A. in Biology at Luther College. He then moved to Ames where he finished his M.S. in Entomology and Forestry at Iowa State University, followed by a move to South Carolina where he worked as a technician for the USDA Forest Service – Southern Research Station Center for Bottomland Hardwoods Research. He completed his PhD in Entomology at the University of Wisconsin and a postdoc at the University of Georgia’s Warnell School of Forestry and Natural Resources. At UGA, Dave spent several years working on various forest health issues in the Southeast, covering both hardwood and conifer systems. Dave has extensive experience with southern forest pests, silviculture, management, and woody biomass systems. He serves on the Board of Directors and is President of the North American Invasive Species Management Association, is on the Advisory Committee for the Southern IPM Center, and is Co-Director for the ProForest group at the University of Florida. You can find Dave’s forest health outreach work at <http://southernforesthealth.net/>, or find him on Facebook (<https://www.facebook.com/southernforesthealth/>), Twitter (@drdavecoyle), or Instagram (drdavecoyle) where he regularly posts about invasive forest pests, silviculture, and forestry in general.

**Presenter: John Paul Culligan**

***“Herbicide Product Review – “New” Products Available for Invasive Weed Managers & Industry Update”***

VM/Aquatics Territory Manager

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### **Abstract**

Will begin with a condensed evolution of herbicide use to more concentrated formulations (reduction of active ingredients being applied/from gallons to ounces), improving product safety, moving away from petroleum based ingredients & the direction towards more selective products. Will cover the difference between Branded products compared to generic alternatives. Will provide a brief Industry update regarding product manufacturers.

A review of herbicide products that Invasive Weed Vegetation Managers may not be aware of. There have been several recent product additions that are now available to reduce herbicide resistance/tolerance of target invasive weeds while improving worker safety & promoting environmental stewardship. Will also cover improved product formulations of older chemistries & detail certain adjuvants which can enhance product performance.

Will also briefly discuss the recent CA court ruling that implies glyphosate causes cancer. Will provide some supporting information which counters the current negative press that lists glyphosate as a “probable” carcinogen.

The intent of the presentation is to generate discussions to consider utilization of the highlighted products over the traditional use of glyphosate & triclopyr.

### **Speaker Bio**

Graduated from Virginia Tech in 1994 with B.S. degree in Forest Resources Management.

Have 24 years of experience working directly with Herbicides & providing vegetation management solutions in a wide variety of markets.

1995 – 2004 (Forestry; Invasive Weed Mgmt)

2004 – present (Industrial Vegetation Mgmt, Aquatics, Invasive Weed Mgmt)

Throughout career, have provided Applicator training for various state recertification needs & licensing requirements. Throughout career, have spoken at numerous trade association events & participated in panel discussions to further educate end users & general public regarding appropriate herbicide use. Past Board of Directors member for North Carolina Vegetation Management Association (2 terms); current Board of Directors member & secretary for Mountain Lake Vegetation Management Council (4 terms).

**Presenter: Afure Joan Ejomah (Ms)**

***“Beloved and despised: current status of *Chromolaena odorata* in Nigeria”***

Afure Joan Ejomah (Ms), Osariyekemwen Uyi (Dr.)

University of Benin, Benin City, Nigeria.

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### **Abstract**

Despite increasing calls to reinstate the biological control programme against *Chromolaena odorata* (L.) in Nigeria and other African countries, the status of the plant as a “conflict species” (positive versus negative impacts) remains the subject of ongoing debate. Understanding the effects of *C. odorata* on agriculture, biodiversity, livelihoods and human well-being, is essential for developing management strategies and guiding policy formulation. Here, we review the existing but scattered literature on the positive and negative impacts of *C. odorata* in Nigeria since its introduction in the late 1930s. Information was synthesized from a total of 196 published journal articles collected from different database platforms using keyword searches. More than half (68.4%) of the total number of publications reported the positive impacts of *C. odorata*, while 31.6% reported negative impacts of the plant. Following its introduction and spread, locals and scientists regarded *C. odorata* as a weed until 2003, when there was an explosion in the reporting of the plant benefits, a situation that remains evident to date. Key benefits or services documented included; its use in ethno-medicine, as livestock feed and processing for use as a pesticide. The phytoremediation and pharmacological properties were documented, as were its use as a fallow species and soil fertility improvement plant in the slash and burn rotation system of agriculture. However, *C. odorata* has also been reported as an invasive weed that threatens agriculture, forestry, livelihoods and is toxic to animals when ingested. Despite the fact that *C. odorata* is despised by some scientists and locals, the significant increase, and burgeoning plethora of publications on the usefulness of the plant suggest that management efforts need to safeguard the many benefits while mitigating negative impacts. In conclusion, we discuss the future of *C. odorata* biocontrol and highlight future research on the socio-ecological impacts of the plant.

Key words: Asteraceae, Eupatorieae, invasive alien plant, positive impacts, negative impacts, West Africa

### **Speaker Bio**

Afure Joan Ejomah is a young academic, researcher and scientist with a Bachelor of Science (B.Sc. Hons) degree in Animal and Environmental Biology (Applied Entomology). She is currently a postgraduate student at the Department of Animal and Environmental Biology University of Benin, Benin City. Her research interests focuses on the ecology and management of invasive alien species using specialist herbivores as biological control agents. She is also interested in

insect toxicity and how pesticides affect the behavior of insects. She has co-authored several papers and have attended and communicated her research findings at prestigious conferences.

**Presenter: Bridgette Flanders**

***“Invasive Plant Management: Increasing the Likelihood of Success on National Wildlife Refuges”***

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**Abstract**

In 2015, integrated pest management coordinators, invasive species strike team coordinators, and other invasive species experts (referred to as the NWRS Invasive Species Working Group) began a coordinated effort to help the field increase their likelihood of success, beginning with invasive plants. The group tackled three main questions: 1. What does a successful approach to invasive plant management look like? 2. What are common barriers to successful invasive plant management? 3. How can we improve field support for successful invasive plant management? To help tackle these questions, the Working Group described a step-wise invasive plant management process that incorporates the concepts of adaptive management, invasion ecology, and integrated pest management, now known as the NWRS' Strategic and Adaptive Invasive Plant Management Model. We identified common barriers to practicing this approach and then used this information to focus our work on developing tools and resources to help the field. The Team has drafted an Invasive Plant Inventory and Early Detection Guide, helped prepare a Guide to Developing an Invasive Plant Management Plan, created an Invasive Plant Inventory and Early Detection Prioritization Tool, and developed methodology for conducting Invasive Plant Prioritization Workshops. Here, we highlight the Model and describe how this national team develops tools and resources nationally and implements locally for customized support of individual National Wildlife Refuges.

**Speaker Bio**

Bridgette is the Regional Refuge Biologist for the National Wildlife Refuge (NWR) System in the USFWS' Pacific Region, which consists of OR, WA, ID, HI, and Pacific Islands. She has served as the Region's Integrated Pest Management Coordinator and Invasive Species Coordinator for the past 8 years. Previously, Bridgette spent 11 years working as a wildlife biologist on three National Wildlife Refuges and two Wetland Management Districts. She has a B.S. in Zoology from North Dakota State University and an M.S. in Wildlife Biology from Colorado State University.

**Presenter: John F. Gaskin**

***“Using genetics for invasive weed management”***

Botanist, USDA ARS Sidney, MT, [john.gaskin@ars.usda.gov](mailto:john.gaskin@ars.usda.gov) , 406.489.1384

**Abstract**

Invasive weed control, especially using biological control, often requires a thorough knowledge of invasive species identity, genetic population structure, systematic relationships, and how the invasive reproduces. These topics are often best answered by analyzing plant DNA. Here we discuss how genetic tools are used on plant invasions and give some examples of current genetic studies of invasive weeds, and how these studies can improve control methods.

**Speaker Bio**

I received a PhD in Evolution and Population Biology from Washington University in St. Louis. I currently manage a USDA Agricultural Research Service lab in Sidney, Montana. For the last 15 years the focus of my research has been the population genetics and molecular systematics of invasive plants. Specific goals of this research are to find out which genotypes of exotic plants are invading, where these plants originated from, which native and exotic species they are most closely related to, and where the invasive genotypes are distributed in North America. I also have a strong interest in hybridization and invasion, and how novel hybrids can influence invasion and resistance to biological control agents. Invasive taxa of interest include saltcedar, rush skeletonweed, hawkweeds, pepperweeds, common mullein, flowering rush, field bindweed, Russian olive and teasel.

**Presenter: Gregg Goodman**

***“Overview of the Technical Advisory Group for Biological Control Agents of Weeds (TAG-BCAW)”***

Senior Agriculturalist

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**Abstract**

I serve as the Executive Secretary for the Technical Advisory Group for Biological Control Agents of Weeds (TAG-BCAW). I plan to present an overview of this group including the mission; participating agencies; petition and test plant list submission procedures and processes; annual meetings, and current petitions in the regulatory pipeline. I also plan to present information on PPQ's structure and policies regarding biological weed control organisms and provide an overview of PPQ's approval and permitting processes.

**Speaker Bio**

Throughout his U.S. Federal career, Gregg has worked for the U.S. Dept. of Agriculture's Agricultural Research Service and Animal and Plant Health Inspection Service (APHIS), as well as the National Institutes of Health, and the Navy. He worked for a small biotechnology company for 5 years prior to his Federal service. He joined APHIS's Biotechnology Regulatory Services as a Biological Scientist Compliance Officer. He then joined APHIS's Plant Protection and Quarantine as an Export Specialist in 2006 and after worked on the Quarantine Policy Analysis and Support staff where he worked on quality management initiatives and later served as the National Postentry Quarantine Coordinator and the Senior National Seed Health System Accreditation Manager. He has been with the Pests, Pathogens, and Biocontrol Permits and Containment, Soil, and Federal Noxious Weeds Permits Branches since 2012. His responsibilities include making determinations for various plant pathogens and pests including weed and microbial biocontrol organisms, arthropods, mollusks, soil, foreign noxious weeds, earthworms, and plant growth enhancer/ soil amendment products. He also serves as the Executive Secretary for the interagency Technical Advisory Group for Biological Control Agents of Weeds. Gregg has a B.S. in Biological Sciences from the University of MD and a M.S. in Biotechnology from the Johns Hopkins University. He also holds a CPL from the Brookings Institution.

**Presenter: Gino Graziano**

***“Choking out the chokecherry: effective basal bark treatments of *Prunus padus*, an invasive and toxic plant invading the Boreal forests of Alaska”***

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### **Abstract**

Documented *Prunus padus* invasions in the boreal forest of Alaska are increasing annually, and are no longer isolated to Anchorage and Fairbanks. To control these infestations invasive plant managers need effective treatments that minimize impacts to surrounding vegetation. Off target impacts on vegetation in the root zone of invasive plants that were treated with herbicides applied with either cut stump, frill, or basal bark treatments are occasionally suspected. These treatments are often applied in order to reduce off target impacts. Little attention has been given to the potential for an herbicide to be released from the target plant into the environment. Our hypotheses are that directly applied herbicides could be released to the soil through decomposition of treated plant material, transfer through root to root contact, or leakage from roots. We conducted a study to determine if basal bark treatments of *Prunus padus* with aminopyralid results in off target impacts to sensitive species due to leakage from roots of treated trees. We previously reported results from laboratory trials that indicated aminopyralid residues were present in soils after basal bark treatments. These laboratory trials were coupled with field trials using 1X label rates of aminopyralid, triclopyr, and the combination of aminopyralid and triclopyr. We will present evaluations of efficacy of the field basal bark treatments, and observed non-target impacts which were present on some but not all treatments containing aminopyralid.

### **Speaker Bio**

Gino works on various invasive plant research and education topics in Alaska for the Cooperative Extension Service. He has worked on invasive plant issues in Alaska since 2006 for various agencies. Presently he is working towards completion of a PhD studying herbicide fate with a focus on both northern climates and non-target impacts.

**Presenter: Jarvis Gust**

USDI Bureau of Indian Affairs  
Rocky Mountain Regional Office  
Billings, MT

**Speaker: Dickie Hall**

***“SGHT Habitat Restoration Project - The World's Largest Rodent Eradication”***

Project Director

SGHT Habitat Restoration Project

South Georgia Heritage Trust

**Abstract for Presentation 1**

**SGHT Habitat Restoration Project - The World's Largest Rodent Eradication.**

In 2018, the South Georgia Heritage Trust (SGHT) declared the Sub-Antarctic island of South Georgia rodent free for the first time in over 200 years. A globally important nesting site for seabirds, South Georgia also has two endemic bird species which were being pushed towards extinction by the rodent invaders. SGHT, a tiny charity from Scotland, undertook the world's largest rodent eradication to date using helicopters to spread poison bait across this remote island. In a race against the retreat of glaciers which divide the island, SGHT's baiting was completed in three phases between 2011 and 2015. In 2018 an island-wide survey proved South Georgia to be free of rats and mice. Thanks to this mammoth undertaking, the island is now returning to its natural state. Dickie Hall, formerly SGHT's Habitat Restoration Project Director, will speak about the eradication and the challenges encountered.

**Abstract for Presentation 2**

**RSPB Gough Island Restoration Programme – Saving the Tristan Albatross.**

Gough, a tiny mid-Atlantic island is home to 99% of the global population of the critically endangered Tristan Albatross. These magnificent seabirds are being eaten alive by introduced mice. Many other seabirds rely on Gough as a key breeding island and it is home to the endemic Gough Moorhen and Gough Bunting. Mouse predation is causing the loss of well over 2 million seabird eggs and chicks every year. In 2020, the Royal Society for the Protection of Birds (RSPB) will undertake an areal baiting operation to eradicate invasive mice from Gough Island. This will be concurrent with a captive holding aviculture project to safeguard the endemic moorhen and bunting species. Dickie Hall, RSPB's Gough Island Restoration Programme (GIRP) Operational Logistics Manager, will speak about plans for the upcoming eradication work and the challenges encountered in undertaking a combined eradication and aviculture project on one of the planets most isolated islands.

**Speaker Bio:**

Originally from Manchester, Dickie graduated from Salford University with an Environmental Science degree and soon joined the British Antarctic Survey. This launched a ten year career working in Antarctica. Initially employed as terrestrial biologist, he moved into management roles including Base Commander at Rothera and Bird Island, South Georgia. After returning to the UK in 2011 and working for the Scottish Environmental Protection Agency, the draw of the 'South' proved too strong and he gained his first island eradication experience, working as Field

Assistant for Phase Two of the South Georgia Heritage Trust's Habitat Restoration project, the world's largest rodent eradication to date.

Dickie returned to South Georgia in 2013, spending a year as BAS Base Commander at King Edward Point, and then rejoining SGHT for Phase 3 of their baiting operations. He was promoted to Deputy and later Project Director which saw him organise Phase 4, the final return to South Georgia to carry out intensive monitoring which demonstrated that the baiting was successful and the island was indeed free of rodents. Dickie believes that the restoration of island habitats is a crucial step towards turning back the tide of man's negative influences on our fragile ecosystems. He also relishes the challenge of tackling projects in demanding environments with complicated logistics. When not working in remote locations Dickie resides in the UK and enjoys running, cycling and exploring the British countryside with his partner Rachel.

**Presenter: Mr. Martin J. Halm**

***“Green Climber Remote-Controlled Slope Mowers”***

President- Green Climber of North America

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**Abstract**

Green Climber of North America specializes in providing the North American Market with Green Climber Remote-Controlled Slope Mowers, a product of MDB Technologies. Founding members of Green Climber of North America have been successfully selling MDB products since 2012. In 2014 president, Martin Halm established Green Climber of North America when he and founding members decided to create a business dedicated to distributing Green Climber Vegetation Management equipment. Green Climber of North America serves several prestigious private and governmental entities, such as the Illinois Tollway, Marathon Petroleum, IDOT, KDOT, and CALTRANS. Green Climber of North America now focuses on providing their equipment to the Federal Government and its many agencies.

Green Climber of North America is dedicated to meeting the needs of our customers. We have a strong network of dealerships throughout the North American market. We take pride in having an extensive and growing network of knowledgeable and enthusiastic dealers, providing outstanding sales, service and rentals.

**Speaker Bio**

Marty Halm is a business owner from the suburbs of Chicago. After running a hardscape company since 1991, Marty decided to diversify and formed a relationship with MDB/SRL, an Italian manufacturer of remote control slope mowers, to start Green Climber of North America. After 4 short years and hundreds of demos Marty and his team are now represented by 30 dealerships throughout the United States and Canada. The growing market and superior technology offered by MDB/SRL has positioned Green Climber of North America as the premier distributor of remote controlled slope technology. For more information, literature, videos, or to find your nearest dealer please go to: [www.greenclimberna.com](http://www.greenclimberna.com)

**Presenter: Jason Hanley**

***“The Hawaii and Pacific Islands Invasive Species Strike Team Model – An Invasive Species Tool to Protect National Wildlife Refuges”***

Invasive Species Strike Team Leader, U.S. Fish and Wildlife Service, National Wildlife Refuge System, Waialua, HI  
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**Abstract**

Within the National Wildlife Refuge System (NWRS), the economic cost of managing non-native species has been estimated in excess of \$336 million and is the fastest growing component of the Refuge Operations Needs System. Invasive species management has resulted in tremendous strain on ever decreasing annual refuge operations budgets and staffing.

To offset the tide, Congress appropriated funds in 2004 for the creation and implementation of U.S. Fish and Wildlife Service (USFWS) Invasive Species Strike Teams (ISST), following the example of Exotic Pest Management Teams, a similar program implemented by the National Park Service in 1999. The primary function of the ISSTs is to provide a mechanism for early detection and rapid response (EDRR) to incipient infestations of highly invasive species in an effort to achieve eradication.

Established in 2006, the Hawaii and Pacific Islands Invasive (HIPI) ISST program accomplishes EDRR projects using inventorying and monitoring techniques to detect, control, treat, and eventually eradicate invasive species. The ISST also provides technical expertise and support to NWRS staff for prioritization of invasive species targets and methods of control using Integrated Pest Management principles. In 2004, the Department of Interior joined forces with the University of Hawaii to establish the Pacific Islands Cooperative Ecostudies Unit (CESU) to emphasize working in collaboration among Federal agencies, universities, and partner institutions. The agreement has led to the creation of invasive species committees and watershed partnerships, which the HIPI ISST program uses extensively throughout the HIPINWRC to address invasive species priorities focused on protecting Hawaii's ecosystems from invasive species encroachment.

Since 2008, CESU cooperators have inventoried over 5,000 acres of Refuge lands in the HIPINWRC and have been responsible for the early detection of many new invaders and outlier populations.

Lastly, the HIPI ISST conducts outreach and education by funding internships through programs such as the Hawaii Youth Conservation Corps and Pacific Internship Programs for Exploring Science to educate young adults about invasive species and provide a pathway to employment in conservation jobs. In 2016, a total of nine interns were funded through the program.

In 2016, personnel from HIPI ISST program surveyed 1,115 acres across five national wildlife refuges. A total of 17 acres and 16,285 stems were treated.

**Speaker Bio**

Jason Hanley is the Invasive Species Strike Team Leader in Hawaii and the Pacific Islands for the National Wildlife Refuge System Program within the U.S. Fish and Wildlife Service. He received a B.S. in Marine Science from Richard Stockton State College. Jason has focused on

prevention, eradication, early detection and rapid response, and control of invasive species for over 14 years.

**Presenter: Greg Haubrich**

***“Using Species Distribution Modeling and Economic Analysis to Justify Invasive Species Management Efforts”***

Noxious Weed Coordinator  
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**Abstract**

What do kudzu, purple starthistle, featherhead knapweed, hydrilla and Texas blueweed have in common? All known populations of these species have been eradicated from Washington State. Eradication is the ultimate goal for many of our invasive plant and animal species and is easily explained to and understood by funders and constituents. However for the majority of our current invasive species statewide eradication is simply not feasible. In these cases management and limiting the impacts of those species becomes our focus. To validate our efforts we can use species distribution modeling to exhibit what could occur on the landscape if we make no effort to manage a given species. We can also show what the potential economic impacts could be should we not make every effort to manage them.

**Speaker Bio**

Greg Haubrich graduated from Washington State University with degrees in Horticulture and Agricultural Economics. He has been with the Washington State Department of Agriculture for over 35 years. He has served as the agency’s Noxious Weed Coordinator since 1992 and currently serves on the board of directors of the Pacific Northwest Invasive Plant Council.

**Presenter: Mark A. Heilman, Ph.D.**

**“Selective management of invasive watermilfoils utilizing ProcellaCOR Aquatic Herbicide”**

Senior Aquatic Technology Leader, SePRO

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**Abstract**

In early 2018, the US Environmental Protection Agency approved the reduced-risk aquatic herbicide ProcellaCOR® (a.i. florypyrauxifen-benzyl). ProcellaCOR has excellent activity on a variety of North American aquatic invasive plants, and is particularly effective on invasive watermilfoils including Eurasian watermilfoil (*Myriophyllum spicatum*), hybrid Eurasian accessions (*M. spicatum* X *M. sibiricum*), variable watermilfoil (*M. heterophyllum* – exotic in certain US states), and parrotfeather (*M. aquaticum*). The new arylopicolinate herbicide reduces use rates by several orders of magnitude versus older spot herbicide strategies for invasive watermilfoil management without restrictions on water use for drinking, swimming, and fishing. Research studies prior to registration and initial operational use following registration have confirmed excellent, short-exposure (as little as 6 – 12 hours) activity on invasive watermilfoils with little or no impact to most common NA native aquatic plant species such as pondweeds (*Potamogeton* spp.), naiads (*Najas* spp.), tapegrass (*Vallisneria americana*), and bulrush (*Schoenoplectus* spp.). In this paper, results from multiple field projects with ProcellaCOR for invasive watermilfoil management will be reviewed including pre- and post-treatment quantitative point-intercept vegetation surveys and herbicide dissipation monitoring.

**Speaker Bio**

As Senior Aquatic Technology Leader for SePRO, Dr. Heilman leads the company's research and development efforts to bring forward new technologies for managing water resources. He also directly assists many public and private natural resource managers in the U.S. and some international colleagues with challenging projects managing aquatic invasive species with an emphasis on aquatic plants. Dr. Heilman received his Ph.D. in Aquatic Ecology from the University of Notre Dame in 1999. He received the APMS Outstanding Research and Technical Contributor Award in 2013. He is a Past President of the Northeast Aquatic Plant Management Society (NE APMS) and President of the national APMS in 2019-2020.

**Presenter: Paul Heimowitz**

***“Walking the Talk: Agency Policy to Prevent New Invasions From Field Activities”***

Invasive Species Coordinator

U.S. Fish and Wildlife Service - Pacific Region, Ecological Services Program

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**Abstract**

From regulations addressing ballast water management to education campaigns aimed at reducing movement of pest-infested firewood, government agencies promote prevention as the most cost-effective strategy in the fight against invasive species impacts. But actual policies to reduce invasive species spread by agency activities are less apparent. Executive Order 13751 (and its predecessor, E.O. 13112) provides an overarching expectation for federal agencies to “refrain from authorizing, funding, or implementing actions that are likely to cause or promote the introduction, establishment, or spread of invasive species...” (with an associated set of caveats). Absent a national directive at the Bureau or Department level that steps down that expectation, the U.S. Fish and Wildlife Service (USFWS) Pacific Region - which includes Oregon, Washington, Idaho, Hawaii, and the Pacific Islands - adopted a regional bioinvasion prevention policy in 2016. The policy requires individual USFWS programs (e.g., National Wildlife Refuge System) to develop specific guidelines that address seven general invasive species risk-reduction strategies for employee-led field activities. It also establishes similar stipulations for contractors, partner organizations receiving USFWS funding, and parties for which USFWS provides regulatory oversight (e.g., permit recipients). This presentation will review the policy’s key elements, describe its bottom-up genesis via the Region’s cross-program invasive species team (and its associated “universal responsibility” philosophy), and discuss challenges experienced during policy development and implementation. It also will explore the dilemma of evaluating prevention program effectiveness relative to tracking how invasive species were not moved or introduced to new areas. Finally, it will address the evolution of a culture of invasive species prevention over time.

**Managed Relocation: Native Species Preservation or Invasive Species Aggravation?**

Abstract:

As the impacts of a changing climate continue to materialize, how should government agencies make decisions about using managed relocation to mitigate range contraction of imperiled species? In the United States, federal directives address certain individual components of managed relocation. For example, the Endangered Species Act applies to species extinctions caused by climate change, and Executive Order 13751 requires federal agencies to prevent invasive species introductions. But no federal policy appears to address the controversial tactic of managed relocation directly and holistically. The national Invasive Species Advisory Council (ISAC) examined this policy gap through a 2017 white paper entitled “Managed Relocation: Reducing the Risk of Biological Invasion”. The white paper focuses on the potential for a relocated organism to become an invasive species and/or spread hitchhiking invaders. In that vein, it recommends developing a clear national policy for managed relocation that: is consistent with Executive Order 13751 (with delineation of legitimate exceptions); limits use of the tactic to extra-ordinary situations; defines key terms; calls for a standardized risk assessment; requires a monitoring and safeguard plan; and identifies consequences for policy violation. This presentation will review the ISAC white paper findings and discuss several recent related efforts

to enhance risk analysis and decision-making regarding the consequences of moving – and not moving – imperiled species to novel ecosystems as a climate change adaptation strategy.

**Speaker Bio**

Paul Heimowitz has worked in the U.S. Fish and Wildlife Service's Pacific Region Office for the past 16 years. In his current role, he coordinates invasive species management and policy efforts within the Ecological Services Program, and also leads the Region's inter-disciplinary invasive species team. Paul's career also includes positions with the Oregon State University Sea Grant Program and Washington Department of Ecology.

**Presenter: Hariet L. Hinz**

***“Weed biocontrol agents in the pipeline for the western USA”***

Country Director, CABI Switzerland

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**Abstract**

Classical biological control of weeds can be one of the most cost-effective, sustainable and environmentally safe methods to control invasive weeds. Nevertheless, due to increased risk aversion, the number of new agents being released declined steadily since the end of the 1990s. In the USA, not one single release permit was granted between 2012-15. Since then, the backlog of petitions has somewhat declined with two agents each approved for release in 2016 and 2017. However, the official time line for the approval process is still extremely long with an estimated 2-4 years. In this presentation I will give an overview of recently released weed biological control agents in North America, agents that are currently in the review process and agents which will be petitioned in the near future with emphasize on the western U.S. I will also review current time lines and requirements for the approval of weed biocontrol agents, as well as specific challenges connected to certain weed families (e.g. Brassicaceae). Although weed biocontrol has gained momentum again, I believe that continuous stakeholder pressure will be necessary to further improve the regulatory process in the U.S.

**Speaker Bio**

My training is in horticulture, pest management, applied entomology and ecology, which provides an ideal background for my main research interest, classical biological weed control. I have 26 years of experience in this area, including studies on the biology, host specificity and impact of herbivorous insects, the population biology of plants, invasion ecology, and mechanisms underlying the host-finding and host-choice behaviour of insects. For the last 12 years, I have been the Leader of the Biological Weed Control Programme at CABI in Switzerland. This role involves managing 15 ongoing weed biological control projects, mainly for the USA and Canada, but also New Zealand and Australia. Since 2002 I am an Affiliated Professor at the University of Idaho. In 2015 I have been appointed Director of our operation in Switzerland.

**Presenter: Andrew Howell, Graduate Research Assistant, North Carolina State University**  
***“Autonomous Robotics for Identification and Management of Invasive Aquatic Plant Species”***

Co-authors: Maharshi Patel, Shaphan Jernigan, Rob Richardson, Scott Ferguson, and Gregory Buckner

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### **Abstract**

Invasive aquatic plant species can expand rapidly throughout water bodies and cause severely adverse economic and ecological impacts. While mechanical, chemical, and biological methods exist for the identification and treatment of these invasive species, they are manually intensive, inefficient, costly, and can cause collateral ecological damage. To address current deficiencies in aquatic weed management, this paper details the development of a small fleet of fully autonomous boats capable of subsurface hydroacoustic imaging (to scan aquatic vegetation), machine learning (for automated weed identification), and herbicide deployment (for vegetation control). These capabilities aim to minimize manual labor and provide more efficient, safe (reduced chemical exposure to personnel), and timely weed management. Geotagged hydroacoustic imagery of three aquatic plant varieties (Hydrilla, Cabomba and Coontail) is collected and used to create a software pipeline for subsurface aquatic weed classification and distribution mapping. Employing deep learning, the novel software achieves a classification accuracy of 99.06% after training.

### **Speaker bio**

Andrew Howell is a PhD student and graduate research assistant at North Carolina State University in the Department of Crop and Soil Sciences, under the direction of Dr. Rob Richardson. He received his BS in Crop Production, and MS in Crop Science at NC State where he focused on the early detection, mapping, and monitoring of invasive submersed vegetation focusing on traditional sampling regimes and boat-based remote sensing technologies. For his PhD research, Andrew is investigating the utilization of unmanned systems in aquatic and non-cropland vegetation management and how these platforms will contribute in making prompt and informed management decisions. Andrew's passion is for the outdoors and spends most of his free time in the field or wading trout streams.

**Presenter: Aimee Hurt**

***“Innovative applications of conservation detection dogs to manage invasive species while protecting native species and habitats: practical considerations and case studies”***

Director of Operations, Working Dogs for Conservation (WD4C)

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### **Abstract**

This presentation provides an overview of the ways that conservation detection-dog handler teams are successfully being enlisted to gather baseline or supplementary data about, manage and protect native and/or threatened species and associated habitats from infiltration by invasives. Lessons learned (or in progress) are offered around the detection of dreissenid mussels, invasive weeds like Dyer’s woad, Argentine ants and pollinator scent targets like bumble bee nests. Factors which make some targets easier to detect than others, or which can make detection more difficult once outside the initial controlled training scenario are frankly considered. The motivations for (and value of) assessing the feasibility of using detection dogs on a particular scent target even if only to rule out their use, or make a narrow deployment recommendation, are further elaborated upon.

Possible lines for collaborative R&D inquiry (e.g., what makes some plant targets easier than others for dogs to find?) and ways of ‘value-adding’ to survey efficacy while increasing cost-effectiveness (e.g., simultaneously seeking several related scent targets like wildlife scats or invasive and native plants; training a dog to multiple, complimentary scent targets) are outlined. Examples of ‘multi-purpose’ targets (e.g., Kincaid’s lupine, whorled milkweed) through which detection offers additional insight on the occupancy of species of interest and on the overall quality of the surveyed habitat are recounted.

The role of conservation dogs as ambassadors that facilitate educational outreach and have the ability to make even the most improbable of targets or mitigation strategies more alluring to the general public is showcased through several cases. Commonly encountered misconceptions relative to what can or might not be achievable using dog-handler teams, ways to most effectively use the teams in relation to other available tools and/or the study objectives, and the types of dogs that can do this work are also touched upon.

### **Speaker Bio**

Aimee Hurt received a B.A. in Biology from the University of Montana, with emphasis on zoology, ecology, and entomology. Awarded a Fellowship to study the ability of dogs to differentiate the scats of black and grizzly bears, she discovered that dogs can indeed distinguish the scats of these two closely-related species. Aimee has worked with conservation dogs since 1998 and is passionate about training, field work and dog rescue. Her professional interests include studying the potential of canine olfaction, perfecting laboratory discrimination experiments, and ensuring that dog-handler teams remain highly trained and consistent in their work. She is one of the co-Founders of Working Dogs for Conservation.

**Presenter: Mike Ielmini,**

***“Wild Spotter™ - Mapping Invasives In America’s Wild Places: A nationwide program to boost citizen-science volunteer capacity for the National Forest System and beyond!”***

National Invasive Species Program Manager

USDA Forest Service, National Forest System Headquarters

Washington, D.C.

## **Abstract**

In partnership with the University of Georgia, Wildlife Forever Inc., and other organizations across the United States, the USDA Forest Service has created a nationwide citizen science volunteer capacity-building program called **Wild Spotter™** to help in the battle against all aquatic and terrestrial invasive species. **Wild Spotter** helps recruit, train, and empower volunteers to provide critical spatial information on aquatic and terrestrial invasions. The program not only helps the public locate and map aquatic and terrestrial invasive species in Wilderness Areas, Wild & Scenic Rivers, and other wild places across the 193 million-acre National Forest System, **Wild Spotter** also empowers the public, local communities, states, tribes, and many other groups to help tackle invasive species that invade ANY of America’s wild places. The **Wild Spotter** program provides customized tools (including a FREE mobile App for Apple and Android devices) that the average citizen volunteer can use in a simple and effective manner. In addition, **Wild Spotter** is unique in that it includes a marketing component to promote numerous collaborations across the landscape, highlights the invasive species work of groups and individuals, raises public awareness about aquatic and terrestrial invasive species, and couples public and private data sources into a seamless system. By helping to build local capacity and citizen involvement **Wild Spotter** has become an easy way for the Forest Service to boost its work against invasive species across every National Forest and Grassland – and beyond. The information gathered through **Wild Spotter** is validated by professionals, shared publically, and used to help quantify the extent and impact of targeted invasive species to improve management effectiveness, and ultimately aid in restoring invaded areas to desired conditions. If you want to become a **Wild Spotter** volunteer or partner with the Forest Service, visit the website: [www.wildspotter.org](http://www.wildspotter.org) . Download the free mobile Apps, and ‘Like’ us on Facebook.

## **Speaker Bio**

Mike has over 3 decades of landscape-scale conservation experience at local, state and federal levels, and currently serves as the National Invasive Species Program leader for Forest Service in Washington, D.C. Previously, he held several state government positions, and served 15 years with the U.S. Fish and Wildlife Service - including positions on eleven National Wildlife Refuges in 6 states and senior positions in the agency’s headquarters. Additionally, Mike works internationally to help overcome challenges related to forest and wildlife conservation, illegal logging and wildlife trade, and invasive species management in Asia, South America, Africa, and across North America.

**Presenter; Clancy Jandreau**

***“Strategies for Restoring Grasslands Invaded by Ventenata dubia”***

Conservation Lands Research Coordinator, Missoula Parks and Recreation

[cjandreau@ci.missoula.mt.us](mailto:cjandreau@ci.missoula.mt.us), (406) 552-6739, 100 Hickory St, Missoula, MT 59801

**Abstract**

Ventenata (*Ventenata dubia*) is an invasive winter annual grass that has been introduced to the arid and semiarid grasslands of the Pacific Northwest. As the demonstrated impact of this invasive grass becomes clear, land managers are scrambling to find effective management tools to control its rapid spread. Recent studies have suggested the herbicide indaziflam (Esplanade ©, Bayer) could prove to be a potent tool in the management of invasive winter annual grasses including cheatgrass (*Bromus tectorum*) and ventenata (Sebastian et al. 2016). Application rates of indaziflam are supposedly non-lethal to resident perennial plants, but have been shown to reduce recruitment by killing dicot and monocot germinants for 2 or more years (Sebastian 2017). In areas dominated by non-native annuals with few native perennials, this can be problematic as indaziflam application may create bare ground for an extended time which may promote secondary invasion, increased soil erosion, and/or complicate effective restoration of the site. Effective restoration protocols following application of indaziflam are largely unknown. In order to increase our knowledge of restoration options, we initiated two studies in the fall of 2018. We are testing different planting strategies, planting grass and forb plugs before and after spraying indaziflam, and different seeding timings after indaziflam application. We will collect first year results in the summer of 2019. The results of these studies will contribute to land manager's toolbox for managing ventenata in areas of depauperate grassland habitat.

**Presentation 2**

***“Integrating Control of Spotted Knapweed by Exploiting its Life Cycle”***

**Abstract**

In the intermountain west, spotted knapweed (*Centaurea maculosa*) is a well-established and widespread invasive plant. A variety of treatment options have been developed to manage knapweed including herbicides, seasonal grazing, and multiple species of biocontrol insects. Although herbicide applications often effectively reduce knapweed abundance in the short-term, repeat applications adversely impact non-target native species (Crone et al. 2009; Ortega and Pearson 2010;2011) or invite secondary invasion of herbicide tolerant species (Rinella et al. 2009). Grazing and biocontrols also show limited success by, for instance, reducing seed production (Shelet et al. 2004); however, knapweed populations continue to persist despite these pressures. Thoughtfully integrating different control methods at different times in knapweed's life cycle could offer one method for achieving longer lasting control while reducing unintended impacts. For the past four years, Missoula's Conservation Lands Management Program has been investigating an integrated approach to knapweed control using repeated sheep grazing, established biocontrol insects, and limited herbicide application. We hypothesized that, spraying once following successive years of grazing with well-establish

biocontrol insects, will capitalize on reduced knapweed seed banks, kill remaining adult knapweed, and provide longer term knapweed control with reduced side effects versus grazing or spraying alone. In 2014, we established 20 paired plots in grazed and ungrazed knapweed populations. Half of the paired plots were sprayed with aminopyralid in the fall of 2014 and half were left unsprayed. We have returned to the plots for the next four years to record vegetative characteristics for both knapweed and native species on site. Preliminary results indicate: 1) repeated grazing has suppressed seedling production in knapweed populations, 2) knapweed treated with herbicide is recovering at similar rates regardless of grazing history, and 3) knapweed with a history of grazing, but not treated by herbicide increased sharply in abundance when grazing was removed. These results underscore the complexity in managing intractable knapweed populations. Additional and more detailed population modeling and analysis will provide further understanding of how knapweed populations are responding to our treatment combinations.

### **Speaker Bio**

Clancy Jandreau is the Conservation Lands Research Coordinator for the City of Missoula Parks and Recreation Department. In this position, Clancy is responsible for conducting and coordinating research and monitoring to support the adaptive management of Missoula's more than 4,300 acres of Conservation Lands. Projects include everything from conducting baseline floristic inventories, to monitoring overwintering elk, to surveying recreationists, and researching effective invasive species control strategies. Clancy holds a B.S. in Wildlife Biology from Colorado State University and an M.S. in Resource Conservation from the University of Montana. He lives in Missoula, Montana and spends his time hunting, fishing, and exploring Montana's many rivers and mountains

**Presenters: Catherine S. Jarnevich and Terri Hogan,**

***“INHABIT: a web application to deliver habitat suitability models and bridge the scientist-practitioner divide”***

**Catherine S. Jarnevich,** [jarnevichc@usgs.gov](mailto:jarnevichc@usgs.gov), U.S. Geological Survey, Fort Collins Science Center, 2150 Center Ave Bldg C, Fort Collins, CO 80526, 970-226-9439

**Terri Hogan,** [terri\\_hogan@nps.gov](mailto:terri_hogan@nps.gov), National Park Service, 1201 Oakridge Drive, Suite 200, Fort Collins, CO 80525, 970-267-7306

Catherine S. Jarnevich (Research Ecologist)<sup>1</sup>, Terri Hogan (Invasive Plant Program Manager)<sup>2</sup>, Peder Engelstad (Research Associate)<sup>3</sup>, Ian Pearce (Research Ecologist)<sup>1</sup>, Jennifer Sieracki (Invasive Plant Program Lead)<sup>2</sup>, Helen R. Sofaer (Research Ecologist)<sup>1</sup>, Julia Sullivan (Student contractor)<sup>1</sup>, Nicholas Young (Research Associate)<sup>3</sup>

<sup>1</sup> U.S. Geological Survey, Fort Collins Science Center, Fort Collins, CO

<sup>2</sup> National Park Service, Natural Resource Stewardship and Science, Fort Collins, Fort Collins, CO

<sup>3</sup> Colorado State University, Natural Resource Ecology Laboratory, Fort Collins, CO

## **Abstract**

The National Park Service (NPS) mission to preserve unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations must be accomplished while addressing the range of challenges that land managers face today. This includes the impacts of invasive species on native plant and animal communities and ecosystem function. However, the NPS is hampered by the scope of the invasive species problem compared to available resources to combat invasive species. Habitat suitability models for invasive species can provide practitioners with information to advise watch lists and target population searches. While many suitability models exist, there is often a divide between researchers creating these models and practitioners who may find them useful in informing land management actions. We have formed a scientist-practitioner partnership to create national models for several high priority species that are integrated into the Invasive Species Habitat Tool (INHABIT), a web application displaying visual and statistical summaries of nationwide habitat suitability models. The models are based on aggregated occurrence data and a species-specific set of predictors from a library of nationwide predictors that we assembled. The models are built following a common protocol, promoting model repeatability and credibility. Managers provide feedback both on the models and on INHABIT's features through various outlets. The content and functionality of INHABIT are designed to provide practical information leading to enhanced land management actions, including mapped products with interactive thresholds to define suitability based on management objectives (with field-device compatible download options), information on modeled environmental relationships, and tabular proximity summaries to inform management area watch lists. Based on comments and suggestions of practitioners, INHABIT is actively evolving to help bridge the gap between scientists and practitioners to help land managers make strategic decisions about where to focus limited resources to best address invasive plant control. We are specifically looking for input from attendees during the conference to help make this tool as useful as possible to land managers.

## **Presenter Bios**

## Catherine Jarnevich

Catherine Jarnevich is a research ecologist with the USGS Fort Collins Science Center, where she has worked since 2000. She obtained her PhD in ecology from Colorado State University. Her research has focused on investigating the patterns of invasions and predicting and mapping invasive species distributions.

## Terri Hogan

Terri Hogan is a plant ecologist and the national lead for the NPS Invasive Plant Program that addresses threats posed by invasive plant species to NPS resources. In this capacity, she also oversees the NPS Exotic Plant Management Team program that provides “boots-on-the-ground” invasive plant management support and expertise to parks. She also has natural and cultural resource management experience in national parks and has worked on landscape scale collaborative efforts. Terri has been working in the field of botany and plant ecology for nearly 30 years having begun her career focusing on rare plant species in the southeastern U.S. Education: M.S. in Botany (Ecology Track), University of Florida, and B.S. in Biology (Emphasis in Botanical Studies), Middle Tennessee State University

**Presenter: Sheilah Kennedy**

***“Portable Invasive Species Rinse off Reclaim and Decontamination System”***

Owner/Operator S-K Environmental, Okanogan, Washington

[shekennedy@hotmail.com](mailto:shekennedy@hotmail.com), <http://s-k-enviro.com>, 509-322-6909

**Abstract**

S-K Environmental's Portable Invasive Species Rinse off Reclaim and Decontamination System provides the strongest prevention tool available utilizing the specific DOTWASH System components and the only weed wash/decontamination system that has incorporated the Electro-static system, (ESS) providing 95-98% seed elimination.

**Speaker Bio**

Sheilah has been involved with all aspects of invasive species. 15 Years as Noxious Weed Control Coordinator for Okanogan County, Washington State. Developing integrated invasive species programs and projects between private landowners, State, Federal and Tribe. Past President and previous Board Member for North American Weed Management Association (when it was NAWMA). Coordinated the first Weeds Across Borders established successful working projects between Okanogan County and two Weed Districts in Canada. Working to educate State and Federal Legislators is always a top priority, testifying several times before Congressional Committees in WA DC as well as State Legislative work sessions and Committees. Utilizing the experience gained over the years, I shifted towards research, development, providing effective, efficient and quality prevention equipment to prevention the introduction of invasive species.

Please visit my webpage <https://s-k-enviro.com> to review the various projects, work and scientific decontamination testing projects with Dr. Craig Ramsay, APHIS and Colorado State University.

**Speaker: Jenny Ketterlin**

***“Invasive Reptile Management and Research in the South Florida Parks and Preserve”***

Invasive Species Biologist, Everglades and Dry Tortugas National Parks

Jennifer\_Ketterlin@nps.gov, (305) 224-4207, 950 N. Krome Ave., Homestead, FL 33030

### **Abstract**

South Florida land managers are facing threats from many kinds of invasive wildlife. Reptiles have been especially successful and there are now more species of nonnative reptiles established in Florida than there are natives. As the manager of over 2.5 million acres of public lands in southern Florida, the National Park Service has played a key role in developing research and management projects that address invasive reptiles. From the well-known Burmese python to the Peter’s rock agama, a relative newcomer, each species presents their own challenges for research and management. Park Service biologists collaborate with local, state, and federal partners to simultaneously remove invasive animals and to learn more about these species and improving control methods.

### **Speaker Bio**

Jenny Ketterlin is an Invasive Species Biologist with Everglades and Dry Tortugas National Parks where she is responsible for invasive wildlife management. Her primary duties are working with federal, state, and local partners on the creation of an Interagency Python Management Plan, assisting with operations for the control of the Argentine black and white tegu, and conducting early detection and rapid response for other invasive wildlife in the South Florida Parks and Preserve. She has worked on invasive species issues in Florida for over 15 years with the University of Florida, the Miami-Dade County Environmentally Endangered Lands Program, and the Florida Fish and Wildlife Conservation Commission.

**Presenter: Sam King**

***“The Tennessee State Parks Environmental License Plate; Making Revenue Work for Parks”***

Stewardship Ecologist  
Tennessee Department of Environment and Conservation  
Division of Natural Areas  
[sam.king@tn.gov](mailto:sam.king@tn.gov)  
629-215-0194  
312 Rosa L Parks Ave. 2<sup>nd</sup> Floor, Nashville TN 37243

**Abstract**

A look at the successes and struggles of using funds collected by the department of revenue to pursue exotic plant removal and native plantings in Tennessee State Parks. We will talk about competition for funds, project limitations, and the future of the “Iris Fund.”

**Brief Bio**

Sam King works as a stewardship ecologist for the Division of Natural Areas. Prior to working for the division he was a Tennessee State Park Ranger.

**Presenter: Andrew R. Kniss**

***“Glyphosate”***

Professor & Head  
Department of Plant Sciences  
University of Wyoming

**Abstract**

Public scrutiny about glyphosate use has intensified in the wake of several high-profile court decisions blaming this herbicide for causing cancer. An analysis of available data related to health impacts of long-term exposure to glyphosate will be presented. Potential impacts of a glyphosate ban will also be discussed.

**Speaker Bio**

Andrew Kniss is a Professor of Weed Ecology & Management in the Department of Plant Sciences at the University of Wyoming. He earned his PhD in Agronomy with a minor in Statistics from the University of Wyoming. Andrew's research program focuses on crop-weed interactions, non-target impacts of weed management, and developing sustainable weed management programs in agronomic crops. He is the Past President of the Western Society of Weed Science, and previously served on the Board of Directors of the Weed Science Society of America.

**Presenter: Lauren Kuehne**

***“Using eDNA to detect and monitor aquatic invasive plants in lakes”***

*Authors: L. Kuehne<sup>1</sup>, J. Olden<sup>1</sup>, C. Ostberg<sup>2</sup>, D. Chase<sup>2</sup>, J. Duda<sup>2</sup>*

- 1. University of Washington, School of Aquatic and Fishery Sciences, Seattle, WA*
- 2. Western Fisheries Research Center, U.S. Geological Survey, Seattle, WA*

### **Abstract**

Environmental DNA is a rapidly developing technology for use in aquatic invasive species management, however, there are substantial unknowns with respect to application in monitoring programs. We conducted experimental and field-based sampling to test detectability of two invasive aquatic plants (*Egeria densa* and *Myriophyllum spicatum*) using eDNA, and evaluate feasibility of this method to supplement current monitoring approaches. In 2017, a mesocosm experiment was conducted over a 10-week period to assess changes in eDNA detection as a function of plant growth stage and biomass. In 2018, eDNA samples were collected from western Washington lakes with varying species abundances, and a subset of lakes were sampled throughout the year to test temporal variability in detection. In mesocosm experiments, we found that detection was less reliable while plants were actively growing, and improved as a function of both increased biomass and senescence. This was supported in field sampling results, which resulted in higher detections during peak biomass and senescence periods. However, detection was unsuccessful except at the highest levels of plant abundance in both experiments and the field, indicating current challenges in using eDNA as a substitute for traditional monitoring.

### **Speaker Bio**

Lauren Kuehne has been a Research Scientist in the Freshwater Ecology and Conservation Lab at the School of Aquatic and Fishery Sciences (Univ of WA) since completing her MS degree there in 2012. Her work focuses on conservation issues in fresh waters, including invasive aquatic species (mainly plants), fish habitat, and water regulation. Most of Lauren's research is done in Western Washington, and in collaboration with agencies, tribes, and non-profits that are engaged in on-the-ground conservation efforts. With all of her spare time, she works on innovative science communication and outreach, including blogging, public talks, and even developing video games about sustainability.

**Presenter: Karen Laitala**

***“Community Based Invasive Species Management in the Blackfoot Watershed “***

**Abstract**

The Blackfoot Watershed of western Montana encompasses 1.5-million acres, extending from the Continental Divide westward for some 132 miles to its confluence with the Clark Fork River. This landscape lies within the only ecosystem in the lower 48 states with a full complement of wildlife that inhabited the area when the Lewis and Clark Expedition traveled up the Blackfoot River in 1806. Prairie grasslands, sagebrush steppe, coniferous forest and extensive wetland and riparian areas contain more than 600 species of vascular plants, including six rare plant communities. The Blackfoot Challenge mission is to coordinate efforts to conserve and enhance natural resources and rural way of life in the Blackfoot Watershed for present and future generations. Our approach is community based conservation that addresses concerns and opportunities by providing regular communication about natural resource stewardship. Directed by a volunteer board of private landowners, federal and state land managers, and local government officials, we follow a consensus-based model to coordinate partnerships and resources that benefit the Blackfoot Watershed, which includes all watershed landowners and managers. Through this approach we find that roughly 80 percent agree and respond to consensus through Board-led committees to implement programs and projects. Volunteer committees and work groups of diverse stakeholders work to identify community and resource concerns and coordinate response. The Weeds Committee supports a holistic approach to controlling noxious weeds and invasive plant species that pose a threat to landowners and managers working to maintain native range and grasslands. A strong private-public partnership has evolved since the 1980s to cooperate on integrated weed management across the watershed, linked by twelve landowner-led Vegetation Management Areas, three county weed districts, and federal and state public agencies.

**Speaker Bio**

Karen Laitala has worked as the Blackfoot Challenge Weed Coordinator since 2013. She has also been the Powell County Weed Board Coordinator since early 2009. Before moving to Montana, Karen worked for the Nez Perce Tribe Biocontrol Center in Lapwai, Idaho and on weed management research projects in range and cropland environments in Idaho and Washington. She received a BS in Environmental Field Biology, with an emphasis on botany from Lewis-Clark State College in Lewiston, Idaho, and an MS in Plant Science from the University of Idaho, Moscow. While at The University of Idaho, her master’s research focused on Eurasian watermilfoil management and the use of benthic barriers as a control measure.

**Presenter: John Lampe**

***“Precision electronic dispenser for application of herbicide sprays and foam”***

Founder of Green Shoots, LLC, Saint Paul, Minnesota

[john@greenshootsonline.com](mailto:john@greenshootsonline.com)

### **Abstract**

Conventional backpack sprayers and nozzles use technology adapted from agricultural spraying systems. In the context of managing natural areas and invasive plants, however, this can be problematic, especially at sites with desirable native plants. Conventional spray systems are designed to be used with high pressure. High pressure produces greater quantities of tiny spray drops. These tiny spray drops can easily move off-target, carried by the wind and even air currents created by the act of spraying. This presentation discusses new results from ongoing tests of the Precision Electronic Dispenser from Green Shoots®. The Precision Electronic Dispenser uses ultra-low pressure (generally under about 10 psi) to deliver an herbicide mixture either as an aqueous foam or as liquid spray drops. The potential benefits of ultra-low pressure include: lowering herbicide usage; reducing mortality of nearby desirable plants; and minimizing exposure of workers and the broader environment.

### **Speaker Bio**

John founded Green Shoots, LLC, in 2011. Green Shoots develops, manufactures, and markets precision devices for the control of invasive plants. John holds more than ten U.S. and foreign patents. He has presented and held demonstrations at numerous national and regional invasive species conferences. He is a licensed pesticide applicator. For more than two decades John has helped restore ecosystems burdened with invasive species – much of that work has been as a volunteer.

**Presenter: James Leary PhD**

***“Bio-Economic Models Prioritizing East Maui Watershed Protection Against Miconia Invasion”***

*James Leary<sup>1</sup>, Kim Burnett<sup>2</sup>, Chris Wada<sup>2</sup>, Brooke Mahnken<sup>3</sup>, Niels Jorgensen<sup>4</sup>, Mark Renz<sup>4</sup>*

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*Miconia* (*Miconia calvescens* DC) is a highly fecund, autogamous species, with propagules dispersed by avian zoochory. It's considered to be one of the worst plant invaders in Hawaii and the Pacific Basin. *Miconia* was introduced to the East Maui Watershed (EMW) almost a half-century ago with over a quarter-century of management recorded. Using a historical spatio-temporal dataset of eliminated targets, we constructed probability distribution kernels estimating the invasion parameters for dispersal and persistence; progeny dispersed out to 1636m and propagule bank extinction beyond 20 years, respectively. This allowed us to project optimal eradication of a local, incipient population with an annual harvest rate eliminating all juveniles before reaching maturity, until extinction. Corresponding (optimal) management efforts were monetized based on current pricing for helicopter operations; the variable cost to locally eradicate an incipient population from a single maternal source was estimated to be <\$42K USD, with ~90% of the effort searching for the most distant 1% of the progeny and expended within the first 9 years after the mature discovery. We further estimated that it was more economical to apply excess effort towards eradication rather than invest efforts biologically outpaced by the invader, resulting in catastrophic failure. We further report on the development of a habitat suitability model of *miconia* colonizing the EMW with an ensemble of five algorithms associating presence data with four variables of the physical environment (e.g., precipitation, temperature, aspect and slope). This model shows a segregation of suitable habitats for immature and mature plants further elucidating the potential impact of a colonizer based on another important life history trait (i.e., fecundity). The kernels described above and the suitable habitat create synonymous probability surfaces that can measure the likelihood of impact based on the spatial combination of invasion and suitability further translating to a cost benefit metric to optimize the distribution of resources with the maximum reduction of impact.

**Speaker Bio**

James Leary is new Assistant Professor in the Center of Aquatic and Invasive Plants at the University of Florida. Prior to this appointment, he served the last decade as a Specialist in invasive plant species management with the University of Hawaii, stationed on the beautiful island of Maui. He was born and raised in Michigan, earning a BS degree in Horticulture and Chemistry at Michigan State University. He relocated to Hawaii, earning his MS and PhD degrees in Horticulture and Molecular Ecology, respectively, at the University of Hawaii at

Manoa. His mission is to extend knowledge and technology contributing to efficient and effective invasive plant species management in natural and managed landscapes.

**Presenter: Katherine Lee**

***“The economics of invasive species: an overview of methods, challenges. and opportunities”***

Assistant Professor

Department of Agricultural Economics and Rural Sociology, University of Idaho

**Contact information:**

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**Abstract:**

Economics is central to understanding the drivers, impacts and management of biological invasions. This talk will provide an overview of invasive species through the lens of economics. Understanding the costs of invasive species is a critical step in determining policy and management actions. Market and non-market valuation methods used to estimate the impacts of invasive species will be discussed. An overview of the economic and bioeconomic tools available to inform how resources can be optimally allocated in invasive species management, with the intent of minimizing the long-term costs. Finally, the knowledge, data gaps, and opportunities for collaboration between natural and social scientists, as well as managers and decision-makers.

**Speaker Bio:**

Katherine is an applied environmental and natural resource economist. Her research primarily explores feedback between humans and natural systems and implications for resource managers and policy makers. Applications of her work include managing environmental uncertainty, biological invasions, conservation, and sustainable agriculture. Katherine received her Ph.D. in economics from the University of Wyoming and a B.S. in economics and biology from the University of Wisconsin-Madison. She worked as a biological research technician at the University of Notre Dame from 2008 to 2011. Her work experience highlighted the importance of communicating ideas and results between researchers, resource managers, and the public, and are the basis her multidisciplinary approach to research.

**Presenter: Chris Looney**

***“Haunted by cane toads? Beliefs and attitudes about classical biological control in Washington State”***

Entomologist; Washington State Department of Agriculture

clooney@agr.wa.gov; 360.902.2042; 1111 Washington St. SE, Olympia WA, 98502

(author 2) Jennifer Andreas, Washington State University Extension, Puyallup, Washington

(author 3) Shannon M. Donovan, Department of Geography and Environmental Studies,  
University of Alaska-Anchorage, Anchorage, Alaska

**Abstract**

What will they eat after they eat all the pests? Will they sting or bite me? What’s going to control *them*? Researchers and practitioners involved in classical biological control (CBC) programs routinely hear questions like these from all sectors of the public, ranging from dental hygienists to conservation biologists. Such questions and other comments seem to simultaneously encompass enthusiasm for and mistrust of CBC programs. However, few studies have investigated where such concerns come from or how best to address misinformation. We conducted an online survey in Washington State to help capture the range of attitudes and beliefs about CBC. Information on survey respondents’ educational background, experience with invasive species management, and their level of knowledge about biological control agent testing and approval were all assessed. Results from 420 participants indicated that there is broad support for CBC, although respondents frequently conflated the practice with other “biological control” strategies. Many respondents reported knowing of CBC agents that had negative environmental impacts, but the examples they provided similarly conflated CBC with a range of other practices, or even other invasive species. Survey results also indicated that the regulatory structure surrounding modern CBC is unknown to many respondents, suggesting that some ambivalence towards CBC could stem from a lack of information. These results indicate that improving public communication about classical biological control, including emphasizing modern success stories, may be a good way to directly combat erroneous beliefs. We hope to expand this survey to all of the United States to determine if the attitudes and beliefs represented in the Pacific Northwest population are shared across the country.

**Speaker Bio**

Chris received an MS in Entomology from Washington State University in 2000, and a PhD in Environmental Science from the University of Idaho in 2007. He joined the Washington State Department of Agriculture in 2009, where he manages the Olympia Entomology Laboratory. The WSDA Entomology Lab provides identification services for Washington stakeholders, supports exotic pest surveys across the state, and conducts research on exotic insect species.

**Presenter: Cadance Lowell, PhD and Jon Jackson**

***“NatureZap DE Technology” “Natural area pest plant control with Directed Energy -- Keep aliens away!!”***

Cadance Lowell, Central State University Department of Agricultural Sciences

John Jackson, Global Neighbor, Inc

### **Biographies**

Dr. Cadance Lowell is a Professor and Chair of Agricultural Sciences at Central State University, Wilberforce, OH. As part of the land-grant mission of the University, Dr. Lowell maintains a research program in non-chemical weed control. Working with Global Neighbor, Inc. researchers and students are using directed energy as an integrated pest management strategy to kill weeds with non-ionizing light with location and duration controlled by integrated sensors and robotics. Directed energy has shown promise in non-specific vegetation control including weeds such as dandelions, crabgrass, ragweed, and Japanese Knotweed. Testing in vegetation control in woodlots and fields have shown promise in controlling herbaceous and small woody undergrowth.

Dr. Lowell received a B.S. in Botany from Duke University, a M.S. in Botany from the University of Florida, Gainesville, and a Ph.D. in Horticulture from the University of Florida, Gainesville. She did post-doctoral work with the USDA in Peoria, IL as a biochemist in soybean oligosaccharide carbon partitioning before joining Central State University.

Jon Jackson is a startup experienced engineer/entrepreneur who founded Global Neighbor, Inc (GNI) where they introduced chemical free weed control solutions, announced the introduction of the first SmartSpray that detects and automatically sprays weeds with organic or traditional herbicides while the user mows the lawn. With startup Greenfield Solar, Jon led the engineering effort to introduce high concentrated solar power (HCSP) with field sites in Taiwan and Ohio. He is a hands on engineer with an MBA whose 34 years of experience includes small, medium and large companies.

GNI has received 3 SBIR's to progress their version of directed energy for plant control. Prototype systems include automated detect and treat small herbaceous and woody undergrowth, manually operated hand held units with operating distances of inches as well as large scale units operating over many feet. Additionally, ongoing work is showing promise for controlling diseases in tree bark, controlling citrus greening in certain conditions, aquatic invasive plant and algae control.

**Presenter: John D. Madsen**

***“Using aquatic herbicides to manage the West’s invasive aquatic plant species”***

Research Biologist, USDA ARS Invasive Species and Pollinator Health Research Unit,  
University of California-Davis, Plant Sciences Department  
[jmadsen@ucdavis.edu](mailto:jmadsen@ucdavis.edu), Davis, CA

**Abstract**

The western United States possesses vast vistas of open land and clean waters. Closer inspection reveals that these lands and waters are often infested with invasive plant species. While natural resource managers are familiar with the challenges and issues with terrestrial plant management, they are largely unaware of aquatic plant problems and management solutions. New reduced risk herbicides may often be used to control problematic species, while legacy herbicides also provide opportunities to manage aquatic weeds when used in innovative ways. These concepts will be examined in depth with four scenarios: using reduced risk herbicides to manage the Sacramento / San Joaquin River Delta waterhyacinth; using submersed diquat application to control flowering rush; application of imazapyr and imazamox to emerging flowering rush in drawn-down areas of a reservoir; and management of submersed weeds in areas of high water exchange in reservoirs and tidal estuaries. However, aquatic herbicides have a number of regulatory compliance issues in the West, including herbicide registration, NPDES permitting, irrigation water restrictions, and geographically-based endangered species mitigation requirements. Regional concerns regarding pesticide safety also figure more prominently in aquatic applications than is often the case with terrestrial use. However, herbicide technology can be used to effectively control invasive weeds, allowing improved access to water use, free movement of water for irrigation or flood control, and improving habitat for fish and wildlife.

**Speaker Bio**

Dr. John D. Madsen is Research Biologist with the US Department of Agriculture, Agricultural Research Service, Invasive Species and Pollinator Health Research Unit on the campus of University of California-Davis. Previously, he was a faculty member at Mississippi State University for ten years, and a Research Biologist with the US Army Engineer Research and Development Center. Dr. Madsen has been involved in research on the ecology and management of invasive aquatic plants around the United States of America for over 25 years. He has over 100 peer-reviewed journal articles on the biology, ecology, and management of aquatic plants. Dr. Madsen has a Bachelor of Science degree from Wheaton College, Wheaton, IL, and Master of Science and Doctor of Philosophy degrees in Botany from the University of Wisconsin-Madison.

**Presenter: Steven Manning**

***“Invasives Free USA”***

President, Invasive Plant Control, Inc. [www.invasiveplantcontrol.com](http://www.invasiveplantcontrol.com)  
[steve@ipc-inc.org](mailto:steve@ipc-inc.org), 615-969-1309

**Presenter Bio**

**Steven Manning** has spent the past 25 years working on invasive species. He is founder and President of Invasive Plant Control, Inc. (IPC). IPC was created to extend internationally its dedication to the control of invasive species utilizing a revised IPM approach and has successfully controlled hundreds of invasive species for a wide variety of land managers including federal, state, municipal and private landowners throughout the world. Mr. Manning also designs and implements multiple training courses and workshops worldwide with topics ranging from “Invasive Species in Ports of Entry” to “On the Ground Control Techniques.” IPC invests heavily in educational and awareness activities annually. Mr. Manning has been an instructor for the USFWS’s National Conservation Training Center’s Field Techniques for Invasive Plant Management Course for the past ten years. Mr. Manning is also heavily involved with local, state and international industry development projects including Volunteer Based Early Detection Networks. In 2012 IPC introduced a suite of software and web based tools dedicated to environmental needs. Manning is co-author to, Miller, J.H.: Manning, S.; Enloe, S.F. 2010 “A field guide for the management of invasive plants in southern forests” was published by the U.S. Department of Agriculture Forest Service, Southern Research Station. (<http://www.srs.fs.usda.gov/pubs/36915> <http://wiki.bugwood.org/Invplantmgmt>). He is the acting President of the Pacific Northwest Invasive Plant Council Current Vice President of the Mid Atlantic Invasive Plant Council, recent co-chair of the NMFWA’s Invasive Species Working Group and serves on the board of the North Carolina Invasive Plant Council.

**Presenter: Aaron Martin**

***“ Challenges and successes with preventing and managing aquatic invasive species in Alaska”***

U.S. Fish and Wildlife Service

**Speaker Bio**

Aaron originally hails from Idaho. He has a Bachelor's Degree in Wildlife Biology from the University of Montana and a Master's Degree from the University of Alaska. Aaron worked for the U.S. Forest Service in Alaska and Oregon for six years as a Fisheries Biologist and has worked for the U.S. Fish and Wildlife Service (Service) in Alaska for the past eight years where he is now the Regional Invasive Species Coordinator. Aaron works across Service programs, state and tribal entities, and non-governmental organizations current to establish a statewide comprehensive prevention and early detection and rapid response framework. He is also one of the U.S.'s representatives to the Arctic Council's Arctic Invasive Alien Species Strategy Implementation Working Group and a member of Alaska's Invasive Species Partnership steering committee.

**Abstract:**

Invasive species have significant ecological, economic, and socio-cultural impacts in the regions they are introduced. Conserving and restoring ecosystems and the industries and cultures that depend on the native species/ecosystems can be challenging and contentious due to project logistics and scope as well as differing views on what actions should occur and what invasive species to prioritize resources towards. However, implementing thorough preventative practices and a comprehensive early detection and rapid response program at various scales can minimize the complexity and cost of invasive species management. The U.S. Fish and Wildlife Service in Alaska is collaborating with others to implement a comprehensive prevention and early detection – rapid response framework across Alaska. In this presentation we will highlight our efforts to achieve priority actions of the Arctic Council's Arctic Invasive and Alien Species Strategy and Action plan and domestic strategies through the development of a multi-stakeholder communication plan, preventing the introduction of new invasive species, and manage current invasive species like Signal Crayfish, Northern Pike, and Elodea.

**Presenter: Bryce Maxell**

***“Predicted Habitat Suitability Modeling for Invasive Species and Biocontrol in Montana”***

Program Coordinator, Montana Natural Heritage Program

[bmaxell@mt.gov](mailto:bmaxell@mt.gov); 406-444-3989; Helena, Montana

**Additional Contact:** Jasmine Reimer, State Noxious Weed Coordinator/Program Manager, Montana Department of Agriculture, [jreimer@mt.gov](mailto:jreimer@mt.gov), 406-444-3140, 302 N. Roberts, Helena, MT 59620

**Abstract**

Predicted habitat suitability models for invasive species can be used to indicate the relative risk posed to various landscapes within a management jurisdiction. Similarly, predicted habitat suitability models for biocontrol species can be used to guide releases to areas where agents are most likely to establish successful populations. Modeling landscape-level habitat suitability of invasive species and biocontrol agents in Montana is done by using presence-only data on state listed noxious weeds and popular biocontrol species that are housed in databases at the Montana Natural Heritage Program. Using presence-only data in conjunction with pseudo-absences and 19 statewide biotic and abiotic layers models can be constructed using the Maxent maximum entropy algorithm. Presence-only data is filtered to ensure spatial and temporal accuracy and reduce spatial auto-correlation. A k-folds cross validation methodology is employed using ten folds for model training and validation (90% of the data for training and 10% for testing). The ten estimated models are averaged to produce a map of 90-meter pixel logistic values ranging from 0-1. When enough training data is available, continuous output is reclassified into non, low, moderate, and optimal habitat suitability classes and the 90-meter pixels are aggregated into 1-square mile hexagons to ensure that models are informative to management decisions and used at the landscape scale. Natural resource managers can view model outputs and download model write ups from the Montana Natural Heritage Program's websites <http://mtnhp.org>.

**Speaker Bio**

Bryce Maxell grew up surrounded by a variety of farm animals and spent many hours dogsledding in the mountains of Utah. He completed a B.S. in Biology and a B.A. in Economics at the University of Puget Sound in 1994 where he studied the demography of kelp species in the Puget Sound and was an NAIA All-American swimmer. After his undergraduate degree, he received a Thomas J. Watson Fellowship for a yearlong independent study of the natural history of Australia and New Zealand in 1994 and 1995. Bryce completed his Ph.D. in Fish and Wildlife Biology in the Wildlife Biology Program at the University of Montana in 2009 where he completed a state-wide status assessment of, and constructed predicted habitat suitability models for, Montana's amphibian and reptile species and examined the population demographics of Columbia Spotted Frogs. Between 1996 and 2015, Bryce conducted field inventories for a variety of animal species in Montana. During his time in Montana he has authored or coauthored three books, a dozen peer reviewed publications, and 35-plus professional reports on amphibians, reptiles, bats, small terrestrial mammals, birds, terrestrial mollusks, and fish. Bryce is passionate about making biological information available to resource managers and the general public so that Montana's plants, animals, and terrestrial and aquatic communities can be appreciated by current and future generations and is excited to lead Heritage Program staff in this endeavor.

**Presenter: Cayce McAlister**

***“Organizing a Weed Wrangle in your State”***

Garden Club of America

Weed Wrangle®, a Garden Club of America stewardship program in communities across the country

Cayce McAlister  
The Garden Club of America  
Weed Wrangle®

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**Abstract**

In 1992, The Garden Club of America launched a national stewardship program called Partners for Plants. In cooperation with state and federal agencies, Partners for Plants volunteers work to monitor and conserve rare plants, restore native habitats and remove invasive weeds on federal, state and local public lands. Using botanists and other horticultural experts, these programs provide critical assistance to park managers at a time when many public lands lack botanists and other critical resources. Since the project was launched, Partners for Plants has spawned over 500 projects across the country. One especially successful model is Weed Wrangle®. This project, is a one-day, citywide, volunteer effort to help rescue public parks and green spaces from invasive species through hands-on removal of especially harmful trees, vines and flowering plants while encouraging the replanting of natives. Launched in 2015, by 2019 Weed Wrangle® partnered with over 110 cities across twenty four states growing from a local effort in Nashville, TN into a sophisticated multi-state volunteer force in only four years. The Garden Club of America believes that partnerships and community collaborations work and sees Weed Wrangle® as an opportunity to connect volunteers with education, eradication and restoration across the country.

**Speaker Bio**

Cayce McAlister, is currently serving as the 1st Vice Chair of Conservation for The Garden Club of America and is the co-founder of Weed Wrangle®. The Garden Club of America, founded in 1913, is a national leader in conservation, horticulture and historic preservation dedicated to restoring, improving and protecting the environment. To learn more about Partners for Plants, go to, [www.gcamerica.org](http://www.gcamerica.org).

**Presenter: Dan McLendon**

***“American conservation experience (ace) invasive species strike team. Building partnerships with federal, state, local and non-profit organizations to restore natural habitats on public lands”***

Texas Regional Director. American Conservation Experience- Non-Profit Organization.

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### **Abstract**

Established in 2004, American Conservation Experience (ACE), headquartered in Flagstaff, Arizona, is a nationally-scaled, environmental restoration nonprofit organization. In September 2017, ACE opened the doors to its newest branch in Corpus Christi, Texas; focusing almost entirely on invasive plant management, habitat restoration, and inventory and monitoring. ACE recruits, supports and trains young biologists and outdoorsmen, providing meaningful transferrable professional experience while working on restoration focused projects on America's public lands.

ACE's efforts are supported by an established National Restoration Department equipped with experienced project managers and subject-matter experts who previously worked in the federal and nonprofit sectors. ACE possesses strong and successful long term partnerships with land management agencies representing federal, state, local, and non-governmental entities to advance hundreds of critical habitat restoration projects. We pride ourselves in providing fully trained crews in herbicide application and chainsaw operation; with Crew Leaders as licensed pesticide applicators.

ACE would like to share its recent success stories organizing and implementing invasive plant management projects and strategies thus far in Texas.

The following projects will be showcased within the presentation:

- Invasive Species Strike Team Cooperative Agreement and partnership with USFWS Region 2
- Revegetation project with Texas Nature Conservancy and Laguna Atascosa National Wildlife Refuge
- Brazilian Pepper Tree control project in partnership with Coastal Bend Bays and Estuaries Program, Nueces County Coastal Parks and Texas Parks and Wildlife Department

### **Speaker Bio**

Dan McLendon is an Invasive Plant Ecologist and Regional Director of American Conservation Experience's Gulf Coast Division located in Corpus Christi, Texas. Dan's background in vegetation management began in 2007 as an arborist and tree climber in Boone, North Carolina. After graduation from Appalachian State University in 2011, Dan began his career in Resource Management specialized in invasive plant ecology with the National Park Service's Southeast Exotic Plant Management Team- headquartered out the blue ridge parkway in Asheville North Carolina. Dan has since lived in North Carolina, California, Oregon and Nevada

working with a number of National Park Service Units, fire crews and regional roving NPS Exotic Plant Management Teams.

Following the aftermath of Hurricane Harvey in South Texas in 2017, Dan took a position with the conservation corps non-profit, American Conservation Experience to open a specialized invasive plant management division out of Corpus Christi, Texas. Dan works with local, state and federal land management agencies in Texas and Oklahoma to help develop progressive integrated pest management strategies. The division deploys three, 6 to 8-person Invasive Species Strike Teams to different land management agencies across Texas and Oklahoma to implement EDRR, Inventory and Management, and progressive IPM.

Using the skills and knowledge inherited over the years of managing invasive plant populations on public lands, Dan has adopted the platforms of Exotic Plant Management Teams and USFWS Invasive Species Strike Teams to create a robust invasive plant management program out of Corpus Christi, Texas. The ACE Texas program consists of 6 invasive plant management subject matter expert staff and 17 trained Americorps conservation corpsmen and women.

**Presenter: Joey Milan**

**“A post-biological control release assessment tool and its implementation in the USA”**

Biocontrol Specialist, USDI  
Bureau of Land Management  
Boise, ID

**Presenter: Thomas Moorhouse**

***“Curly-leaf Pondweed Newly Arrived in the Waters Next to the Coeur d’Alene Resort”***

Aquatic Pest Control Adviser (or Manager)  
Clean Lakes, Inc.

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### **Abstract**

Curly-leaf Pond (*Potamogeton crispus*) is a serious submersed aquatic invasive plant pest in the USA with origins in Eurasia, Africa and Australia, and was recorded initially on the east coast in the mid 1800’s. Since then the plant has spread throughout most of the United States and was first observed in lake Coeur d’Alene in July 2018. Several nearby lakes are infested and it is thought the plant was transported by recreational boaters into the lake at a high use launch ramp next to the Coeur d’Alene Resort. A management response is currently being led by the hydropower company, Avista Corporation, Clean Lakes, Inc. as the aquatic plant control contractor, with financial support from the Coeur d’Alene Resort and in cooperation with the Idaho State Department of Environmental Quality and Idaho State Department of Agriculture. Actions taken to date will be discussed.

### **Speaker Bio**

Mr. Moorhouse’s professional experience in aquatic ecosystem restoration and maintenance and project manager spans 24 years and includes aquatic invasive species monitoring, control and eradication plans, and development and implementation of water quality monitoring programs. Mr. Moorhouse has implemented lake management and invasive species projects from planning through implementation phases with a variety of clients and collaborators that include federal, regional, state agencies, and water districts such as the Idaho State Department of Agriculture, the Florida Fish and Wildlife Commission, the US Army Corps of Engineers, United States Agency for International Development, various California water districts and Universities, as well as with counties, cities, and local organizations. Mr. Moorhouse has also implemented and overseen Compliance Monitoring Programs (CMP) for impairments to local lake and creek systems. Mr. Moorhouse has more than 28 years of development and private sector experience, including program management, technical coordination, monitoring and evaluation, natural resource, and account management. He is a graduate of Virginia Polytechnic Institute and State University and is Past President of the Western Aquatic Plant Management Society, a Past Director of the California Lake Management Society, and is and continues to be a member of those organizations as well as the California Weed Science Society, the Aquatic Plant Management Society and the North American Lake Management Society.

**Presenter: Jon Morton**

John Morton Kenai USFWS (Host a session on the tension between managing invasives and translocating species to places they've never occurred before to facilitate climate adaption)

**Speaker Bio**

B.S. Wildlife Science, Mississippi State University; Has worked for the Invasive Species Management Branch of USACE Jacksonville District since 2005 on various invasive species and wetland restoration projects throughout Florida and the southeastern U.S. Interests with UAS include mapping and analysis of natural area communities; invasive species detection and monitoring; and exploring emerging technologies in auto-classification of high resolution imagery.

**Presenter: James Nagler**  
***"Invasive Fishes in Idaho"***

Professor and Department Chair, Department of Biological Sciences; Director of the Center for Invasive Species  
University of Idaho

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**Abstract:**

Idaho has a long history of non-native fishes. Exotic or non-native fishes were intentionally introduced as new angling targets beginning almost a century ago in some instances. Some of these introductions have seemingly had little environmental impact. However, there are several early introductions that are currently problematic in Idaho today, two charr species, the Brook Trout and Lake Trout. Many fish species have been introduced illegally, too. An illegally introduced fish, the Northern Pike, is a more recent invader that is causing much concern in Idaho and throughout the region. Collectively approximately one-third of the ~70 fishes of Idaho are non-native. This presentation will provide an overview and history on non-native fish introductions in Idaho, review fish species that have become a problem, and highlight three fish species of concern: Lake Trout, Common Carp, and Northern Pike. The methods and approaches for managing and controlling these three species will be covered to provide examples of the problem scope in addressing invasive fish species in Idaho.

**Speaker Bio:**

James is a professor of zoology, and currently department chair, in Biological Sciences at the University of Idaho. His area of specialization is fish physiology with an emphasis on reproductive biology and conservation of native fishes. His research program has a partnership with the Columbia River Inter-Tribal Fish Commission. There are two ongoing projects studying the reproductive physiology of repeat spawning female Steelhead Trout and precocious maturation in male Chinook Salmon. Another project is examining the genomics of the persistence of relict, alpine lake populations of Bull Trout (Charr) in Idaho. A recent development is the formation of a new research center at the University of Idaho, the *Center for Research on Invasive Species*, which he will direct. James has a PhD in Biology from Memorial University of Newfoundland where he studied marine fishes. He has lived in Idaho for more than 2 decades and enjoys all aspects of the outdoors that this state and the Pacific Northwest provide.

**Speaker: Todd Neel**

***“Integrating New Tools and Technologies; Pesticide Policy, and Risk Assessment in the U.S. Forest Service”***

Intermountain and Northern Regions, State & Private Forestry, U.S. Forest Service, Missoula, MT

toddaneel@fs.fed.us , 406-329-3133

**Abstract:**

Decisions regarding the application of pesticides to National Forest lands are driven by a combination of best available science; U.S. Forest Service (USFS) policy, and the National Environmental Policy Act (NEPA). For pesticides commonly used by the USFS in its management activities, Human Health and Ecological Risk Assessments (HHERAs) are prepared. In these documents, the process of risk assessment is used to quantitatively evaluate the probability (i.e. risk) that a pesticide use might pose harm to humans or other species in the environment. The USFS incorporates relevant information from the HHERA into environmental assessment documents prepared for pesticide projects, in order to guide decision-making and to disclose to the public potential site-specific environmental effects. Currently the USFS makes 48 HHERAs available to National Forests and their partners. The USFS also supports the development of new pesticide products and registrations through the USFS Pesticide Impact Assessment Program (PIAP), which started as one element of the National Agricultural Pesticide Impact Assessment Program (NAPIAP), a USDA-wide effort to develop pesticide use and effects data, and to fill data gaps in support of EPA registrations. When NAPIAP was disbanded in 1998 the Forest Service saw a continuing need to develop pesticide use and effects data to support USFS programs and NEPA analysis of forest management projects involving pesticide application. The mission of the PIAP is to support studies that develop use and effects data for priority forestry pesticides. PIAP studies generate data and findings in support of continued registration by the U.S. Environmental Protection Agency of forestry uses for pesticides.

**Presenter: Rebecca (Becky) Niemiec, PhD**

***“Motivating Landowners to Recruit their Neighbors for Invasive Species Control”***

Assistant Professor, Human Dimensions of Natural Resources Department

Colorado State University

[Rebecca.Niemiec@colostate.edu](mailto:Rebecca.Niemiec@colostate.edu)

**Abstract:**

Encouraging motivated landowners to not only manage invasive species on their own property but also recruit and coordinate efforts with their neighbors may enhance the effectiveness of invasive species management on private lands. Landowners may only engage in such recruitment if they believe that their neighbors care about managing invasive species, will positively respond to their recruitment efforts, and are likely to take action to manage invasive species. We designed a series of microinterventions based on social psychology research that can be added to community outreach meetings to change these beliefs to encourage landowner engagement in recruitment of others. The microinterventions included neighbor discussion, public commitment-making, collective goal setting, and increased observability of contributions to invasive species control. We report on the results of a field experiment, which tested whether adding these microinterventions to traditional knowledge-transfer outreach meetings changed those beliefs so as to encourage landowners in Hawaii to recruit and coordinate efforts with their neighbors for invasive species management. Analysis of pre- and post- surveys of residents found that, compared with the traditional outreach approach, the microinterventions altered a subset of beliefs that landowners had about others in their community. These microinterventions motivated reputationally minded landowners to recruit and coordinate with other residents to manage the invasive fire ant across property boundaries. Our results suggest integration of these microinterventions into existing outreach approaches will encourage some landowners to facilitate collective invasive species management across property boundaries.

**Speaker Bio:**

**Dr. Rebecca (Becky) Niemiec** is an Assistant Professor in the Human Dimensions of Natural Resources Department at Colorado State University. She has a PhD from the Emmett Interdisciplinary Program in Environment and Resources, Stanford University, and a B.A. in Ecology and Environmental Studies from Dartmouth College. She applies conservation psychology theory and methods to design and evaluate community outreach and engagement programs for conservation. She has conducted research on the human dimensions of a diversity of natural resource management issues including: invasive species management in New Zealand and Hawaii, wolf restoration in Colorado, wild horse management in the West, and wildscaping on residential properties in Colorado.

**Presenter: Stephen J. Novak**

***“Using Multiple Molecular Markers to Reconstruct the Invasion of *Taeniatherum caput-medusae* (Poaceae, medusahead) in the Western United States”***

Professor

Department of Biological Sciences, Boise State University

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**Abstract:**

The combined analysis of native and invasive populations using molecular markers allows for a better understanding of the invasion process. *Taeniatherum caput-medusae* subsp. *asperum* (medusahead) is a winter-annual grass native to Eurasia and invasive in the western United (US). Medusahead dominates one million hectares in its invasive range and causes an alteration of the composition and structure of native plant communities, and an increase in the frequency of range fires. Allozyme analyses of invasive populations indicates that medusahead was introduced multiple times in the western US. Yet, despite this, the species exhibits low genetic diversity within populations and high differentiation among populations. An analysis of native populations suggested that the geographic origins for this invasion are broadly distributed across Eurasia, especially eastern Europe. These populations were next analyzed using amplified fragment length polymorphisms (AFLPs), to more accurately identify putative source populations or regions. Using 110 AFLP loci, 15 multilocus genotypes were detected among invasive populations, and the number of independent introductions was estimated to range from eight to 11. These data suggest moderate propagule pressure for the introduction of medusahead into the western US. Despite moderate propagule pressure, invasive populations had relatively low genetic diversity and high genetic structure. Moreover, the lower level of genetic diversity of invasive populations, compared with native populations, provides evidence that founder effects have influenced the diversity of invasive populations of medusahead. Several lines of evidence clearly pinpoint seven populations (four from eastern Bulgaria, one from the Crimean peninsula, one from Russia, and one from Greece) as the most likely source populations for this invasion. Allozyme and AFLP results are generally similar; although the estimates of genetic diversity using AFLPs are higher than the estimates using allozymes. Results of this study point to the insights into the invasion process that can be gained by using multiple molecular marker.

**Speaker Bio:**

Steve was born and raised in South Philadelphia. He received his BS in Environmental Science from Johnson State College in Johnson, Vermont, and his MS in Plant Pathology from the University of Massachusetts, Amherst. Steve obtained his PhD in Botany from Washington

State University in 1990 working with Dr. Richard Mack, and had a two-year post-doc at Washington State in the laboratory of Drs. Doug and Pam Soltis. Since 1993 Steve has been a professor in the Department of Biological Sciences at Boise State University. It was at Washington State that Steve's life-long obsession and research with invasive species began, especially work on cheatgrass and medusahead. That work continues.

**Presenter: Sujan Panta**

“A novel approach to host-specificity testing in weed biological control for non-target species restricted to highly specialized soil types”

**Authors**

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**Abstract**

The Eurasian stem and petiole gall-forming weevil *Ceutorhynchus cardariae* (Coleoptera: Curculionidae) is a candidate biological control agent for the Hoary cress *Lepidium draba* (Brassicaceae), which is invasive in the western USA. Conventional pre-release feeding, oviposition, and development tests were conducted to assess the environmental safety of the weevil with 157 plant species and found that some North American *Caulanthus* and *Streptanthus* species may potentially be at risk of attack. Some *Caulanthus* and *Streptanthus* species are endemic to serpentine soils, which are characterized by low nutrient content and high concentrations of various combinations of heavy metals. Several species hyperaccumulate certain heavy metals, which have been shown to act as deterrents against insect herbivory. Pre-release host specificity tests were conducted using plants propagated on standardized horticultural soils, which could have inflated performance by *C. cardariae* on *Caulanthus* and *Streptanthus* species. We investigated the performance of *C. cardariae* on four native North American congeneric species, three *Caulanthus* species and the federally listed threatened and endangered *Streptanthus glandulosus* sp. *albidus*, and *Lepidium draba*, on plants propagated in horticultural soil and in native serpentine soil. While *C. cardariae* nibbled on foliage of all four test species, feeding was much less and fewer galls were formed on these species than on *L. draba*. All plant species, including *L. draba* experienced less feeding and gall formation when grown in serpentine soil. Our data shows that native congeners restricted to specialized soil types may be at less risk of herbivore attack than previously predicted.

**Speaker Bio**

Sujan Panta is a second-year master student at department of Entomology, Plant Pathology and Nematology in University of Idaho, USA in Dr. Mark Schwarzlaender's lab where my work focuses on biological control of exotic invasive species particularly host specificity testing. I received my B.S in Agriculture from Tribhuvan University Nepal.

**Presenter: Jessie Paloposki**

***“Engaging Participation in Weed Management Through Art-based Workshops”***

Education and Communication Manager

East Kootenay Invasive Species Council

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**Abstract**

Although some people may say, “pulling weeds is satisfying or therapeutic,” engaging citizens in stewardship activities involving invasive species is a tedious task. The East Kootenay Invasive Species Council has been using art-based activities to teach their communities about the impacts of invasive plants. Instead of simply pulling, bagging, and disposing of invasive plants, EKISC uses art-based workshops to put the plants to use and during the process, education on how to properly harvest, prevent the spread of, and dispose of them is presented. These workshops have proven successful in reaching audiences outside of those who may typically attend weed pulls and ID courses; in turn, creating a community which has a large base of knowledge of invasive species. Participants of these workshops are able to create a sense of meaning in pulling weeds and are more likely to help the cause than not. Join Jessie in this session to get a feeling of the workshops she provides and examples of work from past participants.

**Speaker Bio**

Jessie started her career as an Environmental Educator even before she knew what a career was. As a child, she spent countless hours exploring the forests surrounding her rural BC home. As she grew up, she began to see these wild places disappear. In 2008 her urge to protect wild places led her to begin her professional life as a Park Ranger. Jessie worked for BC Parks for 8 years, committing to protecting our precious natural areas and helping others discover the beauty of the natural world. In 2016, she moved away from parks and joined the East Kootenay Invasive Species Council.

Jessie earned her MA in Environmental Education through Royal Roads University and a Diploma in Natural Resource Management through Vancouver Island University. In her spare time, she can usually be found kayaking a river, skiing in the mountains, or travelling the world.

**Presenter: Jenifer Parsons**

***“The Columbia River Basin Cooperative Weed Management Area – an interstate and international framework for flowering rush control in the Pacific Northwest”***

Natural Resource Scientist, Washington Dept of Ecology (presenting); Jennifer Andreas, Washington State University; Justin Bush, Washington Invasive Species Council

**Contact information** for presenting author: [Jenifer.parsons@ecy.wa.gov](mailto:Jenifer.parsons@ecy.wa.gov), 509-457-7136, Washington Department of Ecology, 1250 W Alder St, Union Gap, WA 98903

### **Abstract**

Flowering rush (*Butomus umbellatus*) is an invasive aquatic plant that thrives in a wide range of habitats. In the Northwestern US and Southwestern Canada it has been introduced in various locations, with the most abundant populations high in the Columbia River watershed. These locations with well-established flowering rush are providing propagules for downriver invasions. Due to the interstate and international nature of the Columbia River watershed, the groups trying to manage this plant felt that coming together as a cooperative to pool resources and plan for strategic control was imperative to success. In 2016, the Washington Invasive Species Council applied for and received a grant from the National Fish and Wildlife Foundation Pulling Together Initiative to move forward in creating a plan. With the funding, a Cooperative Weed Management Area was formed for the entire Columbia River watershed, a flowering rush summit was held, and a plan has been created. The plan establishes priority areas for both control work and research needs. Next steps include using the plan to apply for additional funding to bolster research and control efforts.

### **Speaker Bio**

Jenifer Parsons has been monitoring aquatic invasive plant populations for the Washington Department of Ecology since 1994.

**Presenter: Curtis Pearce, Uprooter Founder and CEO**  
***“Love the Lever: Multiplying the Force Against Invasive Plants”***

Owner/Operator, Uprooter  
541-226-9872, [TheUprooter.com](http://TheUprooter.com)

**Abstract**

US Patent holder and manufacturer of Uprooter, Curtis Pearce, will be speaking on the benefits and effectiveness of using mechanical methods in removing invasive plant species. Using leverage tools can multiply your individual strength for success in mechanical removal and reinforce community participation. He'll share his personal experience with organizing a volunteer Weed Wrangle work event in Oregon last spring, engaging community partners to take action against the problem of Scotch broom. Join Curtis on Friday for a field demonstration and uproot some of Nashville's invasives!

**Biography**

Curtis Pearce, the owner of Uprooter, launched his product in January 2014 following the Weed Wrench opt-out. Having spent 3 years working for Tom Ness at The Weed Wrench Company, he learned what improvements would better meet the needs of customers and developed his patented woody plant pulling tool, the Uprooter. Proud to be the manufacturer of a USA made product, Curtis and his wife build Uprooters to be shipped world-wide. Curtis has worked in the manufacturing industry for over 15 years and holds an Associate Degree in Industrial Welding Technology. Curtis is passionate about educating the community on land stewardship, removing invasive plant species, and restoring native landscapes. He and his wife have enjoyed partnering on local Let's Pull Together events, hosting a Weed Wrangle, and creating the annual Riparian Restoration rafting trip on the Wild & Scenic Rogue River.

**Presenter: Harry Quicke**

***“Depleting the Seed Bank – Key to Restoration of Annual Grass Infested Lands”***

Western Stewardship and Development Manager, Vegetation Management, Bayer Environmental Science.

Contact information: Email [harry.quicke@bayer.com](mailto:harry.quicke@bayer.com) Phone 970-833-0494

**Abstract**

Western natural areas and rangeland are undergoing catastrophic degradation through invasion of annual grasses such as downy brome (cheatgrass), ventenata and medusahead. In addition to direct competition for resources, these grasses provide the fine fuel that allows for an increase in the frequency and size of wild fires. In addition to societal disruption and health effects from smoke, the increased fire frequency can eliminate desirable perennial grass, forb and shrub species. There is an urgent need to slow the spread of invasive annual grasses and to restore degraded areas. Trials across the west document that a single application of indaziflam herbicide results in multiple years of annual grass control, providing a new opportunity to start depleting the annual grass seed bank. Remnant desirable perennial species respond quickly to removal of the annual grass component.

**Speaker Bio**

PhD in Forest Science. Twenty years of experience developing pest management tools for crop and non-crop uses. Currently working with Universities and agencies across the western USA to develop new tools for restoration of annual grass infested rangelands. This focus is efficacy for control of annual grass and other weeds, response of desirable species, habitat quality changes for wildlife and pollinators, impact on wildfire risk through thatch depletion and restoration of conifer production areas.

## **Johnny Randall**

***“In my lifetime: From introduction and lag phase to invasion”***

### **Presenter Bio**

Johnny Randall is the Director of Conservation at the North Carolina Botanical Garden and adjunct faculty in the UNC-Chapel Hill Program in Environment, Ecology, and Energy (EP3). He received a bachelor's degree in biology from UNC-Charlotte, and both a masters and Ph.D. in botany/plant ecology from VA Tech. Johnny served as biology faculty at UNC-Greensboro and at the University of North Florida for a total of 10 years before coming to the North Carolina Botanical Garden in 1998. His primary responsibilities at the North Carolina Botanical Garden are to oversee the conservation and management of approximately 1,200 acres of natural areas, administer the Garden's conservation seed programs, and direct rare plant recovery projects. He also does research on rare plant reintroductions and habitat restoration/rehabilitation and teaches classes on nature preserve design and management. Johnny is a member of the NC Plant Conservation Program Scientific Committee, board member and past president of the NC Invasive Plant Council, member of the NC Pesticide Board advisory committee, former member and co-chair of the Orange County Commission for the Environment, board member of the Chapel Hill Parks, Recreation, and Greenways, and a former member of the Orange County (NC) Planning Board, and sits on several other conservation boards and committees.

**Presenter: Johan Kristian Rud**

***“Invasive plant species management - Leading the non-chemical way”***

Founding owner, Heatweed Technologies – The weed control company  
Agronomist, NMBU, MSc Mechanical Engineering, NTNU  
Johan.Rud@heatweed.com, (+47) 99960 9999

### **Abstract**

Heatweed Technologies is Europe's leading supplier of technology and machinery for non-chemical weed control in public spaces and is represented in 15 different countries and counting. Heatweed's vision is to set new standard for non-chemical weed control in the green sector. The first patent for hot water weed control was established in the US in 1884, but it took more than 100 years before this method was revisited. Heatweed Technologies has more than 35 years of experience in weed control in all its forms. As a result, Heatweed was the first company to introduce hot water as a method for weed control in Europe and is still leading in innovative weed control technology, offering high-capacity machines with world patented sensor technology.

Physics of weeds is important when it comes to developing the most efficient and cost-effective technology. Based on this, Heatweed developed the acclaimed Invasive Species Reduction Program. The Invasive Species Reduction Program has been developed by Heatweed based on the PhD study done by the Norwegian University of Life Science between 2016-2018 on controlling the species *Heracleum Mantegazzianum*, *Impatiens glandulifera* and *Fallopia Japonica*. This program allows municipalities and land owners to monitor reduction of invasive plant species in real-time via an app during a three-year treatment cycle. Plants like Giant Hogweed, Japanese Knotweed, Police Helmet, *Crassula Helmsii* and many other unwanted species are being treated with the Heatweed Method® by contractors in both Scandinavia and the Benelux countries. This presentation will cover alternative thermal methods for weed control in urban areas, the cost of various methods and the results of such treatments.

### **Speaker Bio**

Johan is 23rd generation land- forest- and farm-owner living on the family farm. He is also an agronomist and a mechanical engineer which means that he has been connecting the knowledge from plant science with his interest for developing machinery to make farming more efficient and productive. During the last 30 years part of his farm fields have been kept for research and studies of new plant species and weeding methods. In 2012 Johan founded Heatweed Technologies in Scandinavia and the Heatweed Method® and machinery became the preferred method for non-chemical weed control in all Scandinavian countries within three years. In Spring 2017 Heatweed Technologies bought up the largest non-chemical weed control provider in Europe, Wave Weed Control and have grown to become Europe's largest non-chemical weed control provider. Today, still majority owner, Johan acts as the CTO. 15% of the company's turnover is invested in research and development projects. Heatweed is today part of 7 different pan-European research projects.

**Presenter: Stephanie Sardelis<sup>1</sup>**

**“eDNA: Bridging the Gap Between Science and Management”**

Aquatic Invasive Species National Advisor, Fisheries and Oceans Canada

**Co-Authors:** Laureen Janusz<sup>2</sup>, Martina Beck<sup>3</sup>, Olivier Morissette<sup>4</sup>,  
Chantal Vis<sup>5</sup>, Susan Roe<sup>1</sup>

**Organization(s):** <sup>1</sup> Fisheries and Oceans Canada, <sup>2</sup> Manitoba Department of Sustainable Development, <sup>3</sup> British Columbia Ministry of Environment and Climate Change Strategy, <sup>4</sup> Ministère des Forêts, de la Faune et des Parcs du Québec, <sup>5</sup> Parks Canada Agency

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**Address:** 200 Kent Street, Ottawa, Ontario, Canada, K1A 0E6

**Abstract**

Detecting aquatic invasive species (AIS) in a timely manner can greatly improve the chances of preventing their spread, establishment and harm to species at risk or species of commercial importance. Environmental DNA (eDNA) sampling and analysis are developing quickly as sensitive tools that can efficiently and cost-effectively complement traditional early detection and monitoring methods for AIS. However, some natural resource managers lack confidence in eDNA technology due to ambiguous results and inadequate communication between researchers and managers. This leads to uncertainty regarding the application of eDNA results in real-time management actions, including rapid response to invasions. As a result, natural resource managers may choose to undervalue or discount eDNA results entirely for fear of sacrificing management integrity and public interest. To bridge this gap between science and management, we suggest the implementation of two critical tools: (1) reporting standards for communicating eDNA results, and (2) a policy statement providing guidance on responding to positive detections. In particular, the policy statement incorporates learning from provincial and territorial experience responding to eDNA positive detections and provides managers with support in decision-making, despite the still-improving practices of eDNA sampling and analysis. The National Aquatic Invasive Species Committee (NAISC) under the Canadian Council of Fisheries and Aquaculture Ministers (CCFAM) has lead the initiative for both tools, and their effectiveness now relies on widespread sharing and uptake by national collaborators. For example, standardized reporting protocols and defined terminology must be promoted across federal, provincial, territorial, cross-border and external partners, researchers, and stakeholders. This will allow managers at all levels of government to incorporate eDNA results into the weight of evidence for determining the presence or absence of AIS. ICAIS provides a unique forum to engage both managers and scientists to promote collaboration across disciplines towards action against the threats of aquatic invasive species. (*Preferred presentation format: Oral*)

**Speaker Bio**

Stephanie Sardelis is a National Aquatic Invasive Species Advisor for the federal department of Fisheries and Oceans Canada, and is the secretariat for the federal, provincial and territorial National Aquatic Invasive Species Committee. Stephanie has a Master's from Columbia University in Conservation Biology, where she conducted research in partnership with the Wildlife Conservation Society.

**Presenter: Lizbeth Seebacher**

***“PNW-IPC EDRR Citizen Science Invasive Plant Program”***

Pacific Northwest Invasive Plant Council

EDRR Program Outreach Coordinator

[info@pnw-ipc.org](mailto:info@pnw-ipc.org), [pnw.ipc.org@gmail.com](mailto:pnw.ipc.org@gmail.com)

**Speaker Bio**

Lizbeth Seebacher has an M.S. and Ph.D. in estuarine and freshwater wetland restoration and invasive species biology. She leads numerous workshops and trainings in invasive species biology and species identification for the PNW IPC. She has worked for Sustainable Conservation developing a Plant Risk Assessment model and the Army Corps of Engineers as a Wetland Biologist. Currently, she works for the Washington State Department of Ecology as a Wetland and Aquatic Ecologist where she works on lakes managing two independent programs on aquatic invasive plants and cyanobacteria. She is also a Research Scientist through the University of Washington working on floating treatment wetlands and stormwater impacts on coho. She is a board member for the Society of Wetland Scientist, Washington State Lake Protection Association (WALPA), the Washington Invasive Species Council (WISC) and the PNW Invasive Plant Council (PNW IPC).

**Abstract**

After prevention, Early Detection Rapid Response (EDRR) is the most effective method to control the establishment and spread of new populations of invasive plants. Invasive species management is often constrained by time and resources. In 2012, the Pacific Northwest Invasive Plant Council (PNW IPC) developed an EDRR Citizen Science Invasive Plant Program in order to support county, state and federal management agencies working to locate and eradicate invasive species in Washington State. To date the PNW IPC's EDRR program has trained hundreds of Citizen Scientists to identify target EDRR species and conduct surveys in natural areas on county, state and federal public lands in Washington and Oregon State. We will present how our volunteers have made measurable progress in the effort to detect report and eradicate priority invasive plants from public lands since 2012. We will also present other metrics of success, challenges and lesson learned.

**Presenter: Mark Schwarzlaender**

***“A new hope – Biological control of houndstongue may finally come to the United States”***

Professor of Entomology, Department of Entomology, Plant Pathology and Nematology  
University of Idaho

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**Abstract:**

In 1996, the root weevil *Mogulones crucifer* was petitioned for the release in North America to control the rangeland weed *Cynoglossum officinale* L. The USFWS raised concerns about the environmental safety of the weevil and ultimately, the petition was denied in the 2000s. Meanwhile, the weevil began successfully controlling the rangeland weed in Canada where it received permission for release in 1997. Much research has since been conducted on the environmental safety of the root weevil and also on its closely related sibling species, the seed-feeding weevil *Mogulones borraginis* (F.). Now, the time has come that both weevils will be (again) petitioned for release in the United States. The question here is not what impact the insects may have on houndstongue. They will control the weed in a matter of years. Instead, we will review the research that has been conducted and discuss the odds that the weevils be approved for release.

**Speaker Bio:**

Mark Schwarzländer was born and raised in northern Germany. He received his M.S. and Ph.D. in Biology in 1993 and 1999, respectively from the Christian-Albrechts-University in Kiel, Germany. He conducted graduate research and worked at CABI Switzerland between 1992 and 2000, on the development of biological weed control agents. Mark joined the University of Idaho in 2000, and is a Professor of Entomology in the Department of Entomology, Plant Pathology and Nematology. Students in Mark's lab study various aspects of biological weed control with an emphasis on chemical ecology and biological control impact assessments.

**Presenter: Daniel Simberloff**

***Presentation 1: “Managed relocation – possible invasive threat, and at best a band aid”***

***Presentation 2: “Managing biological invasions: Progress, problems, and polemics”***

Nancy Gore Hunger Professor of Environmental Studies at the University of Tennessee.

**“Managed relocation – possible invasive threat, and at best a band aid”**

Anthropogenic climate change is driving range shifts of species, threatening some with extinction. Proposed "managed relocation" to stem this threat entails moving a species from its historical range to a location that might be more suitable as the earth warms. Managed relocation has also been proposed in response to threats to native species by invasive species or habitat destruction and has already been implemented by government agencies (including at least one US national park), NGOs, and commercial interests. An immediate concern is the potential impact of the relocated species on the recipient community, and the entire history of invasion biology suggests impacts are diverse, often extremely idiosyncratic, and difficult to predict. Even such widely used tools as weed risk assessments are not proof against unanticipated harmful impacts. Costs and benefits of managed relocation proposals should accompany obligatory formal risk assessments. It is important to recognize that carefully assessed managed relocations can forestall climate threats to at most a small fraction of species and are at best a band aid on a gaping wound. The public and its policymakers should not be lulled into a sense that this technology is a substantial response to global warming.

**“Managing biological invasions: Progress, problems, and polemics”**

Much progress has been made in managing invasions since the beginning of modern invasion science in the 1980s. Several innovations have greatly improved early detection, which nevertheless remains a key challenge. For established invaders, prioritization for eradication or management is difficult but substantial progress has been made. Through both incremental improvement of existing technologies and novel approaches, many invasive mammal and insect populations, and some weeds, have been eradicated from islands, and islands over 10,000 ha are often now feasible targets, as are some mainland invasions. Insect and plant invaders on both continents and islands have been maintained at low densities by biological control, and plants have been controlled by physical or mechanical means, often combined with herbicides. Eradication and maintenance management failures often result from insufficient long-term commitment of resources. Excitement abounds over the prospect that new techniques relying on molecular genetic tools – especially RNA interference and RNA-guided gene drives – may permit eradication or maintenance management in situations that have previously appeared intractable. RNA interference has already been deployed for crop plants, and well-funded gene drive projects targeting insects and mammals are underway. Releasing gene drives in the

environment has elicited concern, but the increasing accessibility of increasingly efficient CRISPR tools means gene drives will nevertheless be deployed. Possible methods to improve safe use and counter unintended consequences are under consideration.

### **Speaker Bio**

Daniel Simberloff is the Nancy Gore Hunger Professor of Environmental Studies at the University of Tennessee. He received his A.B. (1964) and Ph.D. (1968) from Harvard University and was a faculty member at Florida State University from 1968 through 1997, when he joined the Department of Ecology and Evolutionary Biology at the University of Tennessee. His publications number ca. 500 and center on ecology, biogeography, evolution, and conservation biology; much of his research focuses on causes, consequences, and management of biological invasions. His research projects are on insects, plants, fungi, birds, and mammals. He is editor-in-chief of Biological Invasions, senior editor of the Encyclopedia of Biological Invasions (2012), author of Invasive Species: What Everyone Needs to Know (2013), co-editor of Integrating Biological Control into Conservation Practice (2016), and serves on the editorial boards of several journals. He served on the United States National Science Board 2000-2006. In 2006 he was named Eminent Ecologist by the Ecological Society of America, in 2012 he won the Margalef Prize for research in ecology, and in 2015 he won the Wallace Prize of the International Biogeography Society for lifetime contributions. He is a member of the U.S. National Academy of Sciences and the American Academy of Arts and Sciences.

**Presenter: Samantha Simon**

Executive Director, Emergency and Domestic Programs Plant Protection and Quarantine  
Animal and Plant Health Inspection Service, U.S. Department of Agriculture

**Dawn Slack*****“Indiana Invasives Initiative – Engaging on a County by County Basis to Build Capacity for Conservation”***

Director of Stewardship, and Project Coordinator for the Indiana Invasives Initiative  
The Nature Conservancy and Southern Indiana Cooperative Invasives Management Group

dawn.slack@tnc.org

931 216 8373

8350 State Road 46 East, Nashville, IN 47448

**Abstract**

Recognizing that protecting our land and waters requires the support of the masses, Indiana is focusing on educating, engaging, empowering and collaborating with landowners across the state through a five-year funded partnership to develop cooperative invasive species management areas (CISMAs) in every county to build capacity for conservation.

Research is increasingly available about the impacts invasive species have, but this information is often unavailable to many of the very individuals and entities responsible for the spread of invasive species. Efforts by organizations and individuals that manage invasive species, are often-unrecognized and occur singly – not concerted. In addition, state and federal resources to manage invasive species are limited. Indiana seeks to resolve some of the indifference, lack of resources, and lack of knowledge about the impact of invasive species through a focus on landowners and a unity of resources at the county level. The goal of this project is to have each county represented by a cooperative invasive species management area (CISMA) in 5-6 years. Each CISMA will focus on education of and then effective action by local citizens and landowners to work collaboratively with existing expert entities on invasive species management and native species restoration. We are already observing that an increase in the overall knowledge base about native and invasive species increases a desire to bolster conservation efforts and identifies local resources to meet such focused goals and objectives.

This session will present the triumphs and struggles of 2 years of work on the project. It will share the plan, the number of CISMAs developed, the partnership with Weed Wrangle, the local resources uncovered and the movement that is stirring to increase capacity for conservation.

**Speaker Bio**

Dawn has a bachelor's in Biology from Drury University in Springfield, MO, and a master's in Biology with a focus in plant taxonomy and stream health from Austin Peay State University in Clarksville, TN. She was a professional consulting biologist for many years before holding the Wildlife Science Supervisor position with the IN Department of Natural Resources, Fish and Wildlife Division and her current position, Director of Stewardship for The Nature Conservancy. She is also Chair for the Indiana Plant Advisory Committee for the Indiana Invasive Species Council and the Project Coordinator for the Indiana Invasives Initiative for the Southern Indiana Cooperative Invasives Management group.

**Shared Parasitoids and Apparent Competition: Looking for Indirect Effects in Florida's Weed Biological Control Agents.**

Authors: Melissa C. Smith, Ellen C. Lake, Philip Tipping, Carey R. Minter, Alissa Berro, Karen Rice-David

**Presenter: Melissa C. Smith, PhD**

***“Shared Parasitoids and Apparent Competition: Looking for Indirect Effects in Florida’s Weed Biological Control Agents.”***

Authors: Melissa C. Smith, Ellen C. Lake, Philip Tipping, Carey R. Minter, Alissa Berro, Karen Rice-David

Research Ecologist  
USDA-ARS Invasive Plant Research Lab  
3225 College Avenue  
Fort Lauderdale, FL 33314

**Presenter: Jessica Spencer**

***“Attempt to Eradicate Salt Cedar from the State of Florida”***

Invasive Species Biologist  
US Army Corps of Engineers

Jessica.E.Spencer@usace.army.mil  
904-232-1696  
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Jacksonville, FL 32207

**Abstract**

Salt cedar (*Tamarix canariensis*) has invaded multiple dredge material management areas (DMMAs) in Jacksonville, FL and spread into surrounding areas. The US Army Corps of Engineers began controlling this invasive shrub/tree on these sites in 2008. Since then, a plan has been developed with the goal of eradicating this species from the State of Florida. The Corps has worked collaboratively with many partners, including other federal, state and local agencies, Cooperative Invasive Species Management Areas (CISMAs), port authorities, universities and military facilities to gain access to all of the areas that the plant was found and perform control work. There is currently one last known location that has a reproducing population of salt cedar, and there are plans to treat that population. Continued monitoring is essential to ensure that no newly germinating plants reach maturity before they are treated. With the relatively short-term seed viability, the chances of eliminating these populations in Florida are good. Everyone wants an eradication success story, but the integral partnerships that have formed to achieve this goal are the true success story.

**Speaker Bio**

Jessica Spencer is an Invasive Species Biologist for the US Army Corps of Engineers, Jacksonville District, where she is the lead biologist for invasive species management on Dredged Material Management Areas (DMMAs). Ms. Spencer has participated in biological control efforts, facilitated restoration projects, developed management plans for control, containment and prevention of invasive species and coordinated interagency efforts to control invasives. She routinely partners with other federal, state and local agencies to address invasive fish, snails, reptiles, mammals and plants and contributed to interagency efforts to develop an Early Detection Rapid Response Decision Framework for the Greater Everglades area. Prior to her experience at the Corps of Engineers, Ms. Spencer worked at Lake Mead National Recreation Area for five years, conducting invasive and rare plant surveys and associated land management activities. She worked to organize and implement a "Weed Sentry" invasive species mapping and control program for all of the federal land management agencies (US Fish and Wildlife, US Forest Service, Bureau of Land Management and National Park Service) in the region. Her achievements include the implementation of a buffer zone project to prevent the spread of invasive fountain grass along the shores of Lake Mojave. Her career has also included conducting vegetation surveys and research for the US Geological Survey and Sequoia National Park.

Ms. Spencer currently holds a Pesticide Applicator License from the Florida Department of Agriculture and Consumer Services and is an active member of the Florida Native Plant Society, Florida Exotic Pest Plant Council, Florida Aquatic Plant Management Society, Everglades Cooperative Invasive Species Management Area and the First Coast Invasive Working Group. Ms. Spencer earned a Bachelor's Degree in Chemistry and Human & Natural Ecology from Emory University and has taken many graduate level courses related to Ecological Restoration with coursework at University of Nevada, Las Vegas, and the University of Florida.

**Presenter: Erin Stocksclaeder**

***“Prioritizing Limited Resources for Restoration Ecologist”***

Ecologist, Fairfax County Park Authority, [Estock@fairfaxcounty.gov](mailto:Estock@fairfaxcounty.gov)  
703 324-8681, Fairfax VA

**Abstract:**

Those of us in the natural resources field are often faced with the issue of having to make tough decisions on where to utilize limited resources. The Fairfax County Park Authority (FCPA) has over 20,000 acres of natural area, almost all of which has some coverage of invasive plants. With a limited annual budget, the FCPA needed a system to decide where to dedicate this limited funding. The Non-Native Invasive Assessment and Prioritization (NNIAP) survey is used to assign a numerical value to parcels based upon ecosystem health, disturbance, invasive plant density and treatment feasibility, as well as prior public involvement. This has allowed the FCPA to focus on “protecting the best” instead of a scattershot method that had little lasting impact. The NNIAP is a comprehensive approach that is realistic and strategic. The surveying began in earnest with summer interns in 2012, and in 2018 all parkland was scored using the NNIAP. Surveying on 2019 will focus on the parcels that were among the first to be surveyed to see how scores have changed in the 6 years. We expect scores to go up in areas that have received treatment and scores to go down in areas that have not received treatment. This will underscore the importance of early intervention when it comes to managing invasives.

**Speaker bio:**

Erin Stocksclaeder is an Ecologist with the Fairfax County Park Authority, in Fairfax VA. She manages the Invasive Management Area (IMA) program which focuses on habitat restoration through volunteer engagement and community outreach. Erin began working for the Park Authority in 2010, immediately after receiving her Bachelor of Science in Environmental Science and Biology from State University of New York (SUNY) Brockport. In 2015 Erin received her Master of Science from George Mason University in Environmental Science and Policy. She is a Certified Ecologist through the Ecological Society of America.

**Presentation 2**

***“More Than Pulling Weeds, Habitat Restoration with Volunteers”***

**Abstract:**

Those of us in the natural resources field are often faced with the issue of having to make tough decisions on where to utilize limited resources. The Fairfax County Park Authority (FCPA) has over 20,000 acres of natural area, almost all of which has some coverage of invasive plants. With a limited annual budget, the FCPA needed a system to decide where to dedicate this limited funding. The Non-Native Invasive Assessment and Prioritization (NNIAP) survey is used to assign a numerical value to parcels based upon ecosystem health, disturbance, invasive plant density and treatment feasibility, as well as prior public involvement. This has allowed the FCPA to focus on “protecting the best” instead of a scattershot method that had little lasting impact. The NNIAP is a comprehensive approach that is realistic and strategic. The surveying began in earnest with summer interns in 2012, and in 2018 all parkland was scored using the NNIAP. Surveying on 2019 will focus on the parcels that were among the first to be surveyed to

see how scores have changed in the 6 years. We expect scores to go up in areas that have received treatment and scores to go down in areas that have not received treatment. This will underscore the importance of early intervention when it comes to managing invasives.

**Presenter : Sonja Stutz**

***“The challenges of synchronisation in plant and insect phenology for conclusive results of host-specificity tests: the case study of a biocontrol agent on common tansy”***

Research Scientist, CABI in Switzerland, s.stutz@cabi.org, +41 32 421 48 76, Rue des Grillons 1, 2800 Delémont, Switzerland

**Abstract**

Common tansy, *Tanacetum vulgare*, is a perennial plant native to Eurasia that has become an increasing weed problem in pastures, riparian areas and forest margins across the northern USA and Canada. The plume moth *Platyptilia ochrodactyla* is currently being studied as a potential biological control agent for *T. vulgare*. *Platyptilia ochrodactyla* has a rather unique life cycle: females oviposit into the flower heads of *T. vulgare* where the early instar larvae are overwintering. The larvae leave the flower heads the following spring and burrow mines into newly growing shoots. No-choice oviposition and larval development tests revealed that *P. ochrodactyla* can develop on several congeneric species, including the North American native *Tanacetum camphoratum* and *T. huronense*. A common next step in evaluating the risk of non-target attack in the field would be to expose target and non-target species simultaneously under multiple-choice conditions to ovipositing females. However, since the congeneric non-target species flower several weeks earlier than the target weed, *P. ochrodactyla* may not experience a choice-situation under natural conditions. Early flowering non-target species may either be safe from attack by *P. ochrodactyla* or, if *P. ochrodactyla* become reproductively active before any *T. vulgare* are flowering, they may accept nontarget species that would not be accepted if flowering *T. vulgare* were present. To further evaluate the risk of non-target attack by *P. ochrodactyla* we therefore conducted a series of open-field tests where we either exposed non-target species to a natural population of *P. ochrodactyla* or artificially synchronized *P. ochrodactyla* with the flowering period of non-target species. The results of these open-field tests will be presented in conjunction with observations on the phenology of *P. ochrodactyla* and of the target and non-target species.

**Speaker Bio**

Sonja Stutz is a research scientist with CABI in Switzerland. She did her PhD at CABI and the University of Fribourg, Switzerland investigating the potential invasion mechanisms of oxeye daisy in North America. She is now working on several biological control projects for North America, Australia and New Zealand. This work includes field surveys in Europe and Asia as well as host range and impact studies of potential biological control agents for oxeye daisy, common tansy, perennial pepperweed and lesser calamint.

**Title of Presentation:**

Examining pre-alignment host-selection of a biological control candidate *Ceutorhynchus rusticus* for *Isatis tinctoria* in response to olfactory and visual cues of nontarget confamilial plants

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Pre-release assessments of the host range of biological weed control candidates typically rely on no-choice and choice feeding and development tests. However, these tests may exclude environmentally safe biocontrol candidates from consideration if they can develop on nontargets that they would not colonize post release because of behavioral barriers. Accurate assessment of post-release host range should therefore consider host selection behavior. Here, we present data on pre-alignment host selection behavior of the root crown weevil *Ceutorhynchus rusticus* Gyllenhal, a potential biological control agent for the Eurasian mustard *Isatis tinctoria* L. Previous oviposition and developmental tests with 123 test plant species showed that *C. rusticus* can develop on 11 Brassicaceae species. We examined the behavioral response of *C. rusticus* to olfactory and visual cues separately and together for nine of these species, compared with responses to the same cues from *I. tinctoria* and purified air (as control) using a modified y-tube device. We also identified volatile organic compounds (VOCs) in the foliar headspace of *I. tinctoria* using gas chromatography-mass spectrometry (GC-MS). Our data imply that sensory host recognition studies could be an important additional factor to determine the risk of nontarget attack by biological control candidates.

#### **Speaker Bio:**

Bijay Subedi is an international student from Nepal, pursuing a Masters degree in Entomology at the University of Idaho, USA. Under the supervision of Dr. Mark Schwarzländer, he is examining the host selection behavior of *Ceutorhynchus peyerimhoffi* and *C. rusticus*, biological control agents of the Eurasian weed *Isatis tinctoria*.

**Presenter: Bijay Subedi**

***“Examining pre-alignment host-selection of a biological control candidate  
Ceutorhynchus rusticus for Isatis tinctoria in response to olfactory and visual cues of  
nontarget confamilial plants”***

M.S

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Pre-release assessments of the host range of biological weed control candidates typically rely on no-choice and choice feeding and development tests. However, these tests may exclude environmentally safe biocontrol candidates from consideration if they can develop on nontargets that they would not colonize post release because of behavioral barriers. Accurate assessment of post-release host range should therefore consider host selection behavior. Here, we present data on pre-alignment host selection behavior of the root crown weevil *Ceutorhynchus rusticus* Gyllenhal, a potential biological control agent for the Eurasian mustard *Isatis tinctoria* L. Previous oviposition and developmental tests with 123 test plant species showed that *C. rusticus* can develop on 11 Brassicaceae species. We examined the behavioral response of *C. rusticus* to olfactory and visual cues separately and together for nine of these species, compared with responses to the same cues from *I. tinctoria* and purified air (as control) using a modified y-tube device. We also identified volatile organic compounds (VOCs) in the foliar headspace of *I. tinctoria* using gas chromatography-mass spectrometry (GC-MS). Our data imply that sensory host recognition studies could be an important additional factor to determine the risk of nontarget attack by biological control candidates.

**Speaker Bio:**

Bijay Subedi is an international student from Nepal, pursuing a Masters degree in Entomology at the University of Idaho, USA. Under the supervision of Dr. Mark Schwarzländer, he is examining the host selection behavior of *Ceutorhynchus peyerimhoffi* and *C. rusticus*, biological control agents of the Eurasian weed *Isatis tinctoria*.

**Presenter: Samantha Tank**

***“Utilizing an adaptive management approach for invasive species management:  
Implementing the Phragmites Adaptive Management Framework “***

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## Abstract

Effectively managing invasive species is a significant challenge that requires constant learning and adaptation, as well as meaningful engagement of the broader management community which includes federal and state partners, conservation organizations, and private landowners. Non-native *Phragmites australis* is a serious invader that has colonized over 60,000 acres of Great Lakes coastline and many inland areas. Control efforts are widespread, yet effectiveness may vary due to infestation level, application methods, environmental conditions, and other factors. Thus, the *Phragmites* Adaptive Management Framework (PAMF) was developed by the Great Lakes *Phragmites* Collaborative (<https://www.greatlakesphragmites.net/>) as a program designed to reduce uncertainty and increase the efficiency of *Phragmites* control using adaptive management. Through a systematic approach, PAMF partners with *Phragmites* managers across the basin to refine best management practices and provide site-specific management guidance. PAMF is now in its third iterative cycle and has widespread participation across the Great Lakes basin. This presentation will focus on reflections and findings from implementing an adaptive management approach to invasive *Phragmites* management.

## Speaker Bio

Samantha is a program specialist at the Great Lakes Commission (GLC) where she coordinates the *Phragmites* Adaptive Management Framework (PAMF). In her current position, Samantha works binationally to engage land managers, agencies, and private citizens to support their efforts managing invasive *Phragmites*. She has a Master's and Bachelor's in Fisheries and Wildlife from Michigan State University.

**Presenter: Professor Dan Tompkins**

***“Predator Free New Zealand”***

Project Leader Science Strategy, Predator Free 2050 Ltd

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**Abstracts**

**Assessing the potential of synthetic biology for pest management**

Dan Tompkins, IUCN Task Force and Technical Subgroup on Synthetic Biology. Synthetic biology is receiving broad attention as a field that may provide a new toolkit for addressing many conservation issues including invasive species. However, the application of such tools to the natural environment also raises multiple concerns. The International Union for the Conservation of Nature (IUCN), founded in 1948 with the mission to “influence, encourage and assist societies throughout the world to conserve nature and to ensure that any use of natural resources is equitable and ecologically sustainable”, are developing policy on “Synthetic Biology and Biodiversity Conservation”. Part of this process has been the construction of a Technical Assessment, considering the potential risks, benefits and current state of development of these approaches. Here I present the findings of the Technical Assessment “Genetic frontiers for conservation: An assessment of synthetic biology and biodiversity conservation”, highlighting in particular the points relevant to pest management. I finish by outlining the ongoing policy construction process, which will conclude in a vote on policy adoption by the IUCN’s >1300 governmental, non-governmental and indigenous people’s member organisations at the World Conservation Congress in 2020.

**Developing the tools for Predator Free 2050 – progress to date and future strategy**

Dan Tompkins, Project Manager: Science Strategy, Predator Free 2050 Limited

In 2016, New Zealand announced a national goal of eradicating introduced predatory mammals critically threatening native biodiversity (brush-tail possums, rats and stoats) from the country by 2050. The need for this initiative was driven home by the NZ Parliamentary Commissioner for the Environment’s 2017 report ‘Taonga of an Island Nation: Saving New Zealand’s Birds’, highlighting the fact that over 80% of native bird populations are in decline, primarily due to introduced predators. Predator Free 2050 Limited was formed to coordinate partnership approaches to large landscape projects and breakthrough science. It aims to supercharge local and regional efforts to scale up predator suppression and eradication, working closely with community groups and regional and city councils, and to focus research efforts to achieve a breakthrough science solution capable of eradicating at least one small mammal predator by 2025. Here I update on our activities since the presentation given at last year’s Innovations in Invasive Species Management conference in Nashville, covering the general mission and the large landscape projects that have been initiated, but focussing on the science strategy that has

directed research investment to date, and the current process of strategy construction for 2020-24.

### **Speaker Bio**

Dan Tompkins leads the science strategy for Predator Free 2050, New Zealand's initiative to eradicate invasive predators for the benefit of native biodiversity, as the Project Manager Science Strategy of Predator Free 2050 Ltd. Dan is an Honorary Professor at the University of Otago, New Zealand, and member of the International Union for Conservation of Nature (IUCN) Task Force on Synthetic Biology and Biodiversity Conservation. An ecologist and epidemiologist by training, with degrees from Cambridge University and the University of Oxford, Dan's past research includes: exploring novel high-tech approaches to pest control (including the 'Trojan Female Technique' approach to fertility control); understanding the interactions among species in the New Zealand mammal pest community; demonstrating the efficacy of oral BCG vaccination for TB control in brushtail possums; and demonstrating the role of shared diseases in native species declines.

**Presenter: Kateri Tonyan**

***“Challenges of Invasive Species Management on Department of Defense Properties”***

Supervisory Natural Resource Specialist

Colorado State University, Center for Environmental Management - Military Lands

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Avon Park Air Force Range, 29 South Blvd, Avon Park, FL 33825

**Abstract**

Invasive plants are not unique to public lands but managing invasive species on Department of Defense properties involve unique challenges. This public land has military personnel training, public use, budgetary restraints, fellow natural resource staff projects, and more. Juggling military personnel visiting from all over the country (and the world), active prescribed fire programs, limited staffing, general public fighting for their right to hunt, we will be discussing the many challenges we face at our specific Department of Defense properties and how we overcome those challenges to have successful outcomes within our programs.

**Speaker Bio**

Kateri Tonyan is the Supervisory Natural Resource Specialist at Avon Park Air Force Range. Kateri received her Bachelors of Environmental Science from Eastern Illinois University where she concentrated in botany. She has been working with invasives species for 10 years throughout the United States including Illinois, Tennessee, North Carolina, Texas and Florida.

**Presenter: Morgan Valliant**

***“Evaluating the Ecological Impacts of Common Buckthorn in Montana”***

Conservation Lands Manager, Organization: Missoula Parks and Recreation

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**Abstract**

Common buckthorn (*Rhamnus cathartica*) is a large shrub native to Europe that aggressively invades wetter habitats in the Northeast and northern Midwest of the United States, where it has been declared a noxious weed in several states (Knight et al. 2007). In the more arid West, buckthorn exists in scattered populations that reflect a legacy of horticultural plantings and possibly also the early invasion stages of a high-impact exotic. However, buckthorn's status is unclear in the West, where it remains largely unstudied. In 2016, the USDA Rocky Mountain Research Station and Missoula's Conservation Lands Management Program, with funding from the Montana Noxious Weed Trust Fund, gathered data to quantify buckthorn's effects on native riparian plant communities in Montana to inform the Montana State noxious species listing process. We conducted vegetation surveys of populations in and around Missoula, Helena, Bozeman, and Billings that were representative of invasions in western and eastern Montana. We used these data to evaluate the relationship between buckthorn invasion and native riparian vegetation at differing strata, including woody species in the understory and overstory as well as herbaceous species. We found significant negative correlations between buckthorn cover and native vegetation cover indicative of impacts at all strata, but particularly in the overstory. Importantly, these declines in native cover were also correlated with the age of buckthorn individuals within plots, suggesting that negative effects of buckthorn built as invasion progressed. Understory cover of buckthorn similarly increased with time since invasion across study areas. Our results suggest that 1) buckthorn populations in Montana significantly impact native vegetation, and 2) these populations are actively spreading. While it appears that buckthorn is largely restricted to riparian habitats in Montana (we did not formally evaluate this), the fact that we find evidence for significant impacts on native plants across study areas in the Yellowstone, Gallatin, Missouri, and Bitterroot-Clark Fork drainages suggests that buckthorn has the ability to invade and impact many riparian habitats in the state. Based on this research, common buckthorn was declared a noxious weed by the State of Montana in 2017.

**Speaker Bio**

Morgan Valliant has been restoring native habitats on public and private lands in Western Montana for 20 years. He holds a B.S. in Biology from the University of Montana and an M.S. in Botany from Washington State University. Currently, Morgan is the Conservation Lands Manager for the City of Missoula and manages over 4300 acres of public natural areas. These natural areas are adjacent to a City of 70k people and are often introductory points for new invasive species. Missoula's Conservation Lands Program frequently conducts research on novel techniques for invasive species control, habitat restoration, and Jedi mind control of public recreationists.

**Presenter: Ben van Staden**

Senior Manager – Green Jobs | People and Conservation Programme, Working for Water Programme, South Africa

**Presenter: Jeremey Varley**

***“Idaho Aquatic Noxious Weeds Program, an update on the infestations and treatments occurring in Idaho by ISDA”***

Section Manager, Noxious Weeds  
Idaho State Department of Agriculture

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**Abstract:**

When it comes to the management of any invasive species knowing where each species is and its current level of infestation is extremely important and even more so for aquatic noxious weed species. The Idaho State Department of Agriculture has changed how it surveys for aquatic plants and how they are documented. Thus ensuring more accurate applications targeted to areas of infestation with a goal of reducing infestations of Idaho’s listed aquatic noxious weed species. This presentation will also walkthrough ISDA’s 2019 season and the results of surveys, treatments, and post treatment monitoring

**Speaker Bio:**

Jeremey Varley is the Section Manager for noxious weeds with the Idaho State Department of Agriculture. Jeremey oversees all programmatic activities related to the Idaho Noxious Weed Law and it’s respective administrative rules for noxious weeds and noxious weed free forage and straw. Prior to this role Jeremey was a noxious weed superintendent for Lemhi County, Idaho. In addition to his county responsibilities he also managed the Lemhi and Frank Church Cooperative Weed Management Areas

**Presenter: Teagan Ward**

***“Whatcom Boat Inspections: Preventing the spread of aquatic invasive species in Whatcom County, Washington”***

Aquatic Invasive Species Program Coordinator  
City of Bellingham

[teward@cob.org](mailto:teward@cob.org), 360-778-7972, 2221 Pacific Street, Bellingham, WA 98229

### **Abstract**

The Lake Whatcom Management Program began implementing the Whatcom Boat Inspection Program in 2012 to prevent the introduction of zebra and quagga mussels and other aquatic invasive species to Whatcom County waters. To date, the program has conducted over 50,000 watercraft inspections at Lake Whatcom and Lake Samish. The program has not only helped to prevent the spread of additional aquatic invasive species to these local lakes, it has also helped to increase community awareness regarding the threats that aquatic invasive species pose to Washington waters and how to prevent their spread. This presentation will provide an overview of the Whatcom Boat Inspection Program highlighting outreach efforts, inspection results, and lessons learned from 2012 through 2019.

### **Speaker Bio**

Teagan Ward is the Aquatic Invasive Species (AIS) Program Coordinator for the City of Bellingham. She developed the City's AIS prevention program and has overseen its implementation since 2012. Additionally, she is a member of the Interjurisdictional Coordinating Team, a staff group that coordinates Lake Whatcom Management Program activities which aim to improve lake water quality by jointly implementing programs affecting the Lake Whatcom Watershed. She has worked for the City of Bellingham since 2009. Teagan has an undergraduate degree in Biology from Carleton College and a graduate degree in Environmental Management with an emphasis in water resource management from Duke University's, Nicholas School of the Environment.

**Presenter: Raymond Willard, PLA**

***“Applying Transportation Asset Management to Highway Roadsides Invasive Species Prevention through Improved Land Use Planning and Management”***

State Roadside Asset Manager

Washington State Department of Transportation

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Olympia, WA 98504-7358

**Abstract**

The best overall protection against invasive species starts with cultural recognition of the value of environmental stewardship when planning and managing land use. In developing land-based systems to support human existence and prosperity, environmental impacts are often overlooked or overrated. It is the responsibility of government to find a sustainable balance between the operational needs of human society, and protection of the natural environment, and to provide examples that demonstrate this balance, through the effective and efficient management of public lands.

This presentation will show how the Washington State Department of Transportation (WSDOT) would like to use the state's highway roadsides as an example of best management practices for land use, and is using asset management planning to make a case for improving the environmental condition of the state's roadside right of way. WSDOT recently published (June 2019) a transportation asset management plan, which identifies and quantifies operational and ecological metrics for planning, tracking, and measuring outcomes of the work involved with highway roadside land use and vegetation management. To support this asset management plan, the agency has developed a coordinated set of maintenance management tools for roadsides including:

1. Documented annual performance measures for roadside maintenance (since 1996)
2. Annually updated and mapped statewide inventory of all planned roadside maintenance work units (since 2005)
3. Mobile technology application for recording geographically referenced work accomplishment and cost data (since 2017)

While some of WSDOT's roadside assets are currently being maintained in a relatively good state of repair, others are being neglected due to lack of maintenance resources. This presentation will show how WSDOT intends to use these planning tools and technology to make a business proposal for funding to maximize operational and environmental sustainability, and achieving a state of good repair in the management of approximately 100,000 acres of roadside right of way throughout Washington State.

WSDOT's asset management plan is based on the distinction between two major types of roadside areas with dramatically different long-term management strategies:

1. Operational (everything within the first 20 to 30 feet from traffic)
2. Non-operational (everything else – all corridors and interchanges where there is right of way width beyond what is required for traffic operations, and all environmental mitigation sites)

Functional objectives and maintenance requirements in the Operational Right of Way are consistent and mostly standardized throughout the state – Maintenance activity in this area is routine and easily planned. In the Non-operational Right of Way, objectives and required maintenance are dictated by surrounding land use and native ecosystems, and many sites require long-term restoration effort or working in partnership with neighbors and volunteers. Management of the Non-operational Right of Way is challenging due to the varied site conditions throughout the state, and due to the fact that this work is often put off year after year when funding is tight.

This presentation will show how the agency would go about restoring all the environmentally deficient roadsides in the state over a 10 year period, and discuss the projected life-cycle costs and benefits. In conclusion, it will be shown how the business model for land use asset management being created by WSDOT for roadsides could be effectively applied to other types of public lands, as well as in commercial land use ventures and even by private property owners.

### **Speaker Bio**

Ray holds a Bachelor of Landscape Architecture from the University of Washington and is a licensed Landscape Architect in Washington State. For the past 25 years Ray has worked on directing and developing WSDOT's roadside vegetation management program. He has also represented WSDOT on the Washington Invasive Species Council since its inception in 2006 and currently serves as the council chair. At the national level, Ray has helped establish an active network of roadside managers from around the country, to facilitate ongoing research and discussion of best management practices. He currently acts as Research Coordinator for the Transportation Research Board's Standing Committee on Roadside Maintenance Operations, and also served as president of the National Roadside Vegetation Management Association in 2003.

**Presenter: Thomas Woolf**

***“Montana’s Aquatic Invasive Species Program: Show us your Mussels”***

Aquatic Invasive Species Bureau Chiefg, Montana Fish Wildlife and Parks

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### **Abstract**

Invasive mussels were detected in Montana in late 2016 resulting in a rapid expansion of the state’s AIS program. The issue captured the interest of politicians and the public throughout the west and resulted in significant increases federal and state funding. Two years following the detection, the program in Montana has begun to stabilize and no new evidence of mussels has been found. Maintaining interest and support for the issue will be critical for sustaining the AIS effort.

### **Speaker Bio**

Thomas Woolf has worked on aquatic invasive species issues for nearly twenty years, most recently with the Idaho State Department of Agriculture developing and implementing Idaho’s AIS program. In 2017 he started as the AIS Bureau Chief for Montana Fish Wildlife and Parks and currently manages the state’s aquatic invasive species program.

**Presenter: Nic Zurfluh**

***“Idaho Watercraft Inspection Program, Preventing the Spread of Aquatic Invasive Species”***

Section Manager, Invasive Species Outreach and Coordination

Idaho State Department of Agriculture

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**Abstract:**

Idaho invasive species program was created in 2009 to institute an ambitious and proactive watercraft inspection program to prevent the spread of quagga and zebra mussels into the state. To date the program has inspected over 720,000 watercraft and detected 289 mussel fouled watercraft. Idaho's program monitors the waters of the state for various all taxa aquatic invasive species, including quagga and zebra mussels. To date, no evidence of quagga or zebra mussel have been found in the waters of Idaho. Idaho also has a program to prepare and rapidly respond to potential mussel detections. Lastly Idaho's program utilizes various campaign messages through multiple outreach approaches to inform citizens about the impacts of invasive species and pathways.

**Speaker Bio:**

Nic Zurfluh is the Section Manager for Invasive species outreach and coordination with the Idaho State Department of Agriculture. Nic oversees all programmatic activities related to the Idaho Invasive Species Act and respective administrative rules. Prior to this role Nic was a program specialist for ISDA overseeing Noxious Weed and invasive Species related activities in SW Idaho area.

## Poster Presentations

Management of Ventenata (*Ventenata dubia*) and other annual grasses Conservation Reserve Program Land

Jared Beuschlein

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Washington State University Crop and Soil Science

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*Ventenata dubia* is a winter annual grass invasive to Conservation Reserve Program lands in Eastern Washington and Northwestern Idaho. Currently, there is limited management strategies for multiple years of control and does not injure desired species. Indaziflam has been found to control invasive annual grasses such as ventenata, downy brome and medusahead. Our objective was to compare annual grass weed control in CRP with indaziflam alone or in combination with other available preemergent (PRE) products. Treatments were randomized in a randomized complete block design. These included indaziflam ( $102 \text{ g ai ha}^{-1}$ ), propoxycarbazone ( $59 \text{ g ai ha}^{-1}$ ), rimsulfuron ( $\text{g ai ha}^{-1}$ ), imazapic ( $123 \text{ g ai ha}^{-1}$ ), glyphosate ( $533 \text{ g ai ha}^{-1}$ ) and mixes of indaziflam in combination with the other chemicals listed previously. Biomass was taken 91 weeks after application (WAT) by harvesting two tenth meter squared quadrats from each plot. Treatments containing indaziflam with either rimsulfuron or imazapic decreased ventenata biomass by 97% 91 WAT (nontreated: 10 g, indaziflam + rimsulfuron: 0.3 g, indaziflam + imazapic: 0.1 g). Downy brome biomass had no significant difference between treatments 91 WAT due to low population densities. Medusahead biomass significantly decreased when treated with indaziflam and imazapic 91 WAT (nontreated: 70 g, indaziflam + imazapic: 0.1 g). Similar results were observed with all invasive grass biomass was combined over species 91 WAT. Idaho fescue biomass was higher than nontreated biomass when indaziflam was applied due to reductions in annual grass weeds. Results indicate that indaziflam has prolonged control ventenata with reduction in biomass still present almost two years after treatments were applied.

Hi, my name is Jared Beuschlein. I am a current masters student studying weed science at Washington State University originally from York Pennsylvania. My project is working on Ventenata management using Esplanade on Conservation Program land. I have a bachelors in biology focusing on ecology.

## ***Ageratum conyzoides* in West Africa: Friend or foe?**

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### **Abstract**

*Ageratum conyzoides* L. (Asteraceae) is an herbaceous plant native to tropical America, especially Brazil but is now invasive in many tropical regions including West Africa where its status is subject of an on-going debate. Here, we examined the existing literature to ascertain the current status of the weed in West Africa. Of a total of 51 reviewed articles, Nigeria recorded the highest number of publications (66%), followed by Ghana (10%). Furthermore Benin Republic, Burkina Faso, Côte d'Ivoire and Mali had only one publication each. Eighty-eight percent of the total number of publications reported the positive impacts of *C. odorata* while below 12% reported negative impacts of the plant. The use of the plant gained recognition from 2001. Our findings revealed that *A. conyzoides* is used for ethnomedicinal purposes and most studies report on its antimicrobial, antioxidant, anticancerous and wound healing activities, which can be traced to its rich phytochemical contents. Only 3 and 2 publications from Ghana and Togo respectively, considered *A. conyzoides* as a weed with various negative impacts on agriculture and human health. Despite the few reports on the impacts of *A. conyzoides* in the West African sub-region, the significant amount of publications on the usefulness of the plant is suggestive of the fact that the weed is more of a friend than a foe. However, studies on the socio-ecological impacts of *A. conyzoides* are needed to properly ascertain the status of the plant from the perception of the locals.

**Keywords:** Invasive alien plant, Asteraceae, benefits, costs, West Africa

### **Speaker Bio:**

Afure Joan Ejomah is a young academic, researcher and scientist with a Bachelor of Science (B.Sc. Hons) degree in Animal and Environmental Biology (Applied Entomology). She is currently a postgraduate student at the Department of Animal and Environmental Biology University of Benin, Benin City. Her research interests focuses on the ecology and management of invasive alien species using specialist herbivores as biological control agents. She is also interested in insect toxicity and how pesticides affect the behavior of insects. She has co-authored several papers and have attended and communicated her research findings at prestigious conferences.

Lampe, John K. How Precise Is the Spray Pattern with a Typical Backpack Sprayer? Green Shoots, LLC, St. Paul, Minnesota. Email: [john@greenshootsonline.com](mailto:john@greenshootsonline.com).

Using a backpack sprayer with a standard nozzle, how targeted can we be? This question is especially important when spraying in natural areas where native plants: (1) are often long-lived and valuable; (2) are not monocultural; (3) are not herbicide resistant; and (4) are not planted in neat rows. The tests conducted here compared spray patterns when sprayed at ultra-low pressure (10 psi) and conventional pressure (30 psi). The results of the tests show that spray patterns do not conform to the “actual spray coverage” patterns shown in nozzle guides. The presentation offers suggestions on how to increase precision when doing applications.

#### Biographical Sketch

John founded Green Shoots, LLC, in 2011. Green Shoots develops, manufactures, and markets precision devices for the control of invasive plants. John holds more than ten U.S. and foreign patents. He has presented and held demonstrations at numerous national and regional invasive species conferences. He is a licensed pesticide applicator. For more than two decades John has helped restore ecosystems burdened with invasive species – much of that work has been as a volunteer.

Title of Presentation:

Soil moisture and nutrient impacts on biological control of spotted knapweed by seed-feeding weevils *Larinus* spp.

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Abstract:

Spotted knapweed (*Centaurea stoebe* ssp. *micranthos*) is a widespread invasive plant found throughout western North America that has caused significant negative ecological and economic impacts. Releases of insect biocontrol agents have resulted in inconsistent control, and it is unclear how biocontrol will be influenced by climate change. In the Southern Interior of British Columbia, which is forecast to experience increased drought and wildfires, the responses of both biocontrol insects and their host plant to shifts in moisture and nutrient regimes are unknown and may impact the future efficacy of spotted knapweed biocontrol. To assess current and predict future efficacy of spotted knapweed biocontrol in the context of changing climate, I will undertake a three-part study using the seed-feeding weevils *Larinus minutus* and *L. obtusus* (Coleoptera: Curculionidae) including: (1) a systematic literature review of spotted knapweed biocontrol response to environmental heterogeneity, (2) morphomolecular analysis of *Larinus* spp. to compare species' distributions to their purported climatic niches, and (3) greenhouse and common garden experiments comparing *Larinus* sp. and spotted knapweed development under different moisture and nutrient treatments. The results will inform management strategies and further our understanding of climate change impacts on plant-insect interactions.

Speaker Bio:

Kayleigh is a doctoral student at the University of British Columbia, supervised by Dr. Jason Pither and co-supervised by Dr. Rosemarie De Clerck-Floate at Agriculture and Agri-Food Canada Lethbridge Research and Development Centre. Prior to this, Kayleigh attended the University of Lethbridge in southern Alberta, where she received her B.Sc. (Hons) in 2014 and M.Sc. in 2018, supervised by Dr. Stewart Rood. Her M.Sc. research focused on the effects of the environment and human disturbance on non-native plant occurrence at freshwater springs. Following the completion of her M.Sc., Kayleigh spent a semester working with Dr. De Clerck-Floate on a proposed mouse-ear hawkweed wasp biocontrol agent, and in January 2019, she began her Ph.D. with Drs. Pither and De Clerck-Floate at UBC Okanagan. Kayleigh's doctoral research is part of a collaborative research project on weed biocontrol with the BC Ministry of

Forests, Lands, Natural Resource Operations and Rural Development, Agriculture and Agri-Food Canada's Lethbridge and Summerland Research Stations, and UBC Okanagan.

**Title:** Proper Gridding Technique for Invasive Plant Management

**Author**

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**Abstract:** Gridding is a necessary tool in invasive plant management to ensure thorough coverage of a given area regardless of treatment method. Though simple in principle, gridding has a number of complications that can make effective execution difficult in the field. Having a basic framework from which to work from will help a crew to adapt to the many variables they may encounter. For instance, every grid should have roles for the participants including that of a leader and a follower who define the edges of the grid pattern. Use of staggered lines helps to maintain the grid shape through curves and obstacles in the treatment area. Sub-dividing an irregularly shaped treatment area can streamline an otherwise complex grid pattern into manageable pieces. Many tools are helpful in one of the most difficult aspects of on-the-ground gridding – that of following a straight line. Everything from GPS units to flags to compasses can be used - each with its own set of benefits and drawbacks. Multiple issues can arise in the field during the execution of a grid pattern. Knowing how to prepare for and negotiate these obstacles is valuable to all invasive plant managers.

**Author Bio:** Originally from Florida, David Solomon has worked in invasive species management for six years while on field crews with the National Park Service, U.S. Forest Service, and U.S. Fish & Wildlife Service all over the country. He currently co-leads a USFWS Invasive Species Strike Team in Eastern WA that works on seven national wildlife refuges, one national monument, and two Air Force bases.